Waterproofing Design & Failures

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What we'll cover today:

- The critical areas of the Australian standards for Waterproofing
- Materials review and issues with the wrong selection
- Design of waterproofing to internal areas such as polished concrete, showers, baths & laundries
- Design of waterproofing to external areas such as below ground, balconies, roofs and windows
- Questions

Australian Standards:

- **AS 3740-2010** Waterproofing of domestic wet areas
- **AS/NZS 4858-2004** Wet area membranes
- **AS 4654.1-2012** Waterproofing membranes for external above-ground use – Materials
- **AS 4654.2-2012** Waterproofing membranes for external above-ground use - Design and installation
- **There is no standard for below ground waterproofing**
- **The MBA waterproofing guides:** https://www.mbansw.asn.au/waterproofing

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Australian Standards:

- **According to the standard the causes of waterproofing defects are:**

(a) Workmanship.

(b) Understanding of material technology/properties.

(c) Applicator skill and competence.

(d) Application to a variety of use situations.

(e) Changes in design trends.

(f) Quality control, including supervision, inspection and testing.

(g) Maintenance of waterproofing medium when disturbed.

(h) Fixture of fittings after waterproofing and tiling.





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Australian Standards:

- **Terms from the standards that are often misinterpreted:**

1.4.24 Waterproof (WP) – The property of the material does **NOT** allow moisture to penetrate

1.4.25 Waterproofing System – It is the **COMBINATION** of elements to provide a waterproof barrier

1.4.26 Water resistant (WR) – The property of a system that restricts water movement will not degrade under conditions of moisture
(MAY NOT BE WATERPROOF)

1.4.29 Wicking – The action of water rising by a capillary path





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Australian Standards:

- **Examples of water resistant substrates:**
  - Concrete
  - Fibre cement sheeting
  - Structural Plywood
- **Examples of water resistant finishes:**
  - Tiles
  - Vinyl
  - Laminate

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Australian Standards:

- **Classification of waterproof membranes**

- **Class I membranes:** Resin (fiberglass) systems, Water based Epoxies
- **Class II membranes:** Acrylic membranes, Bitumen based Emulsions or Mastics, Torch-on bitumen based
- **Class III membranes:** Water or Solvent based Polyurethane, Sheet PVC, Sheet Rubber, EPDM

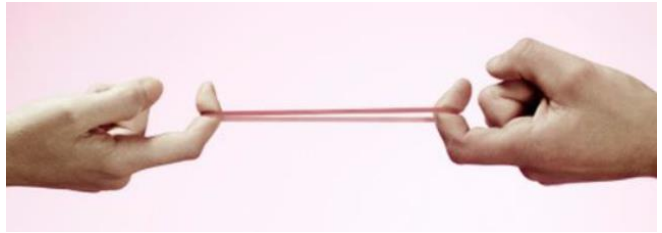

TABLE A1

CLASSIFICATION OF MEMBRANES

Class	Elongation at break (AS 1145, all parts) Type 2 specimen	Include reinforcement if part of system
I (low extensibility)	<60%	Yes
II (medium extensibility)	60–299%	Yes
III (high extensibility)	≥300%	Yes

NOTE: The introduction of reinforcement may alter the classification of the membrane.

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Australian Standards:

- **Joint Movement**

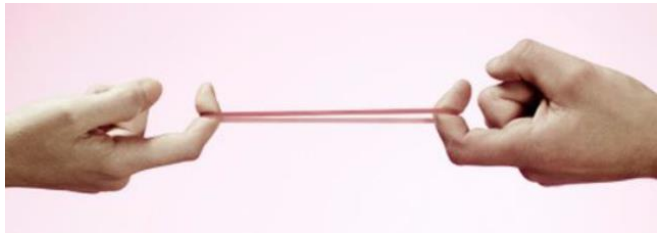

TABLE A2

REQUIREMENTS FOR JOINT MOVEMENT

Class	Movement accommodation factor	Minimum bondbreaker/tape width to bridge joints opening up by 5 mm (see Note)
I	50% of elongation at break	100 mm or 75 mm with backing rod
II	12 mm maximum	35 mm
III	24 mm maximum	12 mm

NOTE: For example, for a Class II membrane, a 35 mm wide bondbreaker/tape should be applied over a joint to accommodate the joint opening by up to 5 mm.

Australian Standards:

- **Fillets and Bond Breakers**

- Clause 2.7 in AS 4654.2-2012 states that:

Fillets shall be used when a membrane changes from a horizontal to vertical or vertical to vertical plane

- The fillet or cove for sheet membranes should be 40mm x 40mm, for liquid membranes a 15mm x 15mm fillet bond breaker should be used

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Detail of materials:

- **Class 1 Rigid Systems**

Resin (fiberglass) systems and water based epoxies

Advantages	Disadvantages
• Fibreglass is UV stable	• Ridged
• Fiberglass can be used as removable tubs	• Low movement accommodation factor
• Likely to be **root resistant** due to hardness	• Fibreglass tubs need to be manufactured off site

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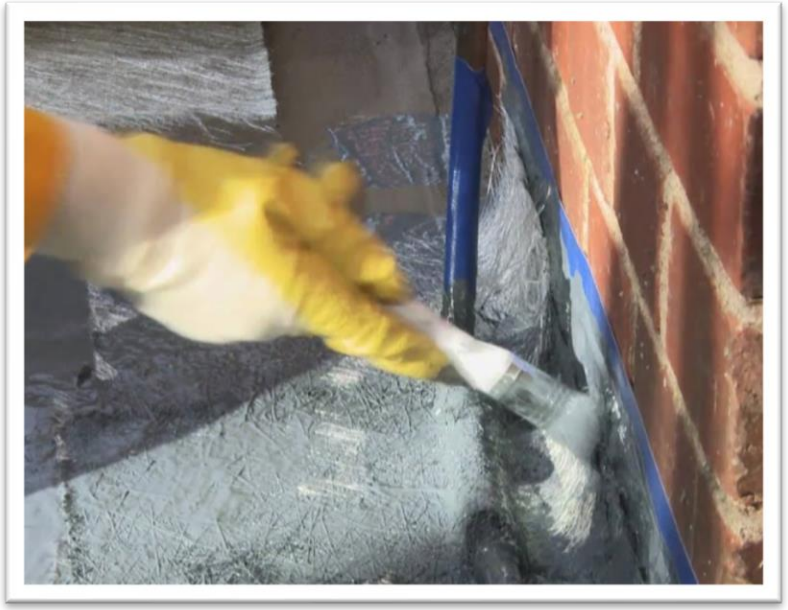
Detail of materials:

- **Class 2 Flexible Systems**

Acrylic Systems

Advantages	Disadvantages
• Easy to clean up (water based).	• Slow to cure in cold climates.
• Low toxicity.	• May need 2-3 coats.
• Some are UV stable.	• Needs priming.
• Compatible with most adhesives.	• Can emulsify if not fully cured especially at bond breakers.
	• Elongation can be diminished by adding fibre reinforcing generally giving them class 1 characteristics.
	• Can absorb moisture and allow moderate levels of water transmission.
	• **Not root resistant**



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Detail of materials:

- **Class 3 Elastomeric Systems Solvent Based Polyurethanes**

Advantages	Disadvantages
• No mixing.	• Some are flammable.
• Mostly no primer.	• Not easy to apply.
• Flexible.	• Adhesive compatibility.
• Fast cure.	• Can be difficult to clean up.
• Elastomeric.	• Can't go over damp substrates.
• Little water vapour transmission.	• Good ventilation and personal • protection required.
• Widely used.	• Not UV stable.
	• **Not root resistant.**

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Detail of materials:

- **Class 2 Flexible Systems Torch-On Modified Bitumen Membranes**

Advantages	Disadvantages
• Guaranteed membrane thickness	• Can't be applied during wet weather.
• Two-layers = providing extra security at laps	• Installing over wet substrates is not recommended
• Long-term durability	• Specialized and trained applicators a must.
• UV stable	• Risk of fire, so additional care to be taken when using a naked flame to apply a membrane
• Vapour distribution base sheets	• Not compatible with PVC fittings including PVC flanges and drainage pipes.
• Tested and proven system.	• High skill level
• **Root-resistant**	

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Detail of materials:

- **Class 3 Elastomeric Systems Sheet PVC / Butynol / Rubber Membranes**

Advantages	Disadvantages
• Uniform thickness	• High skill level
Compatible with PVC fittings and downpipes	• Specialist tools
• Can be laid over damp substrates	
• Can be prefabricated	
• Flexible	
• Durable	
• UV stable	
• Can direct stick tiles to specific Butynol types	
• **Root-resistant**	

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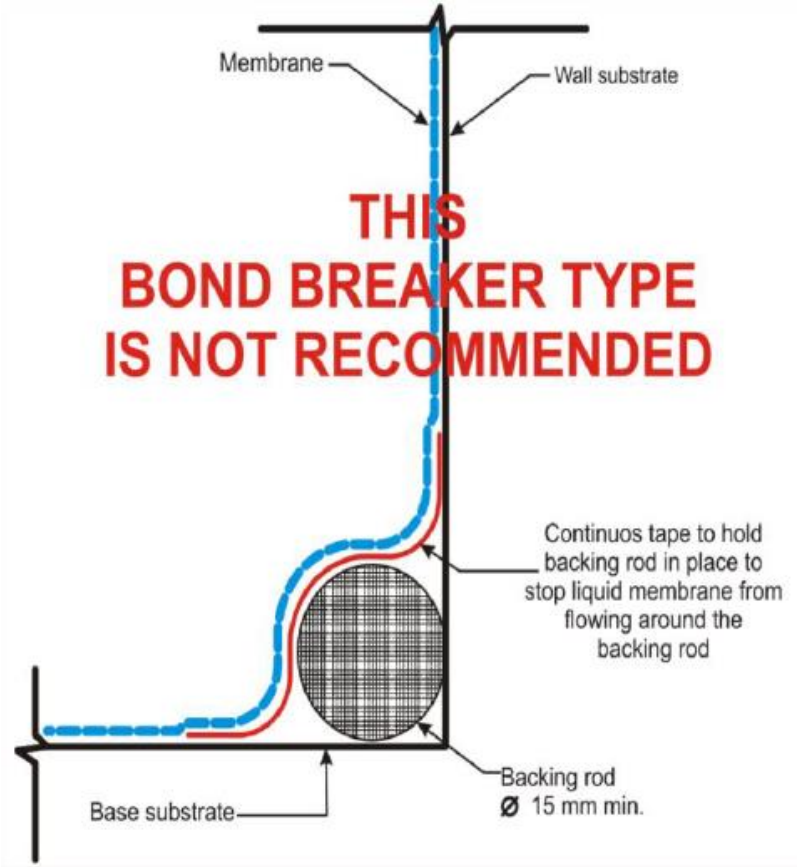
Detail of materials:

- **Fillets and Bond Breakers**







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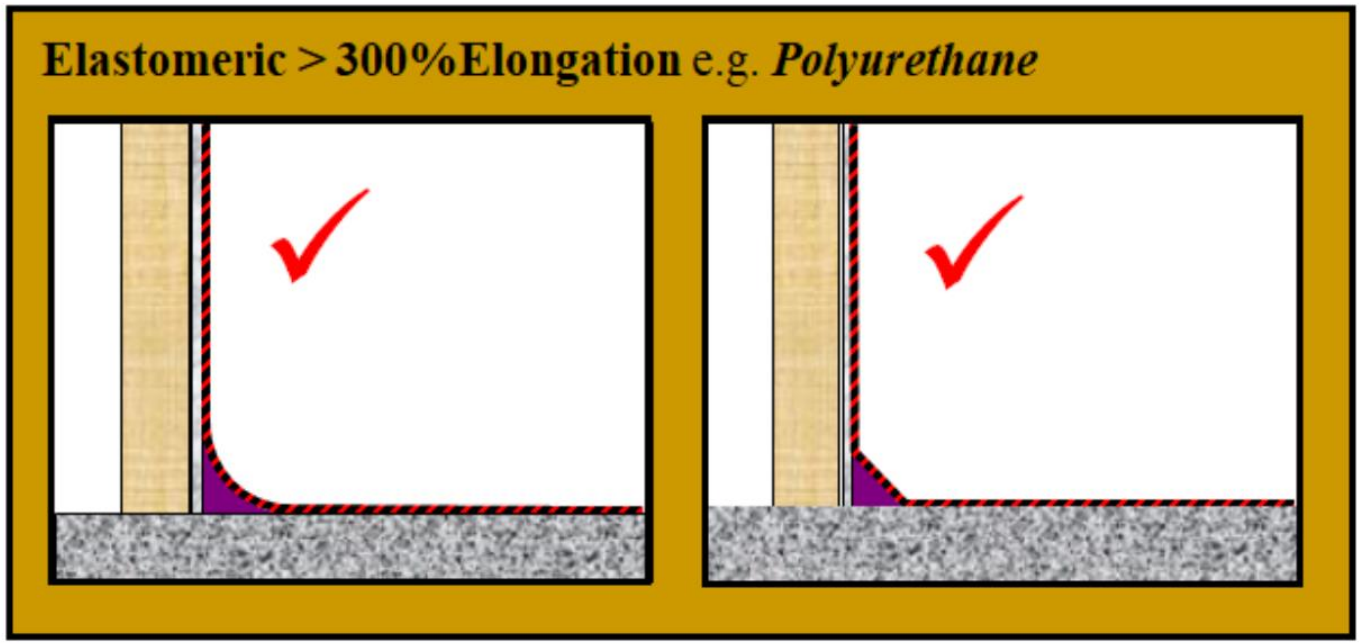
Detail of materials:

- **Fillets and Bond Breakers**

Type III membrane.

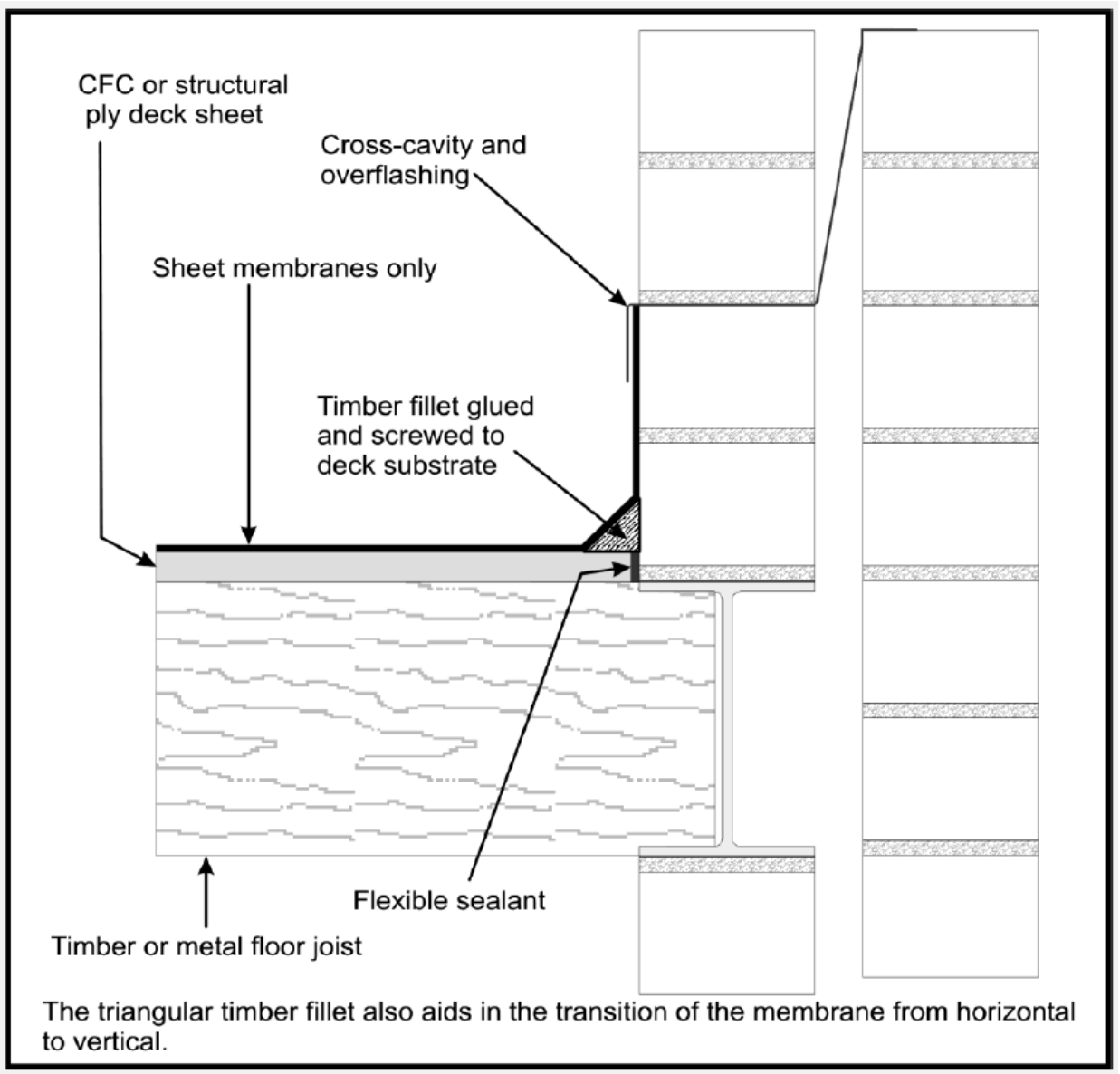






Detail of materials:

- **Fillets and Bond Breakers**

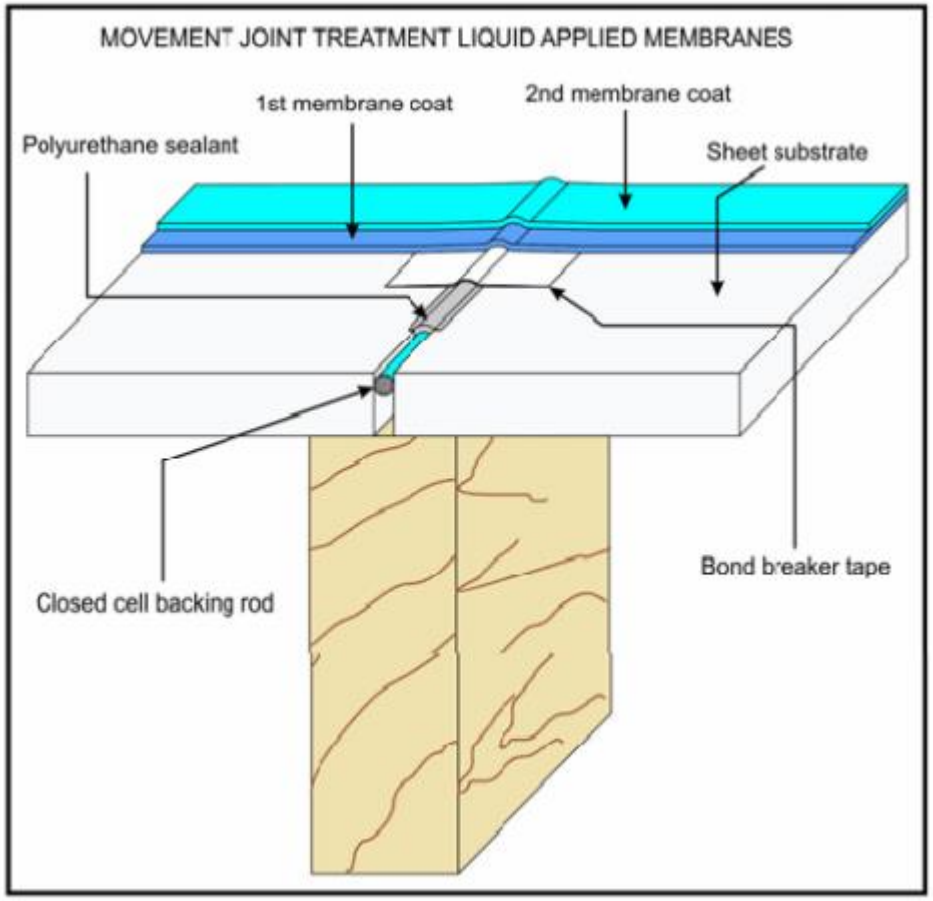


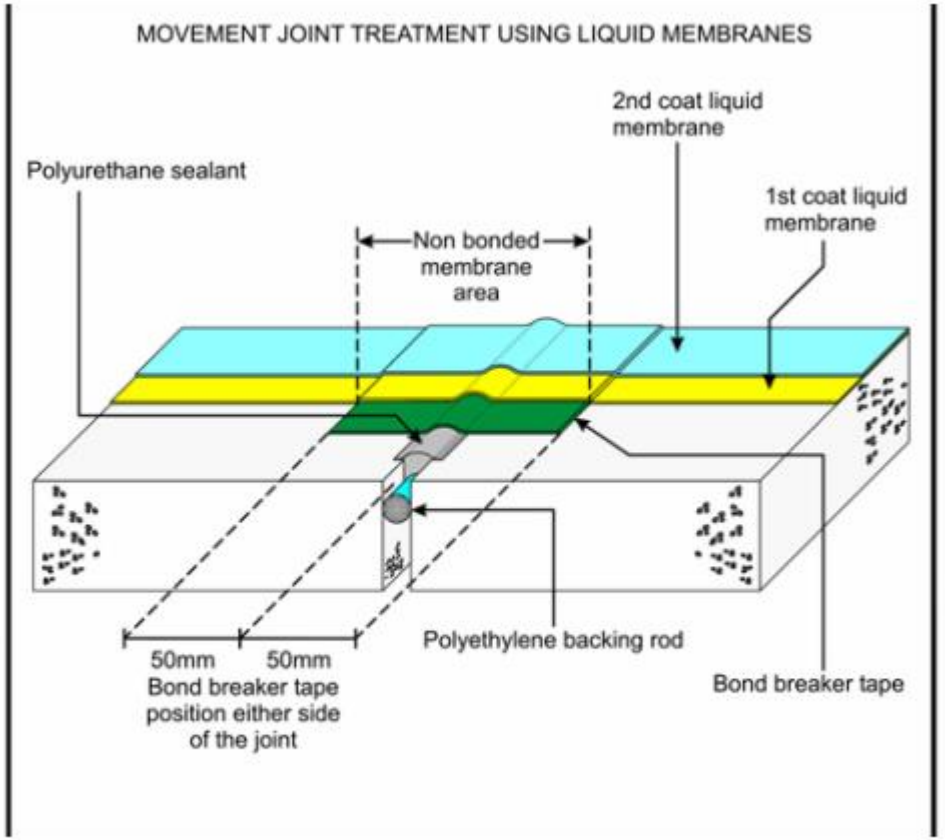
Detail of materials:

- Corner detail using bandage

Detail of materials:

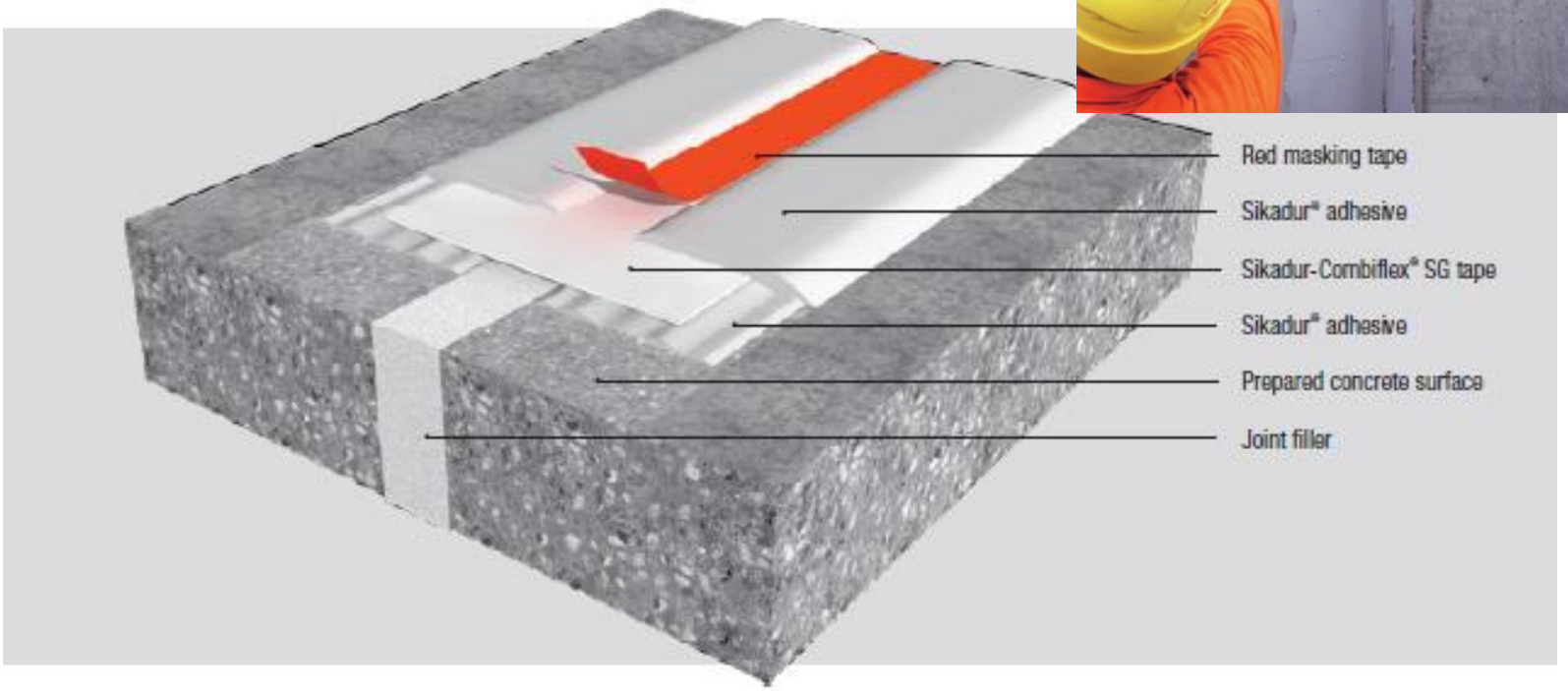
- **Liquid membrane over movement joint**



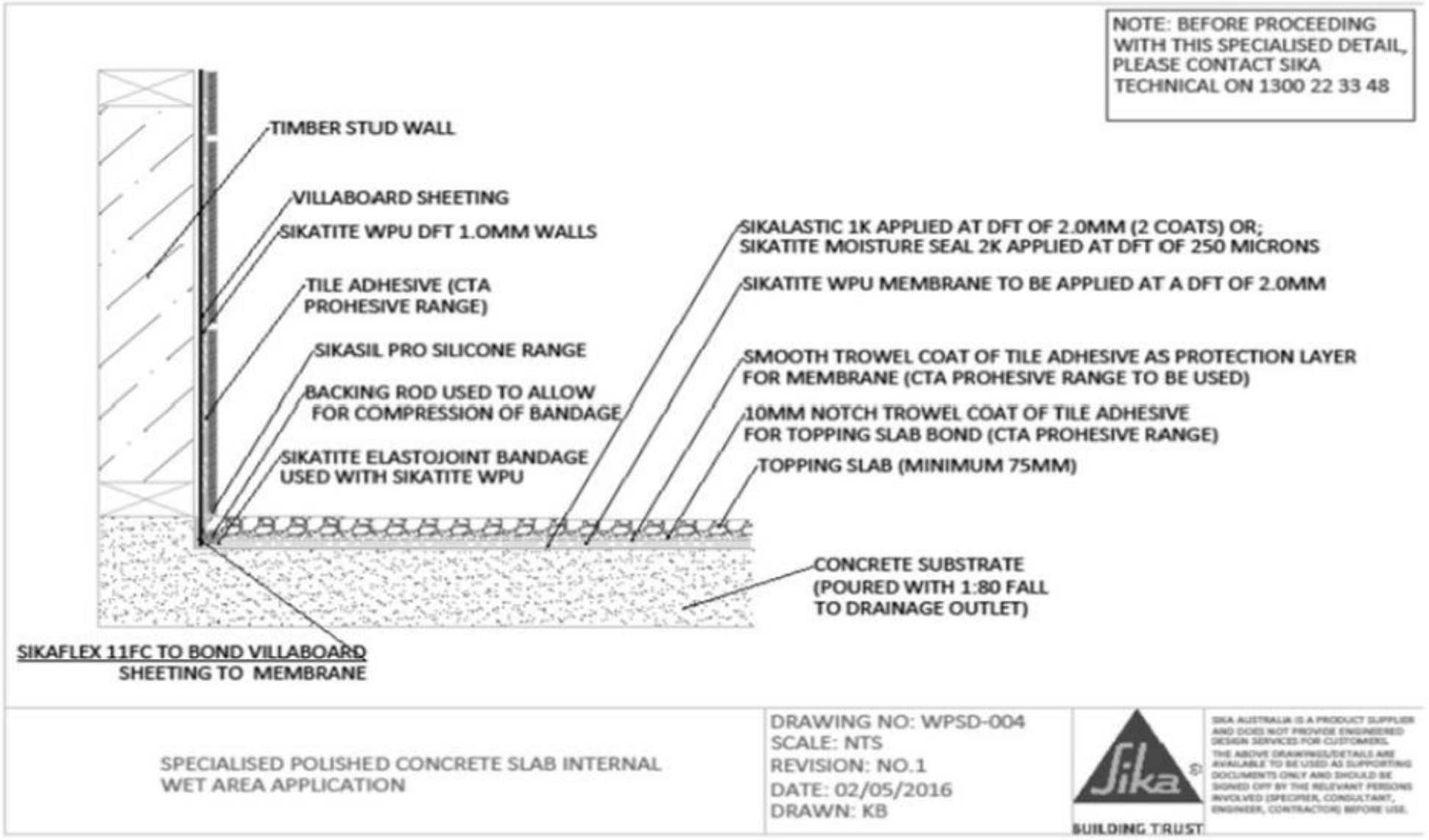


Detail of materials:

- **High movement joints**



Ideal systems – Polished Concrete:



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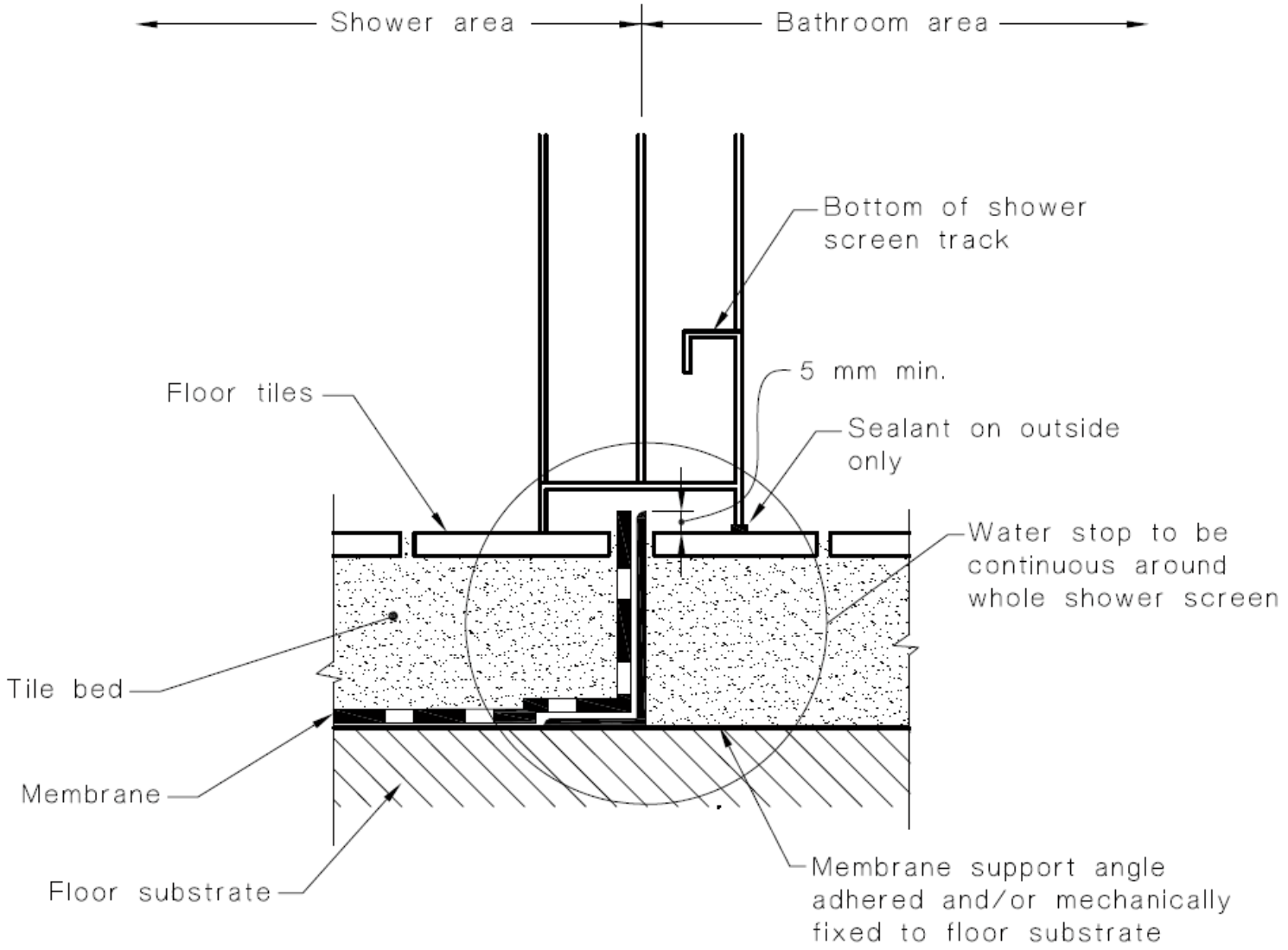
Ideal systems – Internal Wet Areas:

- **Common Issue: Shower Screen**



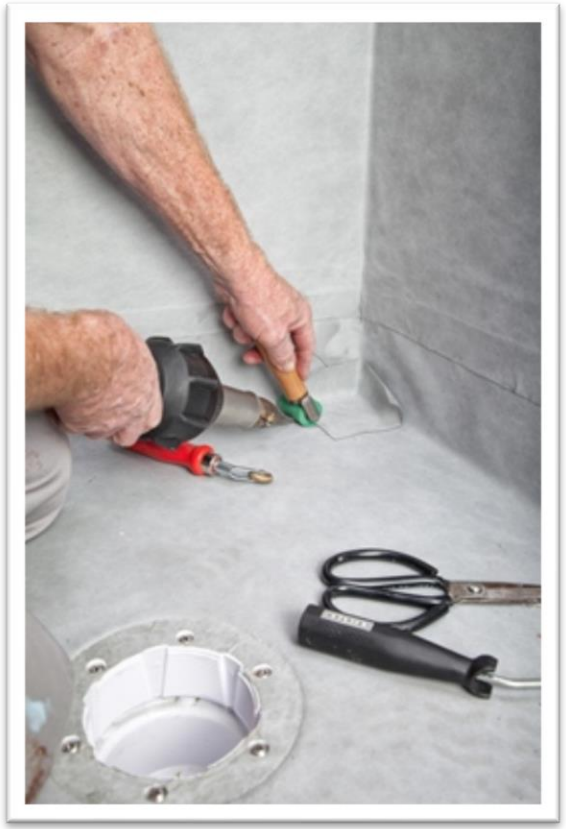
Ideal systems – Internal Wet Areas:

- **Common Issue: Shower Leaks**

Systems – Internal Wet Areas:

- **Wet Area Systems**

Wedi Board



Butynol

Schonox

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Systems – External Areas:

- **Design according to Australian Standards (above ground)**
  - Clause 2.2: The external waterproofing membrane system **shall accommodate movement** that occur in the substrate due to deflection, shrinkage ,temperature variation and at joints.
  - Clause 2.4.1: Note 2: **Particleboard flooring is not suitable** for external decking.
  - Clause 2.4.1: **Falls of finishes shall ensure water drains to the drainage outlet**. Water shall not be retained on the finished surface with the exception of residual water remaining due to surface tension.
  - Clause 2.4.1: The **substrate shall be resistant to moisture damage that is caused by condensation forming on the underside**.
  - Clause 2.4.1: **Preferably fall shall be in the structural substrate**, as an alternative the fall can be formed by the screed over the structural substrate.

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Systems – External Areas:

- **Planter Boxes**

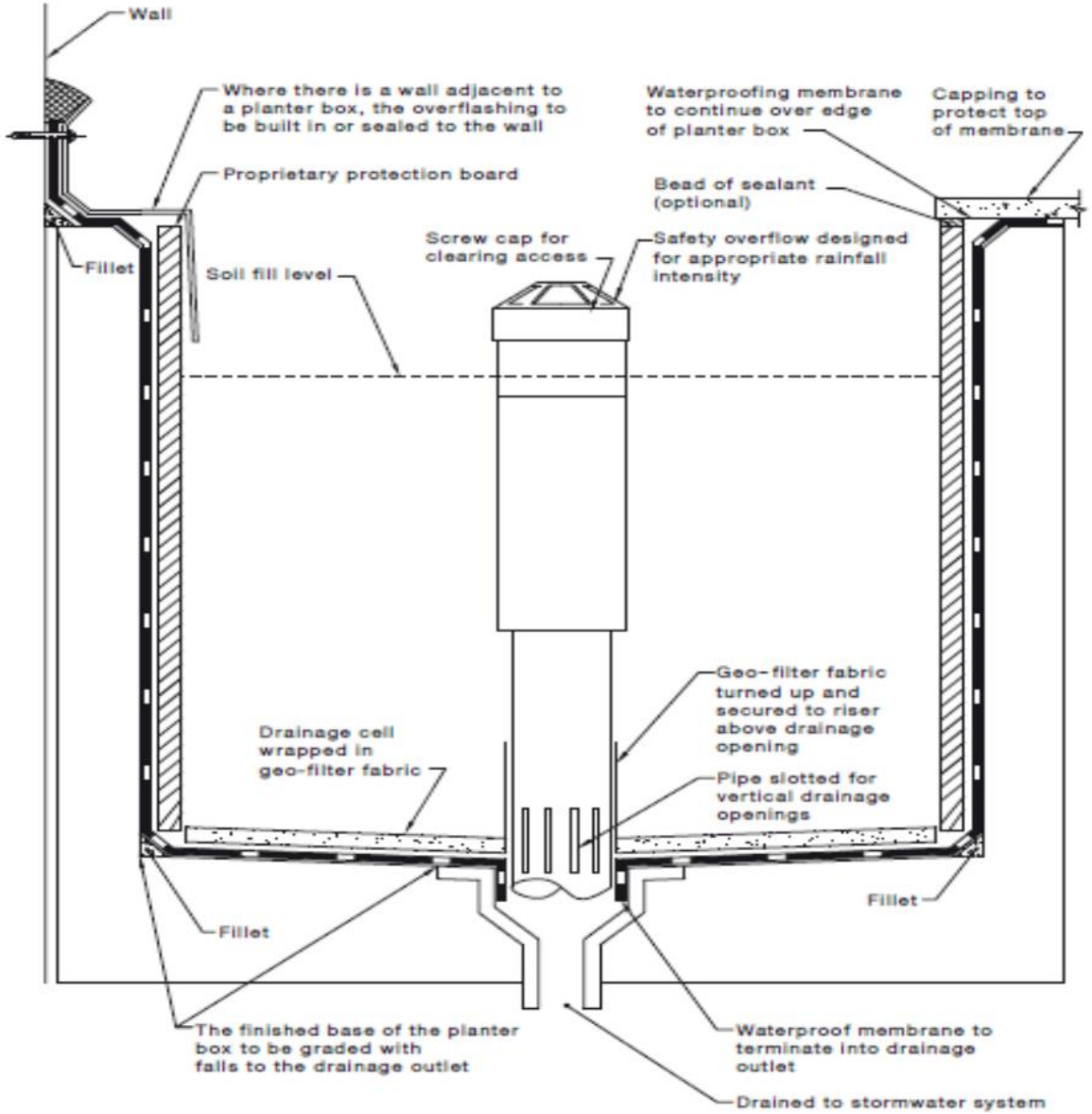


FIGURE 2.17 TYPICAL PLANTER BOX CONSTRUCTION

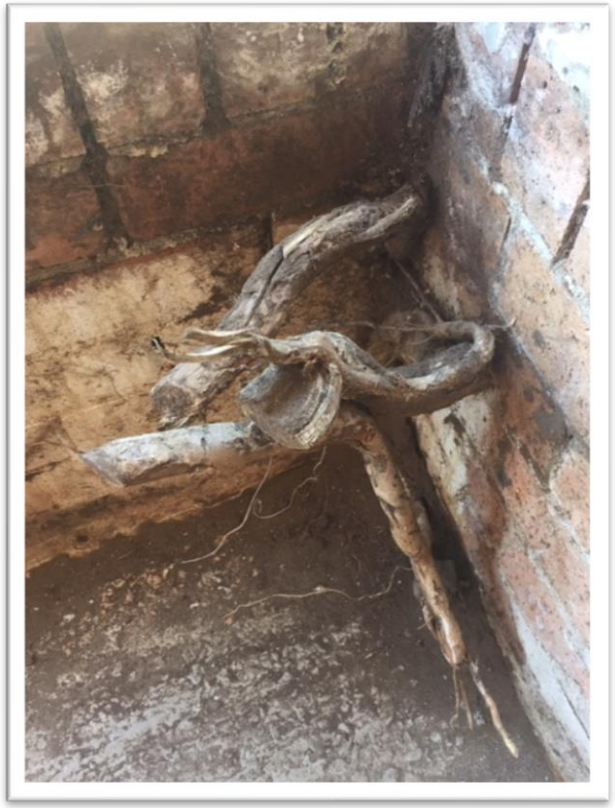
Systems – External Areas:

- **Planter Boxes: Root Resistance**

- Root resistant membranes to date are torch on, PVC and Butynol membranes

- Examples are:

- ARDEX Root Repel
- Sika Sarnafil
- Flagon Sopraflam
- Index Defend



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Systems – External Areas:

- **Balconies & Roofs: AS 4654**

1.4 MEMBRANE SYSTEMS

Assessment of resistance of waterproofing membranes to cyclic movement shall be in accordance with Appendices A and B.

Membrane systems are classified into five main groups, as follows:

(a) *Ballasted membranes* Membrane systems that are held down by ballast or other finish (e.g., rounded river gravel).

(b) *Fully bonded membranes* Systems that are fully bonded to the substrate; include liquid membrane systems.

(c) *Inverted roof membrane assembly (IRMA)* System where the ballasted roof insulation is placed on top of the membrane.

(d) *Mechanically fixed membranes* Membrane systems that are held down by mechanical fastening.

(e) *Partially bonded membranes* Systems where only part of the surface area of the membrane is designed to be bonded to the substrate.

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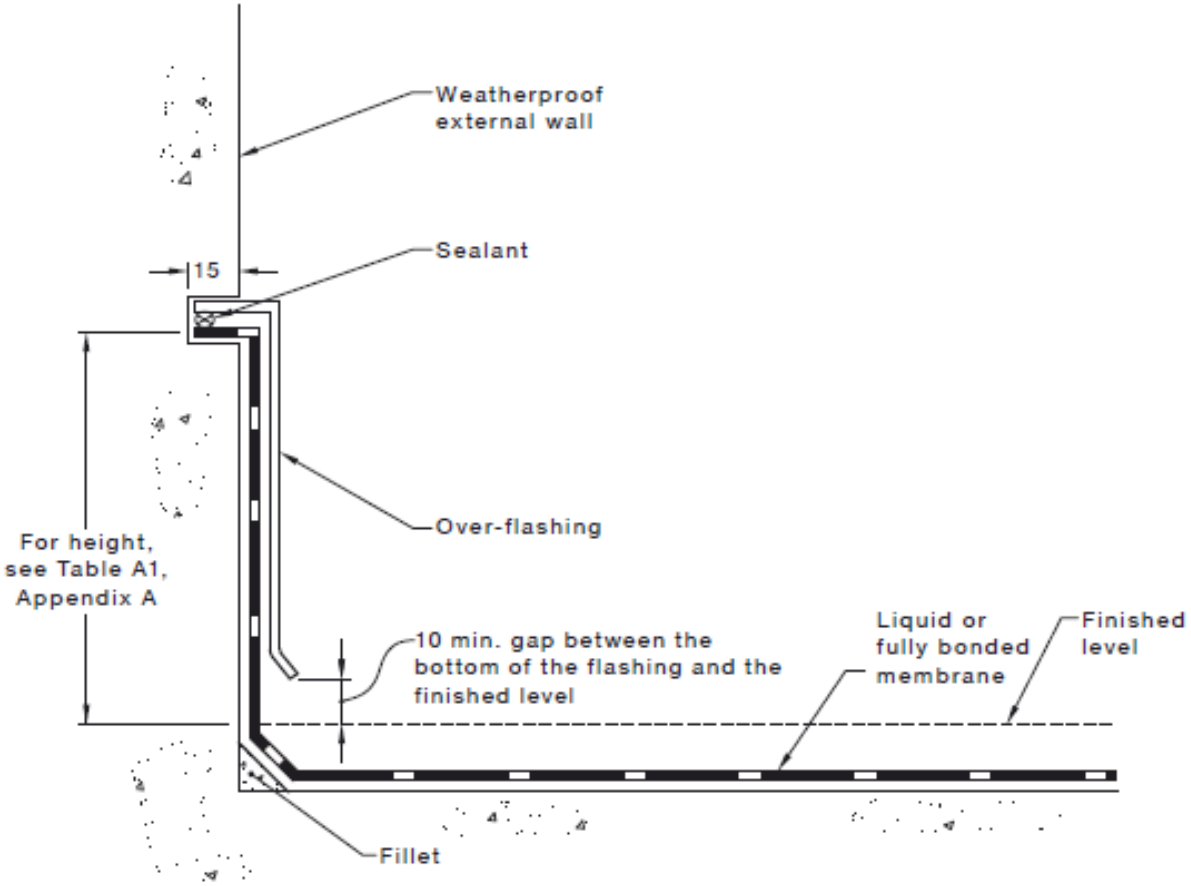
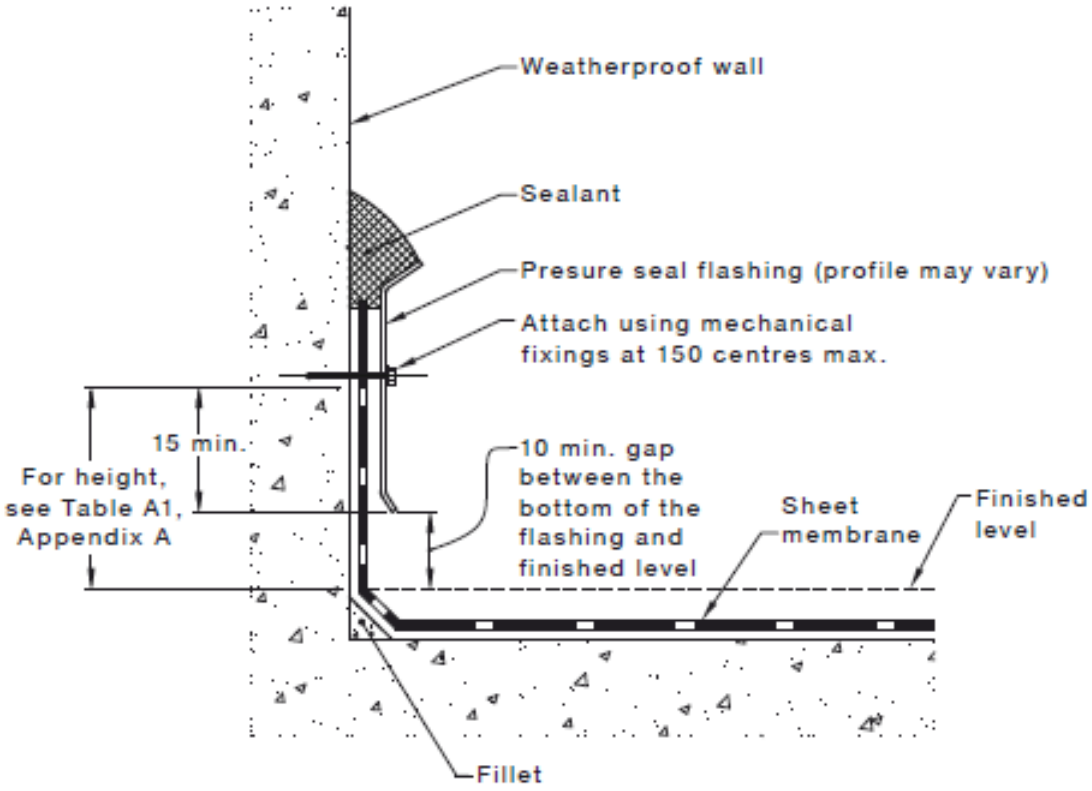
Systems – External Areas:

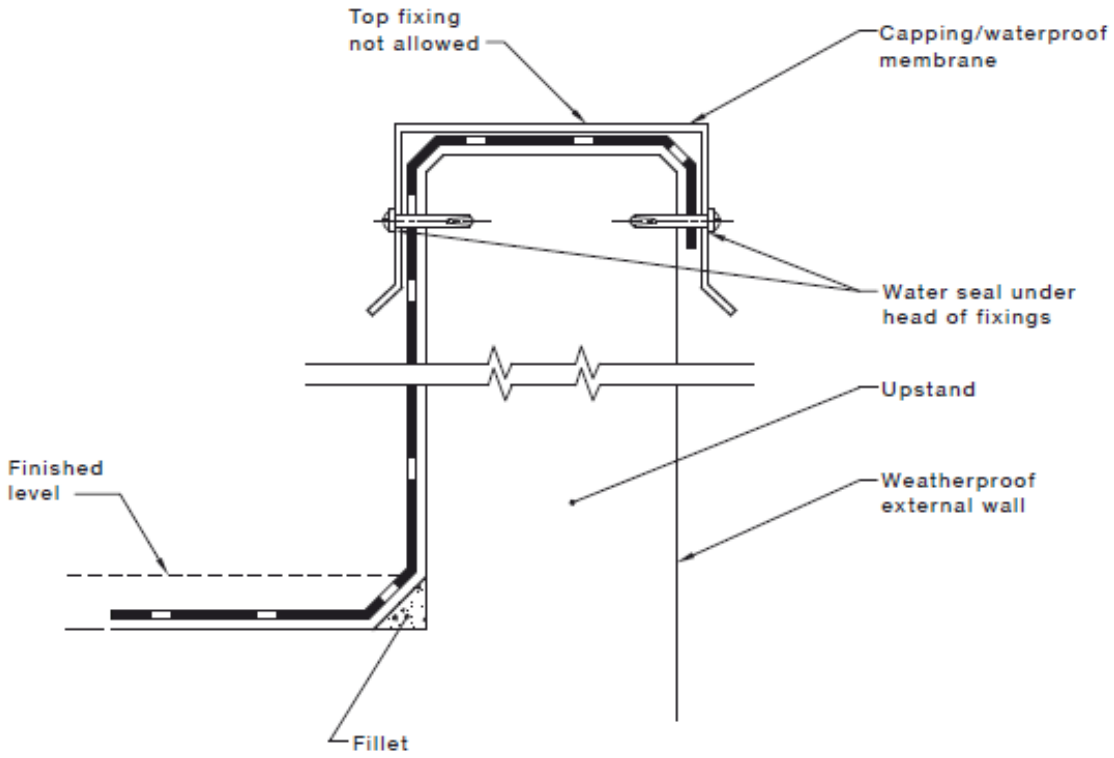
- **Balconies & Roofs: AS 4654**





Systems – External Areas:

- **Balconies & Roofs: AS 4654**



NOTE: For falls, see Clause 2.5.2.

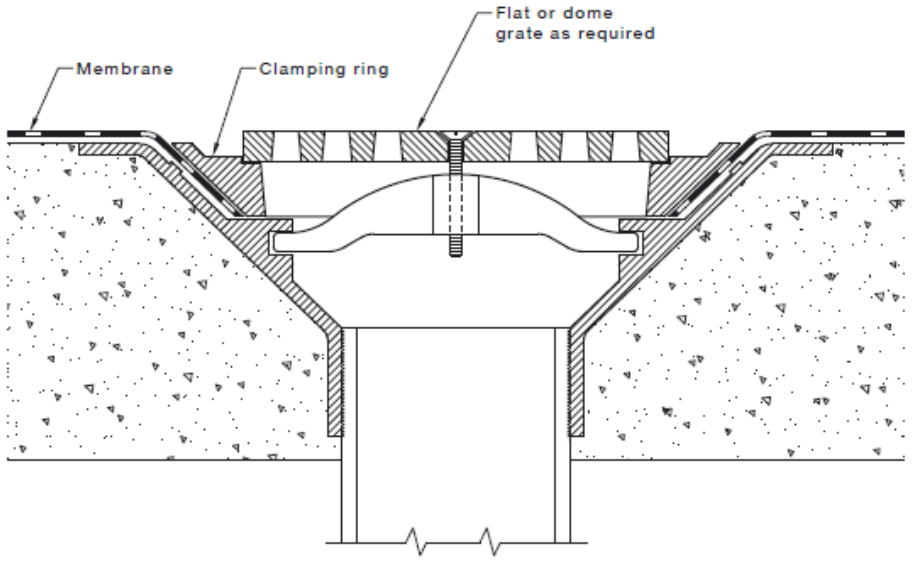
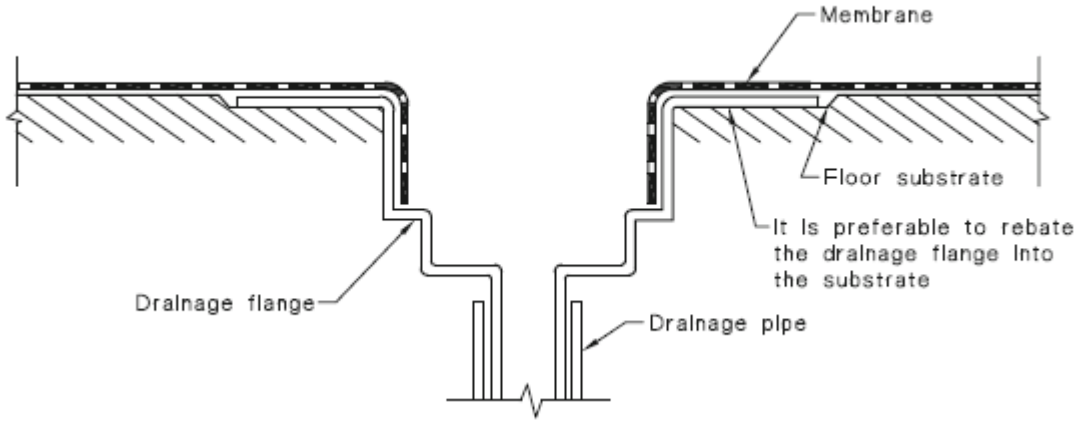


FIGURE 2.15 DRAINAGE DETAIL FOR AN EXPOSED MEMBRANE



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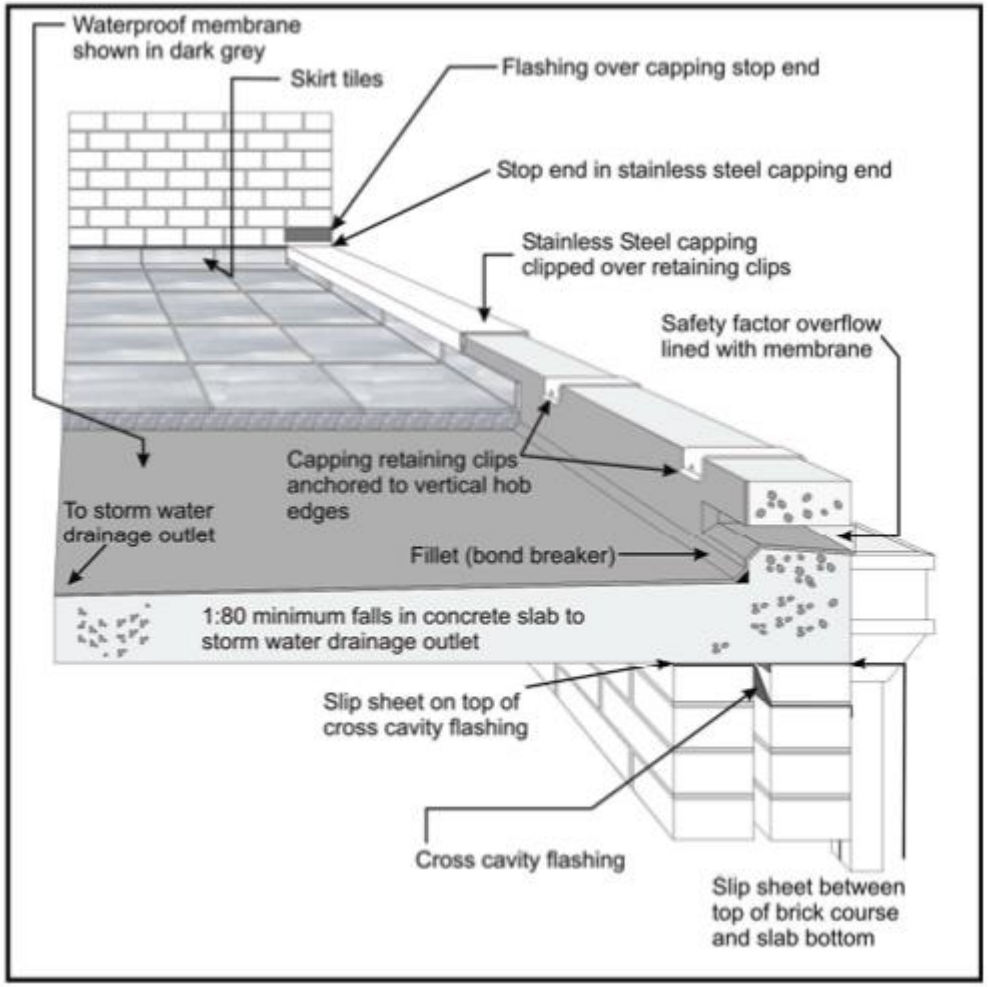
Systems – External Areas:

- **Balconies & Roofs**



Metal Capping with Concealed Fixings

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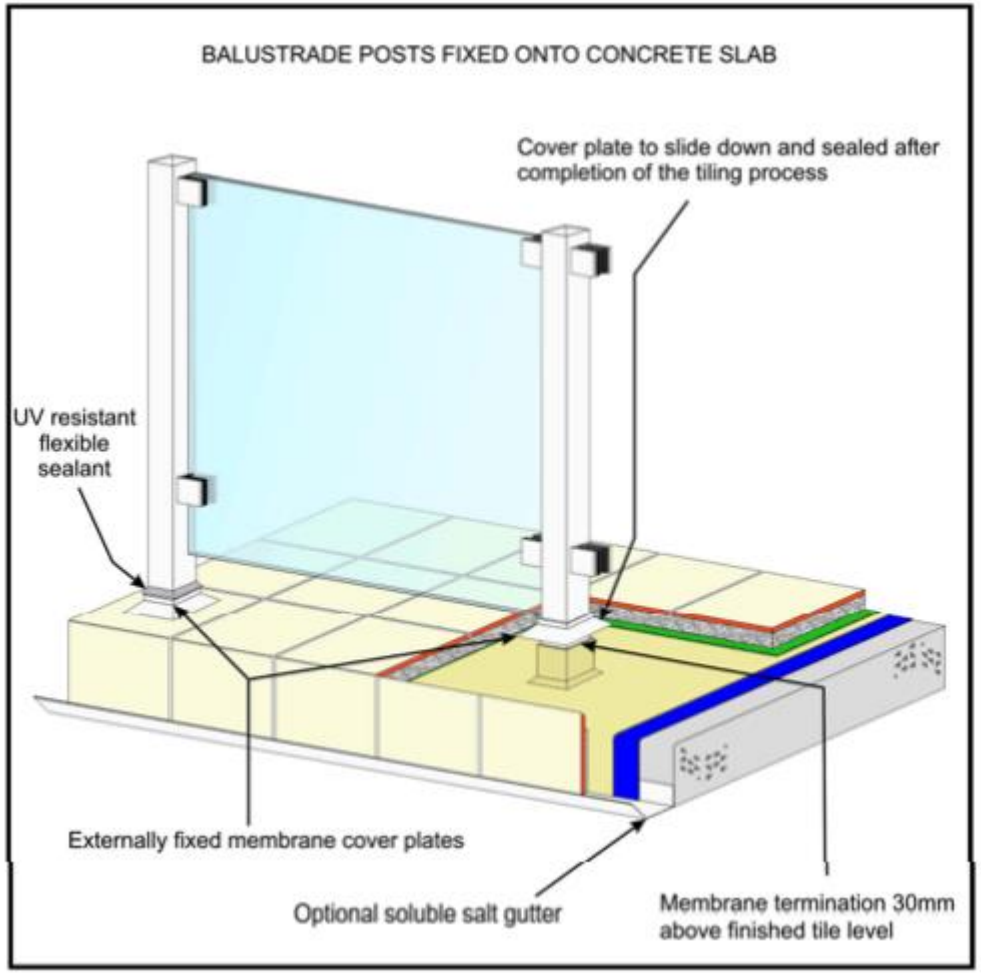
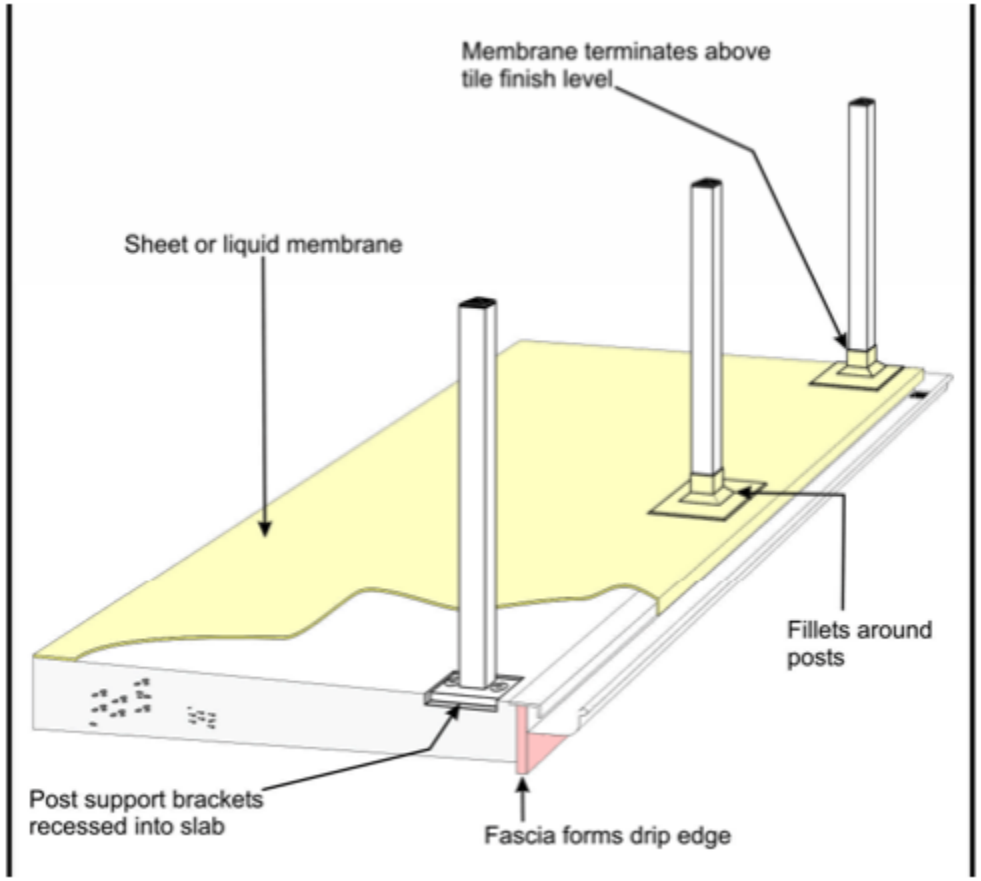
Systems – External Areas:

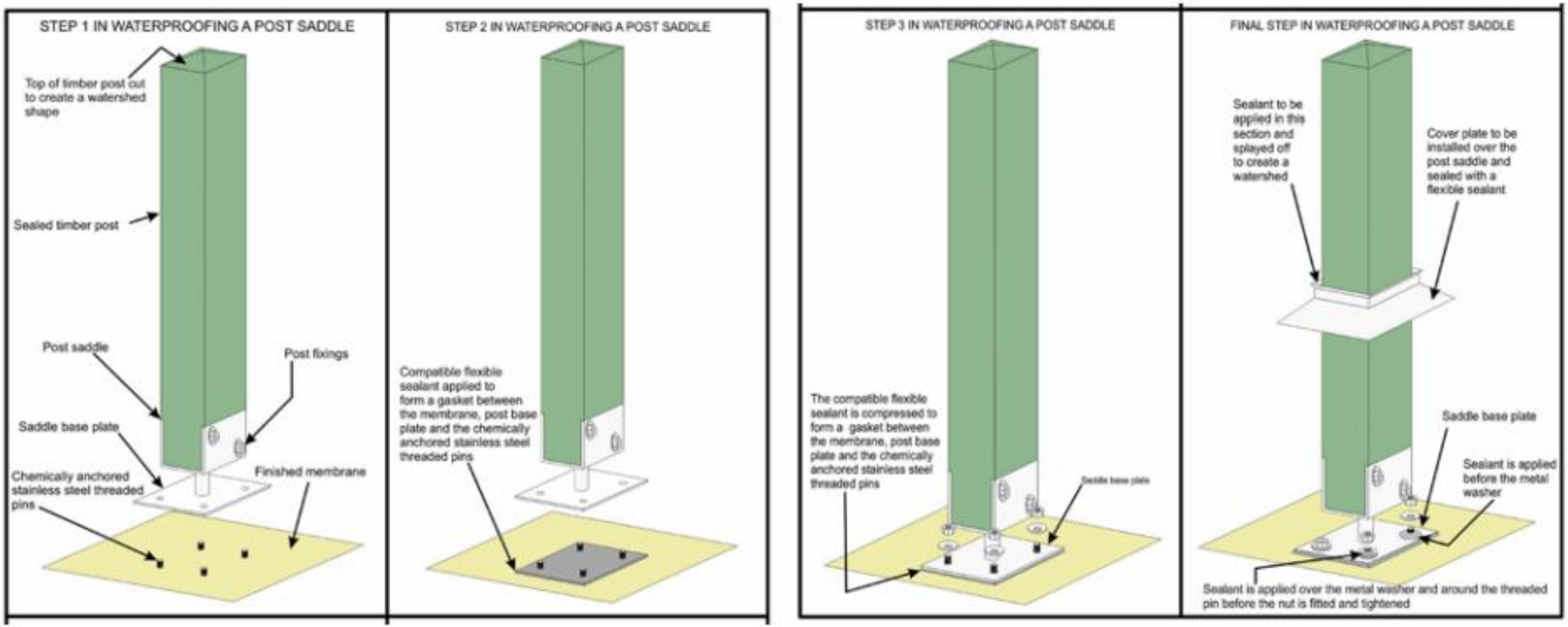
- **Balconies with balustrade/glass panels**





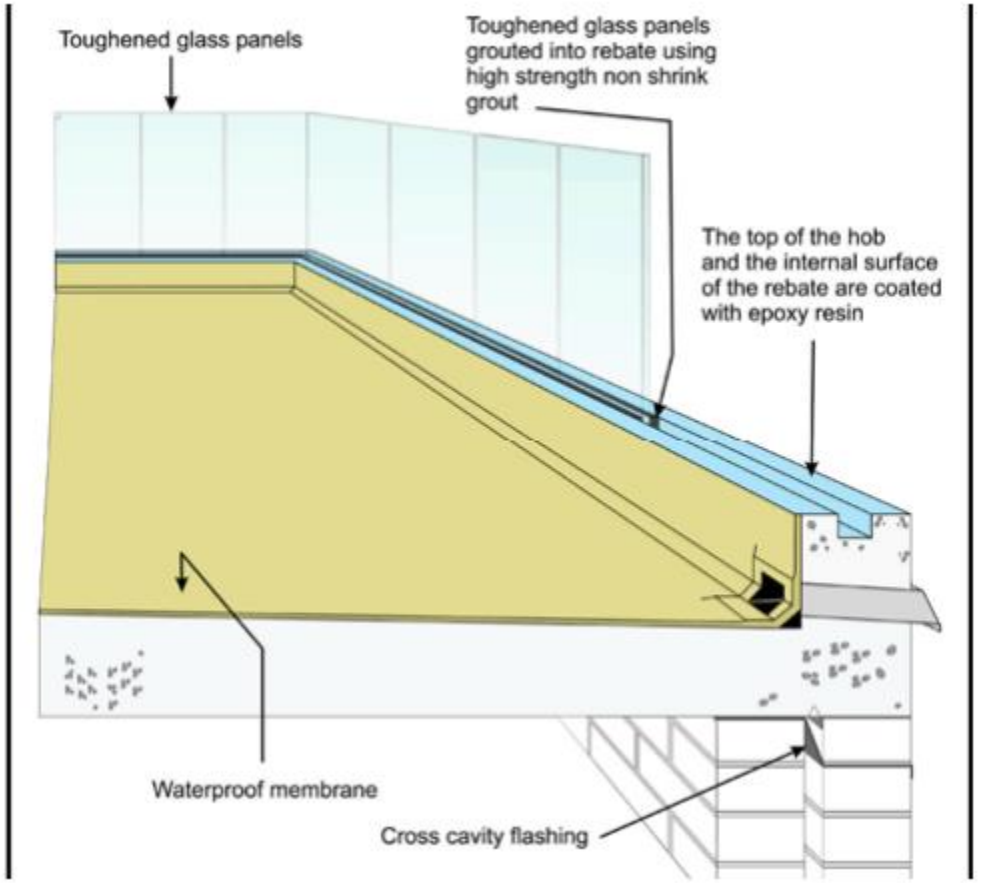
Systems – External Areas:

- **Balconies with balustrade**



Systems – External Areas:

- **Balconies with glass panels**

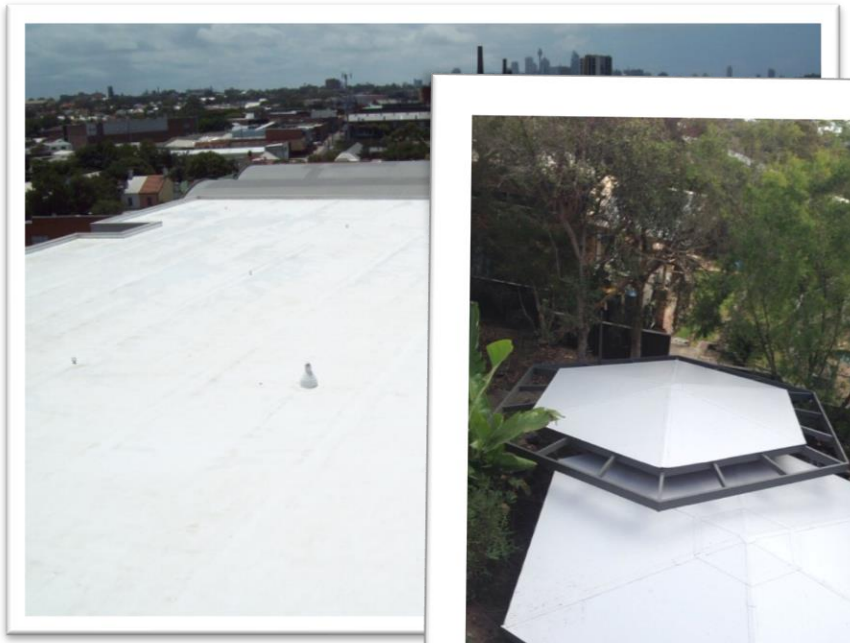


Systems – External Areas:

- **Balconies & Roofs: Common Issues**

Systems – External Areas:

- **Balconies & Roofs**



Roof: PVC Bonded System

Roof: Torch-On System

Terrace: Butynol System

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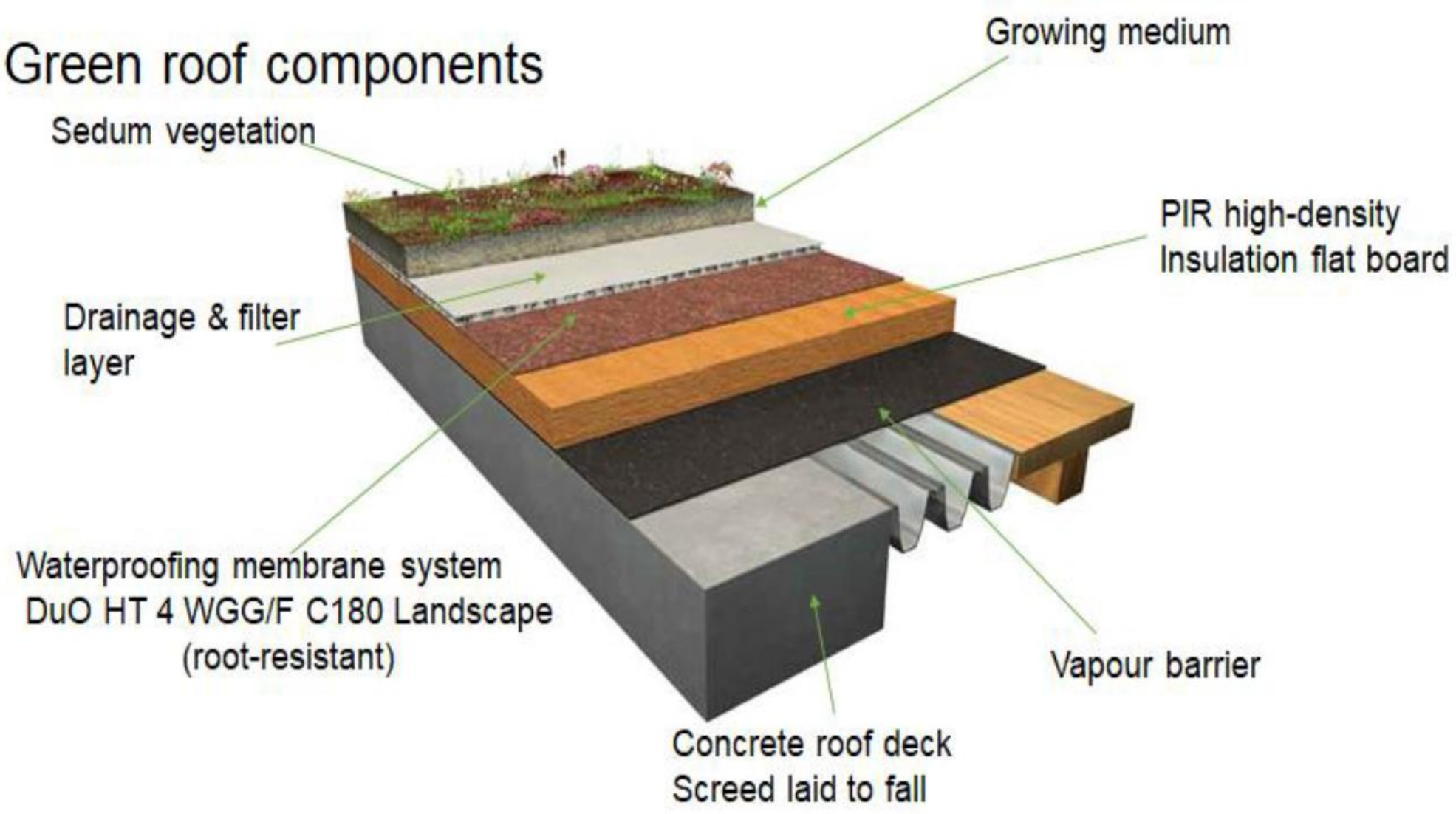
Systems – External Areas:

- **External Walls**

Cavity Systems

Systems – External Areas:

- **Green Roofs: Insulation Under the Membrane**

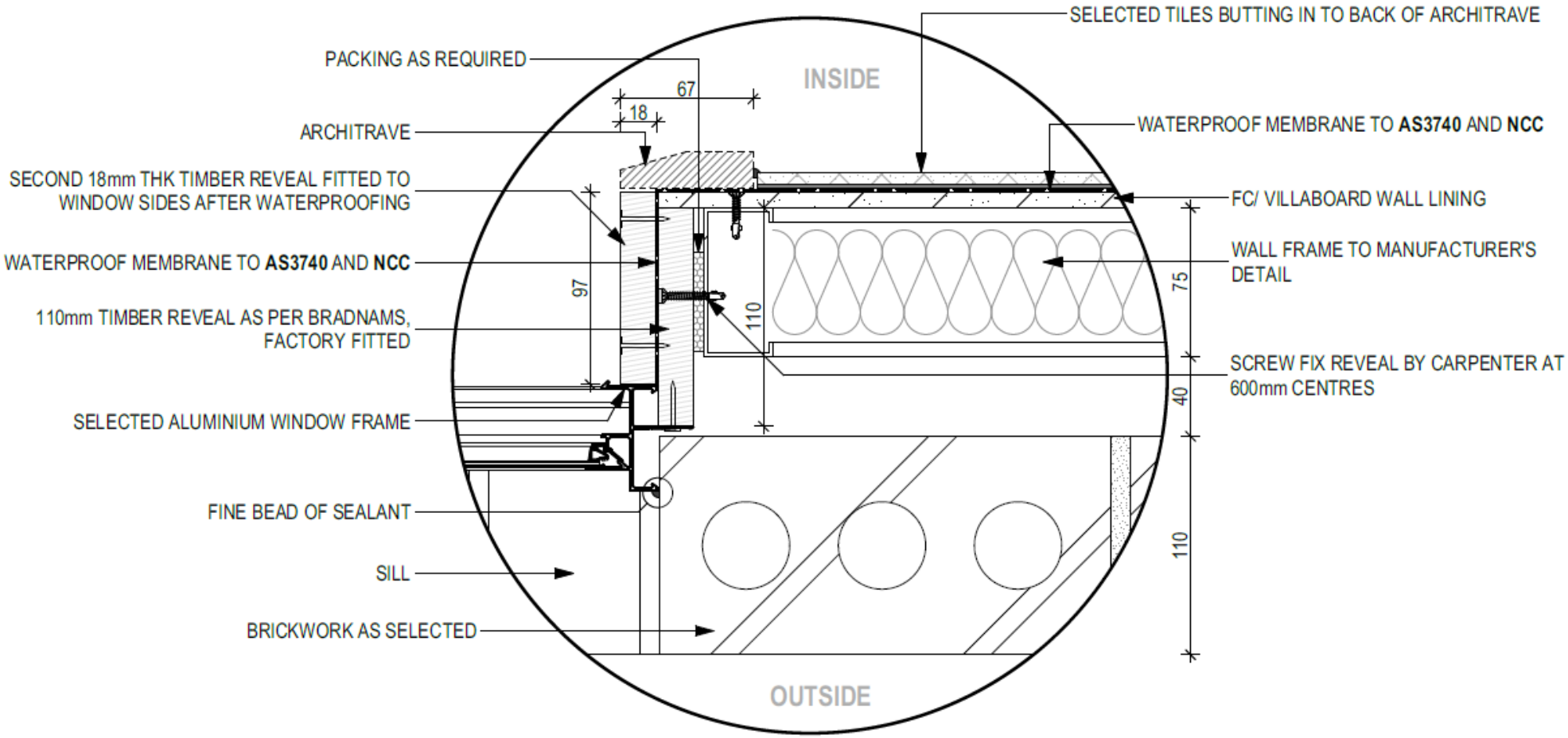


Systems – External Areas:

- **Green Roofs: Without Insulation under the Membrane**

Systems – External Areas:

- **Windows**

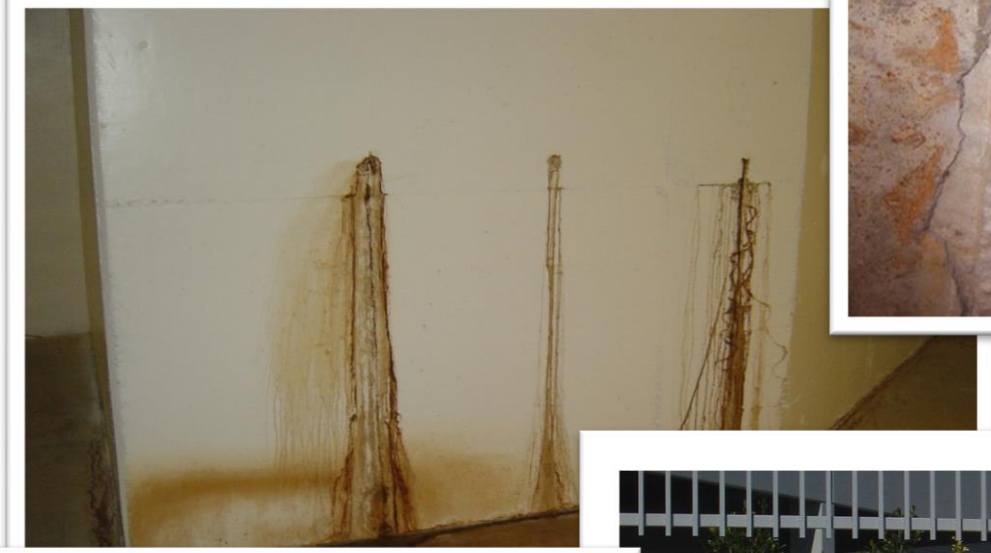


JAMB DETAIL

Scale: 1:5

Systems – External Areas:

- **Below Ground: Common Issues**



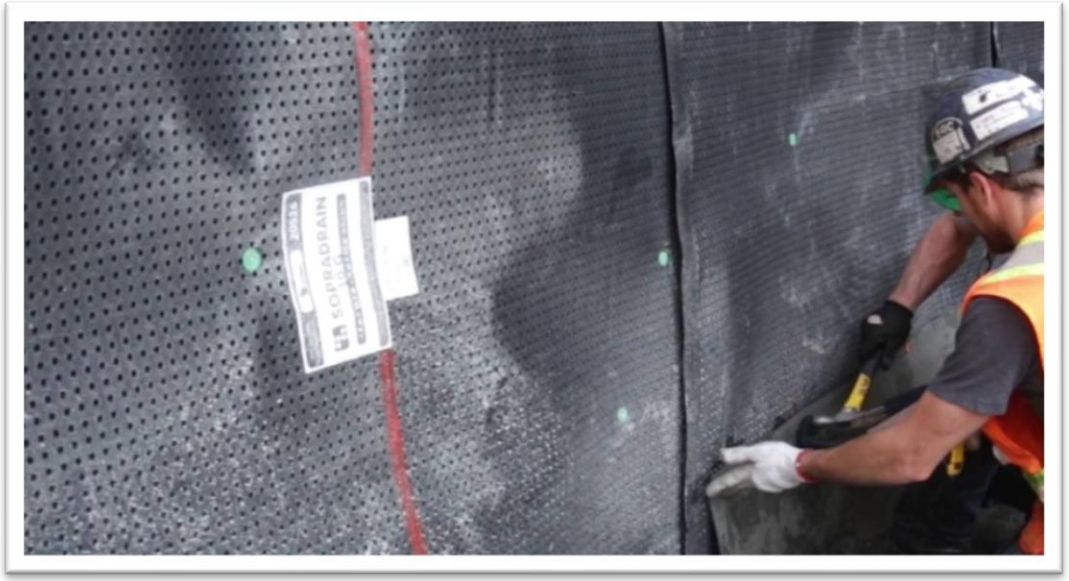
Systems – External Areas:

- **Below Ground**

FPO Blinding System

Bentonite Sheet

SBS Bitumen Sheet



Systems – External Areas:

- **Below Ground**

Newton 500 System

Systems – External Areas:

- **Inspection & Maintenance AS 4654.2-2012 Appendix B**

Where visible, the waterproofing system shall be inspected on a regular basis for evidence of deterioration due to:

1. Deterioration of the membrane, adhesions, flashing, capping, sealant
2. Traffic damage
3. Structural interference
4. Blockage of the drainage system
5. Root damage
6. Birds, pests and wildlife attack

Any necessary maintenance should be carried out promptly:





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Questions?

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Thank You!

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