

Building and Construction Industry



**SuperShow08**

A joint industry initiative produced by BSA

# EXTERNAL WATERPROOFING MEMBRANES *BEST PRACTICE GUIDELINES*

## **FAILING WATERPROOFING SYSTEMS**

Increasingly, BSA is receiving complaints about failed and leaking basements, retaining walls, balconies and planter boxes.

The Building Code of Australia (BCA) requires constructions to safeguard occupants from illness or injury and protect a building from damage caused by surface water, external moisture entering a building, and internal moisture accumulating in a building.

Concerns raised about roof, deck and balcony membranes, by building industry contractors and professionals nationally, has prompted Standards Australia to begin producing two new standards, where previously no contemporary and comprehensive standard existed. These are:

1. *AS 4654.1 Waterproofing membrane systems for exterior use, and*
2. *AS 4654.2 Waterproofing membrane systems for exterior use above ground level.*

These standards are currently being drafted. The aim of the completed standards is to produce a consistent and reliable approach to the materials used in the design and installation of external waterproofing.

Industry research and experience has found that the design of roofs, decks, balconies and planter boxes contributes to many of the failures of waterproofing systems. By setting an industry standard for materials, design and installation, the failure rate of external membranes is expected to dramatically reduce.

## **ROOF, PODIUM SLABS AND CONCRETE BALCONY SLABS**

A number of significantly defective roof and podium slabs have been brought to BSA's attention. These include: delamination of tiles from the membrane to which they were adhered; dissolution of the membrane which results in water penetration; breaks or tears in membranes and/or tiles caused by thermal or footing movement; and inadvertent penetration of the membrane after it has been applied (e.g. by the fixing of balustrade posts).



To avoid these types of defects occurring BSA recommends contractors consider the following best practice guidelines prior to undertaking external membrane work.

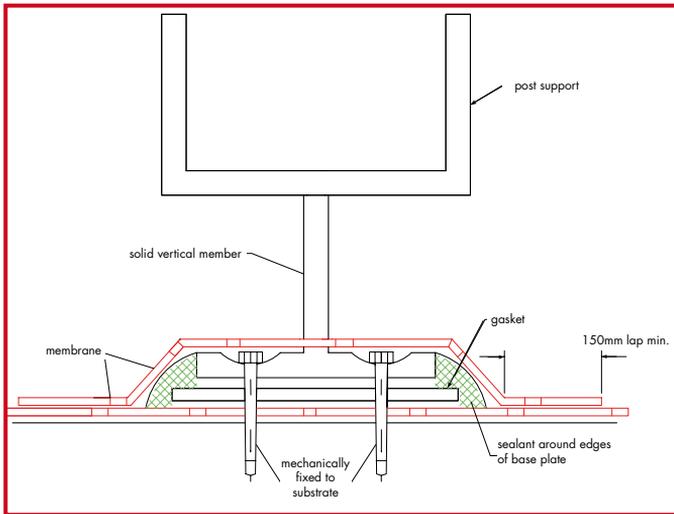
### **Design**

Slabs should be laid with falls to drainage points. A minimum fall of between 1:80 and 1:100 is recommended for slabs in sheltered locations and falls of between 1:60 and 1:80 for slabs in exposed locations. This may vary however, dependant upon: the exposure conditions of the slab; the catchment area of the podium, balcony or roof falling to each drainage point; and the type of membrane being used.

Contractors should avoid penetrating slabs wherever possible, but where penetrations are essential they must be properly sleeved and waterproofed with flanged sleeves and collars.

Balustrade posts should be fixed to the face of the wall if possible. Where penetrations for balustrades are unavoidable, posts should be cored into the slab and the membrane turned up the post to at least 25mm above the surface level of any finishes. The turned up membrane can then be concealed and protected from UV rays and mechanical damage by cover plates.

It is, however, often impractical to face fix or core balustrades into the slab and a baseplate system of fixing is required. In these instances an initial layer of membrane should be applied under the area of the baseplate and a second layer of membrane should later be installed over the baseplate and turned up the post to at least 25mm above the surface level of any finishes. The turned up membrane can then be sealed with a cover plate. When the membrane is laid over a baseplate, any fixings should be countersunk.



*Ballustrade post support detail*

Another aspect of design that is critical to the end performance of the waterproofing system is the detailing of the membrane at its perimeter, e.g. the detailing at its junction with any parapet wall, hob, building envelope and under any door and window sills.

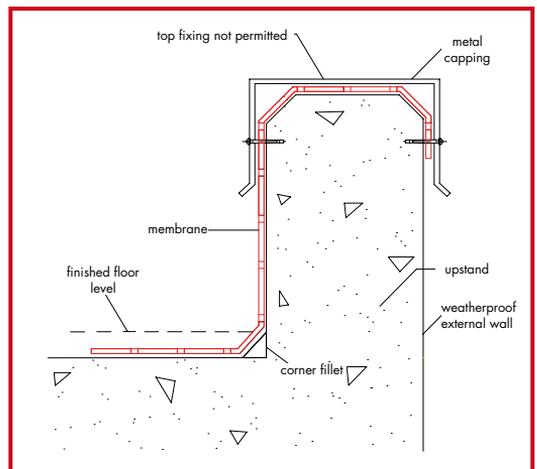
The detailing of membrane to parapet wall junctions can be successfully achieved in a number of ways. Commonly they are capped by metal flashings. Best practice procedures dictate that these cappings should be sloped or fall to shed water and should be side fixed rather than fixed through the top of the flashing. It is also important that the membrane is turned up the wall and preferably terminated behind the flashing.

For higher parapet walls, the membrane and capping may not overlap, however, in these situations the membrane should terminate in a

rebate or reglet and be appropriately sealed and capped to prevent moisture penetrating behind the membrane.

Membranes should extend fully over any perimeter hob and be dressed down its external face, fixed into a rebate or reglet, and finished with a sealed finishing strip.

Detailing at external wall and floor junctions and under door sills are common areas where leaks occur. Although specific detailing will be influenced by the type of membrane to be installed, there are some key design concepts that should be incorporated irrespective of the type of membrane used. In addition to considering these best practice concepts it is important to follow the manufacturer's instructions specific to the system being installed.

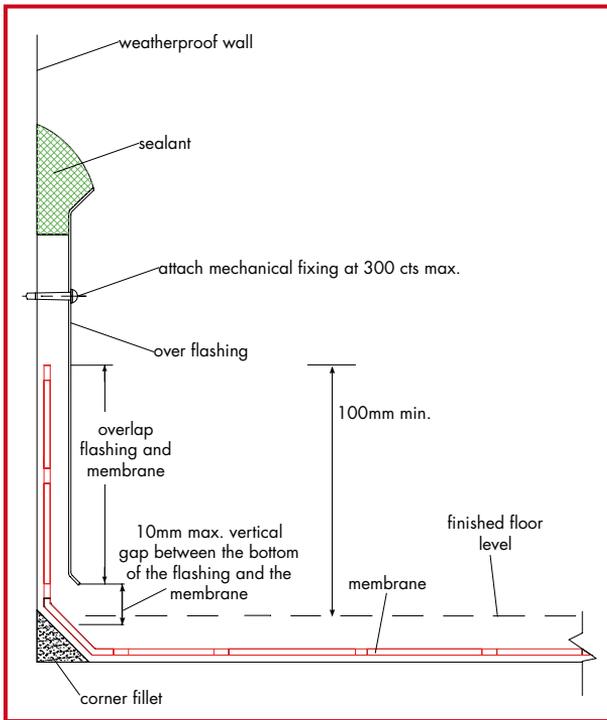


*Upstand/parapet protection*

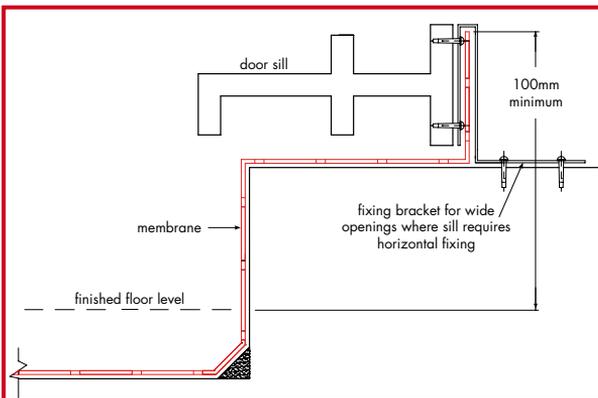
It is recommended, and will be mandatory if the new standard is called up by the Building Code, that an external finished floor level is at least 100mm lower than the turned up top edge of the membrane. This means that the membrane will need to be turned up and terminated 100mm above the finished floor level on adjacent external walls and that the turn up at door sills will also need to terminate 100mm above the finished floor level. Greater membrane turn ups may be required in more exposed locations or in higher wind areas, e.g. at greater heights or in cyclonic regions.

In any membrane system sharp angles and

junctions are points of weakness. Corner fillets and bond breakers are commonly required and must be installed strictly in accordance with manufacturer's instructions.



*External wall/floor junction*



*External door sill protection*

## Membrane Selection

A large number of proprietary acrylic, bituminous and rubber-based waterproofing membranes are available for use on both trafficable and non-trafficable roof and podium slabs. Their ability to accept directly adhered floor tiles varies. Some modified bitumen and acrylic membranes are manufactured to accept tiling. Others

require very specific steps to be followed to ensure the tiles adhere firmly to the membrane. Irrespective of which type of membrane is used, it is essential that the manufacturer's installation instructions are stringently followed. A number of membrane manufacturers have worked with tile adhesive manufacturers to develop complete waterproofing and tile installation systems.

When selecting a membrane it is essential to consider a number of relevant factors including:

- whether the membrane will be exposed to weather or protected by subsequently applied floor finishes
- the type of floor finishes and adhesives that will be applied
- the exposure conditions of the membrane (e.g. coastal or other aggressive environments)
- anticipated substrate movement
- ambient weather conditions (some membranes must be applied within specific temperature and humidity ranges)
- the durability of the membrane
- ongoing maintenance requirements
- availability of specialist contractors to apply certain systems
- ease of application
- re-coating time and time before subsequent finishes can be applied
- the moisture content of the substrate
- cost.

## Installation

Prior to installing any membrane system it is essential that the substrate to which it is being applied is appropriately prepared. Concrete must be appropriately cured for the type of membrane being applied and any debris, curing compound, oil, grease, dust and loose material should be removed.

Waterproof membranes rely on a complete system to ensure that the waterproofing of the roof or podium slab is not compromised. It is essential that the manufacturer's instructions are meticulously followed and that:

- any joints or cracks are filled and sealed as required

- any required reinforcing tape or bond breaker is applied to joints and cracks
- any necessary primer is applied
- specified coverage thickness is maintained
- re-coating times are adhered to
- the application of screeds or finishes is not undertaken until the membrane has sufficiently cured
- membranes are appropriately protected from damage until floor finishes are installed.

## **TIMBER AND METAL FRAMED BALCONIES**

The best practice procedures associated with podium and roof slabs also apply to concrete balcony slabs, but timber or metal framed balconies have some additional and specific requirements that must be recognised and accommodated.

Timber or metal framed balcony decks must be appropriately designed to ensure the integrity of any waterproofing system is not compromised. The framing structure must be capable of withstanding the live and dead loads likely to be applied to the deck. This includes limiting flexibility to accommodate the installation of brittle floor finishes such as ceramic tiles.

Wherever it is likely to be exposed to the weather, framing must be of sufficient durability to perform without degradation. Common problems occur when the underside of a balcony is not lined and the framing is not sufficiently durable. In such circumstances timber bearers and joists will often begin to rot around the perimeter of the deck where the members are most exposed to the weather.



*These photographs show a timber bearer of inadequate durability and an inadequate perimeter membrane detail*

The substrate sheeting should be water resistant and the deck must have adequate fall to the drainage points. Prior design consideration should be given to any penetrations or fixings that may penetrate the membrane, e.g. fixings for balcony and handrail posts.

Due to the ease of penetrating timber and fibre cement decks, it is essential that adequate supervision is exercised to ensure subsequent trades, such as contractors installing balustrades and handrails, do not inadvertently penetrate the membrane.

The two most common problem areas associated with timber and metal framed decks are inadequate fall to the perimeter, and poor design and/or installation at the perimeter of the membrane, e.g. turn-up at the wall and downward termination at the external edge.

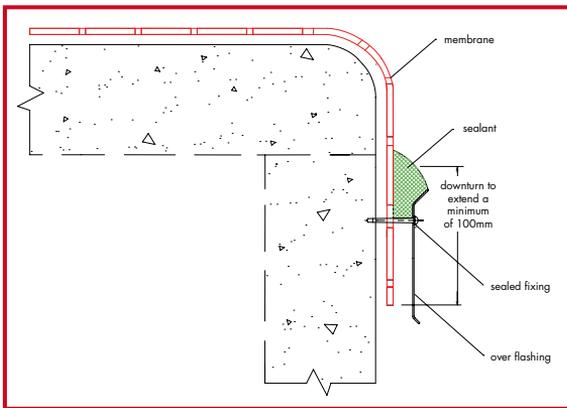
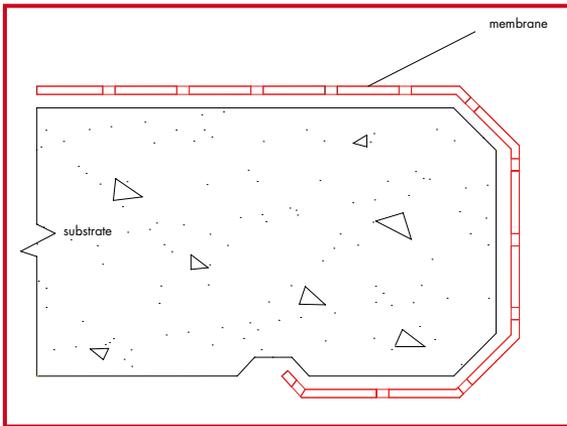


*This photograph shows the result of a poorly constructed membrane system that, amongst other things, had inadequate turn up and protection at the junction with external walls and under the door sill.*

The draft standard provides typical recommended details for these locations, and typical wall/floor and floor/door sill junction details were provided in previous sections of this information booklet.

Treatment at the perimeter can be achieved a number of ways depending upon both the type of framing system and substrate and the type of membrane being used. Some suitable methods of treatment include turning the membrane back under the substrate and dressing it into a drip groove, turning the

membrane down the facing board of the deck and sealing it with an over flashing, or dressing the membrane into a gutter.



Balcony edge details

## **BASEMENTS AND RETAINING WALLS**

Rectification of basement leaks is a particularly difficult and expensive task. The leak may be well underground, access around the building may not be possible, the perimeter of the building may be surrounded with pavements and landscaping and the basement may be fitted out for offices or other tenancies. Proper thought, good design, good installation practices and stringent supervision of the installation of waterproof membrane systems is essential to avoid these problems.

The primary components of any basement or retaining wall membrane system include:

- the structural wall
- the waterproof membrane

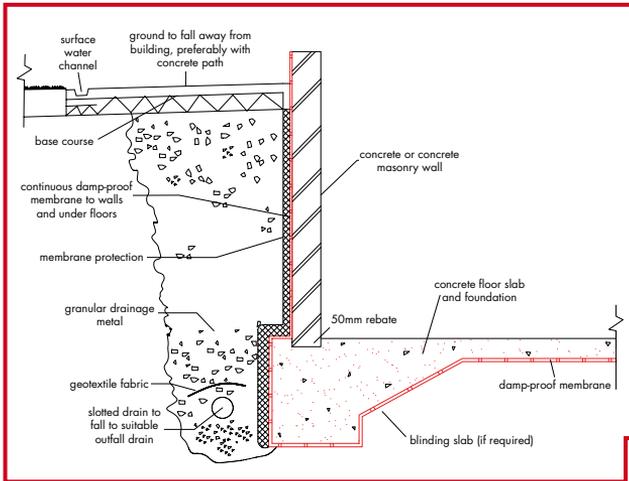
- protection of the membrane
- drainage behind the wall, and
- drainage at or near ground level.

In order to avoid some common causes of basement leaks it is recommended contractors pay particular attention to the following:

- Ensure that a continuous membrane system is installed under the slab and on the walls. If a different membrane is used under the slab and on the walls it is essential that a durable waterproof joint is provided at the junction of the two systems and that the two membranes are compatible.
- Ensure that the external wall to floor junction is appropriately designed, constructed and waterproofed.
- Ensure membrane selection is appropriate and that coverage is complete and of the required thickness. Use a vapour proof as well as a moisture proof membrane where the basement is used as a habitable space or for storage of sensitive equipment etc.
- Use a membrane that is able to resist aggressive chemicals or salts that may be present in the soil and is able to resist anticipated hydrostatic pressure.
- Follow membrane manufacturer's instructions exactly, including issues like re-coating times.
- Adequately prepare the substrate prior to application of the membrane, including ensuring any concrete is appropriately cured.
- Apply the membrane with the specified coverage and thickness.
- Ensure that joints and penetrations are adequately sealed.
- Ensure the membrane is able to resist anticipated thermal movement, soil movement or building settlement.
- Install appropriate sub-soil and surface drainage systems.
- Avoid difficult joints and awkward shapes in basement design that complicate the application of the membrane and have the potential to introduce 'weak points' in

the system.

- Adequately protect the membrane to prevent it from being damaged by construction activities or backfilling.



Basement wall detail

with aggressive root systems that may damage the membrane or clog the drainage system should be avoided. Trees or shrubs that grow overly large can become potentially unstable and cause damage to the planter if they are blown over.

Finally, planter boxes require regular inspection and maintenance, perhaps more than any other membrane system. Building owners or their maintenance contractors need to regularly inspect and identify any damage or degradation caused by people, birds and other wildlife, pests, plant roots or general wear and tear. Prompt repair and maintenance should be undertaken based upon these inspections.

## PLANTER BOXES

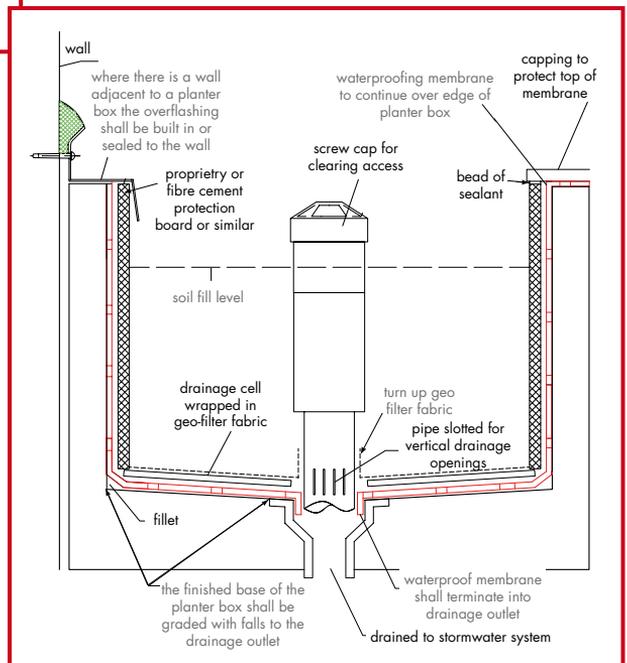
Many of the principles discussed earlier also apply to planter boxes. However, planter boxes do have some additional specific requirements.

The most significant of these is the necessity for adequate drainage. Planter boxes must have a graded base to the drainage outlet and the drainage system must prevent the water level from rising above the overflow level of the membrane. A filtered drainage riser must also be provided to relieve hydrostatic pressure, to provide access for cleaning, and as an emergency overflow in the case of excessive rain.

The membrane must be extended up the sides of the planter box to a minimum height of 100mm above the soil level and must be protected with a drainage cell wrapped in geo-textile fabric or a similar suitable material.

The top edge of the membrane must be appropriately sealed and protected with either a flashing or capping tile or similar.

Care must be taken when selecting the type of plants to be grown in planter boxes. Those



Planter box detail



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**1800 798 488**