AS 4654 -2

The External Waterproofing Membranes Standard
This external waterproofing standard contains solutions for problems which have not been addressed in other countries.
• Any material used for external waterproofing systems shall comply with AS 4654.1.

• In the past membranes which have passed tests in other countries have been found unsuitable for use in Australia.
## Table 2.1
Requirements – Fully Bonded Membranes

<table>
<thead>
<tr>
<th>Property required</th>
<th>Test method</th>
<th>Pass Results</th>
<th>Sheet Exposed</th>
<th>Sheet Non-exposed</th>
<th>Liquid Exposed</th>
<th>Liquid Non-exposed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Traffic</td>
<td>Non-traffic</td>
<td>Traffic</td>
<td>Non-traffic</td>
</tr>
<tr>
<td>Abrasion resistance</td>
<td>ASTM D1242</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Bond strength</td>
<td>ASTM C794</td>
<td>State result</td>
<td>✓</td>
<td>✓</td>
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<td>✓</td>
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<tr>
<td>Cyclic movement</td>
<td>CSIRO Moving Joint Test (see Appendix B)</td>
<td>Pass</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Dimensional stability</td>
<td>ASTM D6207</td>
<td>State result</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Elongation at break</td>
<td>Appendix A</td>
<td>Classification as in Table A1, Appendix A</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<td>Field seam strength</td>
<td>N/A</td>
<td>See Clause 2.5</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<td>Heat ageing</td>
<td>Appendix A</td>
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<td>✓</td>
<td>✓</td>
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<tr>
<td>Temperature resistance</td>
<td>See AS 4654.2, Appendix A</td>
<td>Pass</td>
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<td>✓</td>
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<td>Ultraviolet resistance</td>
<td>See Table A4, Appendix A</td>
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<td>✓</td>
<td>✓</td>
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<tr>
<td>Tensile strength</td>
<td>See Table A4, Appendix A</td>
<td>State result</td>
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<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Thickness</td>
<td>Various methods</td>
<td>State result</td>
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<td>✓</td>
<td>✓</td>
<td>✓</td>
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<td>Durability</td>
<td>See Table A4, Appendix A</td>
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<td>✓</td>
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<td>Water vapour transmission</td>
<td>ASTM E96</td>
<td>State result</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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</tr>
</tbody>
</table>

**LEGEND:**
- ✓ Testing required for this application
- N/A Not applicable

**NOTE:** The requirement for bioresistance testing for fully bonded membranes covered by soil is currently being developed as an EN Standard. This Standard is yet to be published.

*Note: Column 3 for all 3 tables will have criteria of the pass requirements for the test Ed*
WATER PENETRATION AT SLIDING DOORS

- No up stand for membrane.
- No fall in deck to shed water to wastes.
All falls shall ensure that water drains to outlet/s or gutters.

Water shall not pond on the finished surface.

Falls shall be in the structural substrate or as an alternative the fall can be formed by a screed (NOT A MORTAR BED).
Concrete surfaces must be primed to resist “gassing” which can damage membranes.
- The surface of the substrate shall be clean and dry.
- Moisture content of concrete screed shall not exceed 7%.
- To aid adhesion on concrete surfaces smoothness should be the same as wood float or rough power tool finish.
UPSTANDS

The common problems
Deck set higher than internal flooring – no water stop fitted
Tile bed higher than waterproofing upstand ...... a very common problem
The height of the up stands are related to the degree of risk involved. In cyclone areas and exposed positions up stands must be higher than buildings which are in sheltered positions.

The higher the building the higher the upstand (e.g. the upstand would be 40mm higher in a building which is above 15 metres).
DOORS & WINDOWS MUST BE REMOVED PRIOR TO WATERPROOFING
AS 4654-2, Page 17, Para 2.8.3.(A)

- This enables the sill to be tanked and will not delay construction as the remainder of the waterproofing can be installed at a later date.
Figure 2.8 (in part)  
**Typical Detail of Membrane Termination at External Opening Doors**

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**NOTES:**
1. Sub-sill is installed before door
2. Seal between sill, packer and membrane before drilling fixing holes

**NOTE:** For falls, see Clause 2.5.2.

Option 2  Sill with sub-sill

**FIGURE 2.8 (in part)  TYPICAL DETAIL OF MEMBRANE TERMINATION AT EXTERNAL OPENINGS DOORS**
• Many manufactures now produce suitable sliding doors for level entry decks.
FIGURE 8  TYPICAL DETAIL OF MEMBRANE TERMINATION AT WALL OPENINGS WHERE THE INTERNAL AND EXTERNAL FINISHED FLOOR LEVELS DO NOT ALLOW THE UPTURN REQUIRED IN TABLE 3.1
3.5.2.2 *Edge Protection*

The edges of the membrane shall be protected by a capping (see Figure 5).

(a) Solid wall detail

- Top fixing not allowed
- Capping coating
- Granosite finish or similar above pressure seal
- Finished level
- Upstand
- Weatherproof external wall
- 5x5 mm minimum fillet or backing to be placed in corner via cove or similar

(b) Cavity wall detail

- Coping
- DPC if parapet is more than 300 mm above roof cladding
- Flashing
- Wapshole at maximum 1.2 m centres

**FIGURE 5 TYPICAL EDGE PROTECTIVE CAPPING DETAIL**
Common problems are:

- Upstanding angles at edge of decks.
- Angles that allow storm rain to penetrate as vertical leg is too short.
- High front gutters.
Water retained by steel extrusion – tile bed became saturated & water leaked through sheet joints & fasteners
GUTTER TERMINATIONS

- The vertical leg of the angle must be a minimum of 35mm.
- Sheet membranes must terminate on a horizontal surface.
- Liquid membranes must terminate on a vertical surface.
3.5.2.3 Gutter termination

Terminations into guttering shall be as detailed in Figure 6.

NOTE: Overflow facilities should divert water away from the building.

FIGURE 6 TYPICAL GUTTER TERMINATION DETAIL

3.5.2.4 Horizontal termination

Horizontal terminations shall not be used in any situation.

NOTE: The correct method is to continue the membrane to an edge and terminate it on a vertical surface.
Planter boxes shall be drained with a vertical riser.

The finished base of the planter box shall be graded to the outlet.

The membrane shall be sealed to a drainage flange, and shall continue to the top of the box and over the edge of the planter box.

Where a wall is adjacent to the box it shall be overflushed or sealed to the planter box.
POST AND POST SUPPORTS

- Timber posts should be installed in saddles (so that posts can be replaced without damaging the waterproofing).

- On concrete decks post bolts penetrations should be treated with epoxy.
Posts that are fitted after waterproofing has been completed shall be sealed.
Building coatings must be waterproof, and I draw your attention to the “leaky building” syndrome in New Zealand. In many cases water penetrated into the building envelope because the coatings were not flexible enough to withstand quite minor building movements.
The finished floor level shall not reduce the design flow of the outlet, and the outlet pipe should be the same diameter as the risers that drain the roof/balcony.
Drainage holes are too small & are set up from the surface of the deck.
Entry to drain 50% blocked by finished tile surface
AS 4654-2, Page 29, Fig. 2.8 (C)
2.1.2 CHANGES IN DIRECTION OR UPSTANDS
Any changes in the membrane’s direction from horizontal to vertical shall meet the requirements of Clause 2.3.
The membrane system shall be designed to accommodate differential horizontal movement (shear) between the vertical and horizontal substrate.
Bond breakers shall be provided where movement between substrates is expected. They shall be of sufficient dimension to allow the membrane to accommodate the movement.
Upstands (e.g., piers or posts) shall be treated as posts and post supports, and shall be detailed in accordance with Clause 2.8.4.
Hobs around plant rooms or similar structures shall be treated as upward terminations and shall be detailed in accordance with Clause 2.8.1.
NOTE: Plinths used for exposed plant should be placed over the roofing membrane. Protection of the membrane against vibration should be provided.

2.1.3 PLANTER BOXES
The membrane shall be sealed to the drainage outlet. The membrane shall extend vertically to a height of 100 mm above the soil or fill level.
Falls in the base of the planter shall be in accordance with Clause 2.5.2.

NOTES:
1. The planter box should be provided with a suitable overflow.
2. Protection boards should be provided to minimize root damage to the waterproofing membrane. The suitability of the plants to be installed should be considered, as certain rooting systems are aggressive and may penetrate the membrane.
3. Mulch should be considered when determining the soil fill level.
4. Externally exposed walls of planter boxes should be waterproofed to prevent failure of the internal planter box membrane.
5. A typical example of waterproofing inside a planter box is shown in Figure 2.17.
Upward termination of the membrane is to be in accordance with Table A1 appendix A (e.g. above the finished surface of the roof).
Movement joints shall be provided in the topping to accommodate movement in the membrane.
For other than loose laid materials, movement joints must be carried through to and into the surface finish.