WATERPROOFING FOR INTERNAL WET AREAS

CITI TRAINING NOTES ON LESSON 1.

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WATERPROOFING FOR INTERNAL WET AREAS

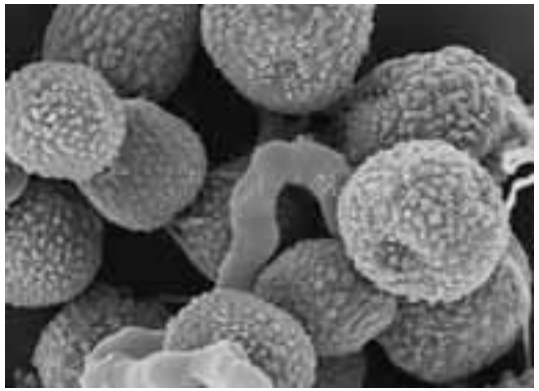
1.1 INTRODUCTION - WATERPROOFING TO WET AREAS.

1.1.1 Definition.

Waterproofing is defined as “treatment of a surface or structure to prevent the passage of water under hydrostatic pressure”.

1.1.2 Why Waterproofing?

- Aesthetics - water seepage causes unsightly stains and damages to property.
- Structural - causes corrosion to steel reinforcement and concrete spalling.
- Health - seepage of grey water and resulting dampness promotes bacterial growth and mold infestation.



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Some Statistics...

Survey on water seepage defects carried out on 39 private condominiums in 2003:

	Building age when defects occurred		Total
	0 -5 year	6 - 10 year	
Total number of home units surveyed.	7,621	2,198	9,819
Number of units affected by water seepage.	284	335	619
Percentage of units affected by water seepage	3.7%	15.2%	6.3%

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Some More Statistics...

Breakdown of water seepage defects:

Location of Water Seepage Defects	Breakdown of defects (in relation to building age)	
	0 - 5 year	6 - 10 year
Internal Wet Areas	24.0%	55.0%
External Walls	52.7%	37.6%
Windows	16.3%	4.6%
Roofs	7.0%	2.8%
Total	100.0%	100.0%

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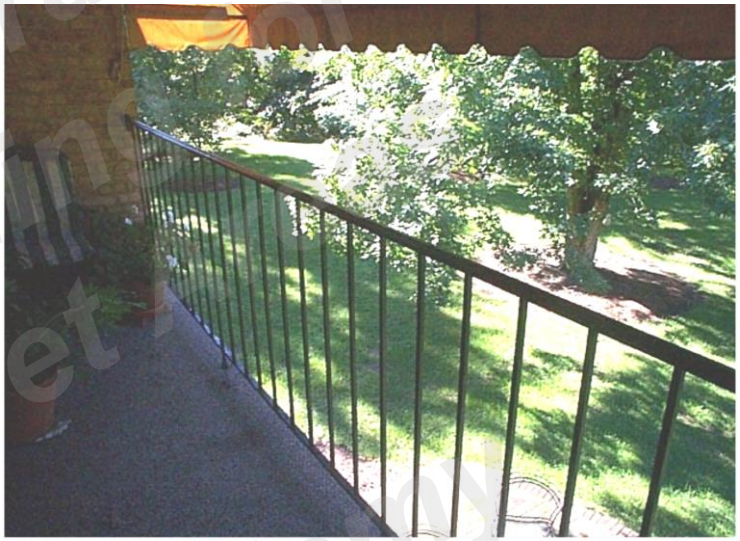
1.1.3 Wet Areas.

Generally wet areas refer to:

•External Wet Areas.

These are locations where they are subjected to either “exposed” or “semi-exposed” situation such as balconies, walkways, corridors & patios etc.



•Internal Wet Areas.

They are areas located within the building premises and are generally exposed to constant wetting due to washing. Examples are toilets, bathrooms (including PBUs), laundry areas, wet kitchens etc.

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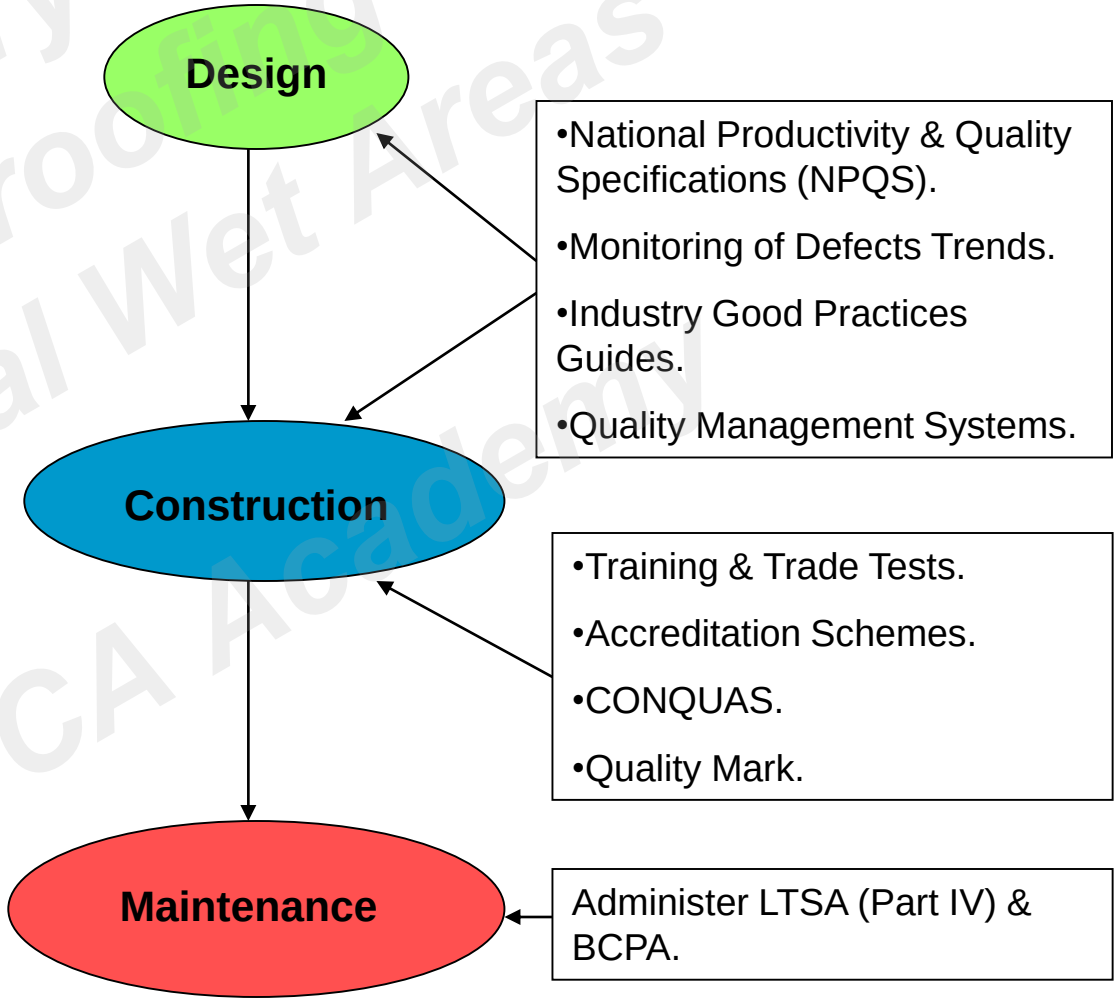
1.1.4 Good Industry Practices.

The main purposes for the Good Industry Practices Guides are:

- Provides simple and practical tips to assist designers and contractors in achieving high quality workmanship,
- It forms part of the CONQUAS 21 (Construction Quality Assessment System) enhancement series to serve as a national yardstick for measuring the quality of of building projects.
- To complement the current Singapore Code of Practice, CP 82:1999 - “Waterproofing of Reinforced Concrete Buildings”.

OVERALL QUALITY STRATEGY.



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1.2 DESIGN, DETAILS & REQUIREMENTS.

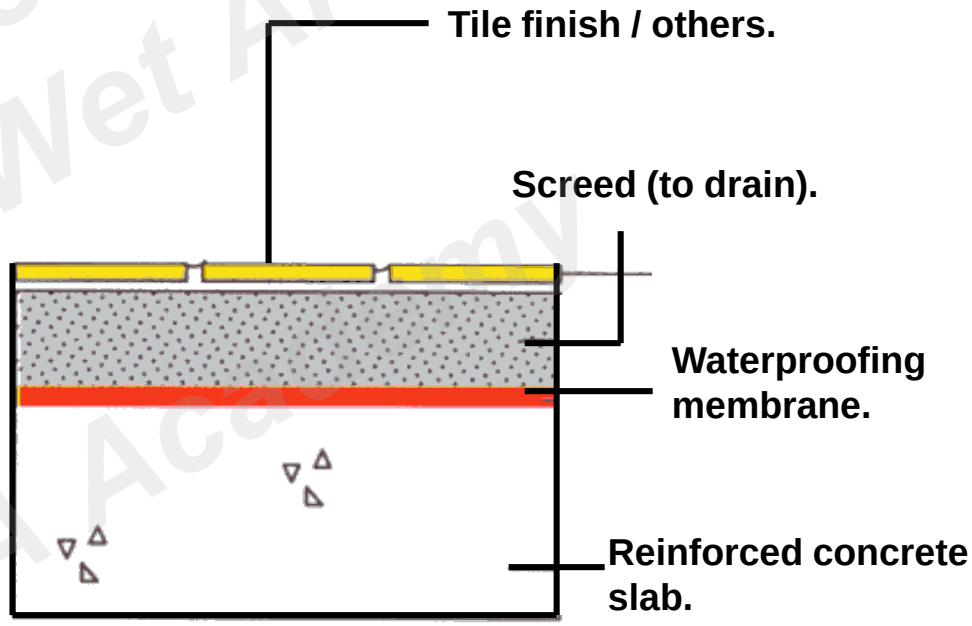
1.2.1 Design & Details.

•Provide sufficient detail in drawings and specifications by architects.

•Review structural, architectural and M&E requirements to ensure compatibility and consistency.

•Sound understanding of the structural design and construction considerations such as the typical built-up layers consisting of:

- Reinforced concrete slab.
- Waterproofing membrane.
- Screed.
- Tile finish / others.



Typical built-up in wet areas.

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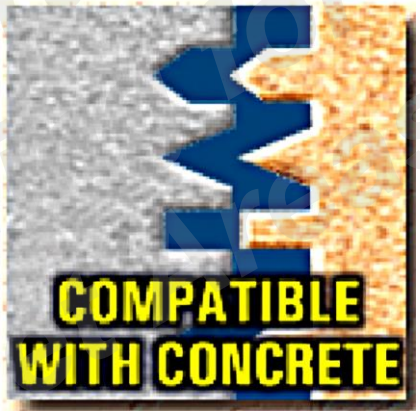
1.2.2 Waterproofing Requirements.

Generally waterproofing requirements for wet areas should include:

- Homogeneity.
- Low water absorption.
- Resistance to mechanical damages.
- Joint bridging ability esp. over cold joints.
- Flexibility to bridge over different construction materials.
- Ease of application esp. at detailing such as pipe penetrations and outlets.
- Good adhesion to concrete and screed.
- Good cohesion properties.
- Compatibility with base slab, screed and plastering.
- Rapid setting under enclosed space.



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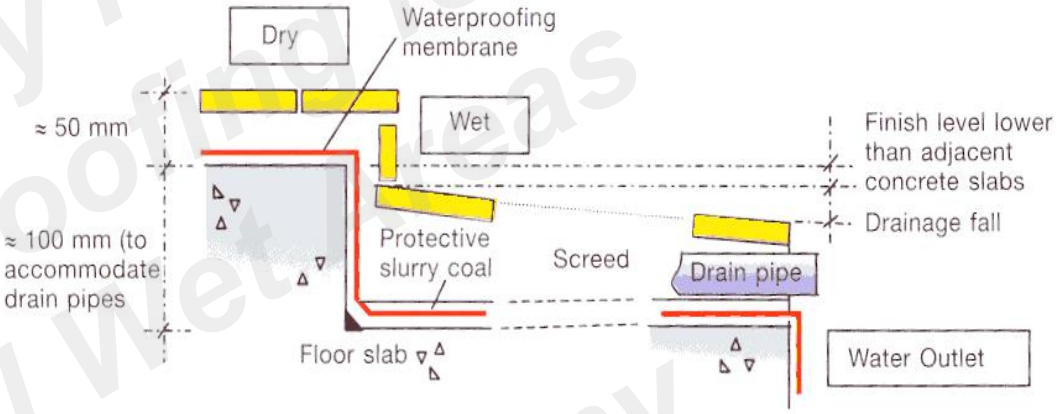
1.2.3 Detailing.

A) Floor detail between wet area and adjoining dry surfaces.

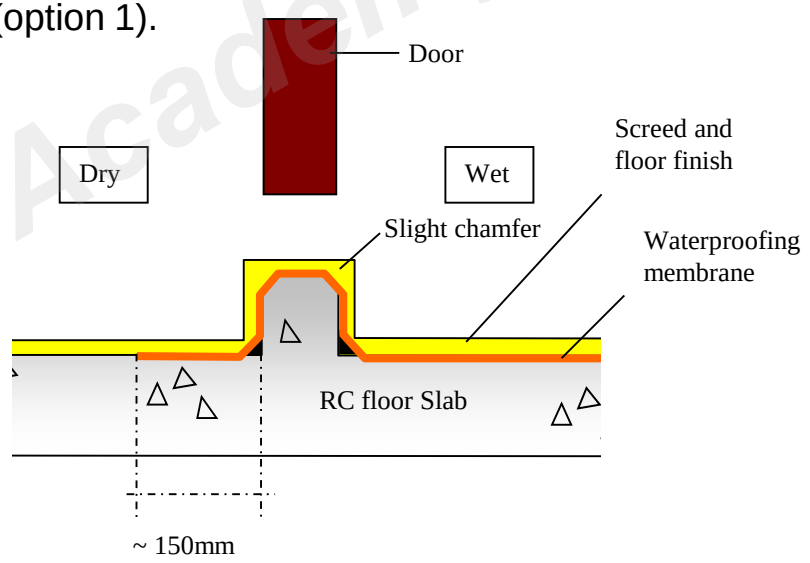
- segregate the wet area from the adjoining dry surfaces by incorporating adequate drop in the finish floor level.

- alternatively provide a concrete kerb cast together with the structural floor slab to form a separation between wet area and adjoining dry surfaces.

- extend waterproofing treatment onto dry surfaces by minimum 150 mm. from edge of wet area.



Typical floor detail between wet and dry areas (option 1).



Floor detail (option 2).

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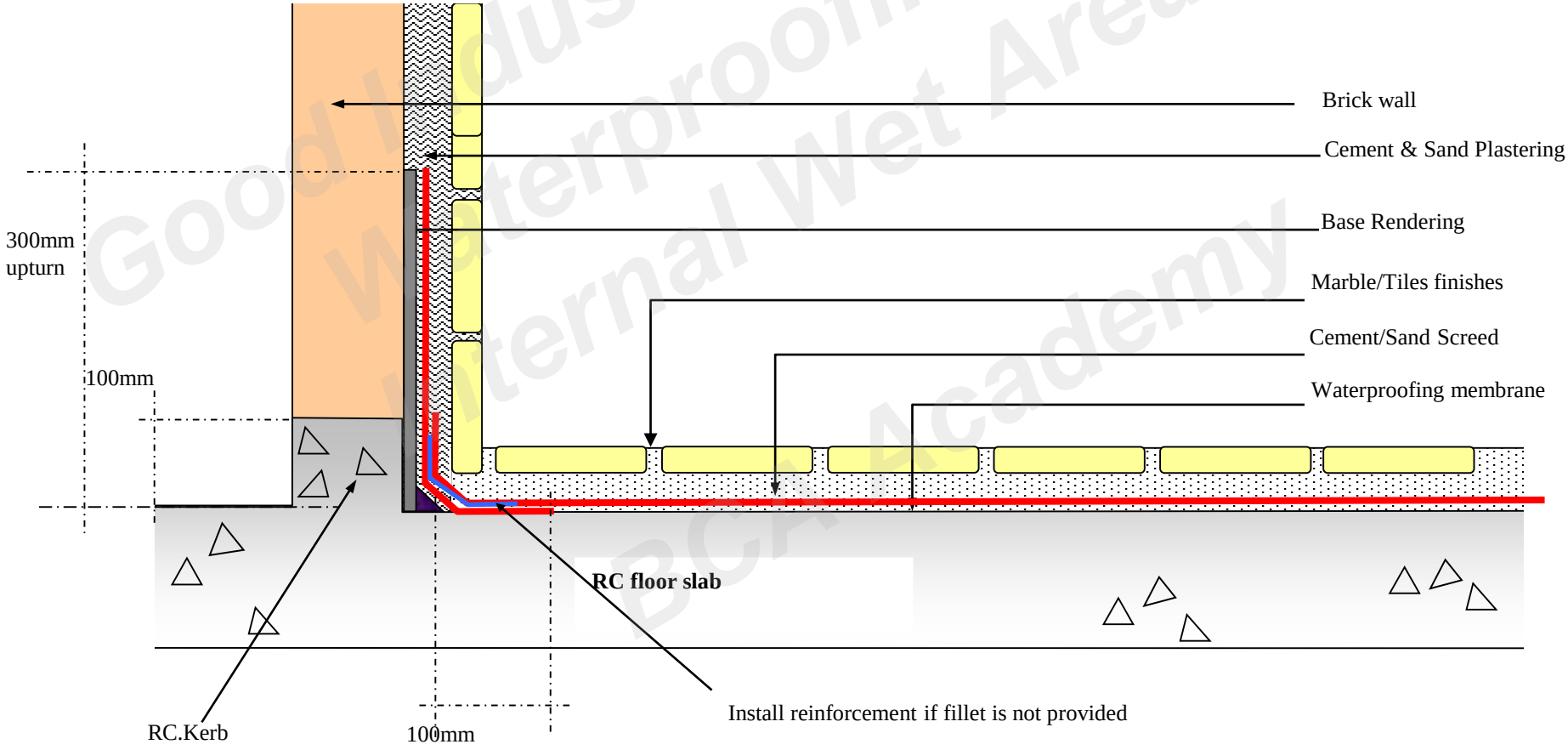
B) Detail between floor and wall.



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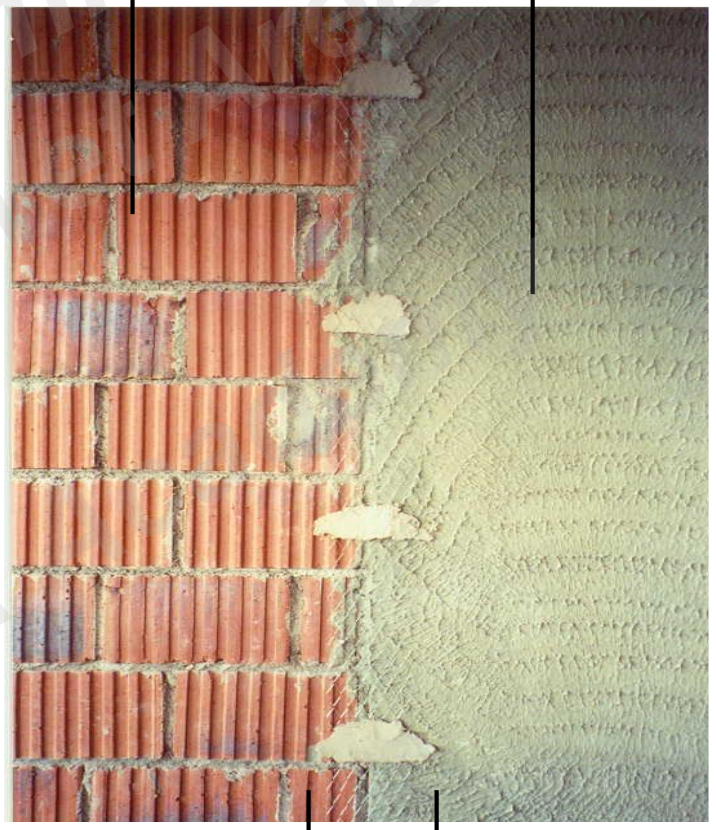
C) Detail at wall joint between different construction materials.

- avoid joints between different construction materials if possible.
- specify reinforcement mesh along such joints.
- render smooth minimum height of 300 mm. from floor level to receive waterproofing treatment upturn.



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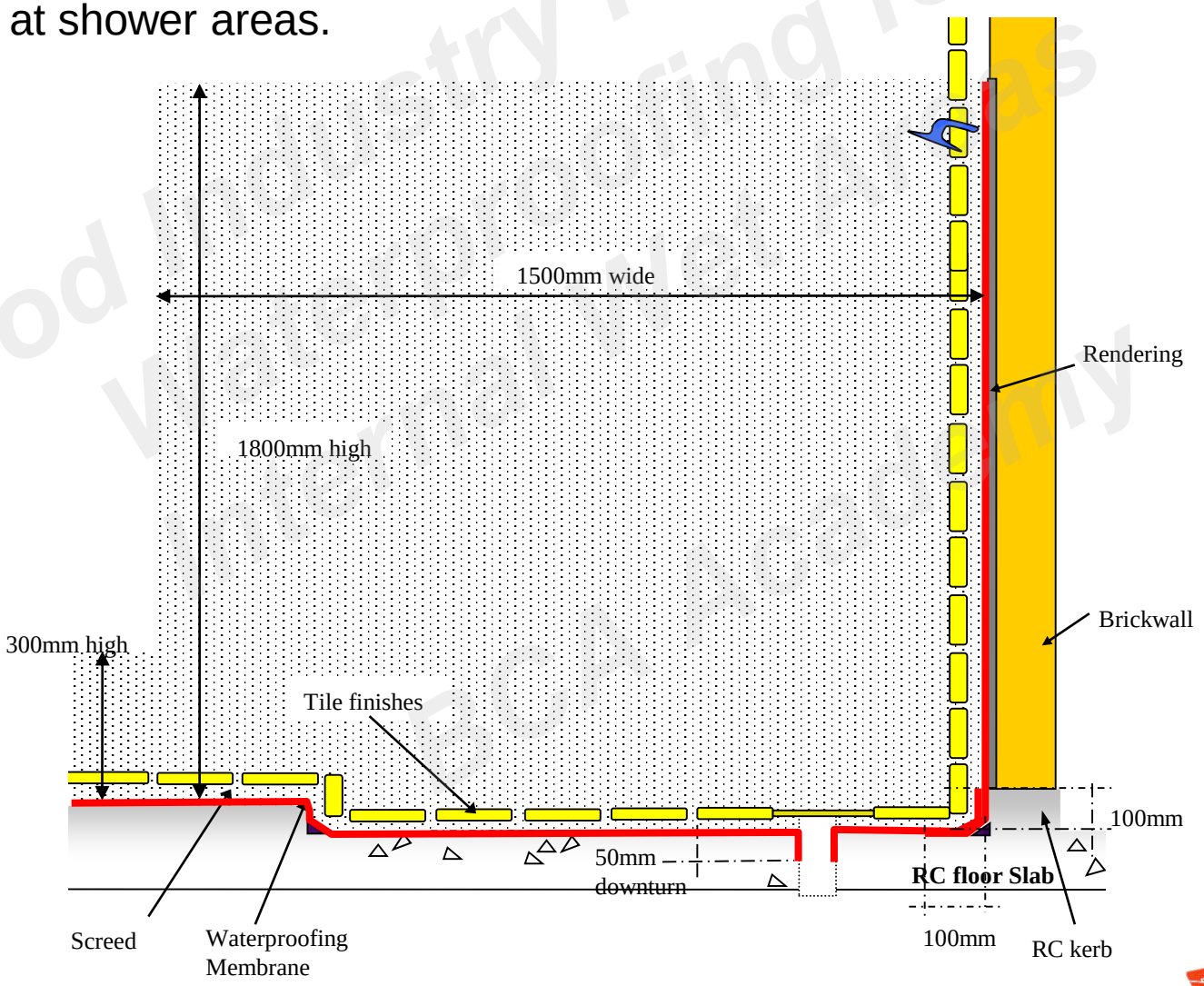
D) Detail at shower areas.



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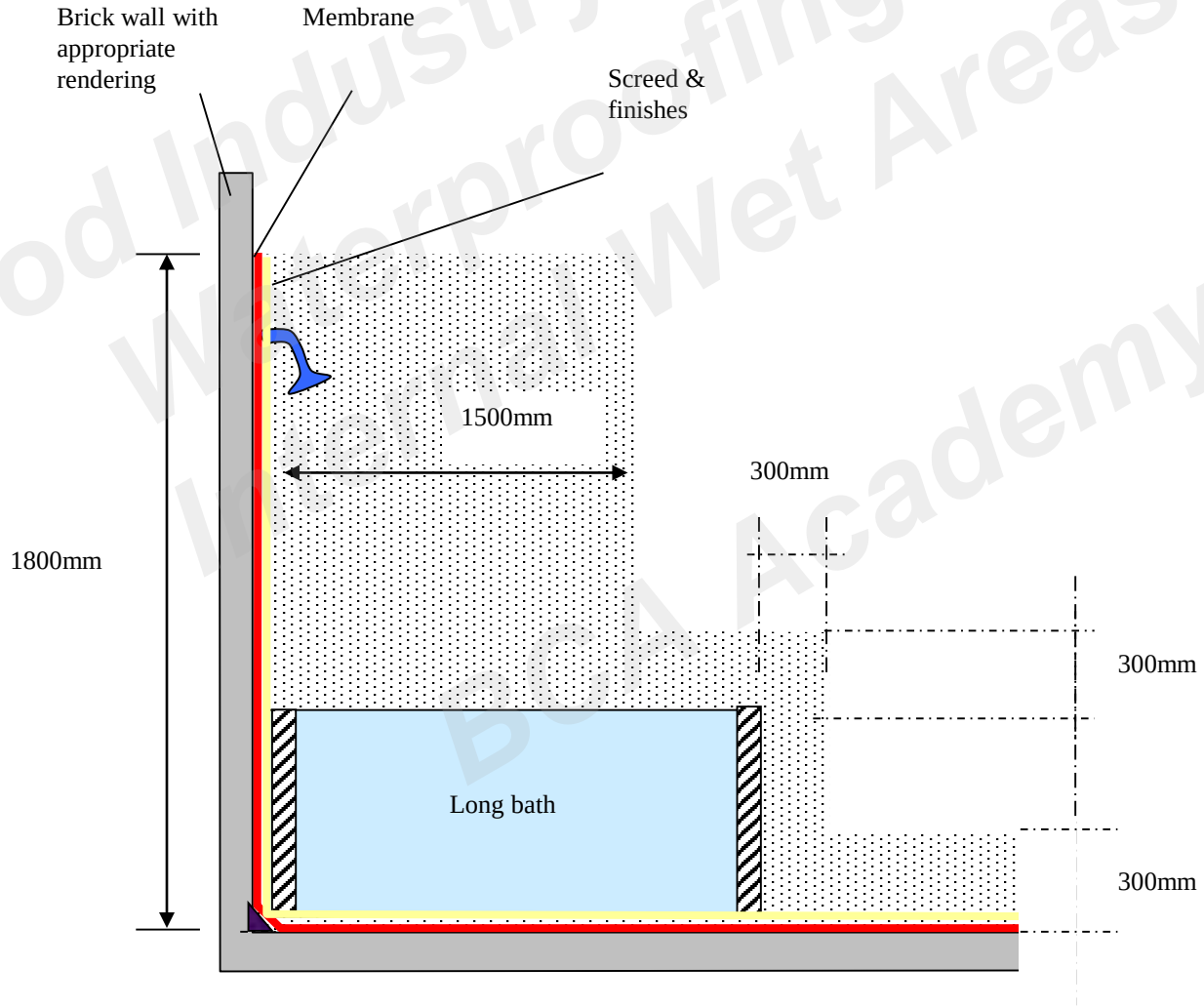
E) Detail at long bath areas.



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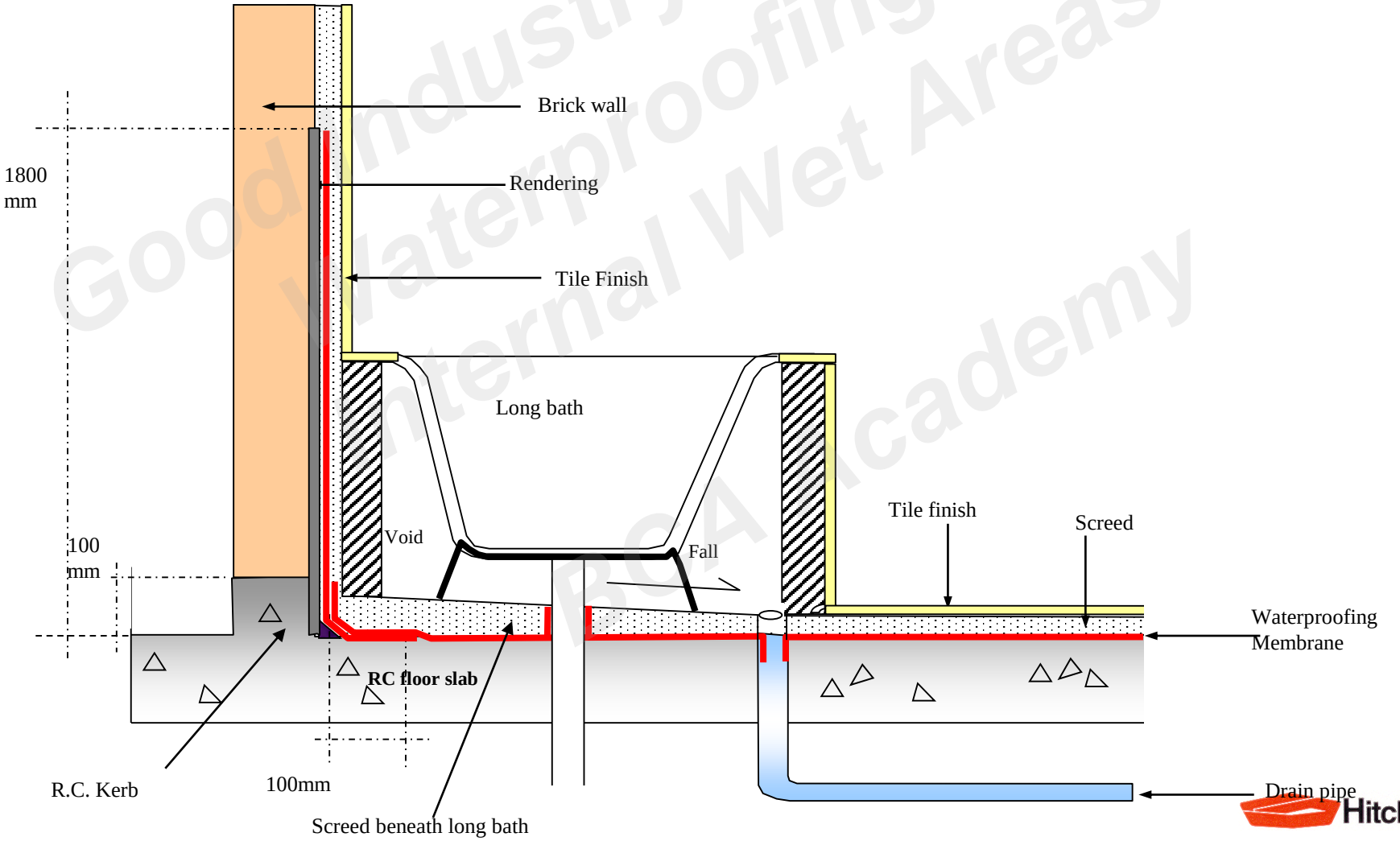
F) Cross-section detail at long bath areas.



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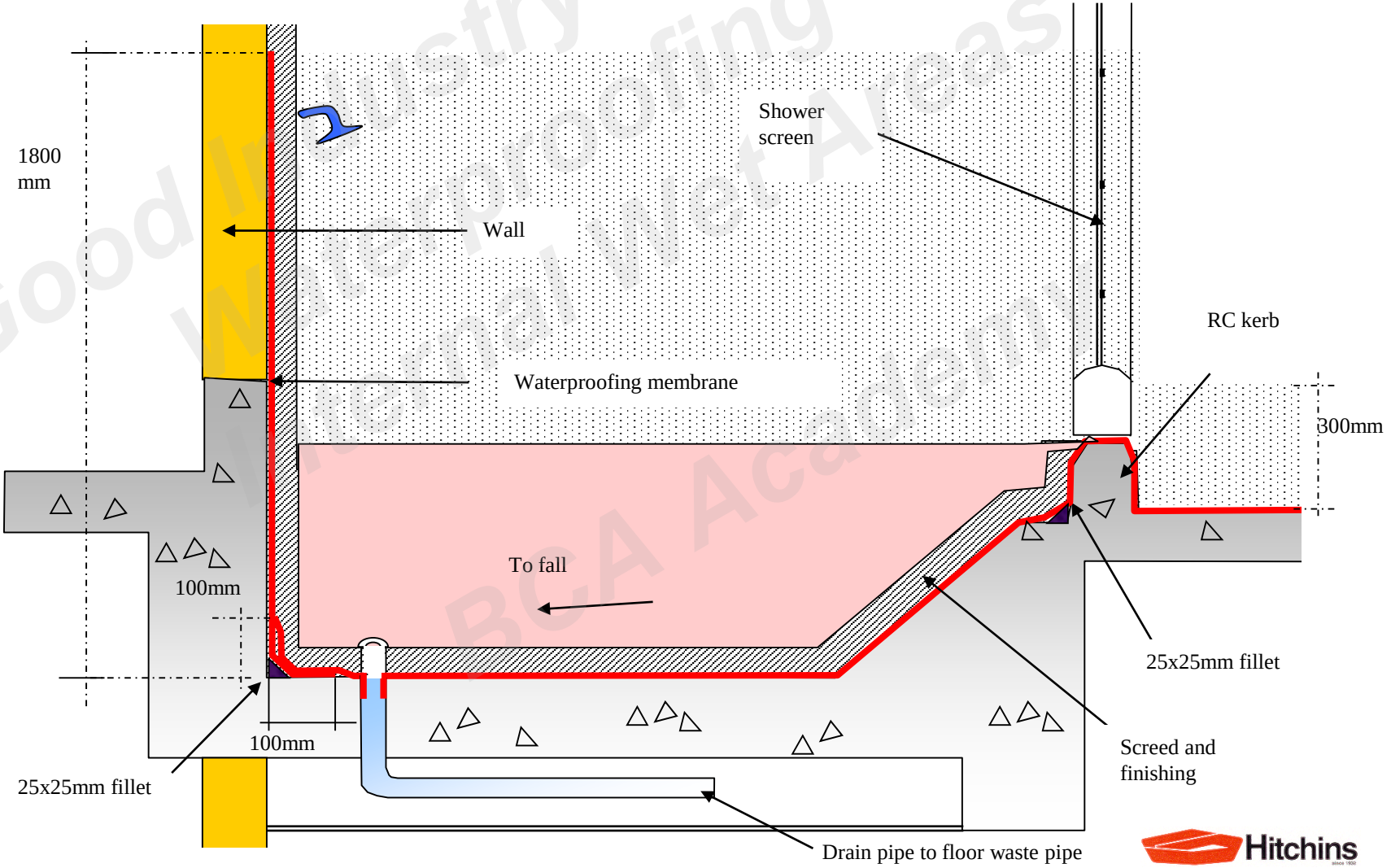
G) Detail at sunken bath areas.



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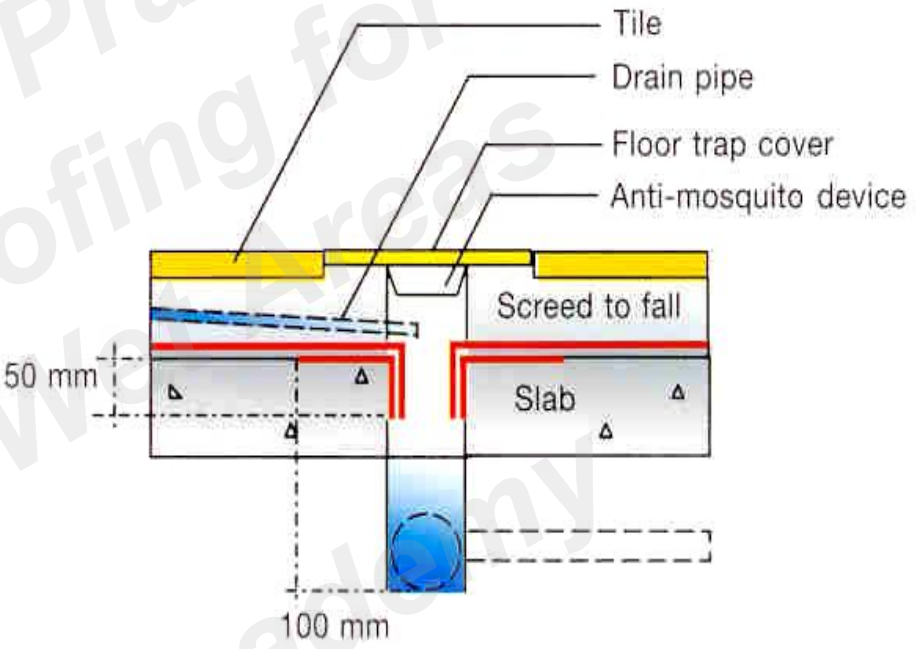
H) Detail at outlets.

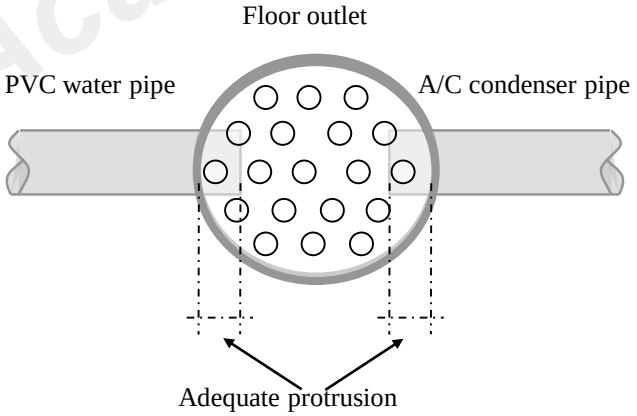
When designing outlet points in wet areas, consider the following details:

•specify that the location of outlets should be checked against the type of finishing and its dimensions so as to align it properly.

•Cast into the concrete slab the outlet pipe instead of separately hacking the slab to accommodate it later.

•Dress down the waterproofing treatment to at least 50 mm. into the floor outlet and 100 mm. horizontally around the down pipe.





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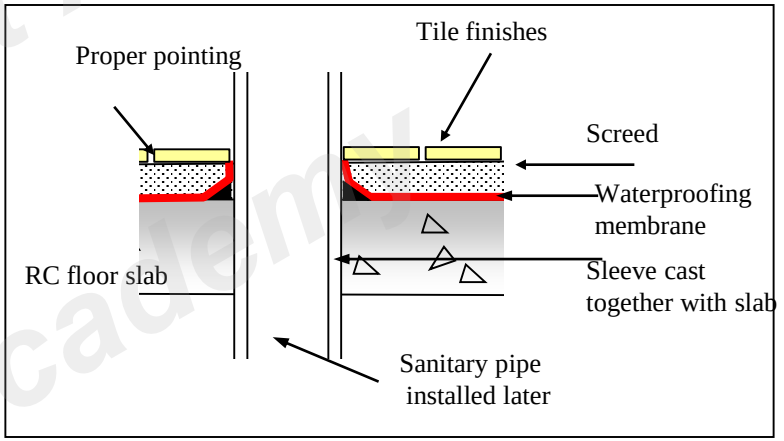
I) Detail at pipe penetrations & pipes arrangement.

- minimise pipe penetrations.
- group pipe penetrations together and provide a raise platform.
- provide shaft/service duct to house them.
- avoid chasing of wall/floor to haunch pipes.
- cast pipe sleeve instead of leaving opening in floor slab.
- dress up waterproofing treatment to finish floor level on pipe penetrations.
- dress around pipe on horizontal surface with min. 100 mm. to overlap with subsequent waterproofing treatment to entire area.
- arrange waste and A/C condensate pipes to prevent obstructing fall within screed.

Tile marking for pipe location

Opening left for pipe



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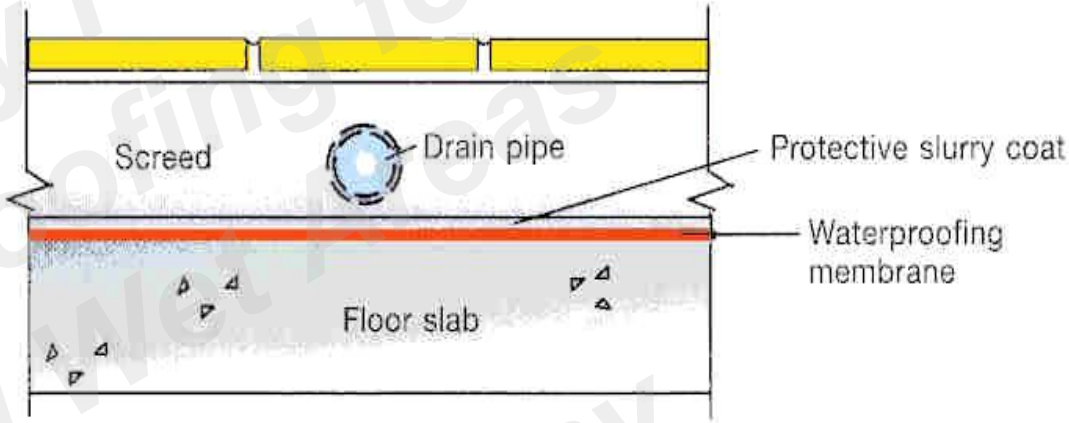
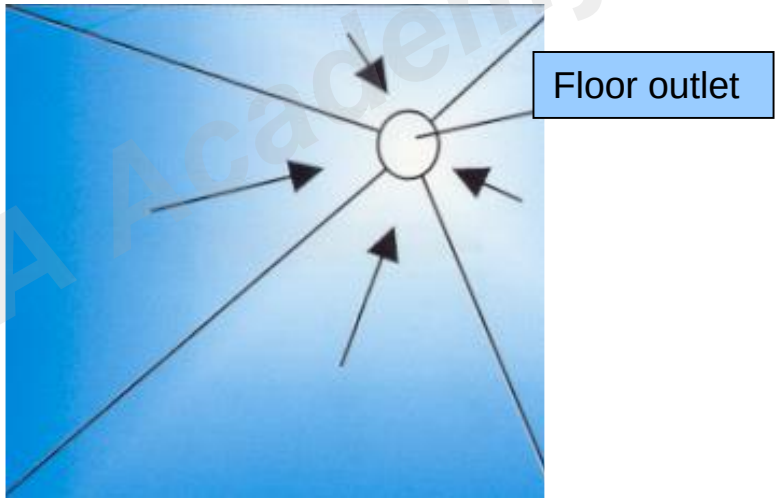
J) Screed.

- screed to be laid to fall towards floor outlet.
- direction of fall should be indicated clearly in drawing.
- plan direction of slope taking into consideration pedestrian traffic moving across slope instead of up and down it.
- protect waterproofing membrane with a slurry coat before screeding.
- tiles should not be laid directly onto membrane.





Saucer slope for internal wet areas.

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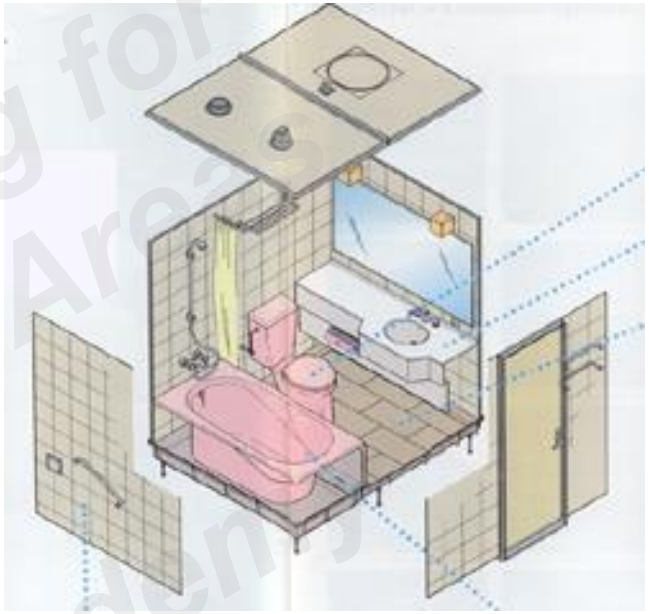
1.2.3 Prefab Bathroom Units.

Key advantages are:

- **single party responsibility for all the various trades ie. plumber, electrician and waterproofer.**
- **better control of materials resulting in higher quality finishes.**
- **services ie. piping and cables are run within the shell and the building structure.**
- **shorten construction time due to production separate from site.**

For further reference - BCA publication on “Reference Guide on Standard Prefabricated Building Components”.



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WATERPROOFING FOR INTERNAL WET AREAS

1.3 INTRODUCTION & COMPARISON OF TYPES OF WATERPROOFING SYSTEMS.

1.3.1 Preformed Sheet Membranes.

Factory produced and comes in sheet or roll form such as bitumen base, PVCs, ECBs etc.

1.3.2 Liquid Applied Membranes.

Generally called “coatings” and applied in a liquid form and drying to form a waterproofed layer. Eg. are acrylics, bitumen, PU’s, Polyisoprenes & flexible cement coatings.

1.3.3 Integral Systems.

These are special chemicals introduced into the concrete to enhance it’s water resistance such as waterproofing admixtures and reactive pore fillers of crystallisation types.

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Description	Preformed membranes		Liquid applied membranes		Integral systems		
	Bituminous	Non-bituminous	Bituminous	Non-bituminous	Crystallisation waterproofing	Chemical admixtures	Waterproof screeds
Surface preparation	Clean and dry (less affected by damp concrete)	Clean and dry (less affected by damp concrete)	Clean and dry (roughness affect thickness)	Clean and dry (roughness affect thickness)	Clean and damp (to promote better penetration into concrete pores)	Not applicable as it is mixed into concrete during batching	Reasonably rough to provide good mechanical key for adhesion of screed
Priming (concrete)	Required	Required	Not required	Not required	Not required	Not required	Old concrete may require a coat of bonding agent
Application	Skill required	Higher skill level required	Simple multi- coat application	Simple coating application	Slurry application by brush / spray or dry sprinkling	Mixed into host concrete during batching	Masonry skills in application of cement screeding
Re- application	Skill required	Higher skill level required	Simple re-application (may need to cut-out)	Simple re-application (may need to cut-out)	Simple re-application by coating	Not possible to re-apply	Re- screed over area — may require bonding agent
Homogeneity of system	Joints are potential weakness	Joints are potential weakness	Seamless (note over- coating time)	Seamless (note over- coating time)	Not applicable	Not applicable	Cold joints are Potential weakness
Inspection	Can be visually inspected	Can be visually inspected	Multi-layers require more inspection	Can be inspected visually	Can be inspected after application	Cannot be inspected	Can be inspected after application
Drying time	Not applicable	Not applicable	Require drying before proceeding	Require drying Before proceeding	Require drying Before proceeding	Drying time same as host concrete	Require drying and proper set before proceeding
Curing	Not applicable	Not applicable	Curing required	Curing required	Curing similar to host concrete	Curing similar to host concrete	Curing required
Bridging over concrete defects	Can bridge over concrete defects	Can bridge over concrete defects	Can bridge over concrete defects	Can bridge over concrete defects	Limited to hair-line cracks only	Cannot bridge cracks in concrete	Limited crack bridging abilities
Protection against damage	Required	Required	Required	Required	Not required	Not required	Require against high impact and abrasion
Ponding test	Can be done immediately	Can be done immediately	Require curing before testing	Require curing before testing	Ponding after initial set (2 hours)	Immediate ponding when concrete sets and cures	Require curing before testing

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