

Please find enclosed Amendment 7, effective 5 November 2020, to Acceptable Solution E3/AS1, for Clause E3 Internal Moisture of the New Zealand Building Code. The previous amendment to the E3 Acceptable Solution (Amendment 6) was in January 2017.

<b>Section</b>	<b>Previous amendment</b>	<b>November 2020 Amendment 7</b>
Title page	Remove title page and document status and history pages 1–2B	Replace with new title page and document status and history pages 1–2B
Contents	Remove page 5/6	Replace with new page 5/6
References	Remove page 7/8	Replace with new page 7/8
Definitions	Remove page 9/10	Replace with new page 9/10
E3/AS1/Index	Remove pages 13-20	Replace with new pages 13–22





MINISTRY OF BUSINESS,  
INNOVATION & EMPLOYMENT  
HĪKINA WHAKATUTUKI

# Acceptable Solutions and Verification Methods

For New Zealand Building Code Clause  
**E3 Internal Moisture**



## Status of Verification Methods and Acceptable Solutions

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Defined words (italicised in the text) and classified uses are explained in Clauses A1 and A2 of the Building Code and in the Definitions at the start of this document.

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## New Zealand Government

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## Document Status

The most recent version of this document (Amendment 7), as detailed in the Document History, is approved by the Chief Executive of the Ministry of Business, Innovation and Employment. It is effective from 5 November 2020 and supersedes all previous versions of this document.

The previous version of this document (Amendment 6) will cease to have effect on 3 November 2021.

People using this document should check for amendments on a regular basis. The Ministry of Business, Innovation and Employment may amend any part of any Verification Method or Acceptable Solution at any time. Up-to-date versions of Verification Methods and Acceptable Solutions are available from [www.building.govt.nz](http://www.building.govt.nz)

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Amendment 3	14 October 2004	pp. 3 and 4 Code Clause	
Amendment 4	Effective from 10 October 2011 until 14 August 2014	p. 2, Document History, Status p. 7, References	p. 9, Definitions p. 13, E3/AS1 1.1.2
Amendment 5	14 February 2014 until 30 May 2017	p. 2A, Document History, Status p. 7, References	p. 9, Definitions p. 13, E3/AS1 1.1.4
Amendment 6	Effective from 1 January 2017 until 3 November 2021	p. 13 1.1.4	
Amendment 7	Effective from 5 November 2020	p. 5 Contents p. 7 References p. 10 Definitions	pp. 14–21 E3/AS12.0, 3.0, Figure 6 p. 22 Index
<b>Note: Page numbers relate to the document at the time of Amendment and may not match page numbers in current document.</b>			



# Contents

	<b>Page</b>
<b>References</b>	<b>7</b>
<b>Definitions</b>	<b>9</b>
<b>Verification Method E3/VM1</b>	<b>11</b>
<b>Acceptable Solution E3/AS1</b>	<b>13</b>
<b>1.0 Prevention of Fungal Growth</b>	<b>13</b>
1.1 Thermal resistance	13
1.2 Ventilation	14
1.3 Condensation control	14
<b>2.0 Overflow</b>	<b>14</b>
2.1 Containment	15
2.2 Floor wastes	15
<b>3.0 Watersplash</b>	<b>16</b>
3.1 Lining materials	16
3.2 Joints	16
3.3 Showers and urinals	17
<b>Index</b>	<b>22</b>

Amend 7  
Nov 2020





# References

For the purposes of New Zealand Building Code (NZBC) compliance, the Standards and documents referenced in this Verification Method and Acceptable Solution (primary reference documents) must be the editions, along with their specific amendments, listed below. Where these primary reference documents refer to other Standards or documents (secondary reference documents), which in turn may also refer to other Standards or documents, and so on (lower-order reference documents), then the version in effect at the date of publication of this Verification Method and Acceptable Solution must be used.

Amend 4  
Oct 2011Amend 5  
Feb 2014Amend 5  
Feb 2014

## Standards New Zealand

NZS 4214: 2006 Methods of determining the total thermal resistance of parts of buildings

Amend 4  
Oct 2011

## British Standards Institution

BS EN 274:- Waste fittings for sanitary appliances  
Part 2: 2002 Test methods

Amend 7  
Nov 2020

## Building Research Association of New Zealand

BRANZ House Insulation Guide: 1995

## Where quoted

AS1 Definitions,  
1.1.2

AS1 2.0.2

AS1 1.1.3



# Definitions

Amend 4  
Oct 2011

This is an abbreviated list of definitions for words or terms particularly relevant to this Verification Method and Acceptable Solution. The definitions for any other italicised words may be found in the New Zealand Building Code Handbook.

Amend 5  
Feb 2014

**Adequate** *Adequate* to achieve the objectives of the *building code*.

Amend 4  
Oct 2011

**Building** has the meaning given to it by sections 8 and 9 of the *Building Act 2004*.

**Building element** Any structural and non-structural component or assembly incorporated into or associated with a *building*. Included are *fixtures*, *services*, *drains*, permanent mechanical installations for access, glazing, partitions, ceilings and temporary supports.

**Concealed space** Any part of the space within a *building* that cannot be seen from an *occupied space*.

#### COMMENT:

This term includes any ceiling space, roof space, space under a raised floor (such as computer rooms, floors, or stages), plenums, spaces under a tiered floor, "left-over spaces" created when some structural element or the like has been covered in; small service or duct spaces within the volume of a *firecell* and the like, but not a protected shaft.

**Construct** in relation to a *building*, includes to build, erect, prefabricate, and relocate; and *construction* has a corresponding meaning.

**Fixture** An article intended to remain permanently attached to and form part of a *building*.

Amend 2  
July 2001

**Floor waste** An outlet located at the low point of a graded floor or in a level floor designed to receive accidental or intentional discharges.

**Habitable space** A space used for activities normally associated with domestic living, but excludes any bathroom, laundry, water-closet, pantry, walk-in wardrobe, corridor, hallway, lobby, clothes-drying room, or other space of a specialised nature occupied neither frequently nor for extended periods.

#### Household unit

a) means any *building* or group of *buildings*, or part of a *building* or group of *buildings*, that is:

- i) used, or intended to be used, only or mainly for residential purposes; and
- ii) occupied, or intended to be occupied, exclusively as the home or residence of not more than one household; but

b) does not include a hostel, boarding house or other specialised accommodation.

Amend 4  
Oct 2011

**Impervious** That which does not allow the passage of moisture.

**Insulating material** A material that has a thermal conductivity of less than 0.07 W/mK.

**Intended use** in relation to a *building*,—

(a) includes any or all of the following:

- (i) any reasonably foreseeable occasional use that is not incompatible with the *intended use*:
- (ii) normal maintenance:
- (iii) activities undertaken in response to *fire* or any other reasonably foreseeable emergency; but

(b) does not include any other maintenance and repairs or rebuilding.

**Person with a disability** means a *person* who has an impairment or a combination of impairments that limits the extent to which the *person* can engage in the activities, pursuits, and processes of everyday life, including, without limitation, any of the following:

- (a) a physical, sensory, neurological, or intellectual impairment:
- (b) a mental illness.

Amend 2  
Jul 2001Amend 4  
Oct 2011

**Plumbing system** Pipes, joints and fittings laid above ground and used for the conveyance of *foul water* to the *foul water* drain, and includes vent pipes.

**R-value** The common abbreviation for describing the values of both *thermal resistance* and *total thermal resistance*.

**Sanitary appliance** An appliance which is intended to be used for *sanitation*, but which is not a *sanitary fixture*. Included are machines for washing dishes and clothes

Amend 7  
Nov 2020

**Sanitary fixture** Any *fixture* which is intended to be used for *sanitation*.

**COMMENT:**

Toilets, urinals, bidets, baths, showers, basins, sinks and tubs are examples of common *sanitary fixtures*.

Amend 7  
Nov 2020

**Sanitation** The term used to describe the activities of washing and/or excretion carried out in a manner or condition such that the effect on health is minimised, with regard to dirt and infection.

**Thermal resistance** The resistance to heat flow of a given component of a *building element*. It is equal to the temperature difference (°C) needed to produce unit heat flux (W/m<sup>2</sup>) through unit area (m<sup>2</sup>) under steady conditions. The units are °Cm<sup>2</sup>/W.

**Total thermal resistance** The overall air-to-air *thermal resistance* across all components of a *building element* such as a wall, roof or floor. (This includes the surface resistances which may vary with environmental changes, e.g. temperature and humidity, but for most purposes can be regarded as having standard values as given in NZS 4214.)

# Acceptable Solution E3/AS1

## 1.0 Prevention of Fungal Growth

**1.0.1** Fungal growth (mildew) is avoided by minimising internal condensation.

Condensation is avoided or reduced by maintaining the correct balance between interior temperature and ventilation. Insulation assists in maintaining interior temperatures at a suitable level.

**1.0.2** The New Zealand Building Code does not specify minimum heating requirements except for old people's homes and early childhood centres. Occupants will determine their own methods and levels of heating. Typically it is necessary and sufficient, for condensation control in winter, to keep interior temperatures 5°C to 7°C above exterior temperatures in a ventilated space.

### 1.1 Thermal resistance

**1.1.1** *R-values* for walls, roofs and ceilings shall be no less than:

- For light timber frame wall or other framed wall *constructions* with cavities, 1.5.
- For single skin normal weight masonry based wall *construction* without a cavity, 0.6.
- For solid timber wall systems no less than 60 mm thick, 0.6.
- For roof or ceilings of any *construction*, 1.5.

**1.1.2** *R-values* shall be determined using the methods in NZS 4214. Laboratory test samples shall be truly representative of the wall, roof or ceiling system, including any provision for reducing thermal bridging.

#### 1.1.3 Materials and installation

The BRANZ House Insulation Guide provides examples of acceptable wall, roof and ceiling *constructions* to satisfy the requirements of Paragraph 1.1.1.

#### COMMENT:

The BRANZ House Insulation Guide gives *constructions* for a range of *R-values*. It is essential to choose the correct *R-values* from these shown in the tables in order to comply with this Acceptable Solution.

**1.1.4** For the *construction* to be acceptable:

- Building paper shall extend from the upper side of the top plate to the underside of the bearers or wall plates supporting the ground floor joists.
- Deleted
- There shall be no perimeter gaps between the *insulating material* and the framing members.
- Where steel framing is used in Housing and Communal Residential building uses a thermal break with a minimum *R-value* of 0.25 m<sup>2</sup>C/W shall be provided at the outside face of each steel framing member. Expanded polystyrene (EPS) strips, 10 mm thick provide an *R-value* of 0.25 m<sup>2</sup>C/W. Other materials or methods may be used to provide the minimum *R-value* of 0.25 m<sup>2</sup>C/W.
- If foil insulation is used it must be placed on the lining side of studs, not the cladding side.

Amend 5  
Feb 2014

Amend 5  
Feb 2014

#### COMMENT:

- Frame *construction* with 10 mm plaster board linings and a single layer of foil has an *R-value* of approximately 0.9 and does not satisfy Paragraph 1.1.1.
- Surface condensation can be a problem where vapour barriers are needed for *buildings* enclosing very warm or wet areas such as spa pools, saunas and swimming pools, or *buildings* in a very cold environment such as ski lodges and mountain huts. These situations are not covered by this Acceptable Solution and require specific design.
- Thermal breaks should be specifically designed for steel framed *buildings* that are not covered by Building Code Clause E3 Internal Moisture. That is where:
  - the *building* use is not *Housing* or *Communal Residential*, and
  - the moisture load is greater than in *Housing*, and the building use has high occupant moisture load (eg, schools), and
  - there is a temperature differential from inside to outside that is sufficient to cause condensation on steel framing members.

Amend 5  
Feb 2014

Amend 6  
Jan 2017

Amend 5  
Feb 2014

#### 1.1.5 Insulation for energy efficiency

Insulation satisfying the energy efficiency requirements of NZBC H1 cannot automatically be assumed to meet the *R-values* for internal moisture requirements of Paragraph 1.1.1.

Amend 4  
Oct 2011

**COMMENT:**

Insulation to prevent condensation relates to *thermal resistance* of the *building element* in question (e.g. wall or roof). Insulation for energy efficiency relates to the *building* as a whole, and the requirement can be met in different ways. It is possible, for example, to obtain sufficient energy efficiency in a *building* by heavily insulating the floor and ceiling with no insulation in the walls. This would not satisfy the requirement for this acceptable solution because there would not be sufficient insulation in the walls to minimise condensation.

**1.2 Ventilation**

**1.2.1** Ventilation shall be provided naturally or mechanically to comply with G4/AS1.

**1.3 Condensation control**

**1.3.1** In *buildings* classified as *Housing or Communal residential* which are not air conditioned, metal-framed windows with single glazing shall be *constructed* with a means of condensation disposal. An acceptable method is the provision of a condensation collection channel which, either discharges the water to the outside or is of sufficient capacity to hold the water, without overflowing, until it evaporates.

**1.3.2** Condensation channels shall have closed ends and no openings which permit ponded water to contact *building elements* susceptible to moisture. Where provision is made for drainage to the outside, drainage outlets shall have the capacity to expel all condensed water and shall have means of preventing condensed water from being blown back by wind pressure.

**1.3.3** Condensation channels and drainage outlets shall be able to be cleaned. The minimum clear dimensions of collection channels shall be 10 mm wide by 5 mm deep.

**COMMENT:**

1. Condensation can be reduced by good ventilation. Windows incorporating passive ventilators, particularly those with full perimeter ventilation, are effective in reducing condensation.
2. While a 10 mm condensation channel width is normally adequate to prevent overflowing, it is awkward to clean adequately. A more practical width is 20 mm.

**2.0 Overflow**

**2.0.1** If a *sanitary fixture* is located where accidental overflow could damage an adjoining *household unit or other property*, then either:

- a) Containment and *floor wastes* that meet the requirements of Paragraphs 2.1.1 and 2.2.1 shall be provided, or
- b) The exemption for household kitchen sinks and laundry tubs with integrated overflows that meet Paragraph 2.0.2 shall apply.

**2.0.2** Household kitchen sinks and laundry tubs that have an integrated overflow with a minimum flow rate of 0.25 l/s do not require additional overflow provision such as containment and a *floor waste* where:

- a) The maximum flow rate from the inlet tap(s) is less than the flow rate of the integrated overflow for that sink or tub, or
- b) The water supplies to the inlet tap(s) for that sink or tub are fitted with proprietary flow restrictors (such as cartridges) to limit the tap flow rate to less than the flow rate of the integrated overflow for the sink or tub.

Integrated overflows shall be tested and verified in accordance with BS EN 274 to determine their minimum flow rates.

**COMMENT**

Specifiers applying for building consents will need to demonstrate that integrated overflows have been tested and verified as meeting the minimum flow rate in accordance with BS EN 274. Manufacturers may be able to supply this information.

**2.0.2.1** For multiple tubs or sinks installed in a kitchen or laundry and served by a single tap, either:

- a) Each individual tub and sink shall have its own integrated overflow complying with Paragraph 2.0.2, or
- b) A secondary tub or sink shall have a controlled overflow path into a main tub or sink which has an integrated overflow complying with Paragraph 2.0.2.

Amend 7  
Nov 2020

**2.0.3** Containment and *floor wastes* are not required solely to account for the failure of a *sanitary appliance* component or hose, where the flexible discharge hose from the *sanitary appliance* can be directly connected into the *plumbing system* either by mechanical fastening to a fixture trap spigot, or by direct insertion into an open standpipe or a laundry tub waste hose connection port.

**COMMENT:**

This Acceptable Solution does not regard the failure of a component (e.g. a washer) or hose (e.g. burst hose) of a *sanitary appliance* as an accidental overflow.

Compliance of the spigot, open standpipe, or laundry tub waste hose connection port with NZBC Clause G13 Foul water is outside the scope of this Acceptable Solution.

Amend 7  
Nov 2020

**2.1 Containment**

**2.1.1** Containment provided to satisfy Paragraph 2.0.1 a) may be achieved by using *impervious* floor coverings which:

- a) Are continuous and coved or joints sealed where they meet the wall (See Figure 1), and

Amend 7  
Nov 2020

- b) Extend to the doorway and all walls of the room, or to at least 1.5 m from all *sanitary fixtures* and *sanitary appliances* in open-plan rooms.

**COMMENT**

Additional protection to adjoining *household units* and *other property* may be provided by the use of construction details that provide more complete prevention of the passage of overflow water at doorways and open plan areas. However, doing so will exceed the requirements of this Acceptable Solution.

Amend 7  
Nov 2020

**2.2 Floor wastes**

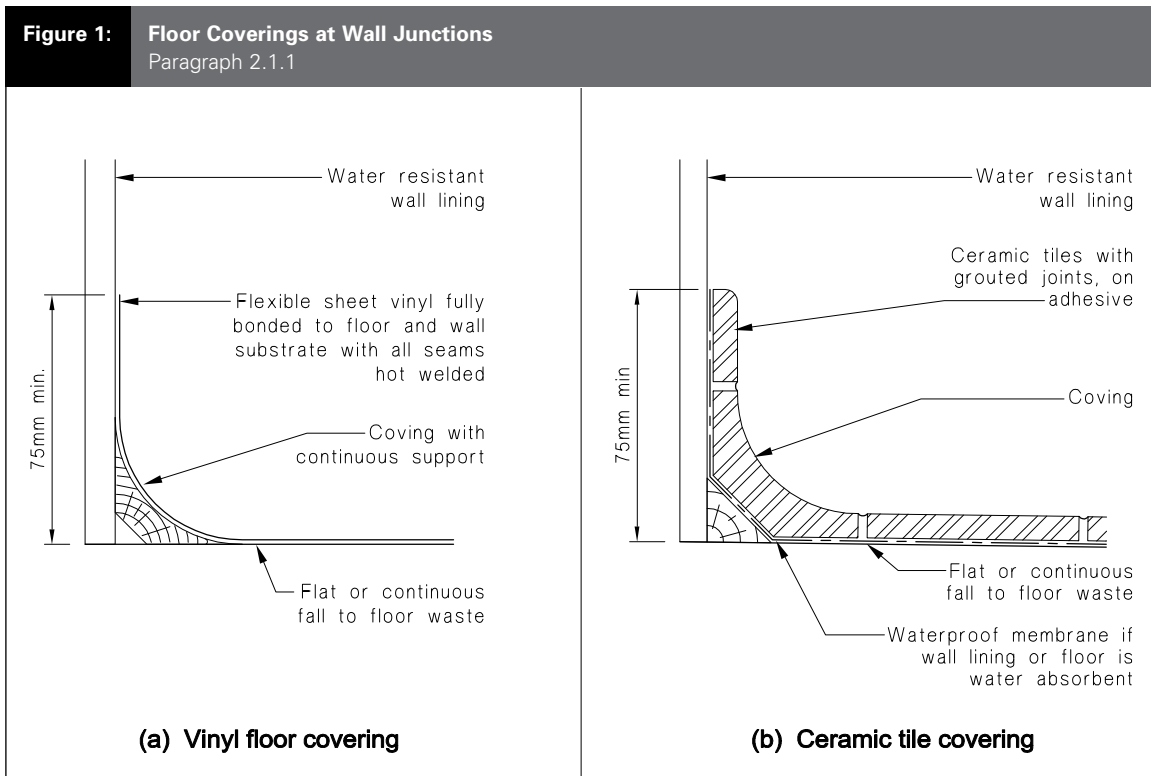
**2.2.1** *Floor wastes* provided to satisfy Paragraph 2.0.1 b) shall comply with NZBC Clause G13. A graded floor is not essential in this situation.

Amend 2  
Jul 2001

**COMMENT**

Acceptable Solutions G13/AS1 and G13/AS3 contain provisions for *floor wastes* that comply with NZBC Clause G13 Foul water.

Amend 7  
Nov 2020



### 3.0 Watersplash

#### 3.1 Lining materials

##### 3.1.1 Floors

The following finishes to floors satisfy the performance for *impervious* and easily cleaned surfaces in spaces containing *sanitary fixtures* or *sanitary appliances*. In open plan spaces this surface shall extend at least 1.5 m from all *sanitary fixtures* and *sanitary appliances*:

##### COMMENT

The requirement for *impervious* and easily cleaned floor surfaces applies to spaces such as kitchens, bathrooms, laundries and toilet facilities. This requirement applies regardless of whether containment is required by Paragraph 2.0.

Amend 7  
Nov 2020

- a) Integrally waterproof sheet material (e.g. polyvinylchloride) with sealed joints and sealed or coved at edges where watersplash may occur.
- b) Ceramic or stone tiles having 6% maximum water absorption, waterproof grouted joints, and bedded with an adhesive specified by the tile manufacturer as being suitable for the tiles, substrate material and the environment of use. Edges of the tiled area where watersplash may occur must be sealed or coved, and tiles must be laid on a continuous impervious substrate or a membrane specified by the manufacturer as being suitable for the tiles, substrate material and the environment of use.
- c) A slab-on-grade concrete floor having a steel trowel or polished finish, sealed at edges where watersplash may occur, when used in a domestic laundry within a garage, or in a *building* that contains only sanitary facilities.

##### COMMENT:

Other floor finishes may also be capable of satisfying the performance for *impervious* and easily cleaned, if installed in a manner that prevents gaps or cracks within the finish and at any parts of its perimeter that are exposed to watersplash, and/or if the surface is sealed with a suitable durable coating. However such other finishes are outside the scope of this Acceptable Solution.

Amend 7  
Nov 2020

Water can penetrate behind or under floor finishes in situations where watersplash occurs regularly (such as around shower enclosures or the fronts of built-in baths), unless these edges are sealed or coved.

Domestic laundries in garages, and *buildings* containing only sanitary facilities, are spaces where the consequences of any small imperfections (such as microcracking) in the imperviousness of a concrete floor are minimal and compliance with NZBC Clause E3 Internal moisture can still be demonstrated.

Amend 7  
Nov 2020

##### 3.1.2 Walls

The following linings and finishes to walls satisfy the performance for *impervious* and easily cleaned surfaces in areas adjacent to *sanitary fixtures* or *sanitary appliances*, or otherwise likely to be splashed in the course of the *intended use* of the *building*:

- a) Integrally waterproof sheet material (e.g. polyvinylchloride) with sealed joints.
- b) Ceramic or stone tiles having 6% maximum water absorption, waterproof grouted joints, and bedded with an adhesive specified by the tile manufacturer as being suitable for the tiles, substrate material and the environment of use.
- c) Sheet linings finished with a semi-gloss or gloss coating or a hard-wearing low-sheen latex paint containing mould inhibitors.
- d) Water resistant sheet linings finished with decorative high pressure laminate or factory applied polyurethane or resin, and installed with *impervious* joints (see Figure 2).

Amend 7  
Nov 2020

Amend 7  
Nov 2020

##### COMMENT:

Other wall linings and finishes may also be capable of satisfying the performance for *impervious* and easily cleaned, if installed in a manner that prevents gaps or cracks within the finish and at any parts of its perimeter that are exposed to water splash, and/or if the surface is sealed with a suitable durable coating. However such other finishes are outside the scope of this Acceptable Solution.

Amend 7  
Nov 2020

### 3.2 Joints

#### 3.2.1 Joints between sanitary fixtures and impervious floor finishes

Where *sanitary fixtures* abut *impervious* floor finishes, the base of the fixture must be sealed to the *impervious* floor finish.

Amend 7  
Nov 2020



**3.2.2 Joints between fixtures and wall linings**

Where baths, basins, tubs or sinks abut *impervious* linings, the joint between *fixture* and lining shall be sealed to prevent water penetration to *concealed spaces* or behind linings. (See Figures 3 (a) and (b).)

**3.3 Showers and urinals**

**3.3.1 Showers**

All shower spaces shall have *impervious* floors or floor finishes and *impervious* wall linings or wall finishes.

The *impervious* shower wall linings or wall finishes shall extend up the wall to the higher of 1800 mm above the shower floor, or 50 mm above the shower rose.

The top edge of *impervious* shower wall linings or wall finishes shall be sealed to the wall behind (or to the ceiling if full height) to prevent condensation penetrating behind the shower wall linings or wall finishes.

Penetrations in the shower wall for tapware, mixers, roses etc. shall be waterproofed with a proprietary flange system or with sealant (refer Figure 6), installed in a way that allows easy access when replacing washers, ceramic discs and o-rings.

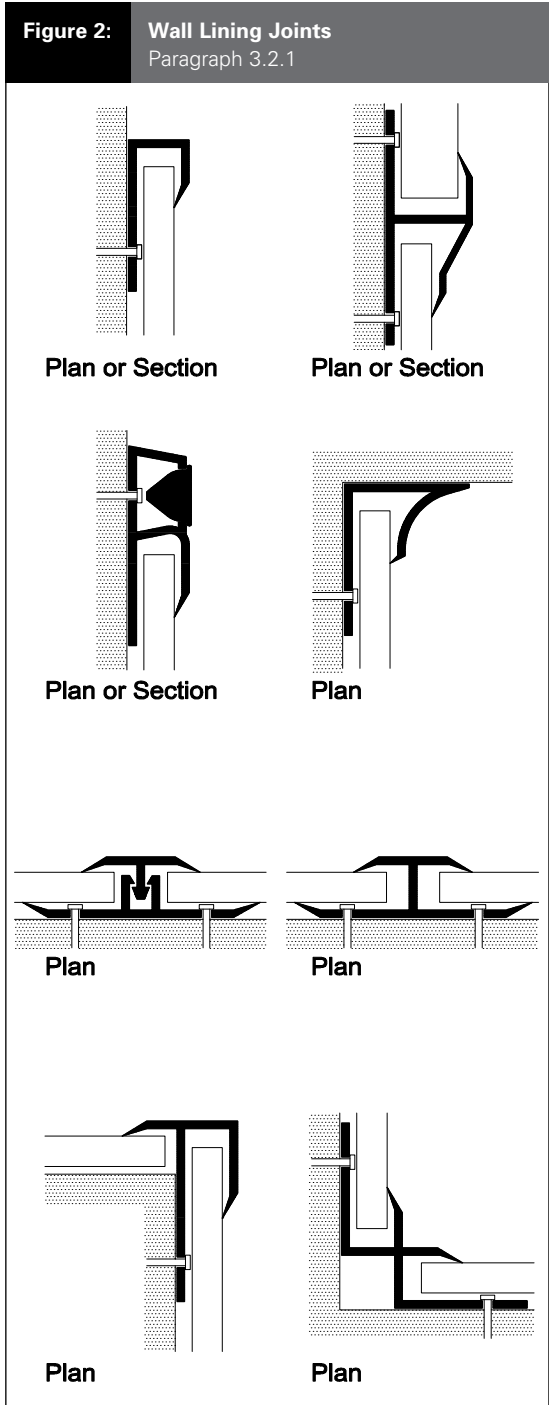
**COMMENT**

Some tapware manufacturers have specific product installation requirements that are additional to the use of sealant around the tapware penetration.

**3.3.1.1 Shower floor materials**

Within shower enclosures, or within a 1500 mm horizontal radius from the shower rose where there is no shower enclosure such as a wall, screen, door or curtain (see Figure 5), one of the following materials or finishes to floors shall be used:

- a) Plastic or stainless steel shower trays
- b) Integrally waterproof sheet material (e.g. polyvinylchloride) with sealed joints, and coved at edges
- c) Ceramic or stone tiles having 6% maximum water absorption, waterproof grouted joints, and bedded with an adhesive specified by the tile manufacturer as being suitable

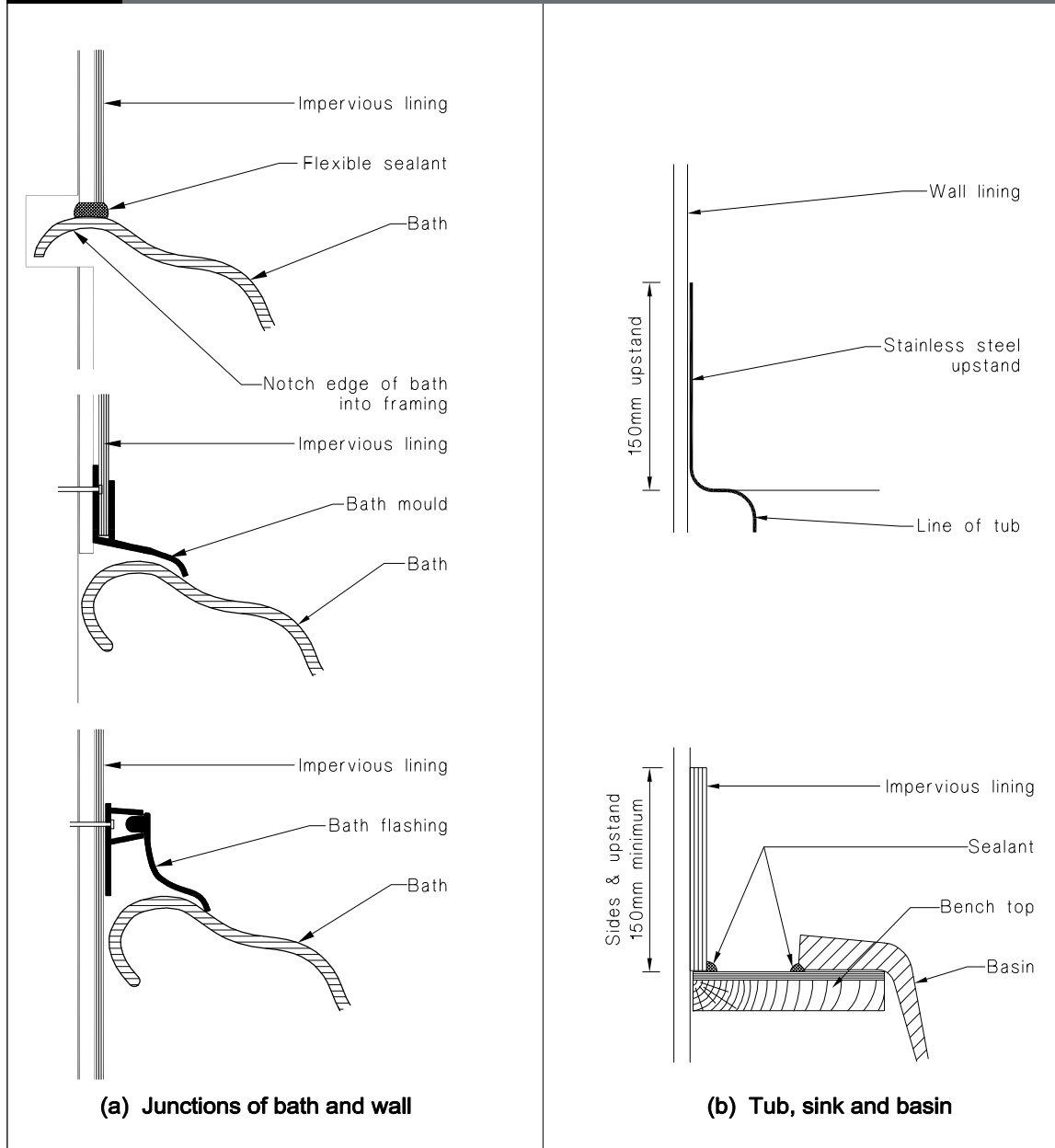


for the tiles, substrate material and the environment of use. The shower must also have tiled walls (see Paragraph 3.3.1.2 c)), and tiles must be laid either:

- i) Within a shower tray specified by the manufacturer as being suitable for the tiles; or

Amend 7  
Nov 2020

**Figure 3: Baths, Basins, Tubs and Sinks, Joints against Wall Linings**  
Paragraph 3.2.2



- ii) On a membrane specified by the manufacturer as being suitable for the tiles, substrate material and the environment of use.

### 3.3.1.2 Shower wall lining and finish materials

Within shower enclosures or within a 1500 mm horizontal radius from the shower rose where there is no shower enclosure such as a wall, screen, door or curtain (see Figure 5), one of the following linings and finishes to walls shall be used:

- a) Plastic shower wall liners, either as a single component without joints, or installed with waterproof joints
- b) Integrally waterproof sheet material (e.g. polyvinylchloride) with sealed joints.
- c) Ceramic or stone tiles having 6% maximum water absorption, waterproof grouted joints, and bedded with an adhesive specified by the tile manufacturer as being suitable for the tiles, substrate material and the environment of use. Tiles must be laid on a membrane specified by the manufacturer as being suitable for the tiles, substrate material and the environment of use.
- d) Water resistant sheet linings finished with decorative high pressure laminate or factory applied polyurethane or resin, and installed with impervious joints (see Figure 2).

### 3.3.1.3 Showers over baths

For showers over baths, the bath rim must have a minimum height of 15 mm, and the shower wall lining shall lap over and be sealed to the rim of the bath. Either the bath rim must be recessed into the wall framing, or the shower lining must be packed out to suit the rim. A bath mould or flashing shall not be used for showers over baths.

#### COMMENT

Notches to recess the rim of a bath into the wall framing may require the use of over-sized framing members to ensure that the notches do not detrimentally affect structural performance of the wall.

Amend 7  
Nov 2020

### 3.3.2 Shower enclosures

Shower floors and bases may be constructed with or without upstands, and where installed for use by *people with disabilities* shall have level thresholds.

**3.3.2.1** When enclosures, such as walls, screens, doors or curtains are used they shall be continuous from floor level or top of upstand to 1800 mm minimum above floor level and not less than 50 mm above the shower rose.

Amend 7  
Nov 2020

**3.3.2.2** Where shower trays are used, the junction between tray and wall linings shall be constructed in accordance with Figure 4 (a) or (b).

Amend 7  
Nov 2020

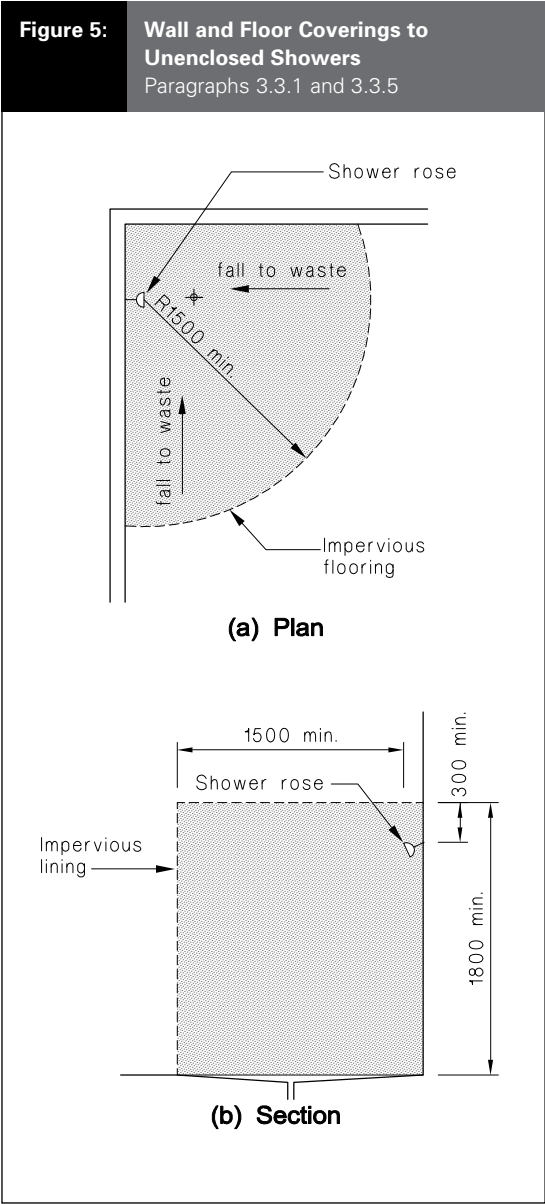
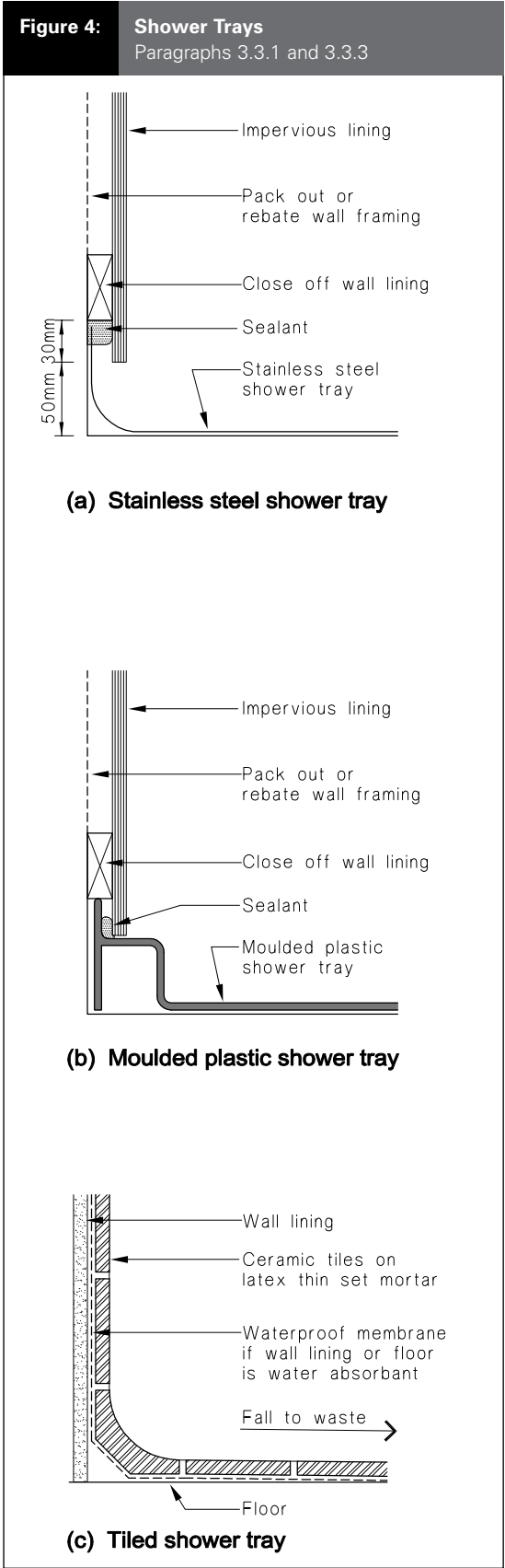
**3.3.2.3** Where the shower floor has no upstand or where a wall, screen, door or curtain is omitted, the floor shall have a fall of no less than 1:50 towards the *floor waste*. The fall shall apply to the floor area within a radius of 1500 mm taken from a point vertically below the shower rose, or from any wall within that radius. (See Figure 5.)

Amend 7  
Nov 2020

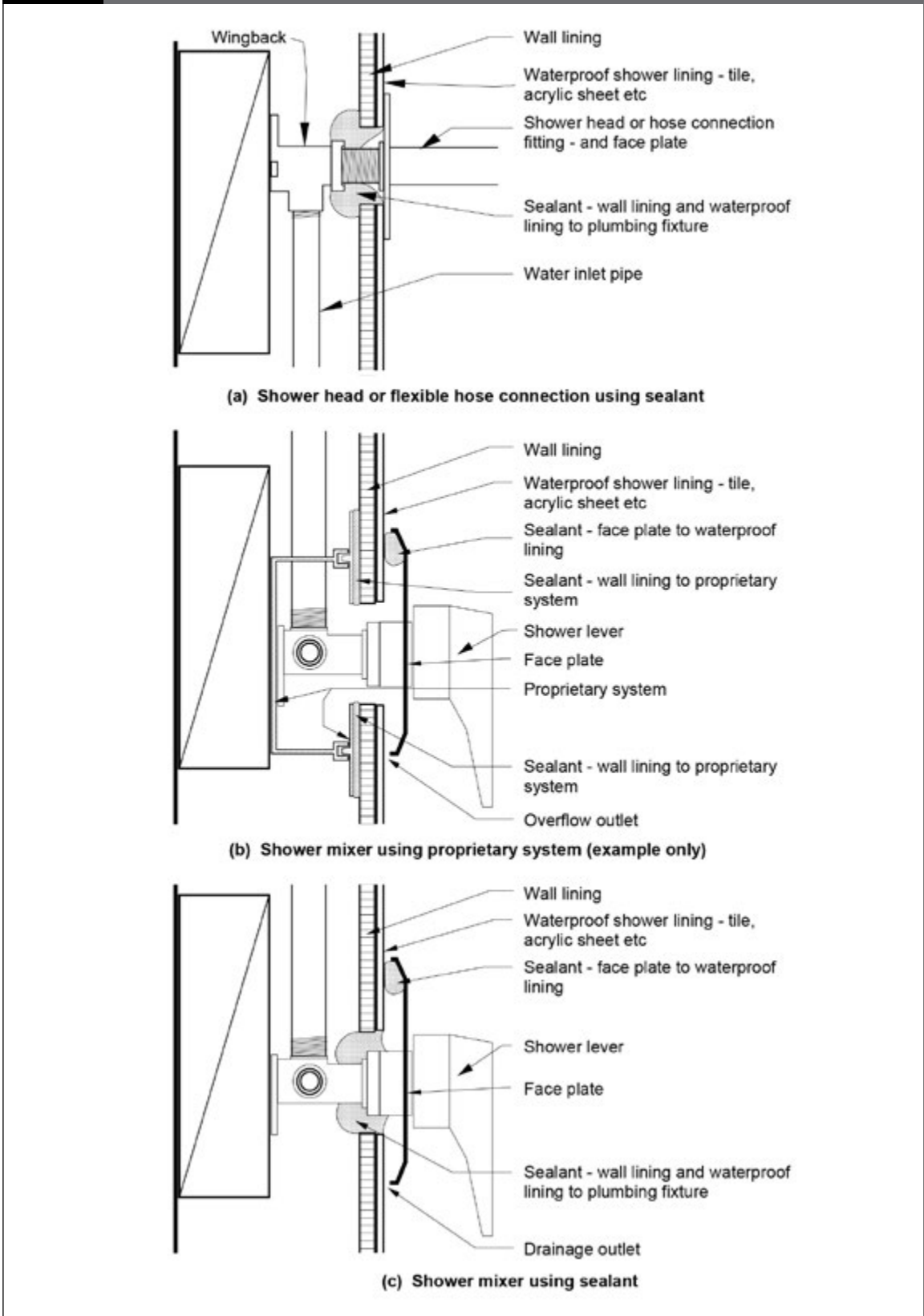
### 3.3.3 Urinals

*Impervious* wall shall extend horizontally at least 300 mm beyond each side of the urinal and vertically from floor level to a height of 1500 mm.

Amend 7  
Nov 2020



**Figure 6:** Examples for waterproofing through shower walls  
Paragraph 3.3.1



Amend 7  
Nov 2020

# Index

All references to Verification Methods and Acceptable Solutions are preceded by **VM** or **AS** respectively.

<b>Condensation channels</b> .....	<b>AS1</b> 1.3
<b>Energy efficiency</b> .....	<b>AS1</b> 1.1.5
<b>Internal moisture</b>	
condensation .....	<b>AS1</b> 1.0.1, 1.1.5, 1.3
fungal growth .....	<b>AS1</b> 1.0.1
<b>Overflow</b> .....	<b>AS1</b> 2.0
containment .....	<b>AS1</b> 2.0.1, 2.0.2, 2.0.3, 2.1, Figure 1
floor wastes .....	<b>AS1</b> 2.0.1, 2.0.2, 2.0.3, 2.2
<b>People with disabilities</b> .....	<b>AS1</b> 3.3.2
<b>Steel framing</b> .....	<b>AS1</b> 1.1.4 d)
<b>Thermal break</b> .....	<b>AS1</b> 1.1.4 d)
<b>Thermal resistance</b> .....	<b>AS1</b> 1.1
materials and installation .....	<b>AS1</b> 1.1.3
<b>Ventilation</b> .....	<b>AS1</b> 1.0.1, 1.2
<b>Watersplash</b> .....	<b>AS1</b> 3.0
basins .....	<b>AS1</b> 3.2.2, Figure 3
baths .....	<b>AS1</b> 3.2.2, Figure 3
joints in linings .....	<b>AS1</b> 3.2, Figure 2
lining materials .....	<b>AS1</b> 3.1, Figure 1
sinks .....	<b>AS1</b> 3.2.2, Figure 3
showers .....	<b>AS1</b> 3.3.1, 3.3.2, Figures 4, 5 and 6
tubs .....	<b>AS1</b> 3.2.2, Figure 3
urinals .....	<b>AS1</b> 3.3.3
<b>Windows</b> .....	<b>AS1</b> 1.3.1

Amend 7  
Nov 2020

Amend 7  
Nov 2020

Amend 7  
Nov 2020