MINISTRY OF BUSINESS,
INNOVATION & EMPLOYMENT
HĪKINA WHAKATUTUKI

Acceptable Solutions and Verification Methods

For New Zealand Building Code Clause
E3 Internal Moisture

E3
BUILDING CODE

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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Verification Methods and Acceptable Solutions are available from www.building.govt.nz

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Document Status

The most recent version of this document (Amendment 6), as detailed in the Document History, is approved by the Chief Executive of the Ministry of Business, Innovation and Employment. It is effective from 1 January 2017 and supersedes all previous versions of this document.

The previous version of this document (Amendment 5) will cease to have effect on 30 May 2017.

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E3: Document History			
	Date	**Alterations**	
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2B

New Zealand Building Code Clause E3 Internal Moisture

This Clause is extracted from the New Zealand Building Code contained in the First Schedule of the Building Regulations 1992.

FIRST SCHEDULE–*continued*

Clause E3–INTERNAL MOISTURE

Provisions	Limits on application
OBJECTIVE	
E3.1 The objective of this provision is to–	
(a) Safeguard people against illness, injury, or loss of *amenity* that could result from the accumulation of internal moisture; and	
(b) Protect household units and other property from damage caused by free water from another household unit in the same building.	
FUNCTIONAL REQUIREMENT	
E3.2 *Buildings* must be constructed to avoid the likelihood of–	
(a) Fungal growth or the accumulation of *contaminants* on linings and other *building elements*; and	
(b) Free water overflow penetrating to an adjoining *household unit*; and	
(c) Damage to *building elements* being caused by the presence of moisture.	
PERFORMANCE	
E3.3.1 An *adequate* combination of *thermal resistance*, ventilation, and space temperature must be provided to all *habitable spaces*, bathrooms, laundries, and other spaces where moisture may be generated or may accumulate.	Performance E3.3.1 does not apply to *Communal Non-residential, Commercial, Industrial, Outbuildings* or *Ancillary buildings.*
E3.3.2 Freewater from accidental overflow from *sanitary fixtures* or *sanitary appliances* must be disposed of in a way that avoids loss of *amenity* or damage to *household units* or *other property*.	
E3.3.3 Floor surfaces of any space containing *sanitary fixtures* or *sanitary appliances* must be *impervious* and easily cleaned.	

Amend 3 Oct 2004

FIRST SCHEDULE–*continued*

Provisions	Limits on application
E3.3.4 Wall surfaces adjacent to *sanitary fixtures* or *sanitary appliances* must be *impervious* and easily cleaned.	
E3.3.5 Surfaces of *building elements* likely to be splashed or become contaminated in the course of the *intended use* of the *building*, must be *impervious* and easily cleaned.	
E3.3.6 Surfaces of *building elements* likely to be splashed must be constructed in a way that prevents water splash from penetrating behind linings or into *concealed spaces*.	

Amend 3
Oct 2004

Contents

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 5 Feb 2014

Amend 4 Oct 2011

Amend 5 Feb 2014

		Where quoted
Standards New Zealand		
NZS 4214: 2006	Methods of determining the total thermal resistance of parts of buildings	AS1 Definitions, 1.1.2
Building Research Association of New Zealand		
BRANZ House Insulation Guide: 1995		AS1 1.1.3

Amend 4 Oct 2011

Definitions

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 4 Oct 2011

Amend 5 Feb 2014

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

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

Amend 4 Oct 2011

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*.

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.

Amend 2 July 2001

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 2001

Amend 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 fixture Any *fixture* which is intended to be used for *sanitation*. **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^2) through unit area (m^2) under steady conditions. The units are $°Cm^2/W$.

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.)

Verification Method E3/VM1

No specific methods have been adopted for verifying compliance with the Performance of NZBC E3.

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:

a) For light timber frame wall or other framed wall *constructions* with cavities, 1.5.

b) For single skin normal weight masonry based wall *construction* without a cavity, 0.6.

c) For solid timber wall systems no less than 60 mm thick, 0.6.

d) For roof or ceilings of any *construction*, 1.5.

Amend 4 Oct 2011

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:

a) 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.

b) Deleted

Amend 5 Feb 2014

c) There shall be no perimeter gaps between the *insulating material* and the framing members.

d) Where steel framing is used in Housing and Communical Residential building uses a thermal break with a minimum *R-value* of 0.25 m^2°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^2°C/W. Other materials or methods may be used to provide the minimum *R-value* of 0.25 m^2°C/W.

Amend 5 Feb 2014

e) If foil insulation is used it must be placed on the lining side of studs, not the cladding side.

COMMENT:

Amend 5 Feb 2014

1. 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.
2. 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.
3. Thermal breaks should be specifically designed for steel framed *buildings* that are not covered by Building Code Clause E3 Internal Moisture. That is where:
   i) the *building* use is not *Housing* or *Communal Residential*, and
   ii) the moisture load is greater than in Housing, and the building use has high occupant moisture load (eg, schools), and
   iii) there is a temperature differential from inside to outside that is sufficient to cause condensation on steel framing members.

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.

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*, containment and a *floor waste* shall be provided.

2.1 Containment

2.1.1 Containment may be achieved by using *impervious* floor coverings which are continuous and coved or joints sealed where they meet the wall. (See Figure 1.)

2.2 Floor wastes

2.2.1 *Floor wastes* shall comply with G13/AS1 Paragraph 3.4.3 c), but a graded floor is not essential in this situation.

Amend 2 Jul 2001

3.0 Watersplash

3.1 Lining materials

3.1.1 Floors

The following linings and finishes to floors satisfy the performance for *impervious* and easily cleaned surfaces in areas exposed to watersplash:

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.

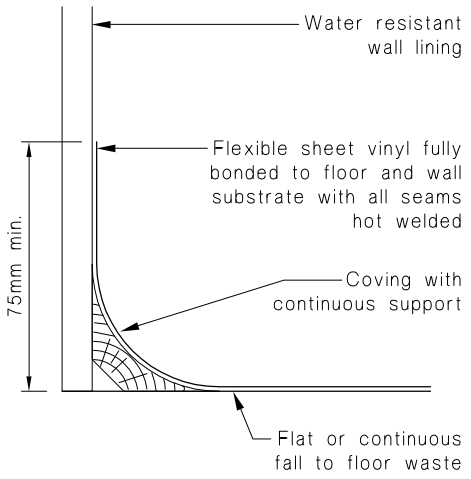
c) Cement based solid plaster or concrete having a steel trowel or polished finish, (semi-gloss or gloss paint must be used if a paint finish is required).

d) Cork tile or sheet sealed with waterproof applied coatings and with sealed joints.

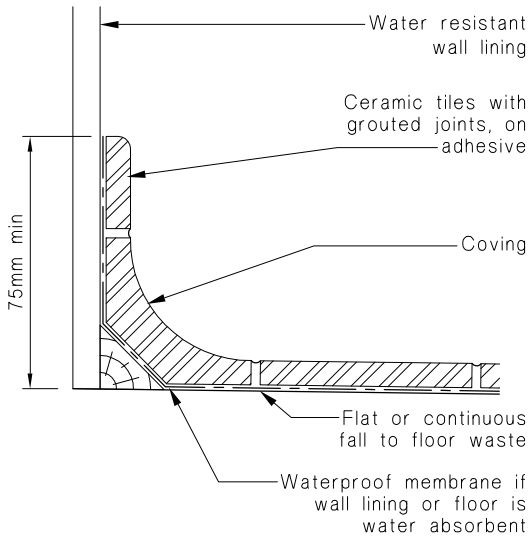
e) Monolithic applied coatings having a polished non-absorbent finish (e.g. terrazzo).

f) A timber or timber based product such as particleboard sealed with waterproof applied coatings.

Figure 1: Floor Coverings at Wall Junctions
Paragraph 2.1.1



(a) Vinyl floor covering



(b) Ceramic tile covering

COMMENT:
In domestic situations where the bathroom is used mainly by adults, carpet may be acceptable provided it is laid over an *impervious* surface. In these circumstances a particleboard floor finished with three coats of polyurethane would be considered *impervious*.

3.1.2 Walls

The following linings and finishes to walls satisfy the performance for *impervious* and easily cleaned surfaces in areas exposed to watersplash:

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) Cement based solid plaster or concrete having a steel trowel or polished finish (semi-gloss or gloss paint must be used if a paint finish is required).

d) Cork tile or sheet sealed with waterproof applied coatings.

e) Monolithic applied coatings having a polished non-absorbent finish (e.g. terrazzo).

f) Sheet linings finished with vinyl coated wallpaper, or semi-gloss or gloss coating.

g) Water resistant sheet linings finished with decorative high pressure laminate or factory applied polyurethane or resin.

h) Modular or multiple lining units which are themselves *impervious* and easily cleaned, and are installed with *impervious* joints.

i) Timber or timber based products such as particleboard sealed with waterproof applied coatings.

3.2 Joints

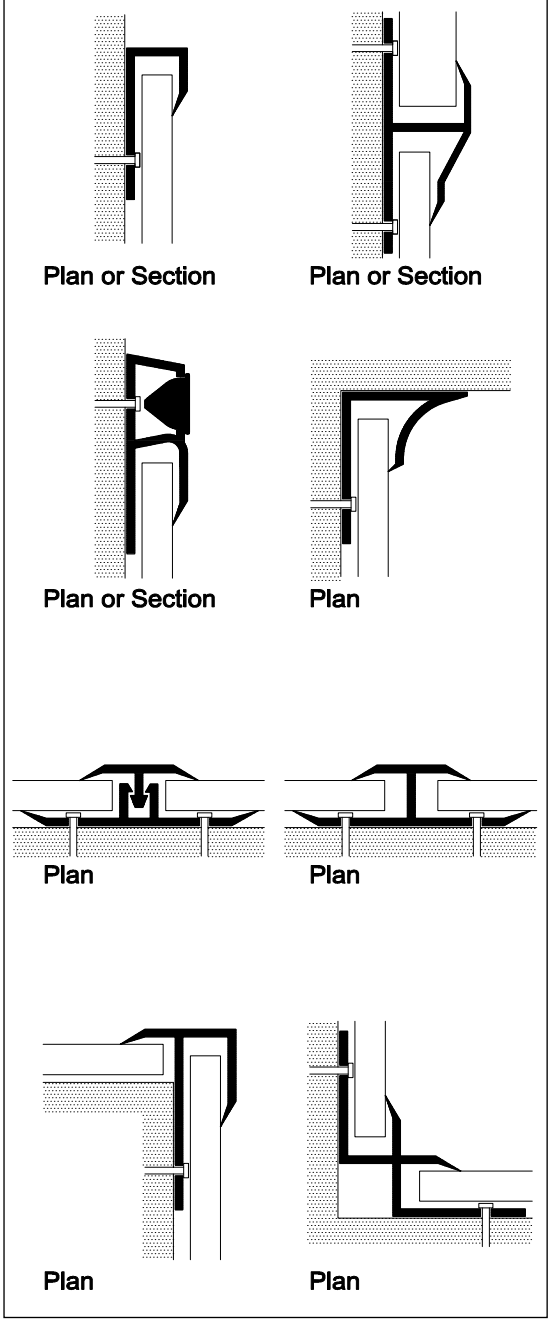
3.2.1 Linings

Where walls and ceilings to sanitary rooms are lined with modular or multiple lining sheets (see Figure 2), the lining system shall:

a) Have *impervious* joints, or

b) Be fixed over an *impervious* substrate.

Figure 2: **Wall Lining Joints**
Paragraph 3.2.1



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* floor and wall finishes. Lining materials and finishes listed in Paragraphs 3.1.1 and 3.1.2 satisfy this requirement except that within shower enclosures or a 1500 mm horizontal radius from the shower rose where there is no shower enclosure (see Figure 5):

a) The following materials shall not be used:

   i) Cork tile or sheet sealed with waterproof applied coatings,

   ii) Sheet linings finished with vinyl coated wallpaper, or semi-gloss or gloss coating.

b) Ceramic or stone tile finishes shall be laid on a continuous *impervious* substrate or membrane. (See Figure 4 (c).)

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.

3.3.3 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 300 mm above the shower rose.

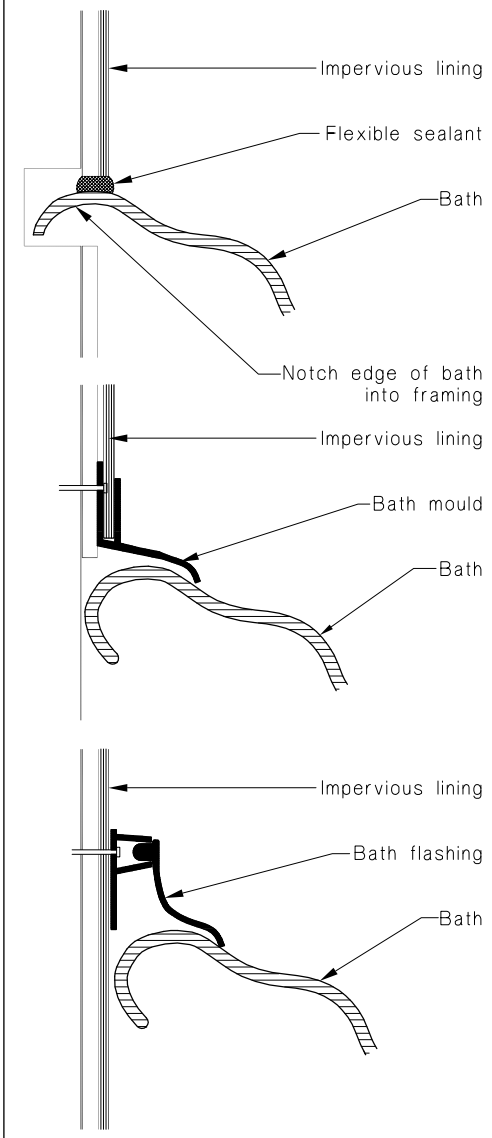
3.3.4 Where shower trays are used, the junction between tray and wall linings shall be constructed in accordance with Figure 4 (a) or (b).

3.3.5 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.)

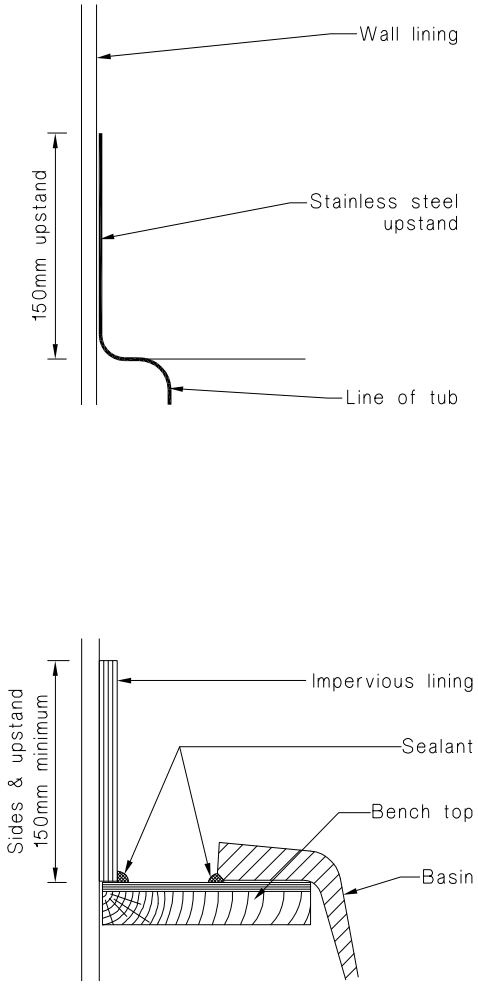
3.3.6 Urinals

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.

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

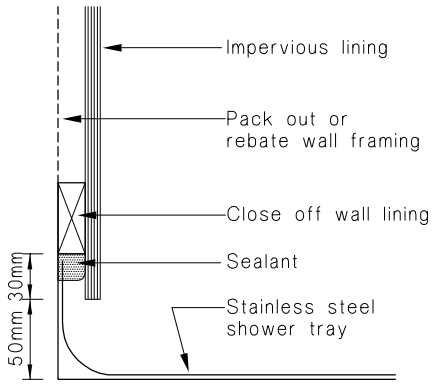


(a) Junctions of bath and wall

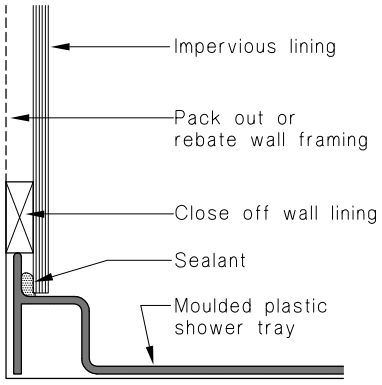


(b) Tub, sink and basin

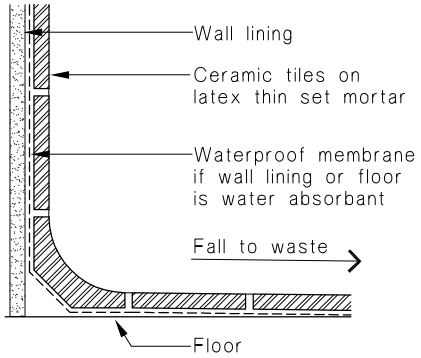
Figure 4: **Shower Trays**
Paragraphs 3.3.1 and 3.3.3



(a) Stainless steel shower tray

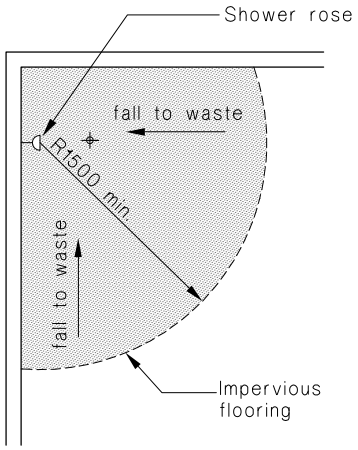


(b) Moulded plastic shower tray

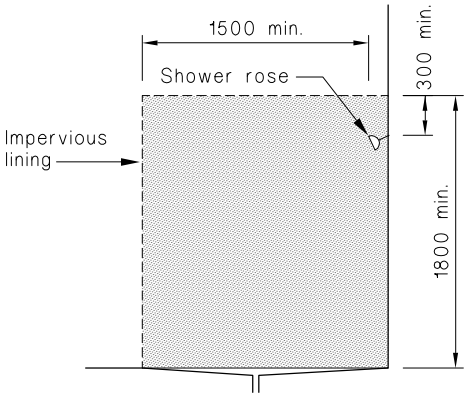


(c) Tiled shower tray

Figure 5: **Wall and Floor Coverings to Unenclosed Showers**
Paragraphs 3.3.1 and 3.3.5



(a) Plan



(b) Section

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