

ISSUE591 **BULLETIN**



WATERPROOFING TILED SHOWERS

June 2016

■ Tiled showers require good detailing and application of waterproof membranes plus careful plumbing installation to remain in good condition.

■ Poor work can result in failures, leaks and potentially expensive repairs.

■ This bulletin explains the requirements and good practices for effective waterproofing of tiled showers.

1.0 INTRODUCTION

1.0.1 While many New Zealand showers have been constructed from formed acrylic or stainless steel units, fully tiled showers or wet areas have become the preferred option.

1.0.2 Tiling with cement-based grouts is not inherently waterproof. A waterproof membrane must be applied over any absorbent substrate in a shower space before tiles are installed.

1.0.3 There is evidence of significant problems with leaks in tiled showers in New Zealand. Leaks can cause serious damage to linings and framing, and this may not be noticed for some time. The problem is often not seen in the bathroom first but in an area such as the wardrobe of an adjacent bedroom.

1.0.4 Common causes of leaks include:

- poor waterproof membrane detailing, particularly at transitions such as floor to wall, wet area to dry area and hob to wall and around drains
- poor application, such as insufficient curing time for liquid-applied membranes
- insufficient membrane thickness
- a membrane already installed being damaged by following trades
- poor plumbing work damaging the waterproofing
- incorrect installation of shower mixer units or floor drains.

1.0.5 Tiled showers must meet certain functional and performance requirements of New Zealand Building Code (NZBC) clause E3 *Internal moisture*.

1.0.6 Installing a tiled wet area shower requires a building consent. (Only replacing an existing shower with a stand-alone or ready-made shower is exempt from consent requirements under Schedule 1 of the Building Act 2004.)

1.0.7 In all cases, manufacturers' instructions should be followed in the selection and application of their products. For warranties to apply, waterproof membranes must usually be bought as a system and applied by trained and approved applicators.

1.0.8 Waterproofing internal wet areas is not specifically covered in the Licensed Building Practitioners Scheme and does not fall under the definition of restricted building work.

1.0.9 This bulletin is not a comprehensive review of tiling or wet areas but focuses on achieving effective waterproofing in tiled showers. However, a number of the principles apply to the waterproofing of tiled wet areas in buildings, such as bathrooms and kitchens.

2.0 NZBC REQUIREMENTS

2.0.1 NZBC clause E3 *Internal moisture* sets out the functional requirements for buildings. They must be

constructed to avoid the likelihood of:

- fungal growth or the accumulation of contaminants on linings and other building elements
- free water overflow penetrating to an adjoining household unit
- damage to building elements being caused by the presence of moisture.

2.0.2 The clause also includes performance requirements:

- Floor surfaces of any space containing sanitary fixtures or sanitary appliances, or wall surfaces adjacent to these fixtures or appliances, must be impervious and easily cleaned.
- Surfaces of building elements likely to be splashed must be impervious and easily cleaned. They must be constructed in a way that prevents water splash from penetrating behind linings or into concealed spaces.

2.0.3 The NZBC therefore requires showers to be waterproofed so water cannot penetrate behind linings or into concealed spaces.

2.0.4 Under NZBC clause B2 *Durability*, waterproofing systems under wet area tiling must have a durability of at least 15 years.

2.1 ACCEPTABLE SOLUTION E3/AS1

2.1.1 Acceptable Solution E3/AS1 has very limited content, so building consent applications for tiled showers must demonstrate compliance as an alternative method/Alternative Solution.

2.1.2 Points in E3/AS1 relating to tiled showers that may still be considered include the following:

- Tiles must have a maximum water absorbency of 6%.
- All shower spaces shall have impervious floor and wall finishes. Ceramic or stone tile finishes shall be laid on a continuous impervious substrate or membrane.
- If a sanitary fixture is located where accidental overflow could damage an adjoining household unit, containment and a floor waste shall be provided.
- Containment may be achieved by using impervious floor coverings that are continuous and coved or joints sealed where they meet the wall.
- Floor wastes shall comply with the Acceptable Solution to NZBC clause G13 *Foul water* G13/AS1.
- 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 showerhead.
- 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 showerhead or from any wall within that radius.

3.0 STANDARDS

3.1 AS/NZS 4858:2004 WET AREA MEMBRANES

3.1.1 AS/NZS 4858:2004 *Wet area membranes* sets out the performance and general test requirements for membranes used in waterproofing wet areas in residential buildings.

3.1.2 The standard has pass/fail tests for membrane immersion in water, household-strength bleach and detergent and the effect of heat ageing. Membranes are also assessed for moisture vapour transmission, water absorption, acceptance of cyclic movement and suitability for use over certain types of substrate. Materials that pass the tests satisfy the performance requirements of the standard.

3.1.3 AS/NZS 4858:2004 divides membranes into three classes (I, II and III) based on their elastic properties:

- Class I is low extensibility – these are the least flexible membranes (they are described in some documents as ‘rigid’) and are best suited to substrates with relatively little movement, such as concrete slabs.
- Class III is high extensibility – these membranes cope with the greatest movement and are suitable for timber-framed and timber floor construction where there may be more movement.
- Class II falls between I and III.

3.1.4 AS/NZS 4858:2004 requires allowance for joint movement. Bond breaker tape must be wide enough to bridge joints that open up by 5 mm. The minimum width is:

- for class I membranes – 100 mm tape for wall junctions and 75 mm tape with backing rod for wall/floor junctions
- for class II membranes – 35 mm
- for class III membranes – 12 mm sealant fillet.

3.1.5 Although AS/NZS 4858:2004 is not mandatory and is not referenced by E3/AS1, BRANZ recommends using only membranes that comply with the standard.

3.2 AS 3740-2010 WATERPROOFING OF DOMESTIC WET AREAS

3.2.1 AS 3740-2010 *Waterproofing of domestic wet areas* gives minimum requirements for materials, designs and installations. It states that membranes that meet the requirements of AS/NZS 4858:2004 are deemed to be waterproof.

3.2.2 The standard has informative appendices:

- Appendix A covers design considerations.
- Appendix C covers the recommended extent of waterproofing.
- Table C1 sets out waterproofing and water resistance requirements for building elements in wet areas.

3.2.3 This standard is not mandatory and not referenced in E3/AS1, but it is good practice to follow it.

4.0 CODE OF PRACTICE FOR INTERNAL WET AREA MEMBRANES

4.0.1 This document was published in 2014 by the Waterproofing Membrane Association NZ Inc. – a group of manufacturers, importers and applicators. It covers membrane selection, design and installation.

4.0.2 Some general requirements in the code of practice are:

- any membrane used in a wet area must comply with AS/NZS 4858:2004
- all components in a membrane system must come from the same supplier
- all wet areas containing a water supply must be protected with a membrane, be contained by a waterstop and have all penetrations sealed
- particleboard must not be used as a new substrate in any wet area
- all waterproofing membranes must be installed by or under the supervision of a registered, certified or approved applicator.

5.0 WATERPROOF MEMBRANES

5.0.1 Because ceramic tiles with cement-based or epoxy-based grouts are not impervious, a waterproof membrane must be installed on the walls and floor behind and underneath the tiling. The only exception is a steel-trowelled or polished concrete substrate, which is regarded as impervious.

5.0.2 The most commonly used tile waterproofing systems for internal wet areas are either liquid applied or sheets. Sheet membranes are often self-adhesive. While joints are self-adhesive too, they require rolling with a heavy roller to ensure effective waterproofing.

5.0.3 Membranes available in New Zealand:

- Liquid applied, including:
 - styrene butadiene styrene copolymer latex admixtures (SBRs)
 - polymer (acrylic) gels or pastes
 - acrylic or latex-modified cementitious coatings
 - waterborne elastomeric moisture cure polyurethane-acrylic
 - one-part polyurethane coatings
 - polyurethane-modified acrylics or polyurethane dispersions
 - epoxy/polyaminoamides.
- Sheets or rolls, including:
 - fleece-coated polyethylene mat
 - SBS-modified rubberised asphalt
 - synthetic thermoplastic (weldable joints) membrane.
- Prefabricated metal or acrylic trays – designed for floor use under a mortar bed or directly under tiles.
- Flexible reinforced polyester resin base systems – typically consist of a flexible polyester resin hardened with a catalyst and reinforced with glass-fibre matting, finished with a catalyst-hardened polymer to provide the finished surface.

5.1 LIQUID MEMBRANES

5.1.1 Liquid membranes may be used on floor substrates of concrete, compressed fibre-cement sheet, fibre-cement sheet tile underlay and plywood (treated to H3 with CCA, not LOSP).

5.1.2 Under the Waterproofing Membrane Association's code of practice, flooring-grade particleboard is not permitted as a new substrate in any wet area. NZS 3602:2003 *Timber and wood-based products for use in building* recommends H3 treated plywood rather than particleboard in this situation. Use of particleboard is at the building consent authority's discretion. Note that:

- if particleboard is used, it should be H3.1 treated
- particleboard manufacturers require the whole wet area floor to be waterproofed, including under baths and vanities
- if tiling work is over an existing particleboard floor, the code of practice requires the floor to be overlaid with a compressed/reconstituted sheet before the membrane is installed.

5.1.3 Liquid membranes should not be used where:

- floor deflections may exceed 1/360th of the span
- hydrostatic or vapour pressure is present in concrete slabs.

5.1.4 They can be used on wall substrates of concrete, concrete masonry, cement render, wet area fibre-cement sheet lining and wet area plasterboard lining.

5.1.5 Liquid membrane waterproofing types include one-part or two-part products. Correct mixing of two-part products is crucial for their success.

5.1.6 One-part formulations are not necessarily slower drying than two-part formulations (SBRs can dry in as little as 1.5 hours). Chemical cure formulations generally cure better than others in colder conditions.

5.1.7 Some manufacturers give their products a shelf life of 12–24 months after manufacture, unopened. Products should be used within 3 months once opened.

5.1.8 Whether a liquid-applied membrane is reinforced depends on the system. Reinforcing may take the form of chopped strands already included in the product or sheets of random strand mat or woven mesh that must be embedded during application. Where reinforcing is added by the applicator, particular attention should be paid to corners and junctions.

5.2 MEMBRANE SELECTION

5.2.1 A membrane should be selected on the basis of:

- the substrate – some membranes adhere better than others to a particular substrate (cementitious membranes are not a good choice for timber or timber-based substrates, for example)
- whether or not there will be underfloor heating
- the potential for movement, particularly in the floor/wall junction

- suitability for horizontal/vertical surfaces – it is good practice to use a single membrane type on all areas to avoid potential compatibility problems
- complexity of the design or detailing – in some complex situations, liquid-applied membranes may be the only option
- time or other constraints – some systems can be applied in a day while others require several days
- site conditions for application (temperature, humidity) – some membranes have requirements that may not be possible to achieve in a particular space
- compatibility of components – it is good practice to buy all materials from the same supplier.

5.2.2 Some waterproofing systems have a BRANZ Appraisal. If using an appraised product, read the Appraisal scope and conditions of use for the product.

5.2.3 Ensure that the membrane selected comes with detailed handling and installation instructions, a technical data sheet and safety data sheet.

6.0 EXTENT OF WATERPROOFING

6.1 FLOORS

6.1.1 Where there is no shower enclosure, both E3/AS1 and AS 3740-2010 require the floor to be waterproofed a minimum 1500 mm horizontal radius from the point of the showerhead plus (for E3/AS1) the length of the flexible hose if the showerhead is removable (Figure 1).

6.1.2 The edge of the waterproofing membrane should be terminated at a waterstop – an aluminium angle set in the tiles (Figure 2). Terminate the membrane lapping it over the waterstop. This will be at the doorway if the whole floor is waterproofed.

6.1.3 AS 3740-2010 requires the entire floor to be waterproofed if the substrate is timber, particleboard or plywood.

6.1.4 BRANZ recommends that the entire floor be waterproofed when the floor is tiled and that waterproofing membrane upstands of at least 150 mm are specified around the perimeter of the wet area floor.

6.2 WALLS

6.2.1 E3/AS1 requires waterproofing (and AS 3740-2010 requires water resistance) on walls a minimum 1500 mm horizontally from the centreline of the showerhead where there is no shower enclosure plus (for E3/AS1) the length of the hose if the showerhead is removable (Figure 1).

6.2.2 E3/AS1 requires waterproofing (and AS 3740-2010 requires water resistance) on walls to extend to a minimum 1800 mm above the floor. E3/AS1 also requires it to finish a minimum 300 mm above the showerhead or to the ceiling for showers with removable heads.

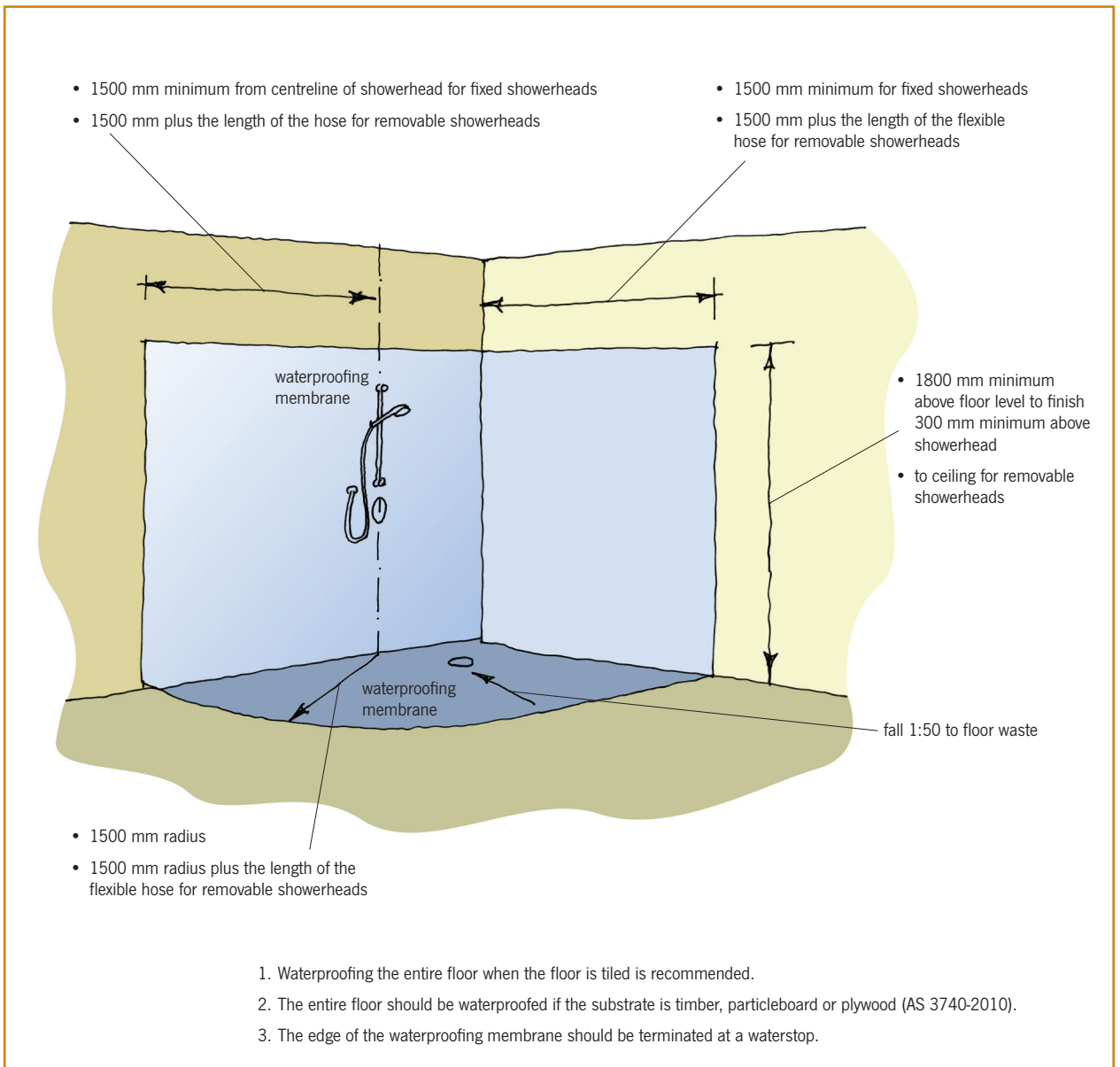


Figure 1. Required extent of waterproofing (E3/AS1).

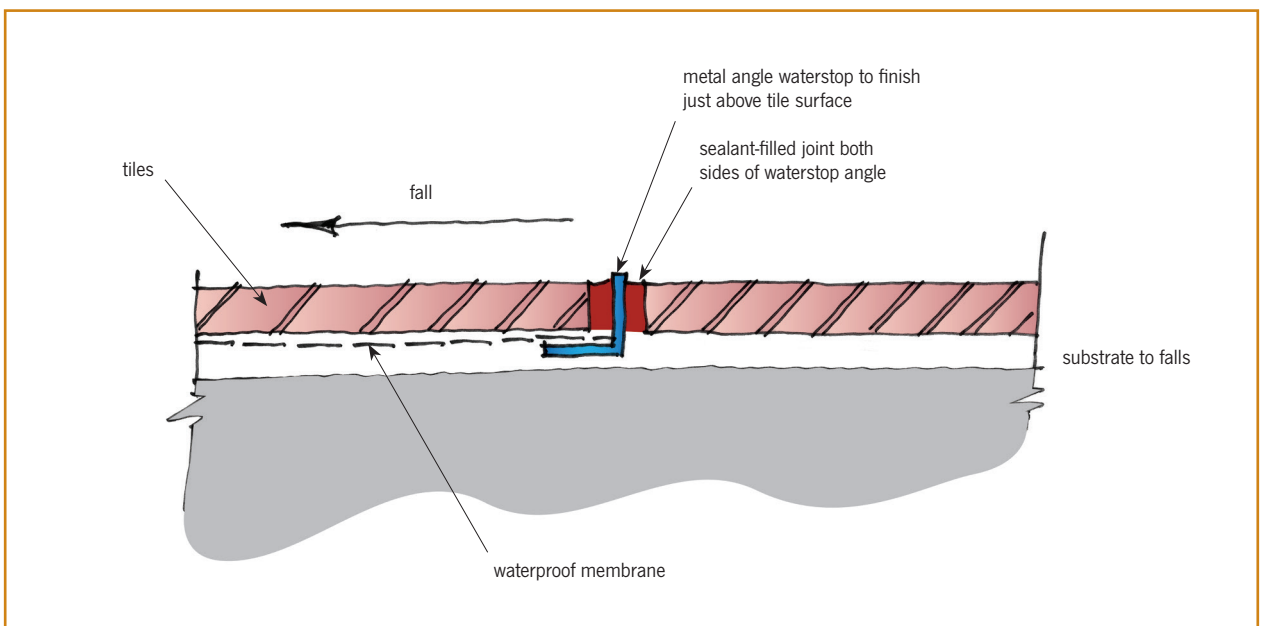


Figure 2. Waterstop detail at the edge of waterproofing.

7.0 DESIGN CONSIDERATIONS

7.0.1 Design documents and drawings for tiled showers should:

- show required falls
- specify the waterproofing system
- show the extent of the waterproofing
- minimise penetrations through the waterproofing and specify the sealing of all penetrations
- ensure cable entry points for undertile floor heating are above the flood level of the wet area
- specify that, where a thick-bed sand/cement mortar or plaster is used, the waterproofing membrane is installed over it
- specify that all movement control joints be waterproof
- specify tiles that have low moisture absorption – while E3/AS1 limits moisture absorption to a maximum of 6%, tiles with a lower rate of absorption (3% or less) are preferable.

7.1 JUNCTION DETAILS

7.1.1 Good detailing and application of waterproofing at junctions is critical for a durable tiled shower. Leaks are commonly traced back to problems at junctions such as floor to wall (Figure 3), hob to wall and around drains.

7.1.2 Some manufacturers' technical literature requires a bond breaker joint system or reinforced underflashing installed at wall/floor or wall/wall junctions and substrate abutments.

7.1.3 AS 3740-2010 requires a waterproof wall-to-wall corner that extends to 40 mm either side of the

junction and runs up to a minimum 1800 mm above finished floor level.

7.1.4 Ensure that shower hobs are constructed from material that is unaffected by moisture (they must not be timber) and carry the waterproofing membrane over the hob (Figure 4).

7.1.5 Membrane manufacturers supply tapes and other materials for use on junctions, and some provide preformed corner reinforcing.

7.1.6 Where tiles are laid over an impervious floor substrate such as steel-trowelled concrete, the detail must ensure the continuity of the waterproofing membrane at the wall-to-floor junction – Figure 5 gives one option.

8.0 APPLICATION OF WATERPROOFING

8.0.1 Membranes must be applied strictly following manufacturers' instructions. Many systems require application by trained applicators for a warranty to apply. Building consent authorities may also require this as well and will check the installer's credentials before they will issue a Code Compliance Certificate.

8.0.2 Substrates must be dry. Concrete slabs should have a relative humidity no greater than 75%. This can be checked with a hygrometer (see BRANZ Bulletin 585 *Measuring moisture in timber and concrete*). Plywood should have a moisture content no higher than 18%.

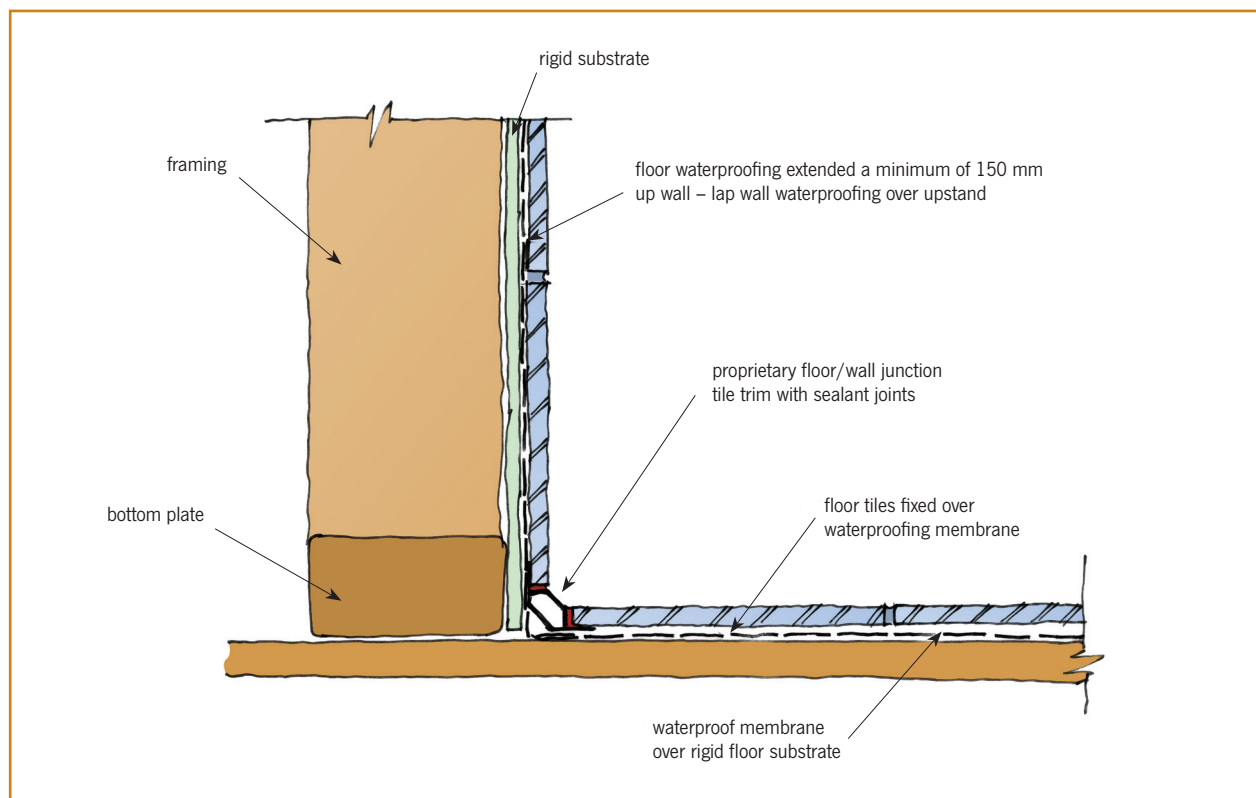


Figure 3. Possible waterproofing detail for floor-to-wall junction. Note that floor and wall waterproofing is usually the same product with a bond breaker at junctions.

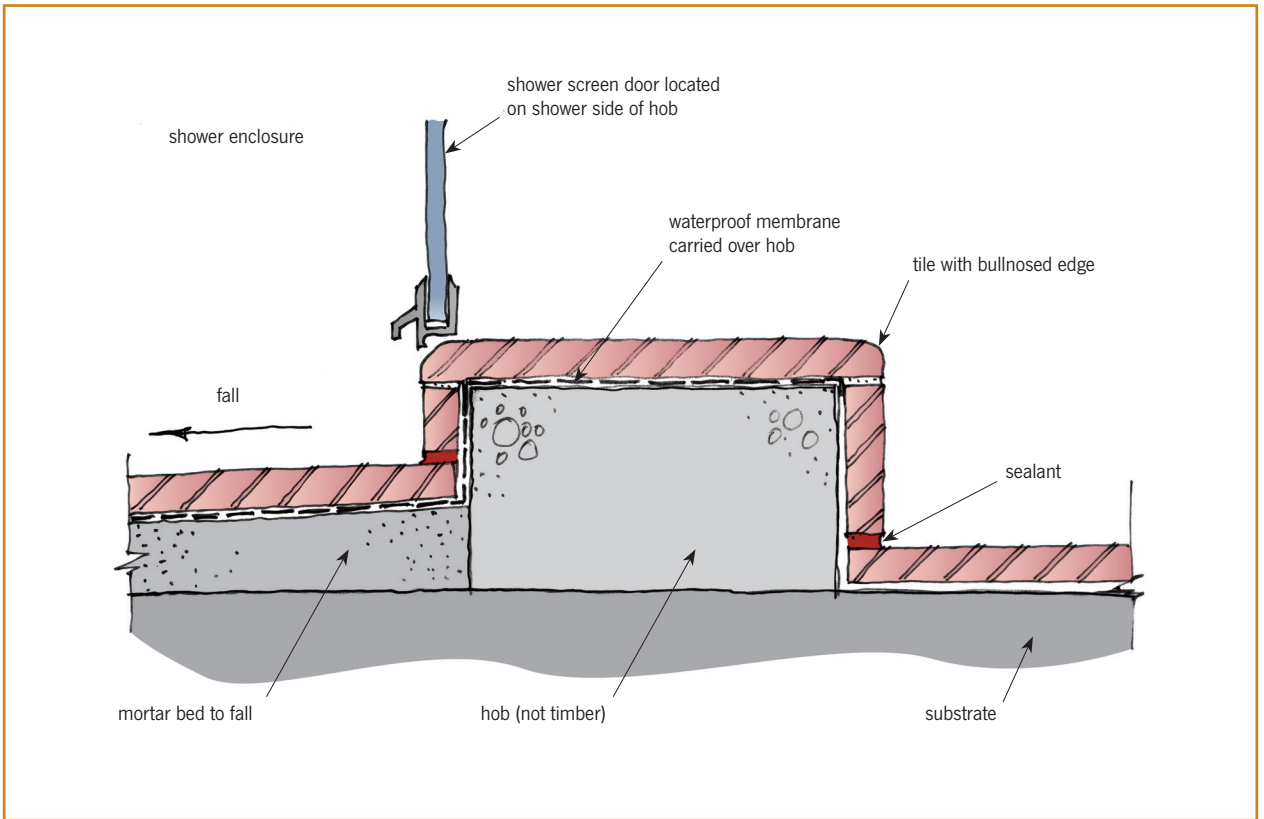


Figure 4. Waterproof hob to shower enclosure.

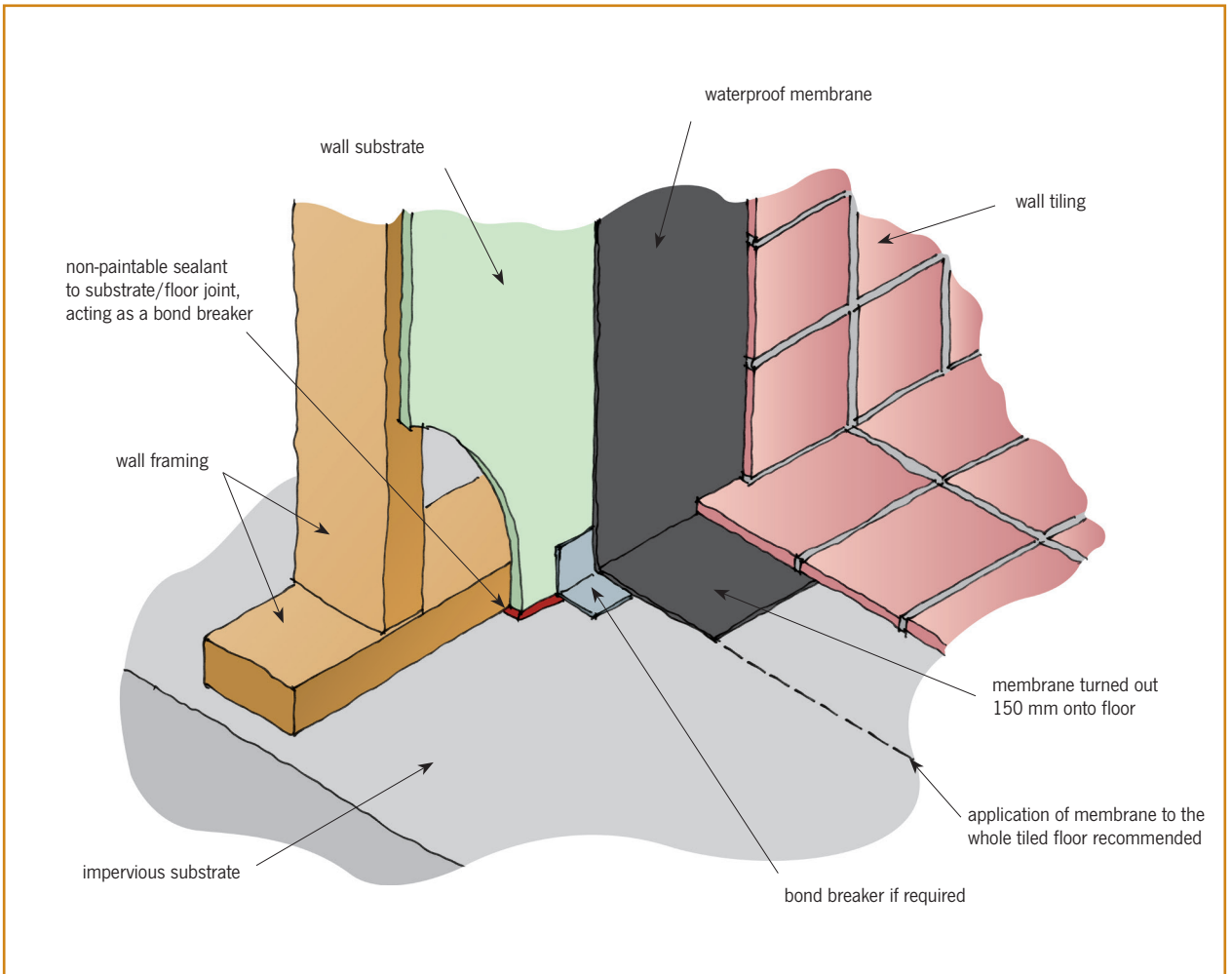


Figure 5. Wall-to-floor junction detail for an impervious floor such as steel-trowelled concrete.

8.0.3 Surfaces should be smooth and sound with surface defects filled. There should be no dust, dirt or grease and no sharp edges.

8.0.4 Membrane manufacturers typically require or recommend use of a primer to seal porous substrates and enhance adhesion of the membrane.

8.0.5 Do not lay membranes in temperatures below 10°C or above 35°C (unless using products that are designed specifically to give a quicker curing time in cool or humid conditions).

8.0.6 For liquid membranes, follow the manufacturer's requirements for the number of coats, how coats are applied and the total finished system thickness required. Some manufacturers require reinforcing or a thickness gauge to ensure the correct thickness is applied.

8.0.7 Membranes must be left to fully cure before tiling is carried out. Building consent authorities commonly require an inspection after application of the membrane and before tiling.

8.0.8 Areas of floor waterproofing should be flood tested (and pass the test) for 24 hours before the installation of tile finishes.

8.0.9 Membranes must be protected to avoid damage before tiling is completed.

8.0.10 For the tiling:

- use a grout specifically designed for wet area use
- ensure it is well tooled into the tile joints
- seal around the sides and tops of fitting flanges and face plates – sealing along the bottom portion of the fitting is not recommended.

8.0.11 For more details about tiling, refer to BRANZ Good Practice Guide *Tiling* (3rd edition, April 2015).

9.0 PLUMBING AND PENETRATIONS

9.0.1 Poor installation of plumbing such as shower mixers and drains can result in leaks that can damage linings and framing. There should be coordination between the main contractor, plumber, membrane applicator and tiler to ensure waterproofing integrity is maintained and the membrane warranty continues to apply.

9.1 SHOWER MIXER INSTALLATION

9.1.1 Make the shower mixer penetration through the wall lining before the membrane is applied. Figure 6 shows a detail for the mixer installation. Correct sealing is crucial.

9.1.2 A two-piece, preformed plastic wall caddy is available that holds a shower mixer and makes a seal in a wet wall lining as an extra line of defence against leaks (Figure 6). Any leaks are prevented from entering the wall cavity and are discharged down the wall lining.

9.2 FLOOR WASTES AND DRAINAGE CHANNELS

9.2.1 E3/AS1 only requires a floor waste where accidental overflow may damage a separate tenancy, but it is good practice to install floor wastes in all wet areas, particularly those above the ground floor.

9.2.2 Ensure floor waste outlets have a sufficiently wide flange and are designed for use with waterproofing membranes and tiles. Prepare the flange as recommended by the membrane manufacturer. Rebate the flange into the substrate so that the surface is flush for effective drainage, and seal the waterproofing system onto the flange (Figure 7). Some manufacturers make outlets with low-profile traps for tiled shower floors that can be easily removed for cleaning.

10.0 MAINTENANCE

10.0.1 At the completion of the work, the Building Act requires the contractor to provide the owner with details that include:

- what maintenance work must be done, especially that required to meet Building Code, guarantee or warranty requirements
- any warranties or guarantees that apply, including information about:
 - how to make a claim
 - whether it is transferable if the house is sold
 - if it needs to be signed and returned to be valid.

10.0.2 Clients should be told to keep tiled surfaces, drains and outlets clean and clear. Tiles should be checked regularly to ensure they remain sound. Cracks or damage must be repaired immediately.

10.0.3 Membranes do not require maintenance as long as the tile finish remains intact. If a membrane is damaged, the tiles and damaged portion of the membrane must be removed and then replaced in the same way that new work is carried out.

11.0 MORE INFORMATION

New Zealand Building Code

Clause B2 *Durability*
Clause E3 *Internal moisture*
Acceptable Solution E3/AS1

Standards

AS 3740-2010 *Waterproofing of domestic wet areas*
AS/NZS 4858:2004 *Wet area membranes*
NZS 3602:2003 *Timber and wood-based products for use in building*

BRANZ publications

Good Practice Guide *Tiling* (3rd edition, April 2015)
Bulletin 585 *Measuring moisture in timber and concrete*

Industry publication

Code of Practice for Internal Wet Area Membranes (Selection, Design, Installation), Waterproofing Membrane Association NZ Inc.

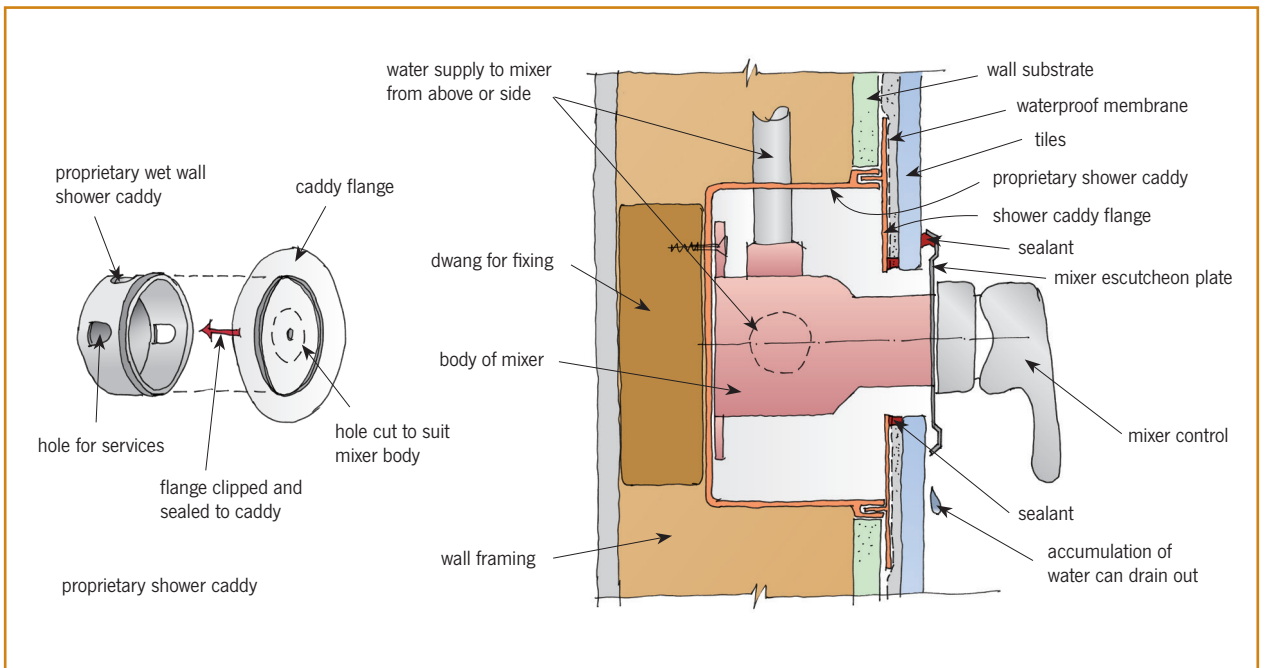


Figure 6. Shower mixer installation detail.

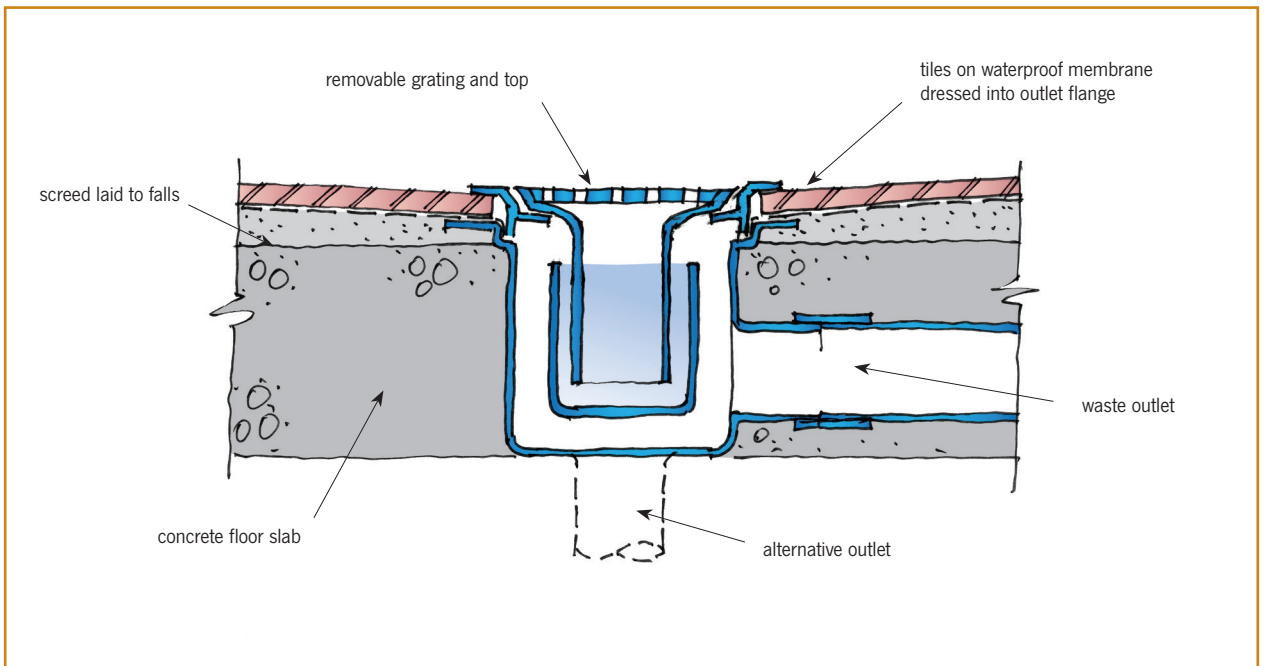


Figure 7. Dressing the membrane to the floor outlet.



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