Code of Practice

for

Internal Wet Area Membranes

(Selection, design, installation)

2nd Edition
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Waterproofing Membrane Association NZ Incorporated

The Waterproofing Membrane Association (NZ) Incorporated (referred to as "WMAI") is a group of companies in New Zealand who aim to set the benchmark for best industry practice for waterproof membranes. All Members undertake to comply with the Rules and Codes of Practice of our Association.

Membership is open to any interested party. For further information, please contact info@membrane.org.nz or go to www.membrane.org.nz.

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Disclaimer

This document is intended as guidance only, and is not specific to any particular project or waterproofing system. The WMAI, in consultation with the New Zealand construction industry, has established this Code of Practice as the guide to best practice in the design and installation of internal wet area waterproofing.

While the Association has taken care in preparing this document, users must themselves ensure all aspects of any particular project are allowed for when establishing compliance with all the relevant requirements of the Building Act 2004 or the Building Code in all cases.

Document History

This document may be updated from time to time. Refer to www.membrane.org.nz for the most recent update(s) of this Code of Practice (if any):

Version	Date	Reason(s) for Amendment
2nd Edition	July 2016	Consultation Version July 2016
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Comments on this Code of Practice are welcome. Please send all comments to info@membrane.org.nz.

Other Published Codes of Practice by the WMAI:

- Code of Practice for Torch-on Membrane Systems

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1. Purpose, Scope, Limitations

1.1 Purpose

This Code of Practice provides the Waterproofing Membrane Association's recommended best practices for waterproofing solutions using internal wet area membranes.

This Code of Practice aims to foster confidence for all parties involved in the use of wet area membrane systems throughout the selection, design, consent, and installation process. It is published with the intention of establishing and improving industry practice, performance standards, systems, materials and their application, and to ensure that public and industry confidence in the membrane industry is preserved.

Further, this Code of Practice may be used to develop recommended training criteria and set installation methodology benchmarks for the industry.

1.2 Scope

This Code of Practice is applicable to the design and application of internal wet area membrane systems for residential, commercial or industrial buildings which comply with the New Zealand Building Code. It also addresses the design and installation of substrates necessary to support the membrane system.

All members of the WMAI are fully trained, and it is a requirement of their membership that they comply with all aspects of this Code of Practice.

1.3 Limitations

This Code of Practice does not cover the design or construction of the building structure, which must comply with the New Zealand Building Code.

The building structure must properly support and accommodate the membrane substrate.
The selection of over-surfacing in wet areas is outside the scope of this Code of Practice, but is discussed briefly in Section 8.3.

This Code of Practice does not apply to contractual disputes, which should be dealt with under the provisions of the contract between the parties involved.

This Code of Practice is not specific to any particular project and is not intended to be, or to provide, a project specification. However, the information will provide assistance for preparing a design and a specification for the membrane work.

1.4 Using this Code of Practice

1.4.1 The following descriptions of the key parties responsible for the waterproofing membrane system have been used:

- **"Designer"** means the person or company who specifies the waterproofing system, who may be an Architect, an Engineer or the Supplier.
- **"Supplier"** means the New Zealand company that supplies the waterproofing system.
- **"Applicator"** means the contracted company responsible for the installation of the waterproofing system.

Acronyms: WMAI = Waterproof Membrane Association NZ Incorporated

1.4.2 Text styles indicate the following:

- Statements in boxes are highlighted for special emphasis and must be adhered to.
- Shaded text indicates information that is introductory commentary only and which will be developed fully in future publications. Such information is not a mandatory part of this Code of Practice.

1.4.3 In reading this Code of Practice, note that:

- Bullet-point lists are not in order of importance, and not all items may be relevant to a specific project.
- Numbered lists are generally in a process order, though some items may not apply to a specific project.

1.4.4 All acronyms used in any chapter are defined at the foot of the first page of each chapter.

1.4.5 Information may be repeated in several chapters so that each chapter is complete without necessarily requiring cross-referencing to other chapters.

1.4.6 Some pages are intentionally left blank to allow related pages to be viewed together or to allow a specific list to be viewed in its entirety.

2. Wet Area Membrane Properties

This chapter is written for the primary use by the Building Consent Authority, but may also be of use to the Designer.

It sets out the minimum properties of any component of an internal wet area membrane system.

2.0 General

There is a wide range of membrane types available, with relatively common detailing when correctly installed, whether applied in a liquid or sheet form. The choice of membrane system to be used in any wet area should be made on the basis of performance and installation requirements specific to the project.

This section introduces the following, to give the optimum selection in Chapter 4 (Design):

- The relevant standards and their requirements
- Membrane types and their classification

2.1 AS/NZS 4858:2004, Wet area Membranes

This Standard is performance-based and contains tests that membranes must pass rather than the specific composition of the membrane.

It assesses the durability of membranes with a pass or fail for each of the following tests:

- Effect of water immersion
- Effect of bleach immersion
- Effect of detergent immersion
- Effect of heat aging

Additionally, a membrane is assessed for:

- Moisture vapour transmission rate
- Water absorption
- Suitability for use over certain types of substrates
- Acceptance of cyclic movement

Note that resistance to cyclic movement does not have a pass/fail requirement, as it is considered that this particular test is the one most critical for performance under site design conditions. It is used as an additional test for assessing classification into extensibility classes by further amplifying the extension tests into a specific movement capability.

Note also that the Standard classifies membranes not by chemical type but by class relating to their extensibility.

Acronyms: AAC = aerated autoclaved cement; (Acrylic) PU = polyurethane; EPDM = ethylene propylene diene monomer; PUMMA = polyurethane methylmethacrylate; PVC = polyvinyl chloride; SBR = styrene-butadiene rubber; TPO = thermoplastic polyolefin; UV = ultra-violet.

2.2 Performance Criteria

ALL COMPONENTS OF A MEMBRANE SYSTEM USED IN A WET AREA MUST BE FULLY COMPLIANT WITH AS/NZS4858:2004

The properties and limitations of certain types of membranes should be considered based on:

- The intended wet area use
- Any project site programme restraints
- The likely site application conditions
- The substrate
- Whether there is a requirement for underfloor heating or sound deadening
- The type of floor/wall junction and potential movement
- The over-surface finish
- Any requirement for maintenance

2.3 Types of Membranes

The list below is not exhaustive, but gives a representative overview of the many types of membranes available in New Zealand for internal wet area waterproofing (listed alphabetically):

- Acrylic PU hybrid water-based: reinforced, unreinforced
- Acrylic latex (UV stable): reinforced, unreinforced
- Elastomeric sheet, e.g. EPDM, TPO, butyl
- Fibreglass: polyester, epoxy
- Latex (not UV stable): reinforced, unreinforced
- Polymer cement: 1-part, 2-part
- Polyurethane: water-based, solvent-based, solvent-free
- Polyurethane-bitumen: solvent-based
- Polyurea
- PUMMA: solvent-less polyurethane
- PVC sheet: vinyl
- Rubber sheet
- SBR rubber, including bitumen: water-based
- Self-adhesive polymer modified bitumen: reinforced, unreinforced
- Self-adhesive polymer sheet
- Water-based epoxy

Table 1: Membrane Types by Class

Note: *For simplicity and selection/design purposes, the membranes have been listed as declared by the Supplier.* *The definitions of the classes are based on Table 1 from AS/NZS 4858:2004.*	**Class 1**			**Class 2**				**Class 3**		
	1A: Rigid, resin-based	1B: Rigid, metal-based	1C: Rigid, water-based	2A: Flexible, acrylic, needs reinf.	2B: Flexible, acrylic, reinf. within	2C: Flexible, 2-component polymer	3A: Elastomeric, water-based	3B: Elastomeric, solvent-based	3C: Elastomeric, flexible sheet PVC	3D: Self-adhesive
Fibreglass: polyester, epoxy	✓									
Water-based epoxy			✓							
Acrylic latex, UV stable: reinforced, unreinforced				✓	✓					
Polymer latex, not UV stable: reinforced, unreinforced				✓	✓					
Acrylic polyurethane hybrid water-based: reinforced, unreinforced				✓	✓		✓			
Polymer cement: 1-part, 2-part						✓				
Polyurea						✓				
Rubber, bitumen, water-based							✓			
Polyurethane: water-based, solvent-based, solvent-free							✓	✓		
Polyurethane-bitumen: solvent-based								✓		
PUMMA: solvent-less polyurethane								✓		
Elastomeric sheet e.g. EPDM, TPO, butyl									✓	
PVC sheet: vinyl									✓	
Rubber sheet									✓	
Self-adhesive modified bitumen: reinforced, unreinforced										✓
Self-adhesive polymer sheet										✓

Table 2: Classification of Membranes

This table is reproduced from AS/NZS 4858:2004 with the addition of the "Description" column for the purposes of this Code of Practice

Membrane Class	Elongation at Break[1]	Include reinforcement if part of systems	Description
1. Low extensibility	10-59%	Yes	Rigid
2. Medium extensibility	60-299%	Yes	Flexible
3. High extensibility	≥ 300%	Yes	Elastomeric

[1]"Elongation at break" is the ability of a waterproof membrane to stretch before breaking or tearing, also referred to in some documentation as the Movement Accommodation Factor (MAF).

2.3.1 Class 1: Rigid Systems

- **Class 1A: Resin-based (chemically-cured) systems**

Resin-based systems (commonly called "fibreglass") are generally two-component polyester or epoxy resins combined with a reinforcing mat. Correct mixing of the two components is critical for success. In general terms, resin-based systems are:

- Fast-curing
- Intolerant of cyclic movement
- Susceptible to osmosis
- Often brittle and may not bond to PVC fittings
- Difficult to use on a damp surface
- To be carefully detailed at the wall/floor junction

- **Class 1B: Metal-based systems (copper and stainless steel shower trays)**

These systems are usually prefabricated and normally installed as a tray with the wall lining overlaying the tray upstand. Installation is generally carried out by the building contractors and/or plumber. They are not covered in detail in this Code of Practice.

- **Class 1C: Water-based epoxies (chemically cured)**

Water-based epoxies are generally used as primers and vapour barriers over damp surfaces prior to applying an acrylic or polyurethane membrane. They assist adhesion and protect the liquid membrane from excessive moisture during curing.

Water-based epoxies are a good surface binder/primer for use over aerated autoclaved cement (AAC) surfaces.

Some varieties of water-based resins can withstand negative hydrostatic pressure when applied in accordance with the Supplier's instructions.

The application of water-based epoxies may slow the application process for subsequently applied membranes.

2.3.2 Class 2: Flexible Systems

- **Class 2A: Acrylic membranes**

Acrylic membrane systems are water-based coatings that are applied to substrates using up to three coats. There are many types of acrylic systems, including pure acrylic, styrene-acrylic and SBR (styrene-butadiene rubber)-modified acrylic.

Typically, these types of membranes are easy to apply and clean up, have low toxicity, and some are UV stable. They generally need to be applied over an appropriate primer and must be applied over a dry substrate.

Acrylic membranes can be slow curing in colder and/or wetter conditions, may absorb moisture, and can allow moderate levels of moisture vapour transmission. Once fully cured, re-emulsification cannot occur.

- **Class 2B: Reinforced acrylic membranes**

Many acrylic membranes contain reinforcement as part of the system.

The elongation characteristics of acrylic membrane systems will be diminished by the addition of continuous fibre reinforcement, sometimes giving the membranes Class 1 characteristics with regard to movement capability. Similarly, some internally fibre-reinforced acrylic membranes will comply with Class 3 characteristics.

There are two broad categories of acrylic membranes:

- Acrylic membranes requiring reinforcing to be added at the time of application
- Acrylic membranes with reinforcing incorporated within the product

- **Class 2C: Two Component Polymer Cement**

Two-component polymer cement membranes are widely used in relatively low movement situations. The polymer emulsion may be acrylic, styrene-acrylic, SBR latex or rubber latex. They may be reinforced at transitions or overall with polyester fleece or coated glass mesh. Reinforcement can reduce movement capabilities to Class 1,2,3 characteristics.

2.3.3 Class 3: Elastomeric Systems

- **Class 3A: Water-based polyurethane**

These systems have very similar characteristics to the acrylic membranes of Class 2. They will require priming and any bond-breaker sealant must be neutral cure silicone or a proprietary tape. These membranes will cure faster than an acrylic membrane, usually within 24 hours.

- **Class 3B: Solvent-based and 100% solids polyurethane**

Solvent-based polyurethanes have high movement characteristics. They are not generally recommended for use over damp substrates unless appropriate water-borne epoxy primers are used, and must only be used with tile adhesives capable of accommodating movement. These types of membranes usually cure within 24 hours.

These membranes are generally not UV stable. Care needs to be taken with the compatibility of these membrane systems with adjoining finishes.

Fillets should always be formed using a compatible polyurethane sealant which becomes part of the membrane. They may be reinforced with polyester fleece, but this will reduce their movement capability to Class 2.

Cement-based tile adhesives are not recommended for use over solvent-based polyurethane membranes.

- **Class 3C: Flexible sheet**

Flexible sheet membranes are adhesive bonded. They may be prefabricated and can be laid over high movement substrates. Some are compatible with PVC drainage systems and can be permanently bonded to drainage pipes.

A process of heat welding and rolling or solvent welding is used to bond joints.

- **Class 3D: Self-adhesive membranes**

Self-adhesive membranes are either an elastomeric modified bitumen or elastomeric rubber.

Such membranes generally have a finish on the upper surface which facilitates tiling, and a selvedge edge which enables lap jointing with pressure and/or gentle heat.

3. Membrane Selection

This chapter is primarily written for the Designer.

It sets out the optimum membrane to select for a given situation.

3.0 General

There are many factors in selecting the optimum membrane for each internal wet area situation, including (but not limited to):

- The specific use of the space
- The substrate type involved, including any anticipated movement in the substrate
- Compatibility with heating and acoustic layers (Refer to Chapter 7 (Feature Systems))
- Compatibility with any overlay, tile adhesives or other finishes (Refer to Chapter 8, (Over-surfacing))
- Construction access and/or programme constraints
- Complexity of detailing in the design
- Suitability for horizontal and vertical surfaces

ALL COMPONENTS IN A WET AREA MEMBRANE SYSTEM MUST COME FROM THE SAME SUPPLIER

Wet area membranes are composed of highly developed and tested chemical compounds. If there are multiple components to a system they will have been tested to ensure compatibility and effectiveness, thus there should be no substitution for any products in a single system.

The following sections outline factors that must be considered when selecting a membrane.

3.1 The Specific Use of the Area

The intended use of the area must be taken into account when selecting the membrane.

For instance:

- A commercial laundry or commercial kitchen may require a more robust and chemical-resistant membrane than in a domestic kitchen or laundry. (Membranes are tested in AS/NZS4858 for resistance to household strength laundry/bathroom chemicals only.)
- An institutional or gymnasium bathroom facility may require a more robust membrane than a residential bathroom.

3.2 The Substrate

The membrane must be selected to be compatible with the substrate.

For instance:

- Cementitious membranes may be unsuitable for use on timber or timber-composite substrates.
- Different substrates will have different expected or anticipated movement characteristics. The membrane specified must be able to accommodate any anticipated movement in the substrate.
- Different substrates will have different face characteristics (e.g. concrete compared to plywood), so some membranes will adhere better than others to a given substrate.

Acronyms: AS/NZS = joint Australia/New Zealand Standard

3.3 Construction and Programme Constraints

3.3.1 Time Constraints

The time available for application will have a bearing on membrane selection, particularly in contracts which involve a number of trades working to a tight programme in multiple areas.

For instance:

- Some membrane systems may require multiple coatings over a period of days, and so may not be suitable if there is a tight construction programme.
- Other systems may be applied and cured within one working day, though usually at an increased material cost.

3.3.2 Compatibility with Tile Adhesives

Wet area membranes are often over-surfaced with tiles fixed with a tile adhesive.

It is imperative that the selected membrane and tile adhesive be compatible, and it is best practice that they are from the same Supplier.

3.3.3 Over-Surfacing of the Membrane

Some membranes are suitable for use without a decorative or protective over-surfacing – for instance, some acrylic and urethane liquid membranes can be the final exposed surface.

Bitumen-based membranes are generally not suitable for use under ceramic tiles, vinyl sheet or vinyl tiles. The bitumen may sometimes bleed from the membrane and destroy the adhesion interface or become visible through the tile or joints, both of which will result in the de-bonding of the tile/vinyl/vinyl tile.

3.3.4 Complexity of Detailing in the Design

Some waterproofing situations may have difficult construction access or available working space, or there may be installation or design difficulties where a sheet or pre-formed membrane may be impractical for use. Liquid-applied membranes can often be the only solution for such situations.

3.3.5 Suitability for Horizontal and Vertical Surfaces

Some membranes are only suitable for use on horizontal surfaces or small upstand areas, while others can be used on surfaces at any angle.

To avoid compatibility issues, select a membrane which can protect all surfaces within an area.

3.3.6 Compatibility with Heating and Acoustic Layers

Where a heating layer and/or an acoustic layer are incorporated in floor surfaces, ensure the chosen membrane is compatible with the installation of other materials or systems incorporated in the floor.

3.3.7 Installation Conditions

Some solvent-borne urethane, acrylic or latex based membranes have very particular application, drying or ventilation requirements which may not be possible on all sites.

Consider and mitigate health and safety risks when membranes are applied in confined spaces – e.g. by ensuring adequate ventilation.

3.4 Membrane Documentation

Minimum membrane documentation requirements are:

- Suppliers of waterproofing membrane materials must ensure that their products meet the requirements of AS/NZS4858 and clearly state on their product technical data sheets the class and type of product.
- Suppliers should provide technical information for the particular product – at a minimum, a Technical Data Sheet, Safety Data Sheet and Handling/Installation Instructions.
- The Designer must adequately research and establish that the proposed specified product does comply with AS/NZS4858, is fit for the intended purpose and will perform as required in the consent documentation.

3.5 Membrane Selection

Table 3 lists the optimum membrane for a given situation. Where there is a choice of membranes, other factors as outlined above should be taken into consideration.

Table 3: Membrane Selection Guide

	Class 1			Class 2			Class 3			
	1A: Rigid, resin-based	1B: Rigid, metal-based	1C: Rigid, water-based	2A: Flexible, acrylic, needs reinf.	2B: Flexible, acrylic, reinf. within	2C: Flexible, 2-component polymer	3A: Elastomeric, water-based	3B: Elastomeric, solvent-based	3C: Elastomeric, flexible sheet PVC	3D: Self-adhesive
Domestic service	O	✓	✓	✓	✓	✓	✓	✓	✓	✓
Heavy duty service	✓	✓	X	✓	X	✓	✓	✓	✓	✓
Substrate compatibility	✓	✓	✓	✓	X	O	✓	✓	✓	✓
Self-finish possible[1]	✓	✓	✓	✓	X	X	O	O	✓	X
Suitable for tiling	O	O	X	✓	O	✓	✓	O	X	O
Suitable for timber overlay	O	O	X	O	X	O	✓	O	X	O
Handling safety	C	A	A	A	A	A	A	B	A	A
Ventilation requirement	F	D	E	E	E	D	E	F	D	D
Install in a day	✓	✓	✓	X	O	X	✓	O	✓	✓
Multi-coat	N/A	N/A	N/A	✓	✓	✓	✓	O	N/A	N/A
Multi-coat extended dry	N/A	N/A	N/A	O	O	O	N/A	N/A	N/A	N/A
Easy to detail successfully	✓	✓	X	✓	X	✓	✓	O	O	X
Compatible with heating layer	O	O	N/A	O	O	✓	✓	O	O	X
Compatible w acoustic layer	O	O	O	O	O	✓	✓	✓	✓	✓

[1]May require additional topcoats or surface finishing.

Legend

A = No hazard involved
B = Some hazards involved
C = Hazard and precaution mandatory for Applicator
D = Safe to handle with limited ventilation
E = Requires some ventilation for safety and/or cure
F = Requires good ventilation

✓ = Recommended for use
O = May be used; check with Supplier first
X = Not recommended
N/A = Not applicable

4. Design

This chapter is primarily written for the Designer and Applicator. It will also assist the Main Contractor and Building Consent Authority.

It addresses the substrate and illustrates typical installation detailing.

4.0 General

The purpose of this Code of Practice is to apply best industry practice to ensure that the requirements of NZBC Clause E3, Internal Moisture, and accompanying Acceptable Solution E3/AS1 are met, and sometimes exceeded. This Code of Practice is also applicable to buildings outside of E3, such as commercial food preparation areas.

Specifically, Clause E3.3.2 and E3.3.6 are:

> *E3.3.2: "Free water from accidental overflow from sanitary fixtures or sanitary appliances must be disposed of in a way that avoids the loss of amenity or damage to household units or other property."*
>
> *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."*

ALL WET AREAS CONTAINING A WATER SUPPLY MUST:

- ✓ **BE PROTECTED WITH A WET AREA MEMBRANE**
- ✓ **BE CONTAINED BY A WATERSTOP**
- ✓ **HAVE ALL PENETRATIONS SEALED**

Floor areas where there could be an accidental overflow must be protected with a wet area membrane, including beneath floor over-surfacing, cabinets, showers, baths etc., whether the area contains an overflow outlet or not.

The over-riding principle must always be to design for any potential situation where there could be water spillage, and that the membrane should be carried behind wall-mounted fittings from the floor up the wall to at least the point of entry through the wall of the plumbing fitting.

Although it is not mandatory, consideration must be given to installing a floor drain in all wet areas.

Acronyms: AAC = aerated autoclaved concrete; CCA = copper chrome arsenate; LOSP = light organic solvent preservative; NZBC B2 AS/1 = New Zealand Building Code Clause B2 Acceptable Solution, Durability; NZBC E3 = New Zealand Building Code Clause E3, Internal moisture; PEF = polyethylene foam; pMDI = para-methylene-diphenyl-diisocyanate; WMAI = Waterproof Membrane Association NZ Incorporated

4.1 Substrate Requirements

4.1.0 General

The substrate onto which the membrane system is to be laid must be:

- Sufficiently rigid in combination with the structure underneath (if a separate building element), dense and dimensionally stable to support the membrane system, insulation, surface protection or other item
- Designed to incorporate, where appropriate, the required falls, drains, sumps and outlets to ensure sufficient drainage
- Designed to have sufficient movement/expansion joints in the substrate and structure

Where an existing surface must be retained for historic or aesthetic reasons, and a conventional membrane installation cannot be incorporated, consult with a membrane Supplier for specific recommendations.

4.1.1 Monolithic Floors

Concrete substrates must be laid to falls and incorporate coves to upstands and rounded corners, drainage outlets at low points and integral expansion joints. They must be finished with a wooden float or lightly broomed to provide an even, open surface. The recommended concrete surface finish is either U2 woodfloat or U3 steel trowel to NZS 3114. Steel-floated finishes may require captive blasting or grinding to permit penetration of the primer.

There must be a minimum 28-day curing period of the concrete surface before membranes are installed.

Unsatisfactory concrete surfaces must be mechanically repaired to a suitable standard for membrane application. Grind off any nibs, flush out any hollows and/or imperfections, and skim over (if required) to improve falls or to provide a satisfactory surface.

Ensure the outlet(s) is/are at the lowest point, adequate in number and size. Saw cut any movement cracks and fill with an elastomeric sealant. Provide expansion joints to large areas.

- **New Concrete Substrates**

Except for topping screeds, new concrete substrates are generally structural building elements in their own right. They must be designed and built to the Engineer's recommendations and specifications, the Building Code and requisite standards.

Moisture content in a concrete substrate is critical as the presence of any moisture will affect the adhesion of the membrane (see Section 6.1.3).

Similarly, the presence of a curing agent must be reported to the Applicator. If the curing agent is not totally removed, the membrane may fail to adhere to the substrate surface.

- **Existing Concrete Substrates**

Existing concrete substrates must be prepared and cleaned as per the Supplier's recommendations.

- **Cementitious Screeds**

Where a reinforced concrete floor is to be overlaid with a concrete or plaster screed to provide falls:

- The screed should be laid and finished in accordance with NZS 3114.
- The membrane must be installed over the screed.
- The new screed surface is to incorporate the required falls and be wood-floated to provide an even surface free of hollows, ridges or nibs.
- The type of plaster or the thickness of the screed will determine the curing period required before application of the membrane system. Normally the minimum period is seven days; however, a non-hydrating screed will cure in a shorter time (see Section 6.1.3).

Where a sheet flooring is to be overlaid with a cementitious screed to provide falls:

- The sheets must be primed, joints bandaged and movement joints (chases) provided in the screed and at the perimeter. The chases must be filled with a suitable sealant.

The substrate must be sufficient to ensure deflection and movement will not compromise the waterproofing system.

4.1.2 Sheet Material on Floor Framing

- **General**

The materials in this section are generally used as flooring materials over framing, in accordance with NZS 3604.

Table 4: Floor Substrate Thicknesses

Material	Minimum Thicknesses
Plywood, support @ 400mm x 400mm	15mm
Plywood, support @ 450mm x 450mm	17mm
Plywood, support @ 600mm x 600mm	19mm
Compressed sheet @ 400mm joists x 1200mm nogs/dwangs	18mm
Reconstituted wood flooring @ 600mm x 600mm	20mm

Note: Fibre-cement sheet is not regarded as a structural underlay.

- **Sheet Layout and Fixings**

Sheet layout and fixings are critical to providing an acceptable membrane substrate:

- Sheets must be installed across the joists and, where appropriate, in a brick-bond pattern. All edges of the sheets must be fully supported.
- There must be solid blocking under all edges of the sheet substrate, including those that have a jointing strip.
- Each sheet must be glued and mechanically fixed with corrosion-resistant counter-sunk screws, e.g. Grade 304 stainless steel 10 gauge with a minimum length 3 times that of the thickness of the sheet.
- Screw spacing must be at 150mm centres at the perimeter of the sheet and 200mm through the body of the sheet.
- All sheets must be fixed from the centre outwards to reduce bowing.

- **Plywood**

Plywood must be branded to comply with AS/NZS 2269:2012. Additional requirements include, but are not limited to:

- The top surface of the plywood should be sanded and plugged, to a minimum standard of C grade.
- Plywood substrate for the installation of a membrane must be treated (CCA) H3.2 grade.
- LOSP-treated plywood or solid timber covings must not be used as some membranes will react with the solvent.
- The moisture content of plywood prior to priming must not be higher than 18%. Pre-prime the top surface and edges prior to installation, or prime on the same day as installation.

- **Timber flooring**

Existing natural timber floors are to be overlaid with an adequately-fixed compressed sheet, reconstituted wood flooring or treated plywood overlay, as the substrate for the membrane.

Where an existing surface must be retained for historic or aesthetic reasons, and a conventional membrane installation cannot be incorporated, consult with a membrane Supplier for specific recommendations.

- **Compressed sheet**

Compressed sheet is an impermeable and dimensionally stable product, made of cellulose fibre-reinforced cement. The basic composition is Portland cement, ground sand, cellulose fibre and water. It should be manufactured to AS/NZ S2908.2:2000 (Cellulose-cement products - flat sheets).

All sheet edges must be supported, including those that have a jointing strip. Refer to the sheet supplier's specifications for:

- Intermediate support
- Fixings
- Joints and/or expansion joints

- **Reconstituted Wood Flooring**

Some reconstituted wood flooring panels are suitable for use as the timber substrate under wet area membranes. These include non-oriented strandboard sheets bonded with pMDI resin and treated to H3.1.

All sheet edges must be supported, including those that have a proprietary jointing strip.

- **Particle Board**

Particle board has a history of failure in wet areas. If there is an existing particleboard floor, it must be overlaid with a compressed, reconstituted sheet, or plywood, as a substrate for the membrane.

PARTICLE BOARD MUST NOT BE USED AS A NEW SUBSTRATE IN ANY WET AREA

4.1.3 Wall Substrates

- **General**

The materials in this section are generally referred to as wall linings.

Table 5: Wall Linings

Material	Minimum Thicknesses
Water-resistant gypsum plasterboards	10mm
Fibre-cement sheet	6mm
Reconstituted wood panels	12mm
Plywood	12mm

- **Gypsum plasterboards**

Where gypsum plasterboard is installed, water-resistant grade gypsum plasterboard which meets the requirements of AS/NZS 2588:1998 must be used, and it must be detailed and installed strictly according to the Supplier's requirements. In tiled shower or direct splash areas it must be waterproofed with a membrane.

- **Fibre-cement sheet**

Where a fibre-cement sheet is used, it must be detailed and installed strictly according to the Supplier's requirements. In tiled shower or direct splash areas it must be waterproofed with a membrane.

- **Plywood**

Where a waterproofing membrane has been applied to a plywood substrate, consideration must be given to the flexibility/deflection of the plywood as the primary substrate.

- For tile installation, use a suitable two-component polymer-modified adhesive designed to be used over flexible substrates.
- When grouting installed tiles, incorporate a flexible grout additive in the grout mix to improve grout flexibility.

- **Reconstituted Wood Panels**

Where a waterproof membrane has been applied to a reconstituted wood panel substrate, consideration must be given to the flexibility/deflection of the pane.

- For tile installation, use a suitable two-component polymer-modified adhesive designed to be used over flexible substrates.
- When grouting installed tiles, incorporate a flexible grout adhesive in the grout mix to improve grout flexibility.

4.1.4 **Other Substrates** (either on floors, walls or both)

- **Cement plaster**

Some shower floors are shaped to falls with a cement-based plaster, referred to as a screed. This can be either site- or pre-mixed, but in both cases must be of sufficient strength.

As a minimum, screeds must be allowed to cure for 7 days prior to waterproofing. However, some high-strength rapid setting screeds can be waterproofed sooner.

Screeds must be dry before the waterproofing process can begin.

- **Concrete**

Before application of any waterproofing membrane, the concrete surface should be finished to NZS 3114:1987 (Sections "U2 and U3 trowelled") and prepared as follows:

- Fully remove any release agent that has been used.
- Ensure that the maximum moisture content is 75% RH as measured by a surface-mounted hygrometer.
- Ensure all surface defects and contaminants are removed and the surface is cleaned.
- Fill all holes, trowel flat and true any surface imperfections with stopping or a waterproof filling compound.

- **AAC Panel or Block**

By its very nature, the surface faces of AAC panels are inherently porous. They must be either plastered over or sealed to ensure a flat continuous surface suitable for the application of a waterproofing membrane.

If the membrane over the AAC will be visible, ensure that any joints in the AAC are filled and finished smooth before the application of the membrane.

4.2 Acoustic and Heating Systems

The purpose of the waterproofing layer is to protect the building elements from any free water.

When installing acoustic, heating and/or insulating layers, the following principles apply:

- Any post-applied heating system to the substrate must be installed above the waterproofing membrane.
- Some acoustic materials or heating elements can be adversely affected by moisture which could reduce their effectiveness. Designers must take this into account and possibly include a secondary waterproofing element.
- Acoustic treatments may break at the floor/wall junction, so the waterproof membrane must be adequately detailed to provide continuity.
- All contractors must take care to avoid damage that will affect the waterproofing integrity of the membrane.

More detailed information can be found in Chapter 7 (Feature Systems).

4.3 General Design Principles

The Designer has overall control of design detailing. The following fundamental principles of design for membrane systems must be taken into account:

- Depending on the usage of the area, internal surfaces must have sufficient fall to effectively drain water.
- The membrane system must be fully supported on a suitable substrate, which itself must be fully supported by the structure.
- Product-specific design and installation instructions must always be obtained from the Supplier, and where practical, the membrane Applicator should provide advice before the final choice is made and drawings are completed.
- The specification/design must comply with all relevant aspects of the Building Code.
- An overflow floor drain should be installed in all wet areas, as per Building Code Clause E3.3.2, paragraph 4.0.
- There must be adequate design and detailing at critical junctions, e.g. floor to wall, door to frame.
- A waterproof membrane must be specified to the complete floor surface, including required upstands and wall cover.
- Sufficient and properly located expansion joints must be provided and compatible sealant installed.
- There must be sufficient floor falls to the drain.
- A sufficient number of floor drains must be provided.
- Products within the whole waterproofing system must be compatible.
- Given that the purpose of a wet area is to contain any free water, the total floor and upstands of a wet area must be waterproofed. For example, in an open-plan kitchen, the waterproofing should extend to the full extent of the kitchen area and be contained by a waterstop.
- Penetrations through the waterproofing membranes and impervious linings must be sealed so that water cannot migrate into the substrate or the cavity. Mechanical fixings, such as when installing shower screens or taps, must be sealed.
- If the substrate is a suspended floor, consideration must be given to service conditions, the floor system construction, and expected deflections. Rigid membranes are less likely to perform satisfactorily, particularly on floors subject to changing loads and deflections (such as in commercial situations, where generally Class 2 and Class 3 membranes are more appropriate).
- If any other Contractor penetrates an installed membrane, e.g. by using fixings or installing a pipe, they must be advised that they have invalidated the Warranty for the system, as the Membrane Applicator was not involved in this item of work.
- Areas subject to possible water overflow must have waterstops and/or a separate floor drain to contain and/or remove excess water.

4.4 General Design Principles for Showers

Showers are one location where internal wet area membranes are commonly exposed to water in the normal course of use. Poor design decisions can lead to greater risk of failure.

Recommendations include, but are not limited to:

- Avoid locating windows within a shower enclosure. There is a risk of water permeating through joints in the window reveal.
- Where windows are located in shower enclosures, ensure that:
    - Window head, jamb and sill junctions are impervious, sealed and meet the requirements of NZBC B2 AS/1 (Durability)
    - Sills fall inwards to the shower area
- Shower floors and bases can be constructed with or without upstands depending on the Designer's intention. Where installed for use by people with disabilities, they shall have either a level threshold or a 10mm step-down.
- When enclosures (such as walls, screens, doors or curtains) are used, they shall be continuous from floor level or the top of the upstand, to not less than 1,800mm above floor level and not less than 300mm above the shower rose.
- Where the shower floor has no upstand or where a wall, screen or door 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 1,500mm, taken from a point vertically below the shower rose. A waterproof membrane is required over the floor area of the entire room; including an upstand of 75mm at all floor-to-wall junctions and containment at door thresholds.
- Water control valves and shower roses shall be waterproofed by sealing with proprietary flange systems, or a sealant, in a manner that allows access to enable repairs and replacement of washers or ceramic disks without damaging the seal.
- If there is a shower hob, it should be at a design-appropriate height, and the top of the hob should slope in toward the shower from the screen.
- If a flexible shower hose is installed, the waterproofing membrane should extend 600mm further than the maximum reach of the hose.

4.5 General Design Principles for Baths

Baths and their immediate surrounds are another location where internal wet area membranes can be exposed to large volumes of water, with severe consequences if there is a failure in the membrane. Poor design decisions can lead to greater risk of failure.

Recommendations include, but are not limited to:

- If a free-standing bath is specified, the waterproof membrane must continue down the wall lining to the floor and under the bath.
- If a "built-in" bath is specified, it is recommended that the bath have an upstand lip around the outer edge. Any wall lining can run over this lip sealed with a sealant behind, so that water is not able to penetrate the wall framing.
- Waterproof membranes must be finished to at least 150mm above the top of the bath.
- If there is a shower over the bath, then all adjacent walls will require waterproofing as per the shower requirements.

4.6 Design Detailing

The following drawings are examples of the extent of the waterproof membrane that must be applied.

Note that:

- The 3-D images show the extent of the membrane that should be applied. They are not a complete design solution.
- The 2-D images show generic construction details. They are not a complete design solution.
- Blue surfaces or dotted lines indicate the extent or location of the membrane.

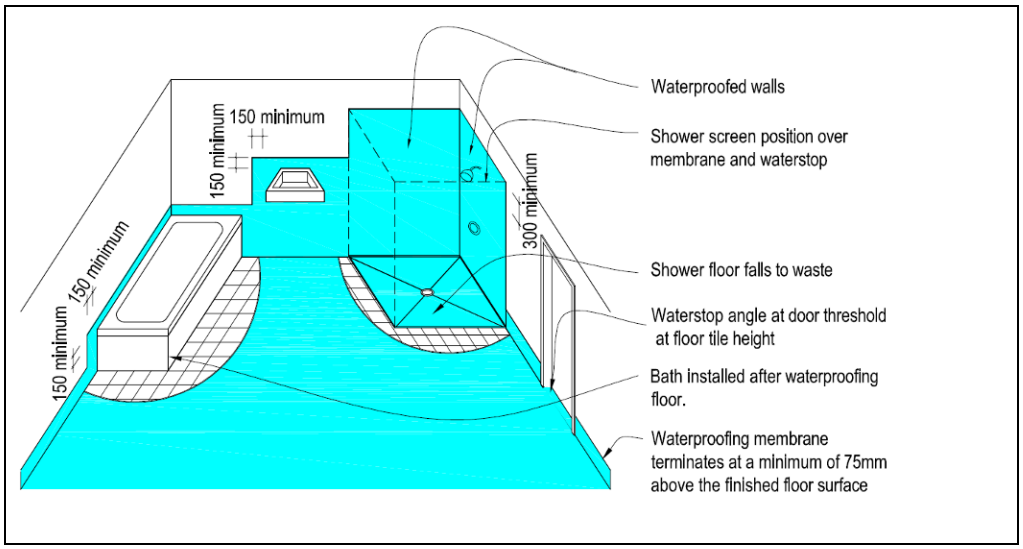


Figure 1: Typical layout of a bathroom with a hob less shower

Note that the membrane must extend over the entire floor and under the bath, even when the bath is inside a boxed-in cradle, and on the wall surface behind the bath. The tiling is indicative only.

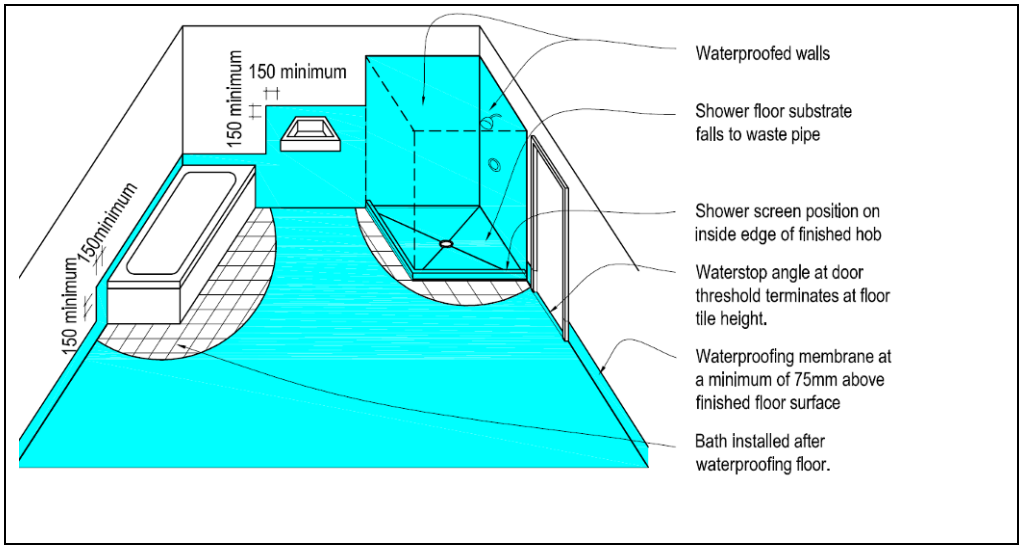


Figure 2: Typical layout of a bathroom with a shower hob

Note that the membrane must extend over the entire floor and under the bath even when it is inside a boxed in cradle. The tiling is indicative only.

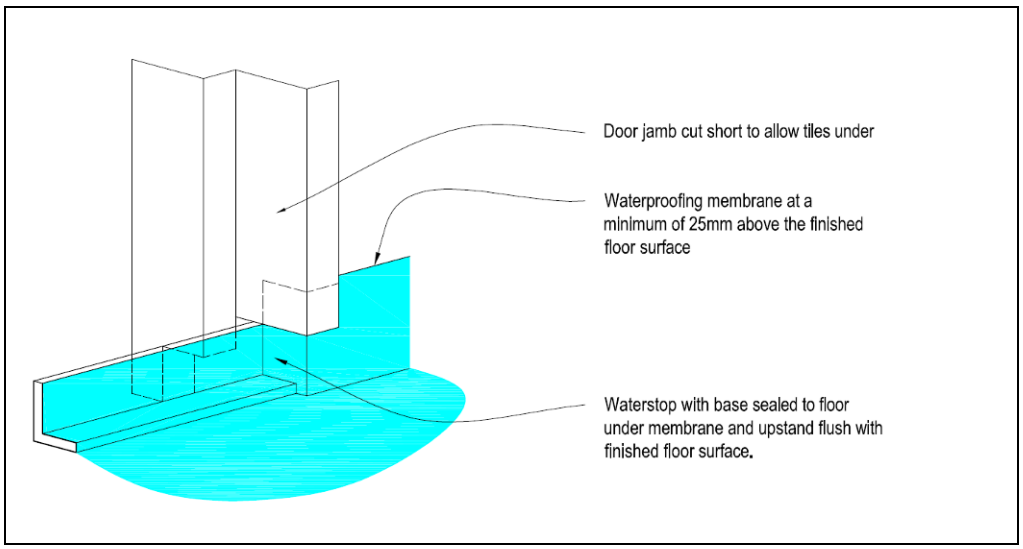


Figure 3: Membrane to a waterstop at a door threshold, tiles under the jamb

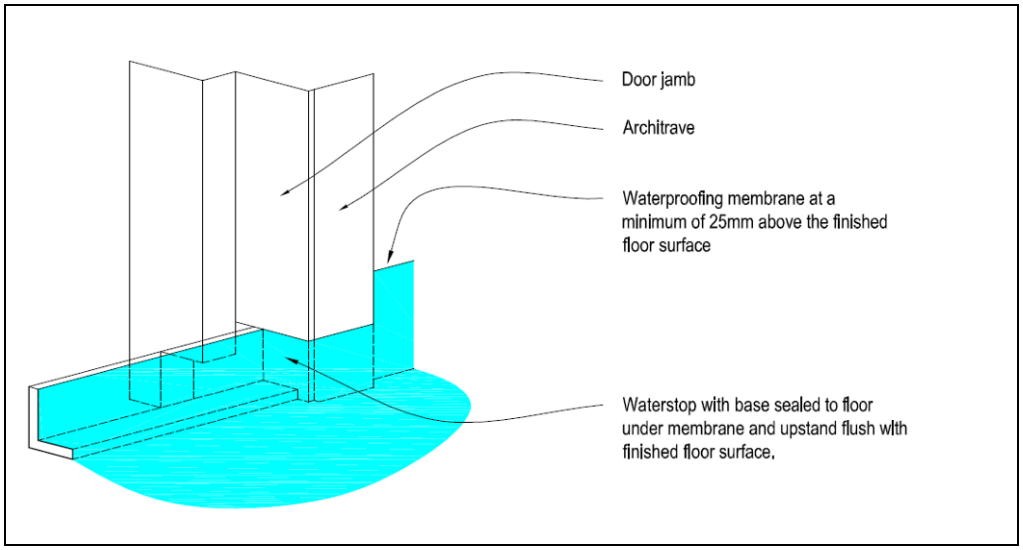


Figure 4: Membrane to a waterstop at a door threshold, tiles around the architrave

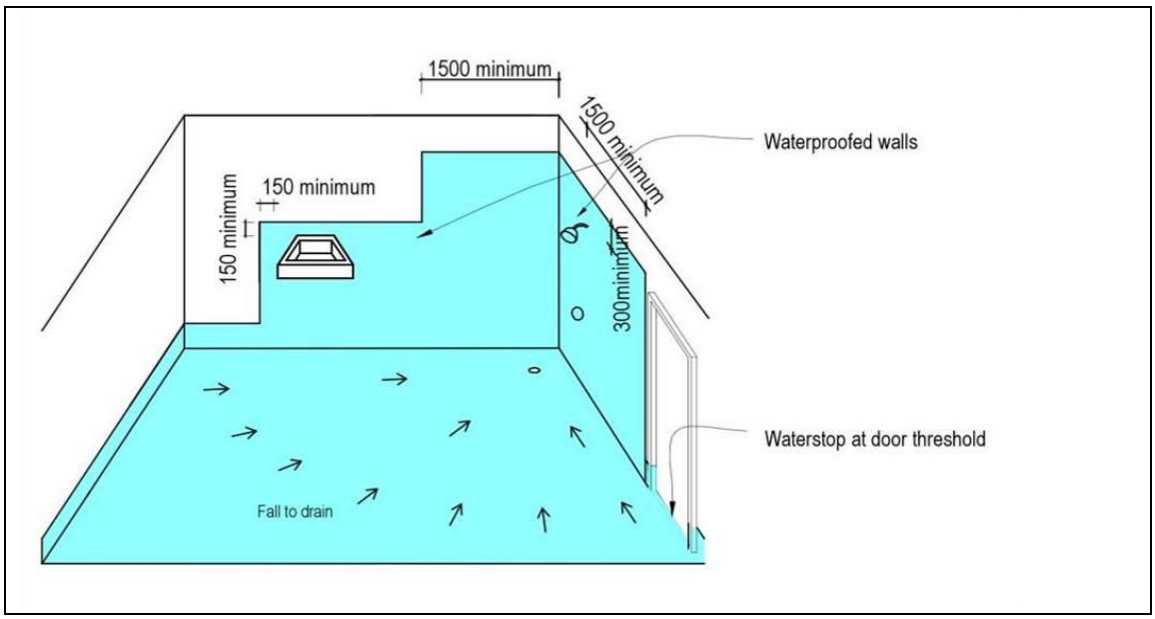


Figure 5: Typical layout of a bathroom for an open shower

Note that for a slide shower the membrane must extend 600mm past the length of the pick (also called a hand-held shower rose).

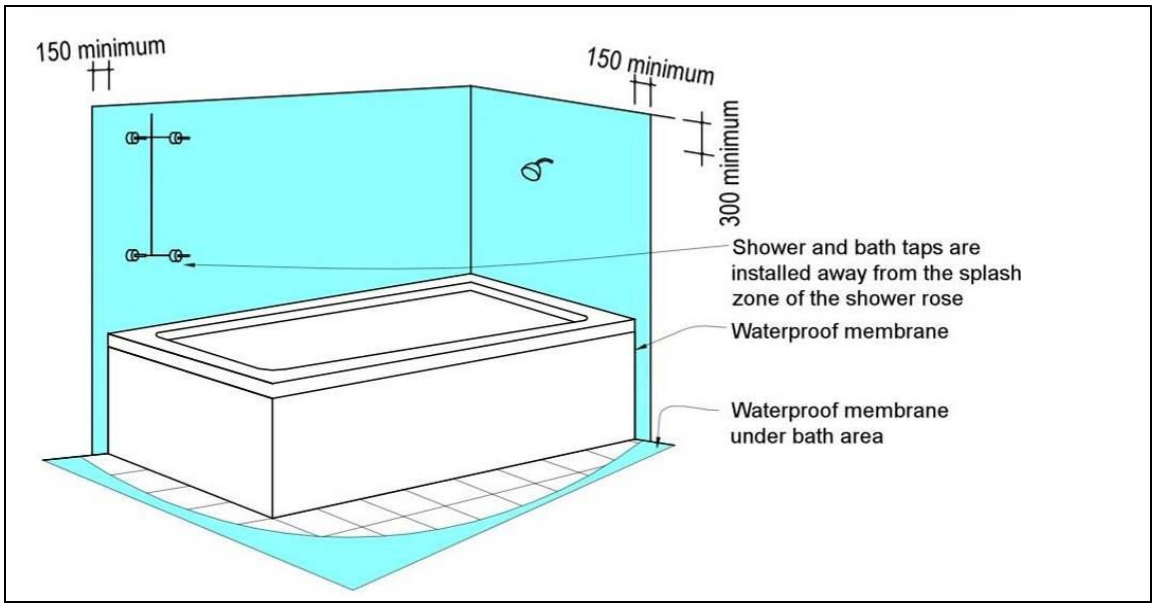


Figure 6: Typical layout of a shower over a bath

Note that the bath could be either free-standing or in a cradle. For a free-standing bath, the membrane must extend down to the floor.

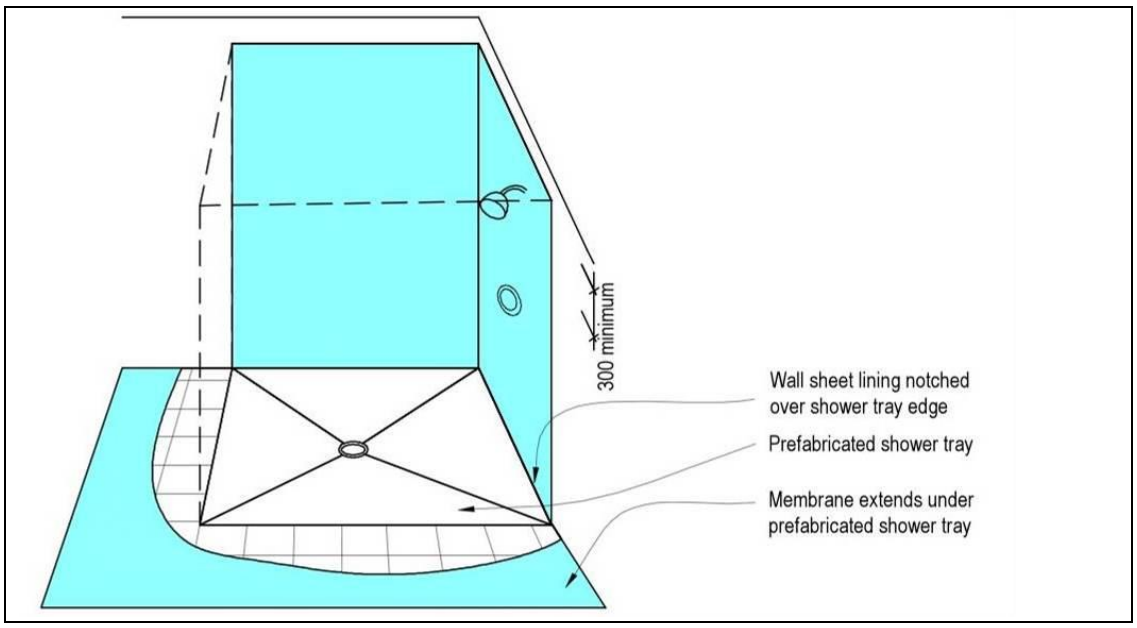


Figure 7: Wall lining termination height with a prefabricated shower base

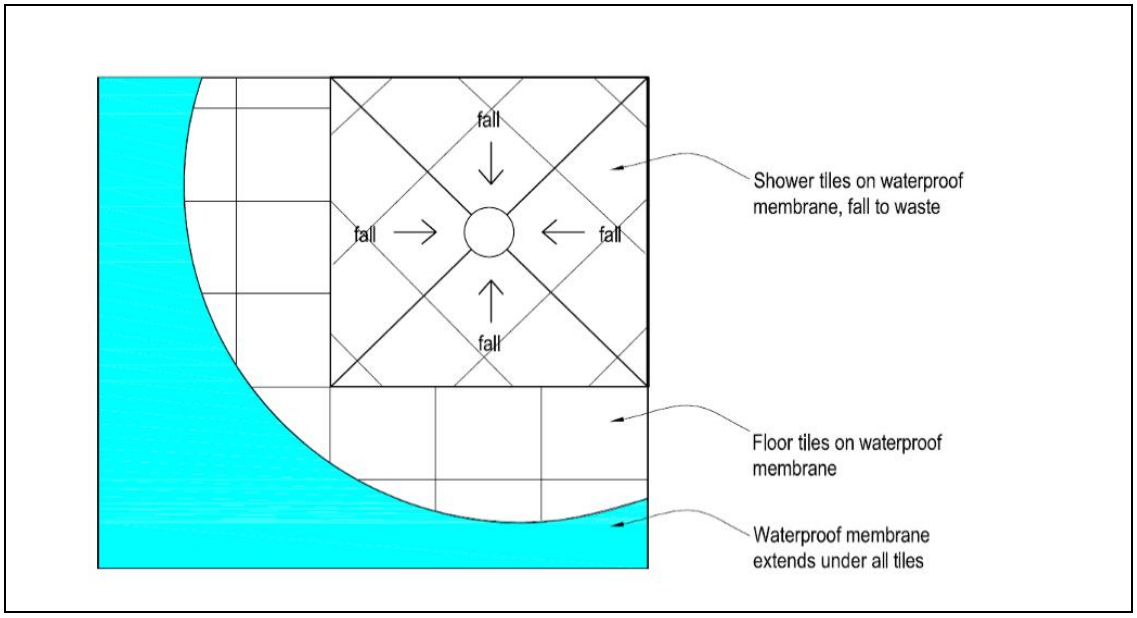


Figure 8: Recommended layout for tiles in a shower with a centre waste

Note that cut tile edges can pierce the membrane. This tile layout minimises the cut edges on direction changes in the membrane.

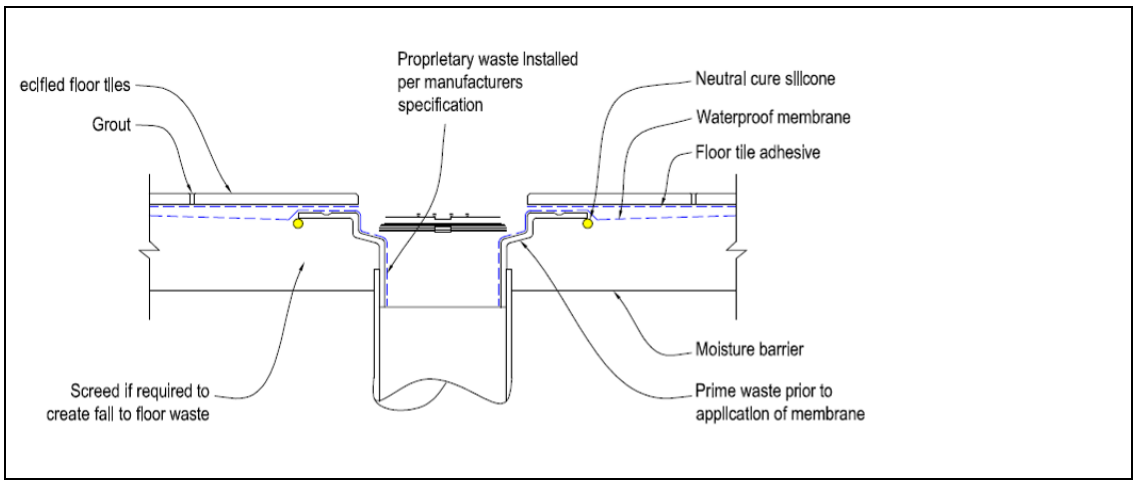


Figure 9: A membrane into a floor waste outlet

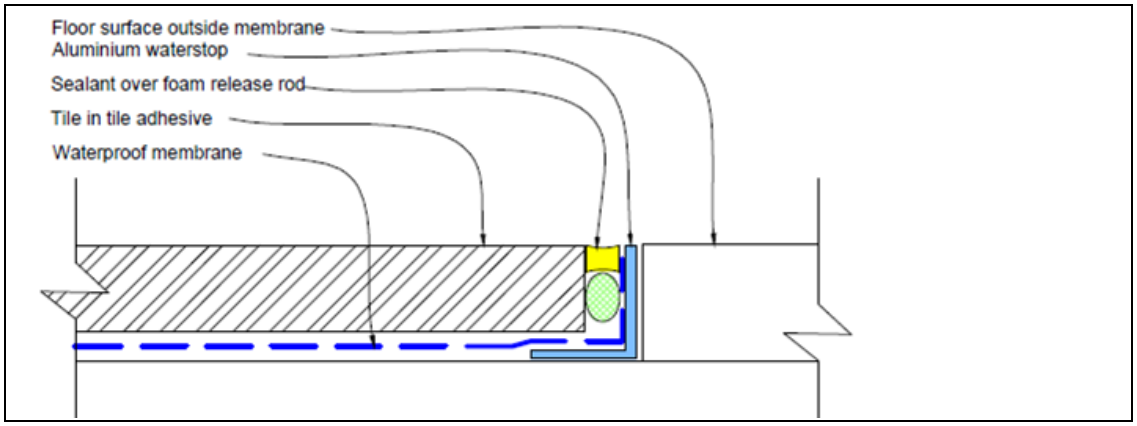


Figure 10: A waterstop at the termination of a membrane

The membrane must cover the whole of the floor area and terminate at the change of flooring material, generally at doorways. However, in some open plan situations, particularly when tiling is carried through, the termination point can be pre-determined and used as the set-out with the waterstop located at a grout line. Where possible, a floor drain should be installed, and the floor should fall from the waterstop toward the drain.

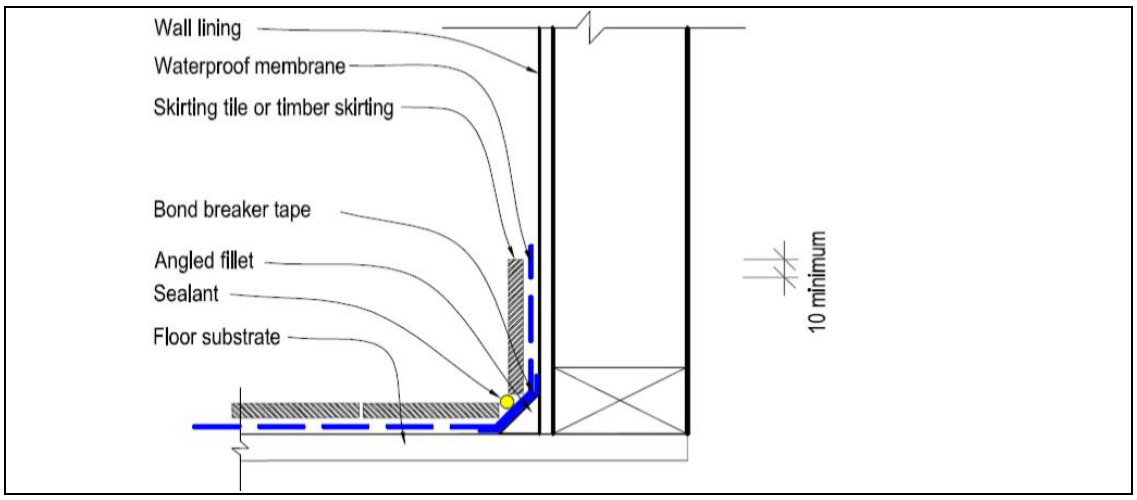


Figure 11: A membrane behind a skirting

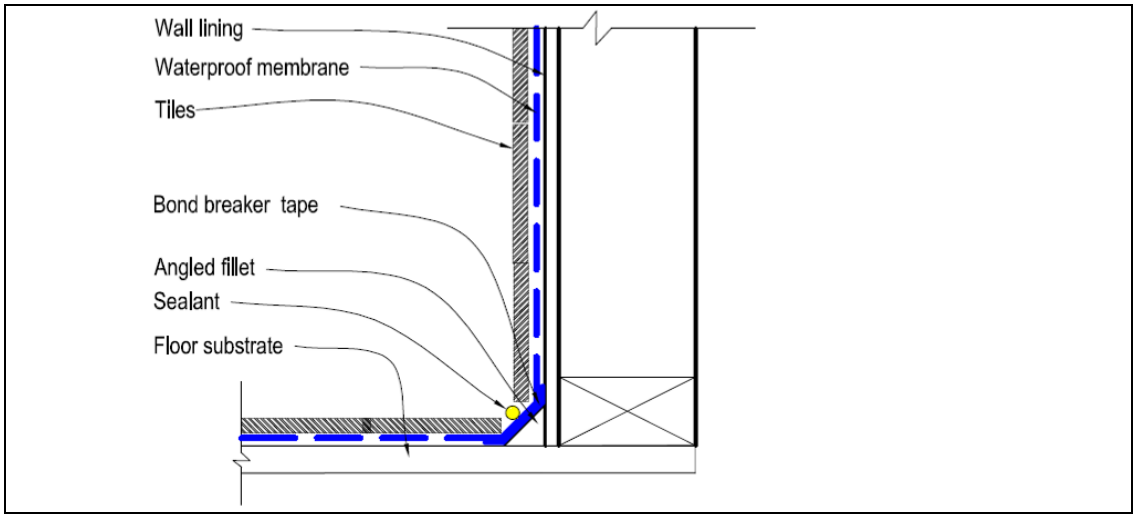


Figure 12: A membrane behind wall tiles

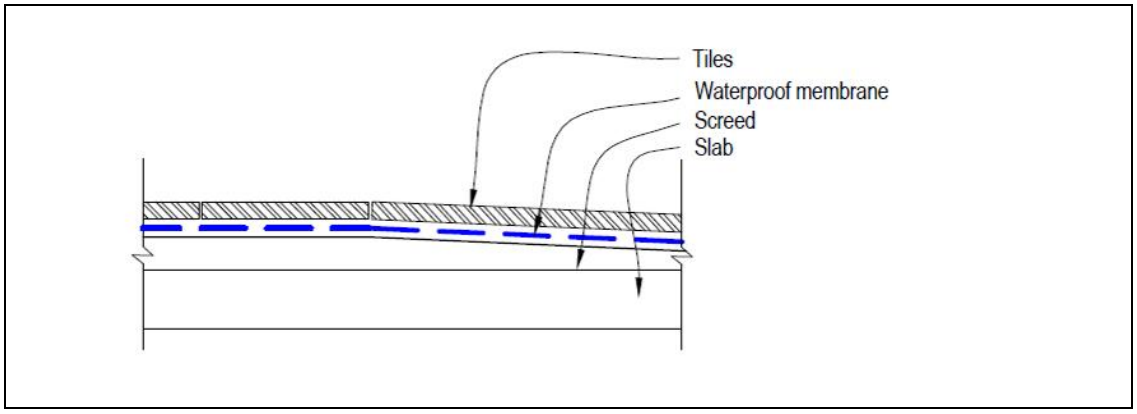


Figure 13: A typical tiled shower with no hob

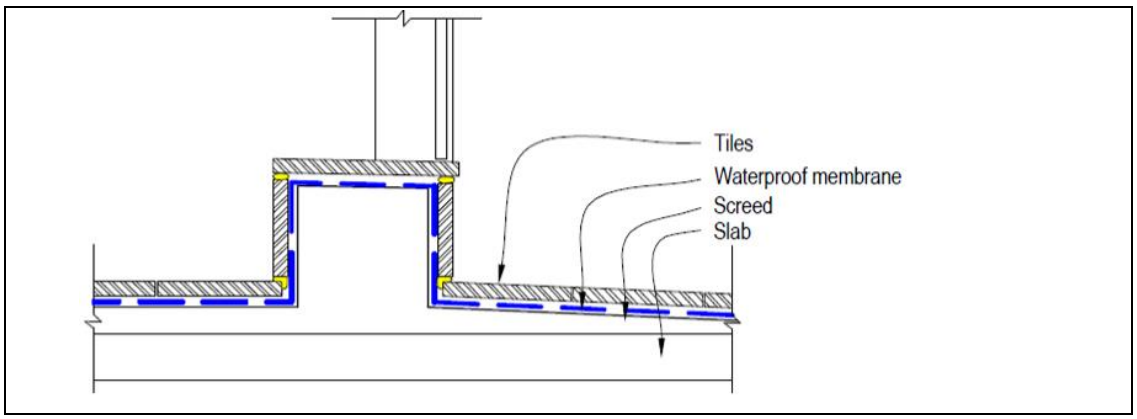


Figure 14: A typical formed shower with a hob

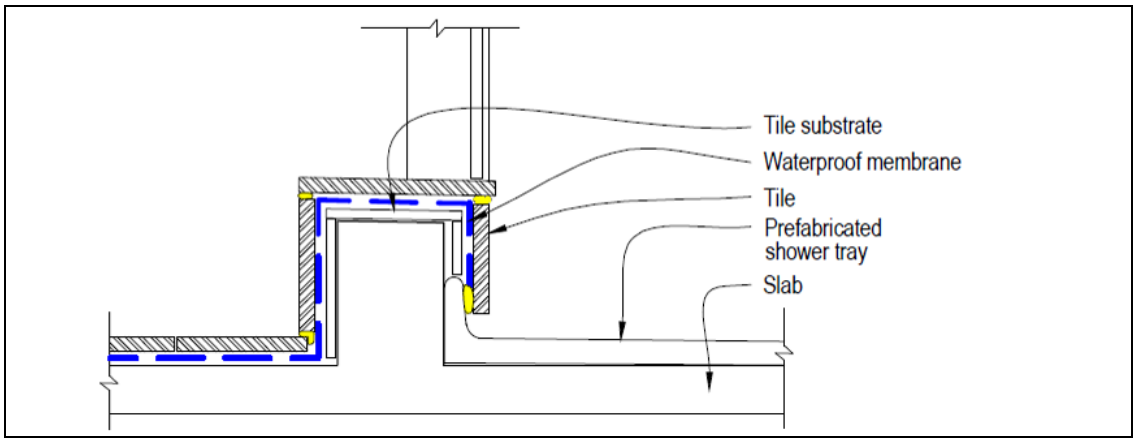


Figure 15: A typical shower with a prefabricated shower tray

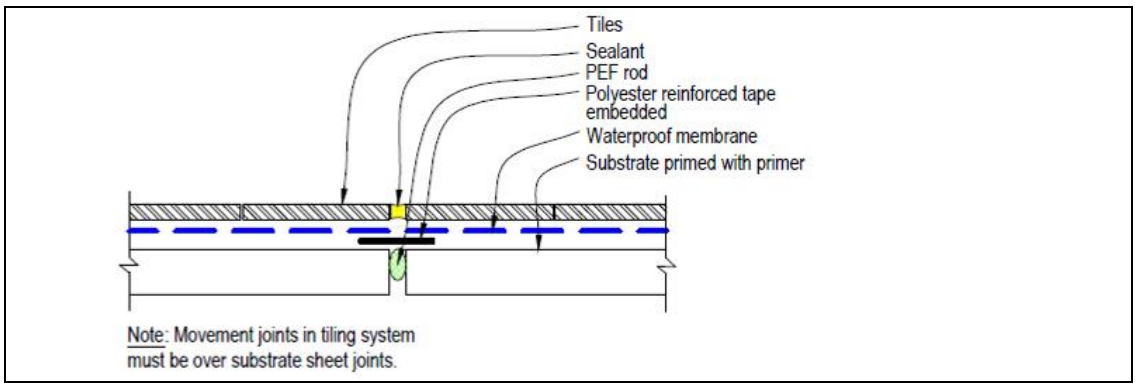


Figure 16: A membrane over an expansion gap

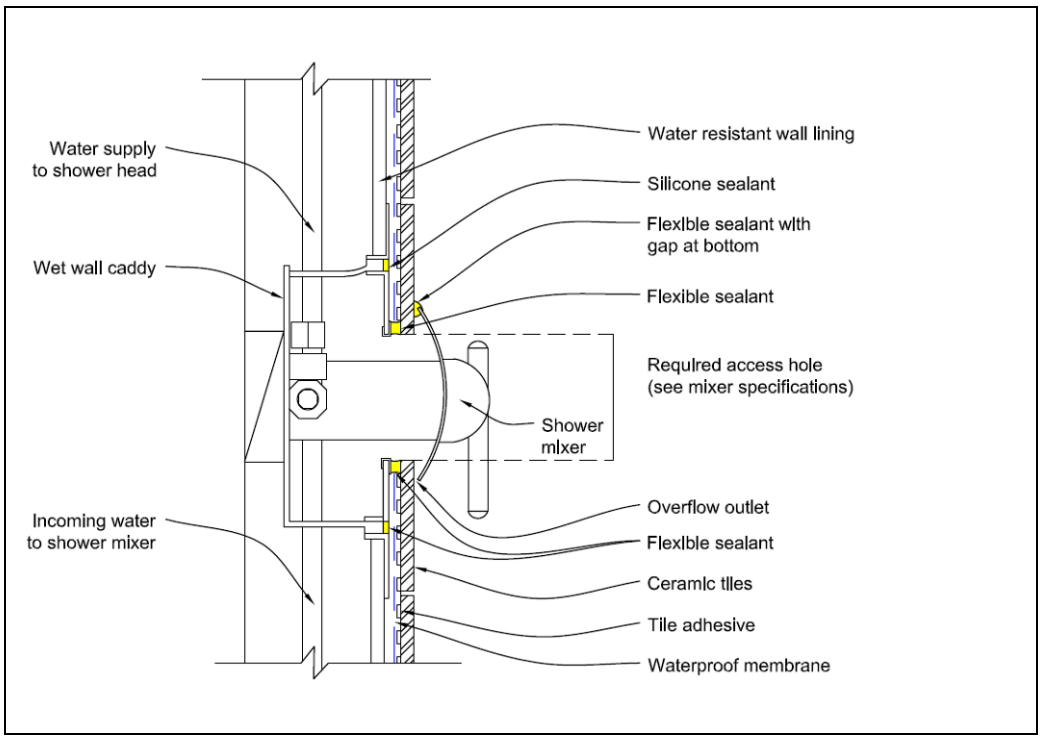


Figure 17: A membrane around a wall penetration in shower

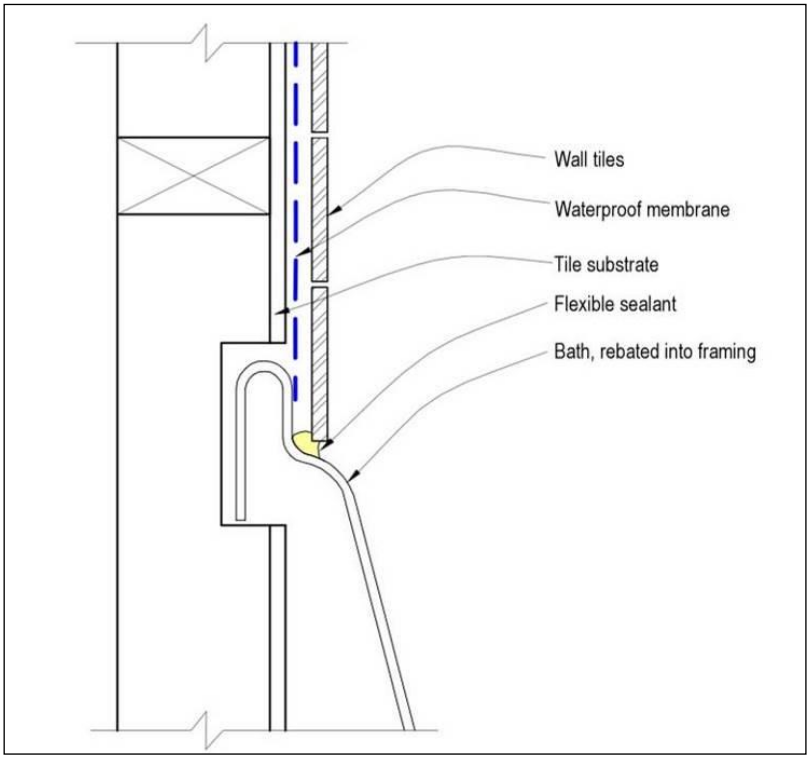


Figure 18: A bath lip checked into a wall stud and lining stops above the bath

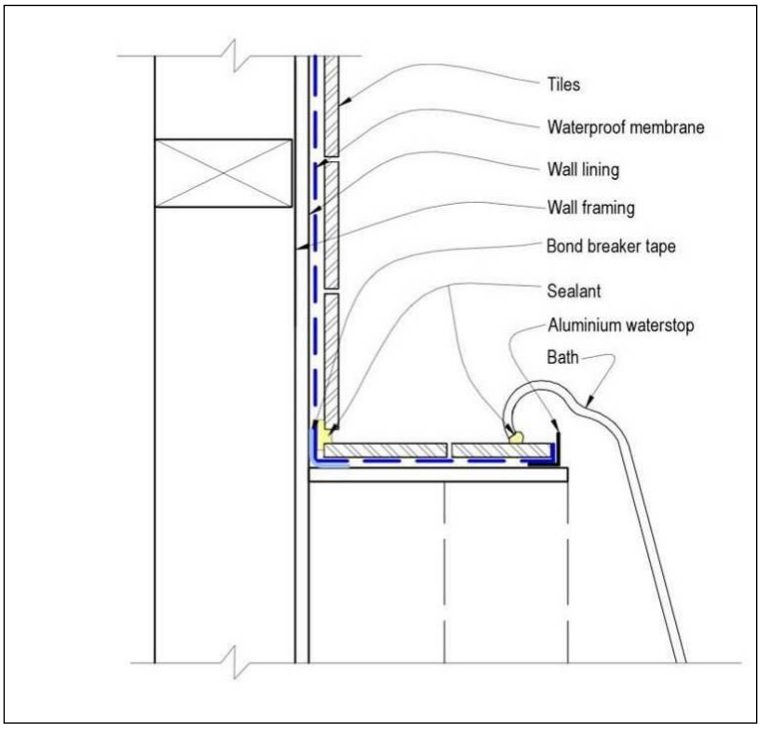


Figure 19: A bath with a level surround

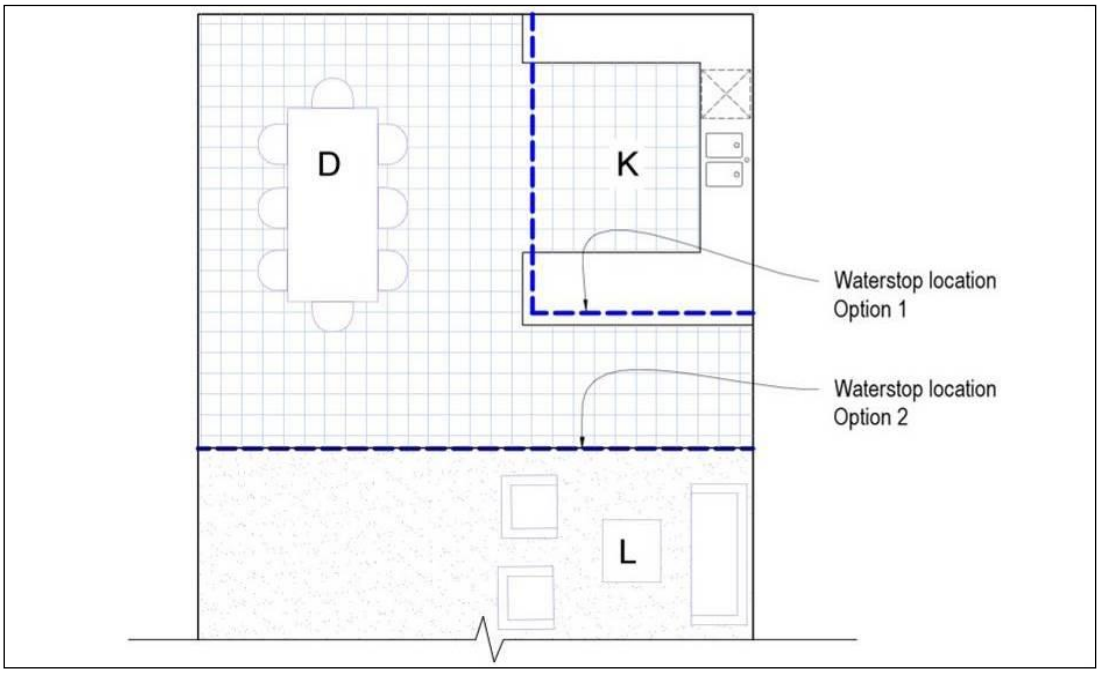


Figure 20: Possible locations of a waterstop in an open-plan kitchen/dining/living room

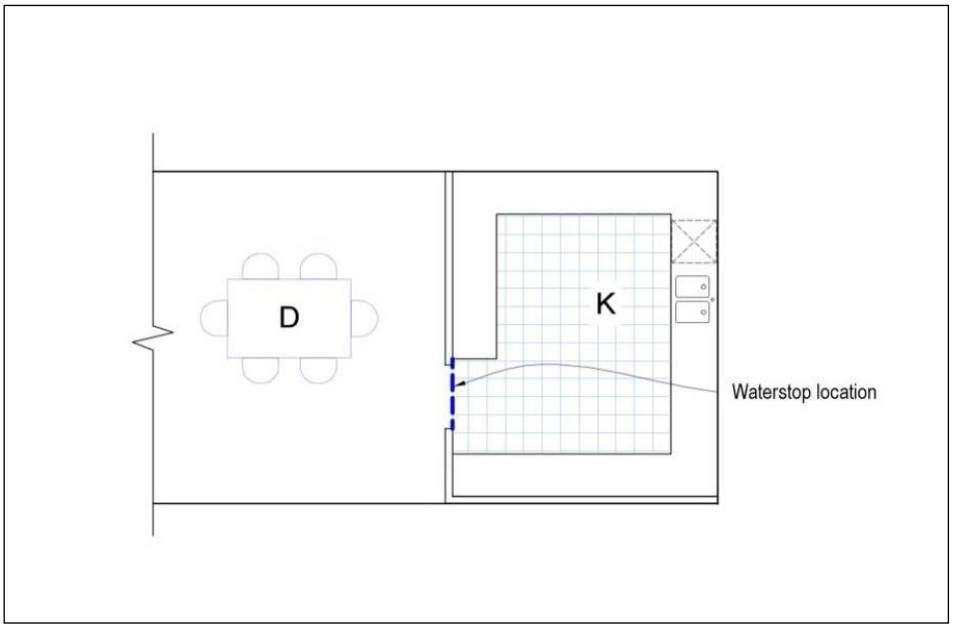


Figure 21: Location of a waterstop for a separate kitchen

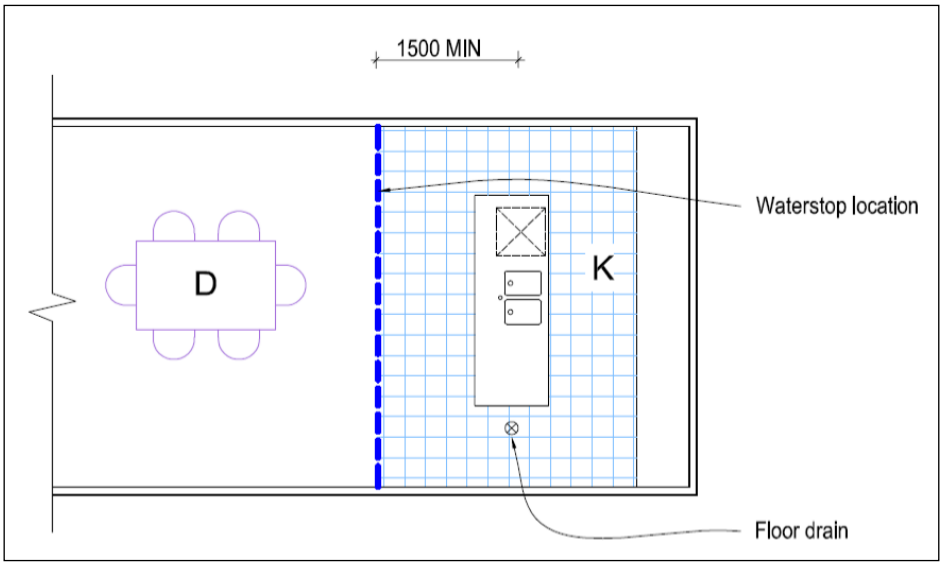


Figure 22: Location of a membrane for an island bench with a sink in the island

The location of a waterstop for an island bench is dependent on several factors, primarily where the sink and/or dishwasher are located and the extent of the tiles in the room. The waterstop should be located a minimum of 1.5m from all water sources.

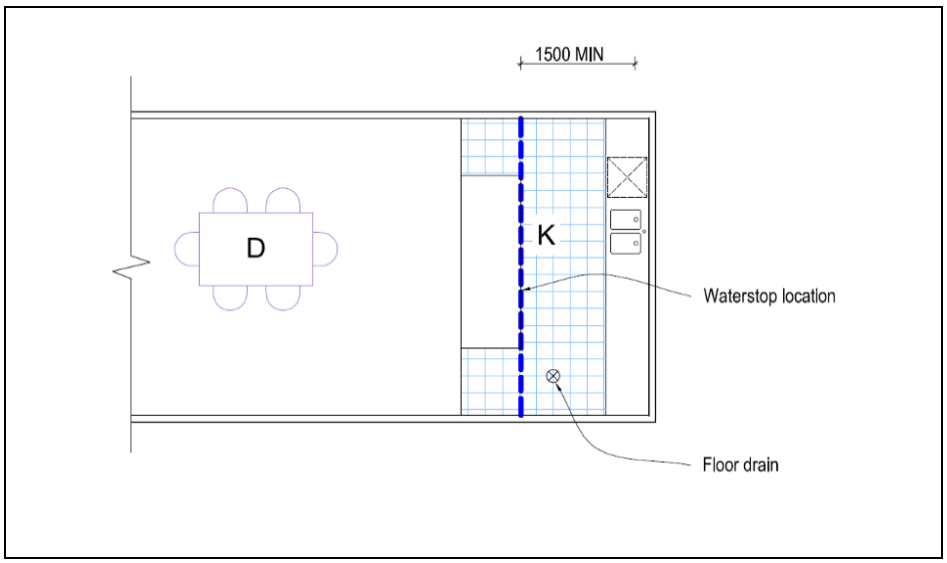


Figure 23: Location of a membrane for an island bench with a sink at the back bench

The location of a waterstop for an island bench is dependent on several factors, primarily where the sink and/or dishwasher are located and the extent of the tiles in the room. The waterstop should be located a minimum of 1.5m from all water sources.

5. Site Practice

This chapter is primarily written for the Applicator and Main Contractor. It will also assist the Building Consent Authority.

It addresses site relations, trade interactions and site safety.

5.0 General

With internal wet area membranes usually being installed in confined spaces, on-site co-ordination of all trades, scheduling and good site practice are critical for a successful installation.

5.1 Administration/Supervision

The Applicator is responsible for the quality control and the installation of the membrane system.

The Applicator should co-ordinate and supervise all aspects of the membrane system (including all pre- and post-work by other trades) with the Main Contractor or Building Owner (whichever is applicable), to ensure that the work proceeds satisfactorily, provides adequate building protection and minimises disruption to the normal building operations.

A pre-inspection and/or a pre-installation meeting of all parties involved with the membrane system (including, if applicable, installers of underfloor heating, sound deadening systems and over-surfacing finishes) must be held to identify any areas of concern. It is important to resolve and clarify any issues or project requirements, work programme and interaction with other trades, the project documentation required, product storage, and site health and safety matters.

The Applicator must ensure that all parties are aware of, and accept responsibility for, the programming of the whole of the waterproofing work, including any curing processes. As curing is critical to the ultimate performance of the membrane, the required time must be allowed for this process. The onus remains with the Applicator to hand over a functioning and completely tested system. The Applicator must not allow any further work to proceed until they are satisfied that the membrane has cured sufficiently and is signed off.

5.2 Project Commencement

Before commencing work, the Applicator must determine that:

- All the building consents have been issued, and the specifications and detailed drawings are workable and suitable for the project.
- There is nothing that will compromise the Applicator's required responsibility under this Code of Practice and the Building Code, specifically E3/AS1.
- The substrate is sound, clean, cured, dry and acceptable.
- No existing conditions at the site prevent the Applicator from performing in a professional and safe manner.
- The product to be installed is as specified in the consent documents.

Acronyms: NZBC E3/AS1 = New Zealand Building Code Clause E3, Internal moisture, Acceptable Solution 1; OSH = Occupational Safety and Health; SDS = safety data sheets; TDS = technical data sheets; VOC = volatile organic compound

5.3 Acceptable Information

The Main Contractor, Building Owner or Supplier will provide the following documents to the Applicator in an accessible location on-site:

- Consented project drawings and specifications
- Supplier's product technical data sheets (TDS)
- Supplier's system installation instructions
- Product safety data sheets (SDS)
- The current OSH "Working in confined spaces" (1997) publication
- Any other relevant project documents

5.4 Handling of Materials

Correct practice for on-site administration, handling and storage of membrane materials prior to use includes (but is not limited to):

- Check all materials and discard damaged or suspect rolls or containers.
- Check that all materials are clearly labelled.
- Ensure materials are stored in a dry and protected environment.
- Rotate all materials which have a limited or specified shelf life. Store such materials in a cool/warm (whichever is applicable) place prior to use and discard any materials which have passed their use-by date.
- Protect products from water damage, exposure to heat or flame or mechanical damage.
- Seal all part-used pails when not in use.

5.5 Working Conditions

Site- and project-specific working conditions are critical to the successful application of a membrane system.

Requirements include, but are not limited to:

- Application must not proceed on unsuitable substrates.
- Application must not proceed in extremes of temperature or humidity, unless the membrane is specifically designed for these conditions.
- The work area must be provided free of other trades until the application of the membrane is completed and cured.
- Membranes already laid must be protected from damage prior to tiling or other over-surfacing finishes.
- All work must comply with the "Confined space - Safe working in a confined space" document from Work Safe New Zealand.

5.6 Scheduling of Work

The Main Contractor or Building Owner is responsible for scheduling all membrane work in consultation with the Applicator and other trades (such as underfloor heating, sound deadening, floor finishing.

The work programme must allow for some or all of the following:

- Surface preparation and drying
- Preparatory plumbing and electrical work
- Priming/sealing of substrate
- Waterproof membrane system installation and curing
- Curing period before access by other trades
- Potential contamination by other trades
- Overlay screed and cure
- Underfloor heating installation and screed system installation
- Sound deadening or acoustic system installation

- Installation of secondary waterproofing layer, if required
- Preparation of over-surfacing finishes
- Installation of over-surfacing finishes
- Installation of plumbing and units

5.7 Care of Adjacent Surfaces

The installation of underfloor heating, sound deadening, waterproof membrane and over-surfacing finishes should be planned and carried out in a manner that ensures adjacent surfaces are protected from damage, and minimises disruption to other trades or normal building operations.

All damage of adjacent surfaces or any work by other trades must be notified to the appropriate project management or personnel, and agreed corrective work carried out.

5.8 Care of Completed Work

The Applicator must inform all other trades on site that the installed waterproof membrane forms a protective barrier against water seepage into the building structure and areas below, and is susceptible to damage before it is fully cured.

To protect the membrane areas from damage by other trades:

- Access to all completed membrane areas is restricted to the Applicator only until the installation has been signed off.
- Membranes on horizontal surfaces must be protected with sufficient impact resistance. (Note that plastic sheeting, tarpaulins or similar will not provide sufficient protection).

All personnel are required to advise the Project Manager and/or the Applicator if:

- The membrane is damaged
- Any pipes, drains etc. are installed, altered or moved after the membrane has been installed
- Any new penetrations are made through the completed installed membrane

In these situations, rectification work will need to be carried out to ensure that waterproof collars and the membrane itself will continue to provide the required waterproofing protection.

5.9 Fire Safety & Ventilation Requirement

Depending on the membrane selected and method of application, certain requirements must be implemented to ensure safe conditions for all work site personnel.

Fire prevention in the first instance is the responsibility of the Applicator. Current industry best practice requirements include (but are not limited to):

- Ensuring fire extinguishers are on site.
- Ensuring no smoking in or near the work area.
- Improving airflow ventilation when required.
- Wearing appropriate protective clothing and a mask.
- Adoption of working procedures which ensure the safety of all personnel on site.
- Complying with all statutory regulations.

5.10 Workmanship

All work must be carried out by persons employed by the Applicator, equipped with the necessary equipment to carry out the work.

Installation procedures must be in accordance with the latest product data specifications, application manual or any other technical document or instructions provided by the Supplier.

All work carried out should be in accordance with the relevant sections of this Code of Practice to produce the required standard for a waterproof membrane that will meet the performance requirements of the Building Code.

ALL WATERPROOFING MEMBRANES MUST BE INSTALLED BY OR UNDER THE SUPERVISION OF AN APPROVED APPLICATOR

5.11 Training

The long-term performance of the membrane system is dependent on the procedures adopted and standard of workmanship in the preparation, installation and finish of the membrane.

This Code of Practice is not a training manual. All applicator personnel must be trained and certified by a Supplier. This training may include, but is not limited to:

- On-site training and supervision by a certified and experienced Applicator.
- In-house training seminars at the Applicator's premises.
- Training seminars provided by the membrane Supplier.
- Training courses by recognised and accredited training providers.

5.12 Health and Safety

It is the responsibility of the site supervisor and the Applicator to be conversant with and to carry out the required safety procedures for their immediate surroundings and work practices.

Applicators must comply with all applicable and appropriate requirements under the Health and Safety in Employment Act 1992. Refer to Work Safe New Zealand for more information.

Required on-site safety practices and procedures include (but are not limited to):

- Usage of protective clothing and equipment, including knee pads and suitable footwear. In particular:
    - Solvent-resistant gloves must be worn to reduce the risk of solvent-based products coming into contact with skin.
    - Respirators must be used when working with membranes that have high VOCs.
- Ensuring that first aid equipment is available on site, and that work personnel are trained in first aid procedures.
- Complying with product-specific requirements as per the SDS.

5.13 Successful Site Practice

The following are suggested guidelines for the Applicator:

- Meet with project management and other trades prior to commencing installation to ensure that all are aware of the scope of the works, especially where there are preceding or follow-on trades.
- Read all contract documents to ascertain what is specified and approved.
- Liaise with the designated Project Manager to ensure that a sound substrate with the required falls, sufficient substrate support is provided, and that it is free from contamination.
- Ensure that all relevant TDS sheets or installation instructions are available on site.
- Ensure that there is a quality-control process in place for signing off, acceptance or otherwise of the membrane substrate.
- Ensure that the selected waterproofing membrane system is appropriate for the task.
- Ensure that there is adequate supervision of the installation and quality control by project management and Applicator Company.
- Arrange protection for all waterproofing membranes from damage by other trades.
- Ensure that the work programme is appropriate, i.e. the correct sequencing of other trades before and after installation.
- Ensure application staff are adequately trained.
- Get sign off for the work completed.

6. Installation

This chapter is primarily written for the Applicator and Building Consent Authority. It will also assist the Main Contractor.

It addresses the sequencing of installation and correct application methodology.

6.0 General

All work must be carried out by a certified Applicator in accordance with the requirements of the building consent documentation, the Supplier's installation manual and good trade practice, having regard to the membrane system selected and any special features of the installation or over-surface finish.

Note that this Code of Practice is not a training manual. Applicators should receive training from their own company or the Supplier of the specified membrane. Only a Supplier or an approved external training organisation can certify an Applicator.

6.1 Pre-Installation

This section describes the actions that the Applicator must complete before commencing any instalment work.

6.1.1 Overall Project Pre-Inspection

Before commencement of work on site, ensure that the overall building project is ready for the application of the membrane system. A pre-inspection and/or meeting with all parties involved in the wet area membrane component of the project must be held to identify any areas of concern.

Specifically, obtain confirmation in writing from the Main Contractor that the conditions of contract and building consent documentation relating to the installation of the substrate have been met.

Similarly, where possible, obtain confirmation from the BCA or Main Contractor that that the substrate has been constructed and inspected as required by the building consent documentation.

Applicators should satisfy themselves that:

- Any notified project conditions or conditions of contract relating to the membrane system have been carried out.
- The extent of the waterproofing membrane work is correctly established, and the membrane installation process is correctly sequenced in the overall project programme.
- Suitable and sufficient storage is available for materials and plant.
- Adequate water, power and other required facilities are available on site.
- Sufficient lighting is provided in all work locations.
- Suitable access is provided to the work area.
- All site health and safety requirements are addressed with regard to the membrane work.
- There is adequate ventilation where the membrane is to be installed.
- There are facilities for the daily removal of rubbish, surplus material and plant.
- Stored materials which may contaminate the substrate or the installation process (such as trade waste or chemicals from other trades) have been identified and removed.
- The latest product data sheets, safety sheets and installation instructions for the proposed waterproofing membrane are provided.
- There is an agreed rectification procedure should the membrane be damaged.

When the installation is completed and signed off, the Main Contractor will assume responsibility for protection of the membrane system.

Acronyms: RH = relative humidity; BCA = Building Consent Authority

6.1.2 Substrate Inspection

A critical factor in the successful application of a membrane system, apart from the membrane system itself, is the substrate. This includes the structural support, the surface to which the membrane is fixed and preparation of that surface.

THE APPLICATOR MUST INSPECT THE SUBSTRATE AND NOTIFY THE MAIN CONTRACTOR/PROJECT MANAGER IN WRITING OF ANY DESIGN OR CONSTRUCTION FAULTS OR DAMAGE TO THE SUBSTRATE.

ALL CONCERNS MUST BE RECTIFIED BEFORE THE APPLICATOR COMMENCES WORK IN THAT AREA

The substrate is the structural element upon which the membrane system is to be laid. It must be sufficiently designed and be able to:

- Withstand point and working loads
- Withstand movement stress
- Provide adequate falls to drains for the expected service conditions

The substrate surface preparation is critical to the successful installation and performance of the membrane system, as the service life of the membrane is dependent on the quality of the adhesion between the substrate surface and the membrane itself.

Avoid potential faults and failures by checking the following (listed in no particular order and not limited to):

- The substrate provides sufficient falls to outlets.
- There is a sufficient number of outlets within the wet area.
- The substrate is correctly installed and fastened.
- The substrate is suitable for a wet area and the proposed waterproof membrane.
- The substrate surface is smooth, with no nibs or hollows.
- The construction and finish of any movement joints meets the requirements of this Code of Practice and the NZ Building Code.
- All changes in direction of surfaces where the membrane is applied are filleted, reinforced or bandaged to ensure the membrane can be applied with no weakening or thinning of the film thickness.
- All penetrations such as pipes, sleeves, ducts and vents have been constructed in accordance with the consent documentation before application of the membrane system.

6.1.3 Substrate Surface

If the substrate is concrete, it is likely that curing compounds or release agents will interfere with the adhesion of the membrane system. The Main Contractor must advise at the pre-installation meeting if a curing compound or release agent has been used, and it must be removed prior to the Applicator commencing work on site.

The moisture content of the substrate can inhibit the adhesion or curing of the membrane system. For example, the maximum allowable moisture content at the time of applying the waterproof membrane is as follows:

- Plywood substrates – 18%
- Reconstituted wood flooring substrates – 16%
- Concrete substrates* – 75% RH @ 25°C

*An accepted method of determining moisture presence for concrete substrates is to tape a 600mm x 600mm transparent plastic sheet of approximately 100 microns thickness to the concrete, leaving for 24 hours then checking to see if there is moisture present. If there is any visible "sweating" or darkening of the concrete surface (which indicates moisture), then the area is too damp to waterproof.

6.1.4 Surface Preparation

When the substrate is accepted by the Applicator as suitable to commence work, the substrate surface should be prepared as required by the Supplier of the membrane system being used.

The surface must generally be dry, clean and smooth – i.e. free of any contaminants, concrete splashes or nibs, dust, holes, protruding nails or screws, or any other protrusions not included in the building plans. External corners must have an arris, chamfer or radius to help the membrane wrap around without stress or thinning.

The substrate must be primed with the Supplier's recommended primer to ensure the satisfactory adhesion of the membrane system to the substrate.

Where there is a delay between priming of the substrate and installation of the membrane, it may be necessary to clean and re-prime the surface in keeping with the Suppliers' instructions prior to proceeding with installation of the membrane.

6.1.5 Equipment

Ensure you have the correct equipment and tools for the installation of the proposed waterproofing membrane, including (but not limited to):

- Brushes, rollers, spray guns or compressed air equipment, depending on the installation method
- Lighting equipment, if there is insufficient existing light
- Ventilation equipment, if there is insufficient ventilation
- Fire-fighting equipment

6.1.6 Materials

The membrane system materials themselves must be suitable for their intended use. Before commencing any application:

- Check the product documentation to ensure that you have the correct materials.
- Ensure that you have all of the required components for the complete system, including surface preparation and repair materials, bond breaker, bandaging, reinforcement and keying materials.
- Ensure that the primer for the substrate and the proposed waterproofing membrane are compatible. All products in a system must come from the same Supplier.
- Check that all materials are within their shelf life.
- Check that all new containers are un-opened.
- If a liquid membrane is to be reinforced, ensure you have the correct reinforcement materials.
- Mix any multi-component materials as per the Manufacturer's specification. Mix immediately before use, then apply the material within its nominated pot life time.
- Discard any material past its pot life.
- Follow all drying and inter-coat times.

6.2 Installation Procedure

The installation phase commences when the Applicator accepts that the substrate is ready for application of the membrane.

As part of any quality assurance programme, we recommend that photographic evidence be collected at time of priming, of all bond-breakers, and of any flood testing.

6.2.1 Primers

The primer must be compatible with both the substrate and the membrane. Note that a membrane can require different primers for different substrates within the same area.

- **Porous substrates** generally require a single-component penetrating primer.
  Porous substrates are typically plywood, reconstituted wood flooring, compressed sheet, fibre-cement sheets, concrete, plaster, etc.

- **Non-porous substrates** generally require a thin solvent or etching type primer.
  Non-porous substrates are typically plastics and metals.

Care must be taken to ensure primers are not applied over any previously applied bond-breaking material. If this happens, the wet primer must be wiped off before it cures.

6.2.2 Bond-breakers and Bandages

A bond-breaker or bandage prevents substrate movement stress being transferred to the membrane.

- Common types of **bond-breakers** are neutral cure silicones and purpose-made bond-breaker tapes.

- Common types of **bandages** are pre-formed elastomeric compounds with fabric face or edges (for embedment in membrane), or flexible open-weave or spun-bonded fabrics which allow for extensibility when impregnated with liquid membrane.

6.2.3 Application of the Membrane

There are many factors in the successful application of the membrane itself, including (but not limited to):

- Ensuring that the Supplier's recommended dry to re-coat and through-dry times are rigorously observed, having regard to prevailing atmospheric conditions.
- Making all penetrations before the membrane is applied. If a penetration is made after the membrane is applied, ensure sufficient membrane material is re-applied to maintain the integrity of the waterproof membrane.
- Co-ordinating and agreeing with the Main Contractor with regard to penetrations and pre- or post-work by other trades.
- Ensuring that the membrane will be protected from other trades both while installation work is in progress and after completion.
- Following the recommended application procedures throughout the complete proposed waterproofing membrane system. If using a liquid system, ensure it achieves the required film build.
- Ensuring that the installed waterproofing membrane system is dressed down into wastes or drains, around pipes, at floor to wall upstands, to door-angled flanges etc., to provide a continuous seamless membrane.
- Broadcasting sand to the topcoat whilst still wet, if the Supplier recommends that the membrane have a keying profile for an over-surfacing finish.
- Barricading access to areas where membranes have been freshly applied, until the membrane is fully cured.
- Noting any special features of the over-surfacing finish.

6.3 Post-Installation

After installation of the wet area membrane, there are some practical steps that must be taken before handing the work site on to the next trade.

6.3.1 Visual Inspection

Visually inspect the membrane for any evidence of:

- Uneven thickness, pin holing or bubbles
- Breaks or creases at all junctions, changes of angle and changes of substrate
- Damage from other trades

If any damage is identified, repair as required for the particular membrane being used. Localised (or spot) repair may be sufficient for some types of membranes; full recoating may be required for other types.

6.3.2 Flood Test

Flood testing must be carried out before the membrane is covered with any over-surfacing material, and only after the membrane system is completed and fully cured.

Use water from an external source to remove any possible confusion of any water ingress. (For example, if testing a shower, do not run water from the shower head.)

It is advisable to take pictures of the flood testing process as part of the quality control sheet.

The recommended procedure for flood testing is as follows:

1. Allow the applied membrane to fully cure for the specified time.
2. Seal off any water outlet with a bung and provide a temporary waterstop at any threshold if one does not already exist.
3. Fill the area with water up to the pre-determined mark.
4. Check for water loss after 12 hours.
5. Check adjacent areas and any rooms below for water-staining.
6. If any water damage occurs, inform the Main Contractor, re-apply the membrane and re-test.
7. Ensure that a minimum 12-hour full area flood test is carried out and signed off.

6.3.3 Defects Liability

Any defects in the waterproofing membrane and/or subsequent over-surfacing within the contract period or Defects Liability Period are the responsibility of the Applicator and/or the over-surfacing Applicator respectively.

The obligations extend to the end of the Defects Liability Period, the length of which will have been stated in the contract documents and in any defects list.

The Building Owner must read these documents and be aware of the maintenance defects liabilities, and also be aware of their maintenance obligations thereafter.

7. Feature Systems

This chapter is primarily written for the Designer and Applicator. It will also assist the Main Contractor.

It covers the planning and installation of underfloor heating and sound-deadening acoustic systems, either alone or together.

7.0 General

Before any installation work commences on underfloor heating, sound-deadening systems or over-surfacing finishes, the feature system installer and the membrane Applicator must co-ordinate their work processes to ensure that both systems can be installed without damage to the other.

Note that underfloor heating may require some electrical work that could impact on the membrane, and the installer of any such system must be either suitably qualified themselves or have their work signed off by a registered electrician.

7.1 Membrane Over- and/or Under-Heating or Acoustic Layers

The primary focus of any waterproofing is to protect the structure of the building – hence the primary waterproofing is always at the structural interface.

Secondary waterproofing may be required to protect acoustic insulation layers and heating systems and ensure these function appropriately. In general, saturated acoustic layers will not reduce sound transmission. Additionally, wet acoustic and heating layers can harbour mould, bacteria and microbes.

Wet areas can be a highly complex combination of waterproofing, heating, acoustic and decorative flooring systems. The Designer, Main Contractor and membrane Applicator should consult with the appropriate experts in the nature and function of heating and/or acoustic layers.

Minimum design considerations include:

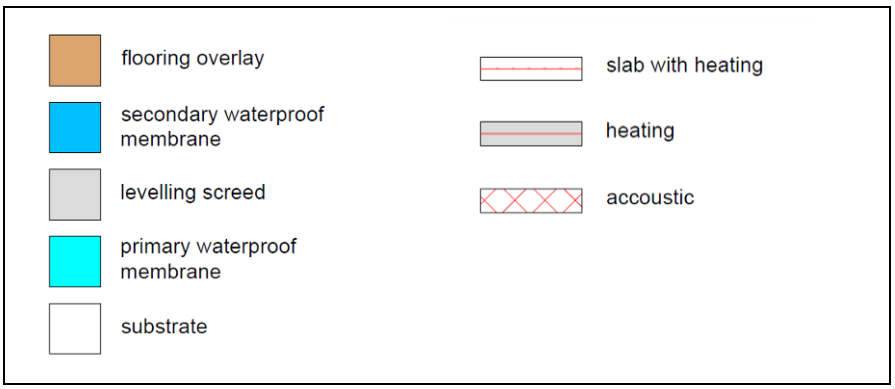
- The wet area must be waterproofed. Evaluate the risks and consequences of leaks, particularly in multiple-storey dwellings or apartments.
- The waterproofing membrane should be applied directly to the substrate.
- Waterproofing membranes can be damaged by deflection if placed above complex acoustic and heating layers.
- Any and all subsequent over-layers must not damage the waterproofing system.
- Failures in acoustic layers, heating layers or flooring systems should not compromise the waterproofing layer.
- The layout of wet area set downs must be well-detailed. The integrity of the waterproofing system must not be compromised due to height constraints in multiple layer systems and/or adjacent floor coverings.
- A secondary layer of waterproofing, to encapsulate acoustic and heating components, should be considered as it will not add significant cost in comparison to the cost of remedial work.
- As a design option, standard European acoustic systems often involve a recessed concrete floor, an isolating acoustic layer followed by a screed. A waterproofing system is placed over this, and then a screed to falls and tiles are installed. This means the acoustic layer is integral with the structure and the waterproofing system still waterproofs the structure.

Acronyms: (no acronyms used in this chapter)

7.2 Illustrative Drawings of Acoustic and Insulation Layers

The drawings below show examples of multiple-system wet area floors. These drawings are the recommended minimum best practice installation methods and meet the stated requirement of waterproofing a structure. Additional membrane layers can be used to waterproof different components.

Note that the heating element could be any one of wires, pads or "liquorice straps".



Key to layers for Figures 24-30

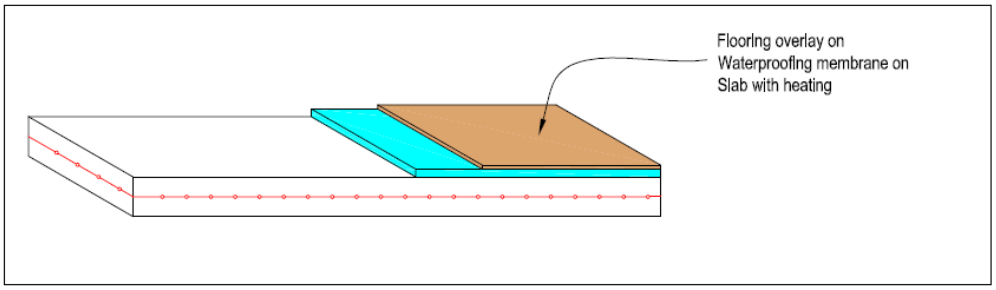


Figure 24: Heating in a slab, no fall

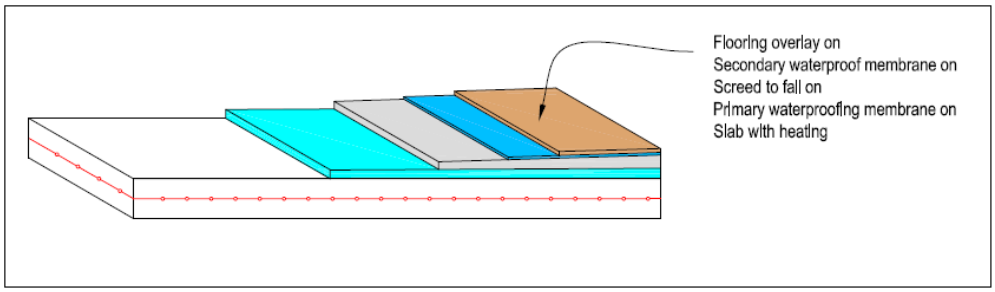


Figure 25: Heating in a slab, screed to fall

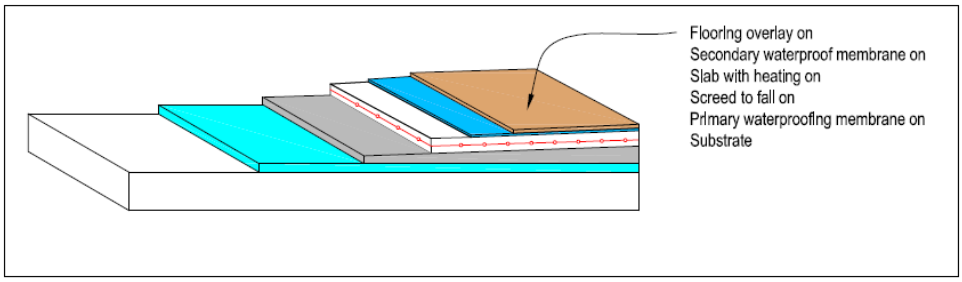


Figure 26: Heating on a slab, screed to fall

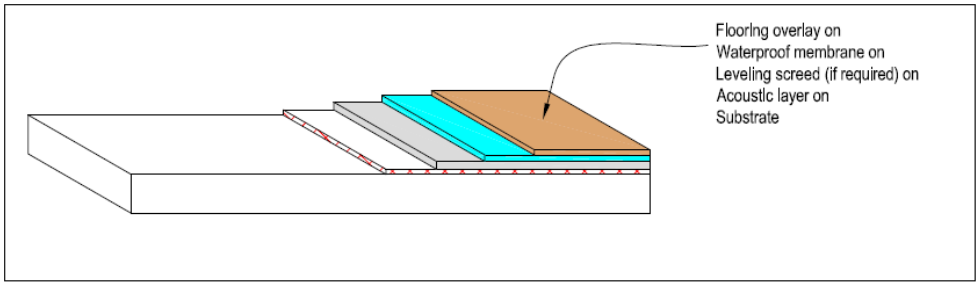


Figure 27: Acoustic layer only, if installed on a new slab

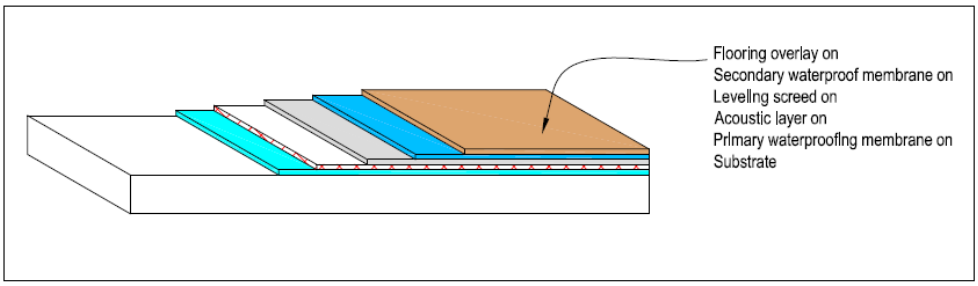


Figure 28: Acoustic layer only, if installed on an existing slab

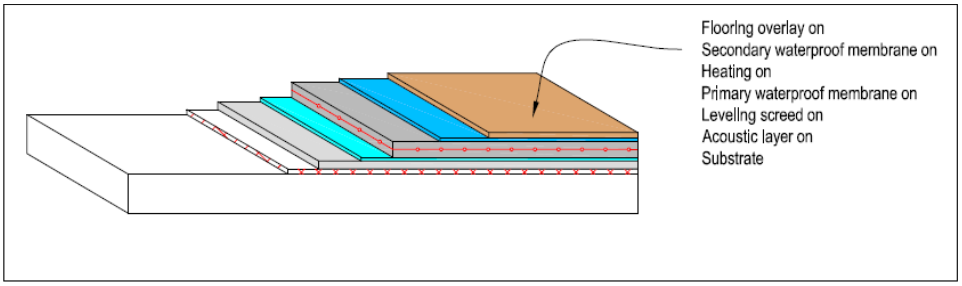


Figure 29: Heating and acoustic layers, if installed on a new slab

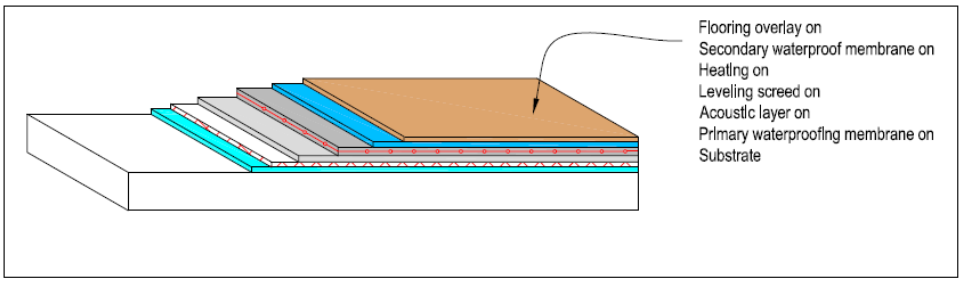


Figure 30: Heating and acoustic layers, if installed on an existing slab

8. Over-surfacing

This chapter is primarily written for the Designer and Applicator. It will also assist the Main Contractor.

It covers the over-surfacing of the waterproofing membrane with tiles or other finishing materials.

8.0 General

Wet area membranes are neither trafficable nor sufficiently robust to be left exposed without any finish protection or over-surfacing. They are designed to be an under-floor or under-wall membrane and are required to be protected from damage, usually by laying a selected flooring or wall surface material over the membrane.

Check that the proposed over-surfacing finish is suitable and compatible with the waterproofing membrane.

8.1 Internal Wet Area Finishes

Membranes over floors that have other dwellings or habitable spaces below are more critical than ground floor wet areas.

Table 6: Over-surfacing Waterproofing Requirements

Flooring / Wall Finishes	Possibility of water leakage	Waterproofing required underneath
Carpet	Very high	Yes
Ceramic tiled floors[1]	High	Yes
Exposed concrete[2]	High	n/a
Pre-finished sheets	Low	No
High-build coating[3]	Low	No
Linoleum - seam welded	Very low	No
Pre-formed shower cubicles & bases	Very low	Yes
PVC tiles	Very high	Yes
PVC plank	High	Yes
Resin-based floor toppings[4]	Low	Yes
Rubber sheet, non-porous, seam welded	Very low	No
Rubber tiles	High	Yes
Rubber porous	High	Yes
Terrazzo[2]	High	Yes
Timber parquet	Very high	Yes
Timber ply laminate	High	Yes
Timber strip	Very high	Yes
Vinyl sheet, seam welded	Very low	No
Vinyl wallpaper	High	Yes

Notes:
1. Ceramic tiled floors can leak through the grout component
2. Not possible to fully waterproof unless a membrane is installed between slab-on-slab. Solvent-based polyurethane coatings to the exposed concrete may give some protection.
3. This must be specified by the Designer as a high-build waterproofing product
4. If used in suspended floor locations

Acronyms: NZBC E3 = New Zealand Building Code Clause E3, Internal moisture; PVC = polyvinyl chloride

8.2 Products That Are Not Waterproof Membranes

This Code of Practice considers that the following products are **not** waterproofing membranes for the following reasons, and therefore their use is not covered:

- **Sealers**, as their films are too thin and are discontinuous.
- **Adhesives** are discontinuous.
- **Grouts** have no waterproofing capability.
- **Grout sealers** have no waterproofing capability.
- **Floor levelling and smoothing compounds** are porous.
- **Coatings/paints** are usually permeable decorative coatings, unless it is specifically stated that they are fully waterproof.
- **Concrete treatments** such as colloidal silicates.

8.3 Over-Surfacing Products

The suitability and selection of over-surfacing in wet areas is outside the scope of this Code of Practice.

This section describes how over-surfacing interacts with the wet area membrane. Any over-surfacing or finished flooring itself is the responsibility of the Designer.

8.3.1 Tiles

There are several design options when tiling over membranes, e.g. including under-tile heating or acoustic isolation sheets. These considerations should be made when selecting finishes and materials.

Considerations when selecting and installing ceramic tile finishes include:

- **Tile selection**
  Tiles are available in a myriad of types, colours and textures. The majority of tiles now available are either porcelain or vitrified. Each have different degrees of porosity, up to making them virtually impervious. Different types of adhesive are required for different types of tile.

- **Adhesive**
  When tiling over a membrane. The primary consideration is the adhesive and the method of curing. Use an adhesive that cures by hydration or chemical cross-linking when tiling over a membrane with impervious tiles, as it is highly unlikely that a dispersion/emulsion adhesive will achieve full cure.

- **Adhesive coverage**
  There are no tiling standards in New Zealand. The closest suitable standard is AS 3958-2007, which specifies minimum adhesive coverage in certain areas, including wet areas, at 90%. Adhesive manufacturers would require 100% coverage. Adhesive coverage (full bond embedding) is critical at the edges of tiles. Full coverage eliminates any pockets under the tiles for water to sit in.

- **Grouting**
  Typically, grout is a weak cement-based material used to fill joints between tiles. Historically, grout was always weaker than the tiles so that any cracking would occur along the grout lines (as the weakest point). These joints are typically no larger than 5mm wide but are sometimes up to 10mm wide depending on tile types and any design considerations. While tiles are either glazed or at least highly impervious, the grout itself is very porous and is the source of many issues and disputes because of cracking and discolouration through water seepage in and evaporation out. Cement-based grouts are not waterproof and allow water and moisture to travel into and through it. Grout sealers can make the grout water- and stain-resistant, but do not make the grout waterproof. Epoxy grouts contain no cementitious material so are less likely to stain, discolour or allow water seepage.

8.3.2 Carpet

Carpet can be installed over the waterproof membrane either loose, by adhesive fixing, "direct stick" to the waterproofing membrane or to a screed which is over the waterproofing membrane.

Any adhesive must be a solvent-free water-based latex or acrylic adhesive.

8.3.3 Timber

Timber is best installed loose as a floating timber floor on an acoustic cushion. If installed by adhesive fixing, direct stick to the waterproofing membrane or direct to screed. Do not use any mechanical fixings which will penetrate and destroy the integrity of the membrane.

Flexible polyurethane adhesives are commonly used.

8.3.4 Vinyl Tiles, Timber Planks, Vinyl Planks

Vinyl tiles or planks are installed by direct adhesive fixing to the waterproofing membrane or direct to a screed which is over the waterproofing membrane.

The adhesive must be a solvent-free water-based latex or acrylic adhesive.

8.3.5 Sheet Vinyl

Wet area membranes are not required under sheet vinyl as they are classified as a waterproof membrane compliant with E3/AS1 (if with heat- or chemically-welded joints).

The sheet vinyl is installed by adhesive fixing to the substrate or to a screed.

If a waterproof membrane is installed, then the sheet vinyl should be installed by adhesive fixing, direct stuck to the waterproofing membrane or direct to screed which is over the waterproofing membrane.

The adhesive must be a solvent- and water-free type.

8.3.6 Resin-based Floor Toppings

These are very water-resistant but are subject to the effects of substrate cracking. A Class 3 Type 2 membrane is recommended when such toppings are used on suspended floors.

The only suitable substrate for these materials is concrete.

9. Maintenance (or "through-life care")

This chapter is primarily written for the Building Owner. It will also assist the Designer and Applicator.

It addresses the care and maintenance of membrane systems after installation, and of over-surfacing materials where they are used.

9.0 General

A membrane system which has been designed and installed in accordance with this Code of Practice should give trouble-free service for many years, provided the area is properly maintained.

Prudent risk management of the building as a whole suggests that regular inspection and maintenance of the wet area is an important part of avoiding future problems. This section of this Code of Practice covers good housekeeping, recognition of "tell-tale" signs of possible problems developing, and the importance of having corrective work carried out.

All references to a Building Owner and their responsibilities also apply to the property management company, the lessee or the tenant, and it is recommended that the Designer, Supplier and/or Applicator notify the building owner in writing of the contract liability conditions and maintenance requirements of the membrane system.

For an over-surfaced membrane, any issue with the waterproofing will often not be evident for many years, so the cause, and therefore any liability, can be difficult (if not impossible) to determine.

9.1 Installation Factors that Can Affect the Membrane

In New Zealand, the Building Code requires that membranes with normal maintenance are durable for at least 15 years. If over-surfaced, the serviceable life of the membrane system should be no less than the expected life of the overlay.

Factors which can affect the durability of an internal wet area membrane include:

- The underlying building design and construction
- The stability of the substrate and its preparation
- The type, grade and formulation of the membrane system installed
- The thickness and type of the finished membrane
- The quality of installation by the Applicator
- The selection, installation and finish of the overlay
- Activities that occur on and over the membrane
- Attention to maintenance requirements for the exposed surface, whether the membrane or an overlay

9.2 Defects Liability

Post practical completion defects liability requirements are covered in the original contract documents for the construction of the building, the re-surfacing tender documents or any other written commercial obligations.

The obligations extend to the end of the Defects Liability Period, the length of which will have been stated in the contract.

The Building Owner must read these documents and be aware of the maintenance defects liabilities obligations and period.

Acronyms: (no acronyms used in this chapter)

9.3 Good Housekeeping

Preventative maintenance by regular inspection checks is highly recommended, rather than waiting for either catastrophic failure to occur or a systemic failure to become evident. The frequency of inspections will depend upon the use of the area.

9.3.1 Risk Elements and Work by Other Trades

Good maintenance starts as soon as the membrane is installed. Internal wet areas are often the one space on any project where all the trades on a site will be required to carry out some work. They are often confined spaces and the workers will be in close proximity to each other or working on top of the waterproofing membrane, so the installed membrane must be protected to minimise any possible damage.

It is recommended that after application any membrane should be protected from possible damage by loose-laid or temporarily-taped solid sheeting. Any damage to the membrane must be notified to the Applicator and remedial work carried out.

9.3.2 Maintenance

Regular and ongoing maintenance is required for all membrane installations, whether the membrane is the finished surface or over-surfaced with another product.

Minimum maintenance tasks in a wet area include:

- Scrub, wash and rinse the surface regularly.
- Treat any mould infestation immediately.
- Keep drains free of debris build-up.
- Mop up any ponding water, and inform the Building Owner if this is a recurring issue which would indicate an underlying building fault that will need to be rectified.
- Check regularly for tell-tale signs as described in Section 9.2.5 (Notification of Remedial Work).
- If the space is above ground floor, check the space or ceiling directly under for any sign for water damage.

For membranes that are the finished surface:

- If the membrane itself appears faulty (including any welded seams), contact the Applicator to carry out corrective work.
- If the membrane becomes damaged through building stress or other mechanical means, contact the Applicator to carry out corrective work.
- Liquid membranes will require re-surfacing after a period of time. The surface must be thoroughly cleaned, prepared and re-surfaced by an Applicator as per the Supplier's recommended procedure and processes.

For membranes that are over-surfaced:

- If the surface finish appears faulty, contact the over-surface Applicator for corrective work to be carried out.
- If the surface finish becomes damaged through building stress or mechanical damage, contact the over-surface Applicator to carry out corrective work.
- Faulty sealants to chases must be removed, chases prepared and new sealant installed.
- For popped, lifted or damaged tiles, consult with the tile layer in the first instance.
- For damaged or eroded grouting, remove and replace the grouting.
- For faulty drain surrounds or pipe penetrations, remove and re-seal.
- Ask the membrane Applicator to check the integrity of the membrane and, if necessary, reinstate before the over-surface is re-applied.

Be vigilant for other issues that can affect the membrane, including:

- Faulty shower mixers discharging water down the wall surface, between over-surfacing finishes or in the wall itself.
- Faulty taps discharging water under or behind cabinets, baths etc.
- Faulty waste outlets discharging below showers, baths and cabinets.

9.3.3 Preventative Maintenance

Any required maintenance will vary depending on the finish of the wet area and its use. The long-term performance of the membrane system installed in any building is reliant on the Building Owner implementing a good housekeeping or preventative maintenance programme.

The wet area should be inspected periodically to determine its condition and any areas of concern identified and noted. Any problems must be reported to the membrane Applicator, tile layer or floor/wall over-surfacing applicator and/or the Suppliers, so that prompt remedial work can be carried out.

9.3.4 Notification of Remedial Work

The Building Owner has a duty of care to promptly notify the Main Contractor, membrane Applicator or Supplier, or tile layer/over-surfacing applicator if they become aware of:

- Faults found in the membrane
- Mechanical damage caused to the membrane
- Damage to the over-surfacing finish
- Building alterations, extensions or movement

Prompt notification is vital to not only rectify a problem, but to reduce any subsequent water ingress problems.

Failure to do so may void any product warranty or insurance cover.

9.4 Maintenance Processes

During the course of regular maintenance inspections, the complete surface should be systematically checked and any areas requiring attention should be noted. It is recommended that an experienced membrane Applicator and/or over-surfacing applicator be used as they will know how to carry out a thorough inspection and the potential problem areas to look for.

9.4.1 Maintenance Checklist

A thorough inspection must be carried out and any areas of concern recorded. The membrane Applicator and/or over-surfacing applicator should be advised and rectification work requested.

The following is a suggested minimum checklist:

1. **General Surface** – Examine the whole of the general area and note any areas of concern with the substrate or within the membrane system; note the extent and type of defects. ☐
2. **Penetrations** – Inspect the membrane around each penetration to ensure that the flashings are intact, not ruptured, and are adhering and performing as required. ☐
3. **Chases** – Inspect the sealant within the chase to ensure that they are sound, well adhered, and not ruptured, perished or faulty in any way. ☐
4. **Trims** – Check for suspect movement or stress areas, ruptures, and de-lamination of the membrane or the over-surfacing material. ☐
5. **Threshold water-stops** - Check the upstand angle flashing to door is performing as required. ☐
6. **Expansion joints** – For large commercial floor areas, check movement or expansion joints or upstands to ensure that they are functioning as required. ☐
7. **Drains** – Ensure that they are not blocked or clogged. ☐
8. **Ponding** – If standing water is a frequent occurrence, contact the Building Owner for remedial work as there could be an underlying substrate issue that needs remedial work. ☐
9. **Substrate** – Check for depressions or deflections in substrate, investigate the cause and resolve. ☐
10. **Sealants** – Inspect all sealants to ensure they are not faulty and are performing as required. ☐
11. **Hobs** – Check that the over-surfacing and the membrane are in good condition. Check any mechanical fastening of shower screens to ensure no moisture ingress points. ☐
12. **Finish** – Check that the complete wall and floor finish is not cracked or delaminated; look for any suspect pointing, loose tiles etc. ☐
13. **Inside building** – Check adjacent spaces under the wet area for any staining or dampness signs that would indicate moisture penetration. ☐

9.3.2 Repair Procedures

Repairs should only be carried out after the type and extent of any defects have been noted and their underlying causes identified. The intention of repair work should be to restore the wet area membrane to its original condition and ensure its continuing performance. All repairs should therefore be carried out using materials, accessories and standards of workmanship etc. compatible with the original installation and/or over-surfacing finish.

Where practical, the original membrane and over-surfacing Applicators should be engaged to carry out the required work.

Corrective maintenance of a liquid waterproofing membrane that has been over-surfaced is impossible unless that over-surfacing material is removed in its entirety. The over-surfacing material must be reinstated once the waterproofing membrane is completely repaired and water-tested.

9.3.3 Re-coating of Exposed Waterproof Membranes

Where an exposed membrane system requires re-coating, it must be carried out only with compatible materials. The original Designer, Supplier and Applicator must all be consulted before any such work is carried out.

The recoating work requires the following steps:

1. Apply a recommended moss, mould and lichen treatment solution.
2. Scrub, wash or water-blast clean at low pressure to leave a sound surface.
3. Repair the membrane installation as required to the Supplier's recommendations.
4. Apply the required number of coats of protective coating as specified by the Supplier.
5. If the membrane requires complete re-surfacing, contact the original Applicator/Supplier.

9.3.4 Maintenance of Tiled Surfaces

Check the surfaces over for tell-tale problem signs and resolve as follows:

- Tiles loose and require surface preparation: re-bed, then re-grout.
- Grouting badly cracked: remove and re-grout.
- Sealed expansion joints failed: remove, repair and replace with suitable quality sealant.
- Check and if necessary improve seal to drains, floor to wall junctions, etc.
- Seal around any new protrusions, drains etc.

9.3.5 Maintenance of Other Finishes

Check the over-surfacing finish for suspect defects and work with all other parties involved to resolve:

- De-lamination, rippling etc. at upstands flashing.
- Welded joint failures.
- Poor seals to drains.

10. Definitions, Abbreviations and Acronyms

The following definitions apply in relation to this Code of Practice only, as they may have alternative meanings elsewhere in the industry.

Some of the terms below may not appear in this document but are included as they are commonly used in this industry.

Term	Definition
AAC	Aerated autoclaved cement
Absorption	*As a measure*: The relationship of the weight of the water absorbed by a material specimen subjected to prescribed immersion procedure, to the weight of the dry specimen, expressed as a percentage. *As a material property*: The ability of a material to accept (absorb) quantities of liquid, such as water, within itself.
Acceptable Solution	Acceptable Solutions and Verification Methods are for use in establishing compliance with the New Zealand Building Code. They are prepared by MBIE in accordance with Section 22 of the Building Act 2004. A person who complies with an Acceptable Solution or Verification Method will be treated as having complied with the provisions of the Building Code. However, using an Acceptable Solution or Verification Method is only one method of complying with the Building Code. There may be alternative ways to comply. *See also*: Alternative Solution.
Access hole	A penetration in the wall lining that is a requirement from tapware manufacturers under their warranty conditions, for servicing and replacement purposes.
Acid etch	The use of an acid to cut away and remove the surface of concrete to expose profiled surface, for improved adhesion.
Acoustic layer	A sound insulating material.
Acrylic latex	Water-based dispersion resins made by polymerisation of acrylic monomers, such as ethyl acrylate and methacrylate.
Adhesion	The strength of bonding of two materials. Failure will result in a fracture at the interface between the two materials. *See also*: Cohesion.
Adhesive	A material that holds two other materials together by surface attachment or bonding.
Adhesive-bonded	A method for bedding and adhering membrane on to the substrate, or adhering sound-deadening materials or heating systems over waterproofing membrane.
Adhesive failure	The failure of two materials to remain adhered together. Failure will result in a fracture at the interface between the two materials. *See also*: Cohesive failure
Aging	The physical effects on material that are exposed to an environment for a period of time.
Alligatoring	Random minor cracking of the surface liquid membrane.
Alternative Solution	A design solution that differs totally or partially from Acceptable Solutions or Verification Methods as published by MBIE, yet complies with the performance requirements of the Building Code. These are "stand-alone" solutions put forward and substantiated by the building consent applicant and considered and approved on their individual merits by a Building Consent Authority. *See also*: Acceptable Solution.
Ambient temperature	Room temperature or the temperature of the surroundings (fluid or air).
Angle fillet	*See*: Fillet.
Application rate	The quantity (mass, volume or thickness) of material applied per unit area.
Applicator (person)	An Applicator is a site worker employed by the Applicator company. The Applicator must work within recommended trade practices and undergo sufficient training to ensure that the product is installed as required by the Supplier.
Applicator (company)	Any company approved by the Supplier to install its product.
AS/NZS	A joint Australia and New Zealand Standard.
B2/AS1	B2 refers to Clause B2 "Durability" of the Building Code, and "B2/AS1" is an Acceptable Solution for Clause B2. Buildings designed and built to B2/AS1 are deemed by MBIE to comply with the performance requirements of Clause B2.

Term	Definition
Backer rod	A closed-cell foam rod inserted in a joint to be sealed, to provide non-adhesion to the substrate and to regulate the depth of sealant.
BCA	*See*: Building Consent Authority.
Bio-resistance	Resistance to degradation by biological attack.
Blister	An enclosed pocket of vaporised water and/or solvent trapped between the substrate and the membrane or between impermeable layers within the waterproofing and overlay system.
Blocking	A specifically-placed framing element between structural members to support finish fittings or sheet joins.
Bond-breaker	A material or system used to prevent adhesion between two elements to accommodate structural movement and reduce stress on those elements.
Bond strength	The force per unit area necessary to rupture a bond.
Bonding	Adhesion of two elements. *See also*: Adhesion.
Bonding agent	A chemical substance applied to a suitable substrate to enhance a bond between it and a subsequent layer.
Boot	A pre-formed shaped material to seal around a penetration.
Bridging	When a membrane is unsupported at a juncture.
Buckle, Buckling	An upward elongated tenting displacement (rippling) of the membrane due to movement in the substrate or structure.
(NZ) Building Code	The First Schedule to the Building Regulations 1992 that sets national, mandatory standards for building work. All building work in New Zealand must comply with the Building Code. The Building Code is performance-based and specifies how a building and its components must perform, as opposed to how the building must be designed and constructed.
Building Consent Authority (BCA)	A Building Consent Authority is a territorial authority, regional authority or private body that has been registered by MBIE after having been assessed and accredited by the Building Consent Accreditation Body. BCAs issue building consents, undertake inspections during construction and issue Code Compliance Certificates, notices to fix and compliance schedules.
Butt joint	*See*: Seam joint
Butyl rubber	A rubber-like material produced by copolymerising isobutylene with a small amount of isoprene. Butyl rubber can be blended with other elastomeric materials to make sealants and adhesives or manufactured into sheets.
Butyl tape	A fabric-finished sealing tape used between substrate joints or upstands.
Capillary action	The action that causes movement of liquids by surface tension when in contact with two adjacent surfaces.
CCA	Copper chrome arsenate
CCC	*See*: Code Compliance Certificate or Consent Completion Certificate.
Ceramic tile	A ceramic tile is made from clay or a mixture of clay and other materials, which can be glazed or unglazed, and is fired at a temperature sufficiently high enough to produce specific properties and characteristics. It has a higher porosity than a porcelain tile.
Chalking	The degradation or migration of an ingredient in paints, coatings, membranes or other materials, causing a powdery residue on the surface of the material.
Coated fabric	Fabrics that have been impregnated and/or over-coated.
Code Compliance Certificate (CCC)	A certificate issued by a Building Consent Authority under Section 95 of the Building Act 2004 at the completion of building work, confirming that the building work complies with the approved building consent. This can also be called a Consent Completion Certificate.
Cohesion	The strength within a material to stay as a whole. Failure will result in a fracture within the body of the material. *See also*: Adhesion.
Cohesive failure	The failure of a material to remain as a whole. Failure will result in a fracture within the body of the material. *See also*: Adhesive failure.
Cohesive strength	The internal strength of an adhesive. Adhesives either fail in adhesion or cohesion.
Cold lay, Cold laid	The application of liquid or sheet membranes where no heating process is involved.

Term	Definition
Compliance document	*See*: Acceptable Solution.
Concrete curing agent	A material applied to concrete to retard the rapid evaporation of moisture to allow the concrete to hydrate more efficiently.
Condensation (on a surface)	The conversion of water vapour or other gas to liquid state as the temperature drops or atmospheric pressure rises.
Consent Completion Certificate (CCC)	A Consent Completion Certificate is a formal statement issued by a Building Consent Authority at completion of building work that the building work complies with the building consent. This can also be called a Code Compliance Certificate.
Contact adhesive	Adhesive used to adhere or bond various components of a membrane to a substrate.
Copolymerisation	A chemical reaction that results in the combination of two or more dissimilar monomers to produce large, long-chain molecules, which are copolymers.
Cove, Coving	*See*: Fillet.
Coverage, Coverage rate	The surface area covered by a specific quantity of a particular material.
Crack	A separation or fracture caused by induced stress, dimensional instability or substrate movement.
Creep	The deformation of the membrane due to lack of bonding caused by thermal stress or stress movement or loading of the substrate.
Cure	A process whereby a material is caused to form permanent molecular linkages by exposure to chemicals, heat, pressure, time and/or weathering.
Cured concrete	Concrete that has attained its intended design performance properties.
Curing agent	Helps with maintenance of desired moisture and temperature conditions in new concrete.
Curing time	The time required to complete the curing at a specified temperature and/or humidity.
Damp-proofing	Treatment of a surface or structure to resist the passage of water in the absence of hydrostatic pressure.
Defects Liability Period	A period stipulated in a construction contract (or sub-contract) during which any defects or unsatisfactory performance is the responsibility of the Contractor (or sub-contractor) to correct. *See also*: Maintenance and Post-installation maintenance.
Degradation	A deleterious change in the chemical structure, physical properties or appearance of the membrane or overlay.
Delamination	Delamination can describe 2 possible scenarios: • Separation of the membrane system from the substrate. • Separation of the overlay system from the membrane.
Department of Building and Housing (DBH)	On 1 July 2012 the former Department of Building and Housing became incorporated into the Ministry of Business, Innovation and Employment. *See also*: MBIE.
Designer	The person who specifies the products to be used and who prepares the installation design and documentation.
Determinations	A determination is a binding decision made by MBIE. It provides a way of solving disputes or answering questions relating to the Building Code and Building Consent Authority decisions under the Building Act. A range of matters can be determined, including whether a building or building work complies with the Building Code, or a Building Consent Authority's decision on a building consent, a notice to fix, or a Code Compliance Certificate (CCC).
Dew point	The temperature at which air is saturated with moisture, and condensation will occur on a surface at a lower temperature than the air.
Dimensional stability	The ability of a material to resist changes in length and/or width and/or thickness that result from exposure to changing elements over time.
Discontinuous	A product that is not waterproof. Discontinuous products are often not full coverage, can be thin film, and can be porous.
Drain	An outlet or other device used to collect and direct the flow of runoff water from a floor area.
Drainage flange	A flange connected to a waste pipe at the point at which it passes through the floor substrate to prevent leakage and allow the tile bed to drain into the waste pipe.

Term	Definition
Durability	The ability to withstand expected wear and tear and environmental conditions in use. In Building Code Clause B2, there are specified time periods of the building or building elements that can be applied to waterproofing internal wet areas that are to be achieved with only normal maintenance, without reconstruction or major renovation and including elements that are moderately difficult to replace. *See also*: B2/AS1.
Dwang	An intermediate framing element. *See also*: Nog
E3/AS1	The Acceptable Solution for complying with Building Code Clause E3, "Internal Moisture". Buildings designed and built to E3/AS1 are deemed to comply with the performance requirements of Clause E3.
Efflorescence	The formulation of crystalline deposits (leaching salts), generally whitish in colour, on the surface of concrete or other masonry surface, including mortar or grout joints, which occurs when moisture moves through and evaporates on the surface.
Elastomer, Elastomeric	*As a noun*: A material which at room temperature can be stretched repeatedly and, upon release of the stress, will return to its approximate original length. *As an adjective*: Describes the properties of an elastomer.
Elongation	The ability of a membrane to be stretched by the application of force.
Embedment	The process of installing by impregnation of reinforcement felt, fabric or mat with a liquid-applied membrane
EPDM	Ethylene propylene diene monomer
Epoxy	A class of synthetic, thermosetting resins that produce tough, hard, chemical-resistant coating, adhesives and grouts.
Expanded polystyrene (EPS)	EPS is manufactured using a mould to contain small foam beads. Heat or steam is then applied to the mould, which causes the small beads to expand and fuse together. This manufacturing process does not form a closed cell insulation as there can often be voids between each of the beads where they are not touching one another. *See also*: Extruded polystyrene (XPS).
Expansion joint	A structural separation between two building elements that allows free movement between the elements without damage.
Exposed membrane system	A membrane system that is directly trafficable within the wet area without the need for an additional overlay membrane.
Extruded polystyrene (XPS)	XPS is manufactured through an extrusion process, where plastic resin and other ingredients are melted together. The liquid formed is then continuously extruded through a die and expands during the cooling process. This produces a closed cell rigid foam insulation which is impervious to water and dimensionally stable. *See also*: Expanded polystyrene (EPS).
Fabric	A woven or non-woven material of organic or inorganic filaments, threads or yarns used for reinforcement of some membranes and flashings.
Fall	A graded and shaped surface that directs water and moisture to an outlet.
Fillet	A material placed as a transition between two plane surfaces. Usually triangular or curved.
Finish layer	An overlaid finish of sheet material or tiles.
Flashing, bandage	A component used to weatherproof or seal the edges of an internal wet area membrane system at all perimeters and penetrations. It may be a custom-formed membrane or other rigid or flexible waterproof material that drains or deflects water away.
Flashing, perimeter	A flashing used at the wall/floor junction.
Flashing, under-flashing	A strip or sleeve of impervious material dressed, fitted or built-in, or a liquid-applied product which provides a barrier to moisture movement, diverts the travel of moisture, or covers a joint where water would otherwise penetrate.
Flashing, vertical	A flashing used at wall junctions within shower areas.
Flood test	A procedure of controlled retention of water over the internal wet area membrane to determine the effectiveness of waterproofing prior to over-laying.
Floor drain, floor waste	A drain in a floor, which connects to the plumbing system and removes unwanted water from an area or room.
Glass mat	A woven or non-woven glass fibre reinforcement mat used within some internal wet area membranes for dimensional stability.
Grout	A material used to fill tile joints.

Term	Definition
Guarantee, warranty	A written statement of product, system or workmanship performance. *See also*: Implied Warranties in Contracts for Building Work.
Gusset	A corner flashing.
Hardener	*See:* Curing agent.
Heat welding, fusing, seaming	A method of melting and fusing together the adjoining sheets of a floor covering or the overlapping edges of separate sections of thermoplastic sheet or elastomeric membranes by the application of heat, generally in the form of hot-air and pressure.
Hob	The upstand or threshold at the perimeter of a shower area, upon which a shower screen is usually installed.
HVAC Engineer	An Engineer who designs heating, ventilation or air-conditioning systems.
Hydration	The process in which contained water initiates and completes the reaction process in the product.
Impact resistance	The ability of the membrane material to resist damage (e.g. puncturing) from falling objects, application equipment, foot traffic, etc.
Imperviousness	The ability of a material to prevent water or moisture from passing through or being absorbed.
Implied Warranties in Contracts for Building Work	From 30 November 2004, implied warranties to protect consumers took effect under Sections 396-399 of the Building Act 2004. These implied warranties are implied in all building contracts for household units, whether specified in the contract or not. These warranties include the expectation that the work of builders, specialist trades and developers will be done competently and use suitable materials. The warranties are implied despite any provision to the contrary in any agreement. It is not possible to contract out of these provisions.
Installation instructions	Instructions provided by the Supplier of the internal wet area membrane covering the recommended installation procedures for their product.
Installer	An Installer is a site worker employed by the Applicator. *See also*: Applicator.
Interface	A common boundary between two surfaces or materials.
Joint *(adhesive use)*	The point at which two surfaces are joined by an adhesive.
Joint *(sealant use)*	The gap or formed space between component parts of a structure.
Laminate	To bond two or more layers of a material together to make a finished product.
Lap	That part of a waterproofing membrane or flashing component which overlaps other sections of adjacent membranes.
Layer	
Licensed Building Practitioner (LBP)	Someone who MBIE has assessed to be competent to carry out restricted building work essential to a residential building's structure or weather tightness. For designers this also includes the design of fire safety systems in small-to-medium sized apartments. The licensed building practitioner (LBP) scheme was established under the Building Act 2004. There are seven licence classes: Design, Site, Carpentry, External plastering, Bricklaying and block-laying, Roofing and Foundations. Critical building work that is known as restricted building work (RBW) must be carried out or supervised by an LBP.
LOSP	Light organic solvent preservative
Low-temperature flexibility	The ability of the membrane material to remain flexible at low temperature.
Main Contractor	The person, company or body that contracts the Applicator to install the membrane system.
Maintenance, Contract maintenance	Maintenance or remedial work carried out after the completion of the contract, including any contracted Defects Liability Period, is the responsibility of the Main Contractor or Applicator. Subsequent maintenance must comply with the conditions of the maintenance statement/manual provided by the Supplier and is the responsibility of the Building Owner *See also*: Defects Liability Period and Post-installation maintenance.
Manufacturer	The Manufacturer is the company that produces the liquid or sheet membrane and any required components.
Material Safety Data Sheet (MSDS)	*See*: Safety Data Sheet.

Term	Definition
MBIE	*See*: Ministry of Business, Innovation and Employment.
Membrane	A membrane is a barrier layer that is impervious to moisture. Note that a barrier may be a single- or multi-layer system.
Microbiological resistance	The ability of a material to resist attack and degradation by various air- and soil-borne micro-organisms
Ministry of Business, Innovation and Employment (MBIE)	The Ministry of Business, Innovation and Employment (MBIE) was formed on 1 July 2012, bringing together four separate government agencies into one ministry. These were the Department of Building and Housing, the Ministry of Economic Development, the Department of Labour and the Ministry of Science and Innovation.
Mosaic tiles	Small tiles placed on a sheet or mat to make up a larger single unit. Available with a gauze fabric mat on the back or a paper face on the front back for wet areas.
Multiple-layer systems	Membrane systems of multiple stages and/or layers.
Nogs	An intermediate framing element. *See also*: Dwang.
NZBC	New Zealand Building Code.
Organic	Being or composed of hydrocarbons, or their derivatives, originating from plant or animal matter.
Osmosis	The diffusion of fluids through a semi-permeable membrane or porous partition.
Particleboard	*See*: Reconstituted wood panels.
PEF	Polyethylene foam.
Penetration	A drainage outlet, channel, pipe or support through the substrate and the membrane.
Permeability	The capacity of a porous material to conduct or transmit fluids.
Pinned	Fixed at regular intervals with flat-headed annular grooved clouts.
Plinth	Any formed construction designed as a support. For the purposes of this Code of Practice, such plinths are required to be protected by the internal wet area membrane system.
Ply	*See:* Layer.
pMDI	Para-methylene-diphenyl-diisocyanate
Polyurethane	An elastomeric polymer that is a combination of a polyol and an isocyanate or blocked isocyanate.
Polyvinyl chloride (PVC)	A synthetic thermoplastic polymer, prepared from vinyl chloride, to produce membrane materials.
Ponding	The excessive accumulation of water, which does not freely drain away from low-lying areas on a floor.
Porcelain tile	Also known as vitrified tile, generally formed under great pressure during the manufacturing process and fired at high temperatures, and having very low porosity. A porcelain tile can be glazed, polished or unglazed.
Positive drainage	The plane of the surface allowing water to pass freely to the drainage outlet.
Post-installation inspection	Product system or finish inspection at completion of installation, for sign off.
Post-installation maintenance	This is outside of the contract and its maintenance Defects Liability Period. Post-installation maintenance is the responsibility of the Building Owner. Any such maintenance must comply with the conditions of the maintenance statement/manual provided by the Applicator or Supplier. *See also*: Defects Liability Period, Maintenance.
Pot life	*See:* Working life.
Pre-installation inspection	Inspection of substrate surface prior to application of membrane.
Primary waterproofing layer	The waterproofing layer that protects the structure.
Primer	A thin, liquid-applied solvent or water-based product that is applied to a surface to improve the adhesion of subsequent coat or membrane applications.
Producer Statement	A formal statement supplied by or on behalf of either an applicant for a building consent, or by or on behalf of a person who has carried out building work. It may be accepted by a Building Consent Authority as verification that certain work will be or has been carried out in accordance with nominated performance requirements of the Building Code. Note that although no longer expressly referred to in the Building Act 2004, a Producer Statement may be accepted and considered as part of the plans or specifications.

Term	Definition
Product Certification	The Building Act contains provisions for a voluntary product certification scheme to enable product manufacturers to have their products certified as meeting nominated performance requirements of the Building Code. Building products or methods that are used in accordance with a product certificate as provided by Section 269 of the Building Act must be accepted as complying with the Building Code.
Proprietary	A standard catalogue item that can be used directly "off the shelf".
PUMMA	Polyurethane methyl methacrylate
Puncture resistance	The extent to which the membrane material can withstand the action of a sharp object without perforation. Measured as the force required to be applied by a standard tool to cause the tool to penetrate the membrane system
PVC	Polyvinyl chloride.
Quality assurance	The process of ensuring the site work is carried out in accordance with the Manufacturer's or Supplier's instructions.
Quality control	The provision of quality assurance utilising measurable steps against pre-determined standards.
Quarry tiles	Made by extruding wet (plastic) clay through a mould. Can be both glazed and unglazed.
RBW	*See*: Restricted Building Work.
Re-coat time	The minimum time after which a further coat can be applied at a specified temperature and/or humidity.
Re-cover, Re-surface	The addition of a new coating or membrane to an existing floor covering.
Reconstituted (or composite) wood panels	Wood residue material (including strands, fibre and particles) combined with an adhesive resin and other additives, to which heat and pressure is applied to form into flat panels. Products include: oriented strandboard, non-oriented strandboard, fibreboard, particleboard (chipboard) and hardboard, all of varying densities. Some of these panel options are bonded with durable pMDI resin adhesive and are treated to H3.1 treatment levels. These products are suitable as substrates to form internal structural platform floors and also wall lining substrates where wet area membranes are to be applied.
Reflection cracks, transmission cracks	Cracks in the membrane that reflect the crack pattern or sheet layout in the structure underneath.
Reinforced membrane	A waterproofing membrane that has been strengthened by the addition or incorporation of one or more reinforcing materials.
Relative humidity (RH)	The ratio of the weight of moisture in a given volume of air vapour mixture to the saturated (maximum) weight of water vapour at the same temperature, expressed as a percentage.
Release tape, Release strip	A plastic film or paper strip that is applied to the substrate to ensure non-adhesion of the membrane at that junction. *See also*: Bond-breaker.
Resilience, Resilient	The ability of a material to resume its original size and shape after deformation, such as stretching, twisting, compression or indentation. Commonly refers to resilient flooring.
Restricted Building Work (RBW)	Critical building work that must be carried out or supervised by a Licensed Building Practitioner. This covers, without limitation, work that is essential to a residential building's structure or weather tightness and also includes the design of fire safety systems in small-to-medium sized apartments. *See also*: Licensed Building Practitioner.
Rippling	*See*: Buckling.
Safety Data Sheet (SDS)	Data sheet with specific health and safety information for a specific product.
SBR	Styrene-butadiene rubber.
Screeding	The process of striking off excess concrete to bring the top surface of the concrete to the proper finish and elevation. *- or -* The process of overlaying a base substrate with a cementitious layer, laid to falls.
SDS	*See*: Safety Data Sheet.
Sealant	An elastomeric material that is used to fill and seal cracks and joints. This material prevents the passage of moisture while allowing movement between elements.
Sealer	A liquid-applied film over the top of a material to prevent the entry of water-borne and other contaminants. This is not a waterproofing membrane.

Term	Definition
Seam joint	An edge-to-edge joint of two materials in the same plane, formed between two separate sections of material. It can be made in a variety of ways, including adhesive bonding, hot-air welding, solvent wipe, adhesive tape, sealant, etc.
Secondary waterproofing layer	A waterproofing layer which may be required to protect water-sensitive elements contained within the system above the main waterproofing layer.
Self-adhesive membrane	Where the underside of a sheet membrane has a soft pliable and sticky compound designed to adhere to the substrate without any additional bonding compound or requiring the application of any heat.
Selvedge edge, selvage edge (*alternative spellings*)	An edge designed for certain sheet materials in order to obtain better adhesion of the overlapping sheet.
Sheet	A membrane supplied in roll form.
Sheet corner detail - internal	*See*: Gusset.
Shelf life	The length of time a material can be stored and still retain its properties.
Shower area	An area within a wet area affected by water from a shower rose, including a shower over a bath.
Shower area, enclosed	An area enclosed by walls or screens (including hinged or sliding doors) that confine the spread of water to within the enclosure.
Shower area, unenclosed	An area that is open on one or more sides, extending in an arc on the open sides 1,500 mm from the shower rose, where the water is not contained within the shower area.
Shower base	The finished floor to a shower, which may be formed in situ or be a pre-formed shower tray.
Shower pick	*See*: Shower rose.
Shower rose, Shower wall rose, Shower ceiling rose	A shower water outlet. Can be fixed, sliding or with an extendable hose.
Slip layer	*See*: Bond-breaker.
Slip-resistant	The nature of a profiled surface which improves user safety.
Solvent	A liquid used to dissolve or disperse film-forming constituents, which evaporates during drying and does not become part of the dried film.
Solvent welding	A process where a liquid solvent is used to chemically weld or join together two or more layers of certain membrane materials, usually thermoplastic.
Specifier	*See*: Designer.
Spun-bond	A type of non-woven fabric formed from continuous fibre filaments bonded without an intermediate step.
Substrate	The material to which a membrane is applied.
Substrate structure	The structural element upon which the substrate is fixed.
Substrate surface	The face of the substrate to which the internal wet area membrane is to be applied.
Sump	A box-like structure with bottom or side outlet for drainage, placed at the lowest point in a floor or drainage channel. It can be cast in the concrete floor, made from either plywood or composite materials, fabricated in metal, or be a proprietary pre-formed or moulded material.
Supplier	A company that supplies liquid and sheet membrane system components and provides training for Applicators in the use and installation of the product range in accordance with the Manufacturer's recommendations and this Code of Practice. Note that all membrane sheets are imported, and liquid membranes are either imported or manufactured in New Zealand.
Surface water	Excess water occurring during shower use or spillage.
Synthetic rubber	Any of the several elastic substances resembling natural rubber, prepared by the polymerisation of butadiene, isoprene and other unsaturated hydrocarbons.
TDS	*See*: Technical Data Sheet.
Tear strength	The maximum force (edge tear) that can be applied to a membrane at the edge before it will tear. (Similar to tearing a sheet of paper in half.) *See also*: Tensile strength.
Technical Data Sheet (TDS)	A document advising of a product's current methods of use, areas of use, mechanical and physical properties, and limitations.

Term	Definition
Tensile strength	The maximum force (pulling stress) that can be applied to a membrane so that it is stretched without splitting or breaking apart. (Similar to gripping a piece of tissue paper at opposite ends with two hands and pulling the hands apart till the tissue splits.) *See also:* Tear strength.
Tenting	*See*: Buckling.
Termination	The treatment or method of anchoring and/or sealing the free edges of the membrane in a waterproofing system.
Termination bar	A flat metal trim that protects an exposed edge of an internal wet area membrane system and is mechanically fixed in place.
Terracotta tile	Baked tile of variable colour and water absorption. Usually unglazed, this product has very high water absorption and generally requires a sealer to prevent staining.
Threshold, hob	The upstand at the perimeter to a shower area.
Through-cure	Complete and even curing within the membrane film.
TPO	Thermoplastic polyolefin.
Under-flashing	Bandaging of floor to wall upstands or sheet joints prior to installing membrane.
UV	Ultra-violet light.
Vapour barrier	Any material, typically in sheet form, that resists diffusion of moisture through floor, wall, ceiling or roof assemblies of buildings, to prevent interstitial condensation.
Vapour migration	The movement of water vapour from a region of high vapour pressure to a region of lower vapour pressure.
Ventilation	The movement of air through a working or building space.
Verification Methods	*See*: Acceptable Solutions.
Volatile organic compounds (VOCs)	Organic chemical compounds that have a high vapour pressure and low water solubility, and which easily form vapours at normal temperatures and air pressures.
Water immersion test	A test method which determines the long-term water-resistant properties of a product.
Water-permeable	The property of a material that allows water or moisture to permeate through it.
Waterproof	The property of a material that does not allow moisture to penetrate through it when tested in accordance with AS/NZS 4858.
Waterproof adhesive	An adhesive suitable for constant water immersion.
Waterproofing system	A combination of elements that is required to achieve a waterproof barrier as required by this Code of Practice, e.g. substrate, membrane, bond-breakers, sealants and finishes.
Water-resistant	The property of a system or material that restricts moisture movement and will not degrade under conditions of moisture.
Water-resistant adhesive	An adhesive suitable for wet areas but not constant water immersion.
Waterstop	A vertical extension of the waterproofing system forming a barrier to prevent the passage of moisture in the floor.
Water vapour transmission	A measure of the rate of transmission of water vapour through a material under controlled laboratory conditions of temperature and humidity.
Wet area	An area within a building supplied with water from a water supply system. This includes (but is not limited to) bathrooms, showers, laundries, sanitary compartments, kitchens and shower rooms.
Wet wall caddy	A device used to create a seal in a wet area wall lining to prevent the passage of moisture into the wall cavity.
Wicking	The movement of moisture through a material by capillary action
WMAI	Waterproof Membrane Association NZ Incorporated.
Working life	The amount of time an epoxy remains low enough in viscosity that it can still be easily applied to a substrate.
XPS	*See*: Extruded polystyrene.

Note: The previous Edition of this Code of Practice contained a section called "Framework of Building Regulation". This section has been removed as there is a growing familiarity in the building industry and amongst Licensed Building Practitioners with the requirements of the Building Act and Regulations.

Appendix 1: Related Documents, Standards, Legislation and Websites

The following documents relate to this Code of Practice. Readers should ensure that they access the latest versions of all related documents, including amendments, if any. In the case of New Zealand and joint Australian/New Zealand Standards, these can be viewed on the Standards New Zealand website at www.standards.co.nz. In the case of other documents, these can be accessed through the list of websites set out in A1.4.

A1.1 New Zealand, Australian, Joint (AS/NZS) or International Standards

Agency	Code	Year	Title
AS/NZS	1604.3	2004	Specification for preservative treatment – plywood
AS/NZS	2269	2012	Plywood – Structural
AS/NZS	2588	1998	Gypsum plasterboard
AS/NZS	2908.2	2000	Cellulose-cement products – flat sheets
NZS	3101	2006	Concrete structures standard – the design of concrete structures
NZS	3109	1997	Concrete construction
NZS	3114	1987	Specification for concrete surface finishes
NZS	3602	2003	Timber and wood-based products for use in building
NZS	3603	1993	Timber structures standard
NZS	3604	2011	Timber framed buildings
NZS	3640	2003	Chemical preservation of round and sawn timber
AS	3740	2010	Waterproofing of wet area within residential buildings
NZS	4203	1992	General structural design and design loadings for buildings
AS/NZS	4858	2004	Wet area membranes
AS	4992	2004	Ceramic tiles - Grouts and adhesives

A1.2 International Standards

- ISO 9001:2000 Quality management systems
- EN 12004:2001 Adhesives for tiles – definitions and specifications

A1.3 Other Documents

- IB33 Specification and Production of Concrete Surface Finishes, Cement and Concrete Association of New Zealand – www.cca.org.nz
- New Zealand Building Code, 2004, The Ministry of Business, Innovation and Employment – www.mbie.govt.nz, with specific reference to Clause E3, Internal Moisture.

A1.4 Related Websites

- American Society for Testing and Materials – www.astm.org
- Building Research – www.buildingresearch.org.nz
- British Standards Institute – www.bsi.co.uk
- Canadian General Standards Board – http://www.pwgsc.gc.ca/cgsb/
- Cement and Concrete Association of New Zealand – www.cca.org.nz
- Commonwealth Scientific and Industrial Research Organisation (Australia) – www.csiro.au

- Deutsches Institut Für Normung – www.din.de
- European Committee for Standardization – www.cenorm.be
- European Union of Agrément. Also known as the European Union for Technical Approvals or Union Européenne pour L'Agrément Technique dans la Construction – www.ueatc.eu
- International Union of Laboratories and Experts in Construction Materials, Systems and Structures – www.rilem.org
- Joint Accreditation System of Australia and New Zealand – www.jas-anz.com.au
- Ministry of Business, Innovation and Employment – www.mbie.govt.nz
- New South Wales Master Builders – www.mbansw.asn.au
- New Zealand Legislation – www.legislation.govt.nz
- Site Safe – www.sitesafe.org.nz
- Standards Australia – www.standards.org.au
- Standards New Zealand – www.standards.co.nz
- Waterproofing Membrane Association Inc. – www.membrane.org.nz

A1.5 New Zealand Legislation

- Building Act 2004 – www.legislation.govt.nz
- Health and Safety at Work Act 2015

Appendix 2: About the WMAI

The Waterproof Membrane Association NZ Incorporated (WMAI) is a free association of people in the industry who represent membrane suppliers, marketers, applicators and other persons or entities with an interest in the use and installation of membrane products.

All members of the WMAI undertake to comply with the Rules and Codes of Practice of the WMAI, which is a condition of membership. Additionally, it is a requirement of membership that all members ensure that all agents acting on their behalf are fully conversant with the provisions of this Code of Practice.

This Code of Practice does not apply to contractual disputes. Disputes over contractual rights and obligations should be dealt with under the provisions of the particular contract between the parties. It is not the purpose of this Code of Practice to alter contractual rights or obligations between parties - any such disputes should be referred to the courts/an arbitrator or other dispute resolution body.

Adherence to WMAI Codes of Practice in no way reduces the member's responsibilities to comply with the Commerce Act 1986 and the Fair Trading Act 1986, and with other legislative requirements including the Building Act 2004 and the NZ Building Code.

Appendix 3: About WMAI Codes of Practice

This Code of Practice has been published based on the collective experience of membrane suppliers, applicators and designers, with the intention of maintaining and improving the performance standards of internal wet area membrane systems, materials, associated products and their application.

The purpose of this Code of Practice is to define and set best practice in the use and installation of membrane products.

WMAI Codes of Practice reflect the WMAI's commitment that membranes and all other materials and installation methodologies associated with membrane products maintain a high standard in order to ensure that public and industry confidence in the membrane industry is preserved.

WMAI Codes of Practice are intended for use in New Zealand by all sectors of the building industry to provide best trade practice guidelines for the selection, design and installation of membrane systems for general commercial applications and otherwise for residential buildings.

The required minimum properties of materials are listed and relevant test methods are referenced. Specific performance limits where applicable are included to assist in the specification of membrane systems.

WMAI Ordinary Members:

Ardex NZ Ltd

Bostik New Zealand Ltd

Equus Industries Ltd

Hitchins NZ Ltd

Jaydex International Ltd

Nuplex Industries Ltd

Nuralite Waterproofing Ltd

Sika NZ Ltd

Viking Group Ltd

WMAI Associate Members:

- Adhesion Sealing Ltd
- Allan Tong Ltd (Manawatu)
- Allan Tong Ltd (Wanganui)
- Auckland Waterproofing Services Ltd
- AWL Ltd
- Brian Oliver Ltd
- Builders Plastics Contracting
- Cantec Services Ltd (Hamilton)
- Cantec Services Ltd (Rotorua)
- Cantec Services Ltd (Tauranga)
- EB Waterproofing
- GMR Holmac
- Goleman Wellington Ltd
- Gunac Christchurch Ltd
- Gunac GME Ltd
- H2 Off Ltd
- Highrise Ltd
- Hydroproof Ltd
- ILD NZ Ltd
- MPM Waterproofing Ltd
- Mulford Holdings Ltd
- Sansom Construction Services
- SWP Commercial Ltd
- Terracon Industries Ltd
- Titus Waterproofing Ltd
- Torch-on Waterproofing Ltd