

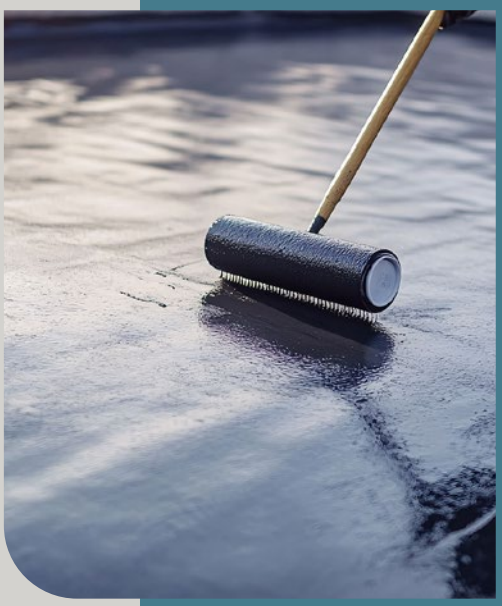





CIDB MALAYSIA

GOOD INDUSTRY PRACTICES

for WATERPROOFING OF INTERNAL WET AREAS

CIDB Technical Publication No. : 2603

GOOD INDUSTRY PRACTICES FOR WATERPROOFING OF INTERNAL WET AREAS

CIDB MALAYSIA

Good Industry Practices for Waterproofing of Internal Wet Areas
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FOREWORD

The “Good Industry Practices (GIP) on Waterproofing for Internal Wet Areas” guide shares some of the good practices adopted by practitioners and contractors on how good workmanship quality for waterproofing can be achieved on site. Common issues associated with waterproofing, their causes and possible solutions to address them are also highlighted.

This guide is not meant to be a definitive dictation on how waterproofing systems must be designed and installed. It only serves to illustrate good practices in the design, pre-installation, installation and post installation of waterproofing systems. We gratefully acknowledge the contributions of practitioners in the production of this guide and trust that the industry will find this publication useful. We welcome any contributions from readers to further improve any subsequent editions of this guide.

This guide is intended to provide general good practice recommendations on waterproofing for internal wet areas. While every effort has been made to ensure accuracy and reliability, CIDB Malaysia accepts no responsibility or liability for any errors, omissions, or consequences arising from the use of this publication. Responsibility for the design, specification, and execution of waterproofing systems rests exclusively with the appointed project professionals and contractors, who must ensure compliance with applicable codes, manufacturer guidelines, and project-specific requirements.

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ACKNOWLEDGEMENT

The development of this Good Industry Practices (GIP) on Waterproofing for Internal Wet Areas would not have been possible without the invaluable contributions, expertise, and collaboration of a dedicated panel of industry stakeholders.

CIDB Malaysia wishes to extend its sincere appreciation to the members of the technical committee, comprising representatives from key construction industry associations, professional bodies, consulting firms, contractors, specialist applicators, material suppliers, and other relevant practitioners. Their collective insights, drawn from years of hands-on experience and technical knowledge, have been instrumental in ensuring the guide reflects practical, relevant, and high-impact good practices for the Malaysian construction context.

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It is through such industry-wide cooperation that we can continue to raise construction quality standards and promote best practices. We hope this guide will serve as a useful and practical resource for all industry players, and we look forward to continued collaboration in future initiatives.

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1. INTRODUCTION

This guide aims to provide clear, practical, technically sound recommendations and good practices on waterproofing for internal wet areas in the Malaysian construction. It focuses on best practices across pre-installation (design and specification), installation and post-installation phases to improve durability, reduce defects, and extend materials and/or buildings' lifespan. The guide also encompasses specific challenges and solutions pertinent to common waterproofing issues.

While existing standards such as MS 2529:2013 appropriately address performance specifications for waterproofing materials, they often do not adequately bridge the knowledge gap by consolidating these necessary foundational structural requirements with detailed site-level detailing, construction tolerances, or the installation sequencing of the applied waterproofing membrane. Failures frequently originate at these interfaces.



This guide addresses this critical necessity by providing a consolidated baseline of local industry experience and practical knowledge, connecting the mandates of structural design with execution practices to ensure concurrent quality, specification, application, and maintenance, thereby enhancing overall building performance.

2. PRE-INSTALLATION

Watertight performance in internal wet areas depends on how the structure and waterproofing system are detailed. Designers should align their work with relevant local and international codes, standards, and specifications

2.1 Designing for Watertightness

Watertightness in concrete for a toilet or wet internal areas is the designed and constructed property of the concrete slab and walls to prevent the transmission of liquid water under a low, sustained head, primarily from intermittent ponding (i.e. water from spills, overflows, or cleaning that sits on the surface). It can also be achieved by utilizing a low-permeability concrete mix, stringent crack control measures, and carefully detailed joints and service penetrations, thereby forming the structural barrier against leakages.

Intermittent ponding resistance is verified through a 24-hour watertightness test carried out at three key stages: before installation works, after waterproofing membrane application, and after screeding or final finishes. Each test requires maintaining a minimum ponding depth of 25 mm across the entire test area.

2.2 Details of Waterproofing System

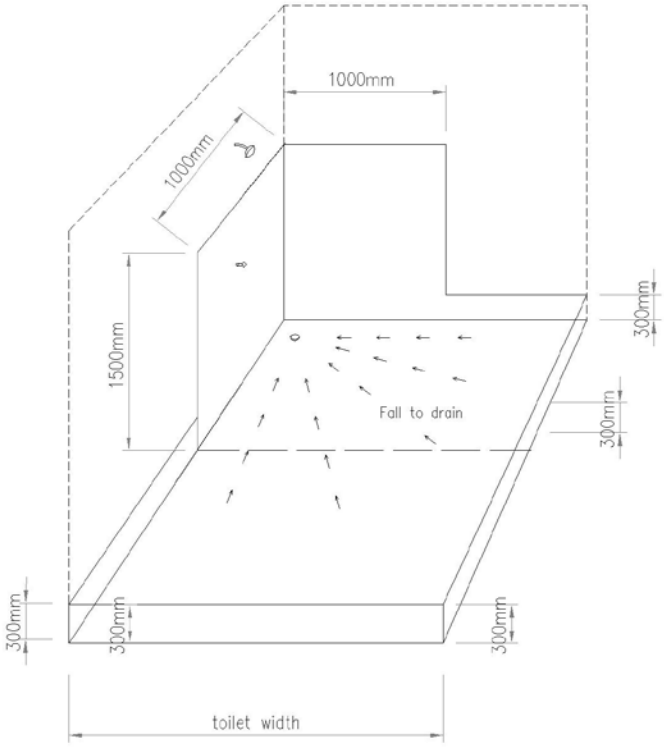
Drawings must be prepared with sufficient clarity and detail to provide unambiguous guidance to the Waterproofing Specialist and all other related trades. Comprehensive CAD details, sectional drawings, and isometric views shall be prepared and included within the construction details.

All waterproofing details must be thoroughly coordinated with the architectural, structural, and M&E designs to prevent conflicts and ensure continuous, uninterrupted waterproofing integrity throughout the structure.

2.2.1 Substrate and Floor Detailing

The waterproofing system in a typical wet area consists of the concrete slab, waterproofing membrane, screed, and tile finishes/others.

- An adequate drop during concrete casting is required to ensure the finished level of the wet area is sufficiently lower than the level of the adjacent concrete slab.
- If pipes are encased in screed, the required drop must take into account a minimum screed thickness of 20mm required at the lowest level, i.e., at the floor water outlet.
- Wet screeds shall be laid to fall towards floor outlets, with a minimum slope of 2% for wet areas larger than 2m² to prevent ponding. Tile installation must be compatible with the waterproofing system.

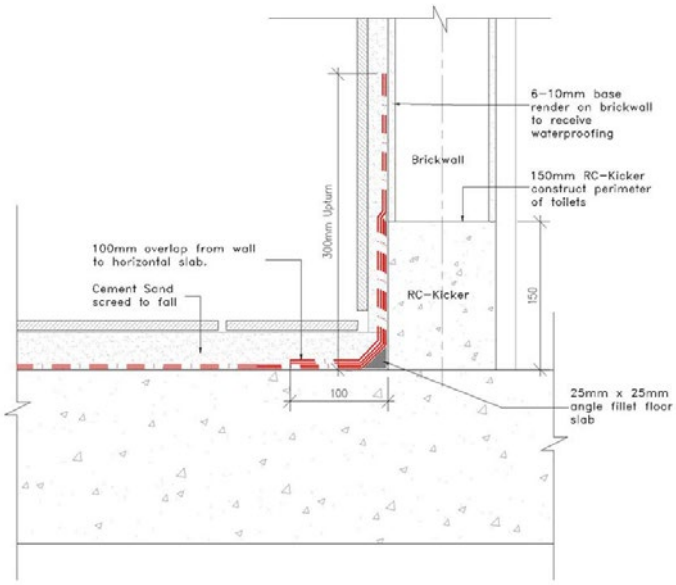


Isometric view of the bathroom showing the fall towards floor outlet

2.2.2 Bathroom

a) Dry Area

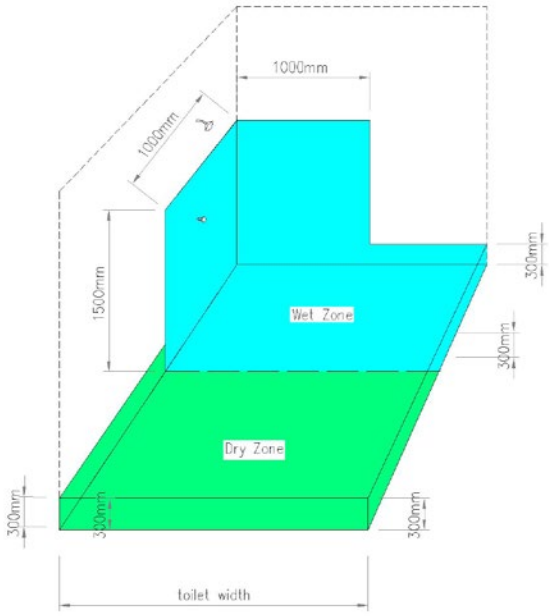
- Joints at walls of wet areas (e.g., brickwall to reinforced concrete columns) should be minimized. Where unavoidable, reinforcement should be considered.
- The designer should consider rendering walls for a smooth finish to receive the waterproofing membrane upturn.
- The waterproofing membrane should turn up to a minimum height of 300mm at dry area.
- At upturn areas, the membrane should extend a minimum 100mm horizontally from the wall-floor joint to ensure sufficient lapping.



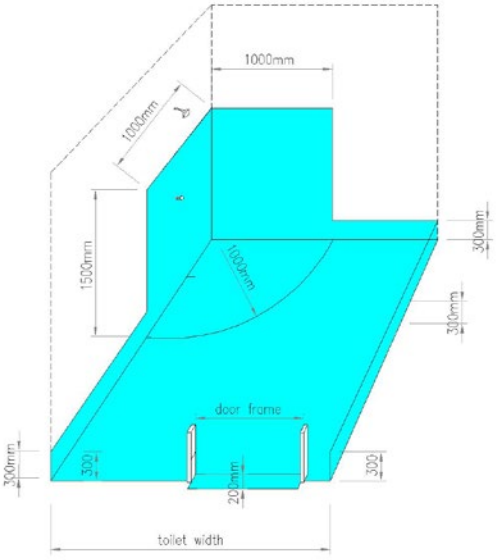
Typical detail on waterproofing upturn at walls

b) Wet Area

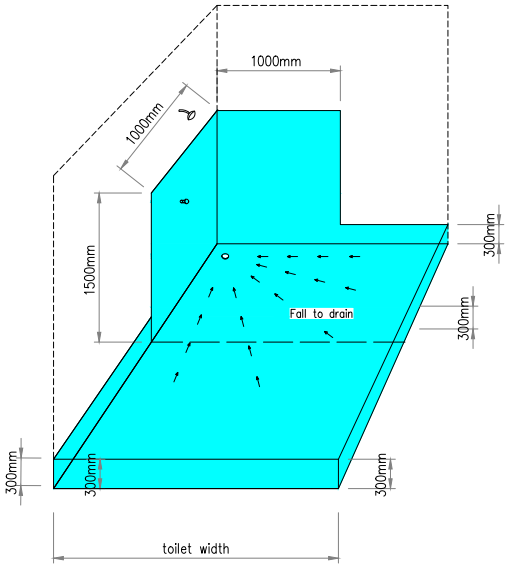
- At bath and shower areas, ensure that the waterproofing membrane is applied to at least 1500mm height of the wall and extended to cover all shower or bath walls within 1000mm radius from the shower head.
- The wall immediately adjacent or behind a basin or sink must be applied with membrane to a height of not less than 300mm above the fixture.
- At sunken bath areas, the membrane should similarly be applied to a minimum height of 1500mm.



Wet and dry areas of bathroom



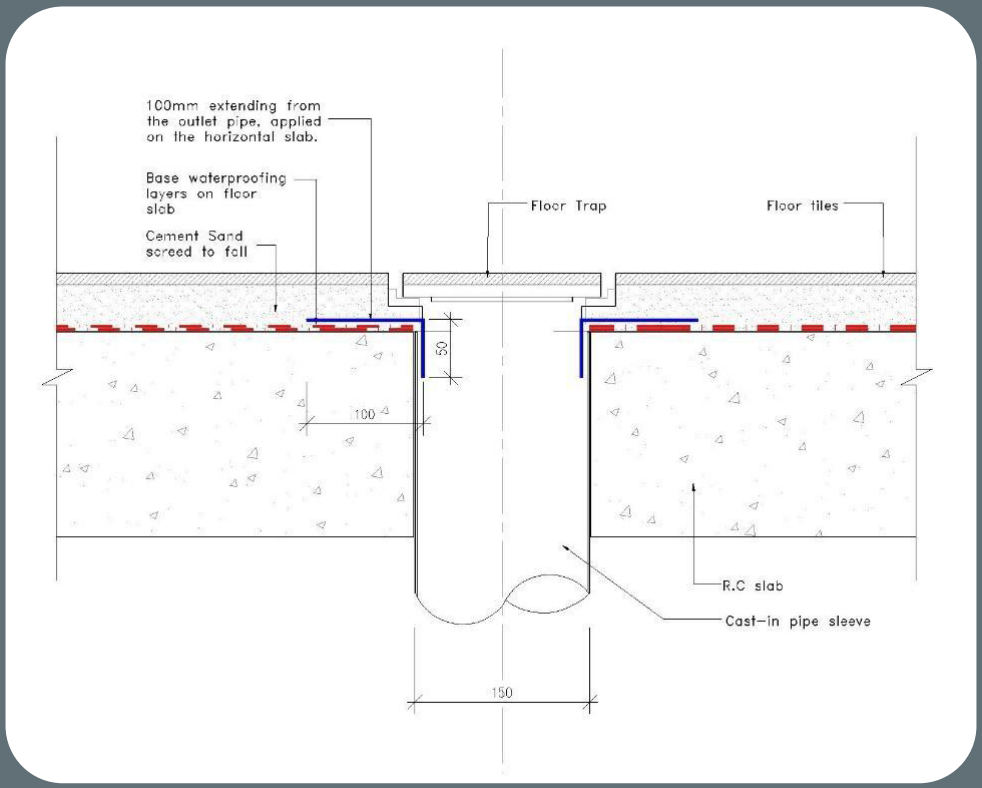
Extend of waterproofing near shower area



Typical layout of bathroom with an open shower area

2.2.3 Drainage Outlet

- The membrane should be dressed down to at least 50mm into the floor outlet.
- The membrane should be applied 100mm horizontally around the pipe.
- Avoid chasing of walls and floors. Drain pipes should connect directly to waste pipes. Pipes/pipe sleeves should be cast with the floor slab, avoiding leaving an opening.



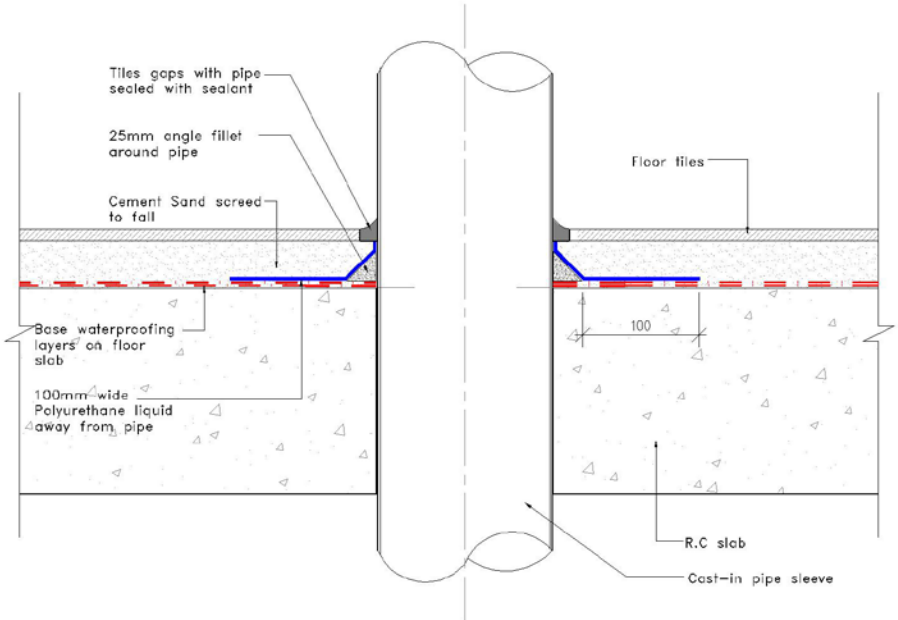
Typical detail on waterproofing around drainage outlets



Apply membrane 100mm horizontally around the pipe

2.2.4 Pipe Penetrations

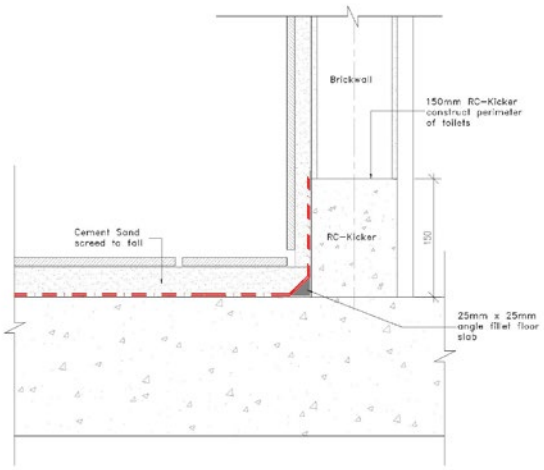
- The Designer should minimise the number of penetrations through the slab/wall as this affects the membrane continuity and increases the probability of leakage.
- The waterproofing membrane should be dressed up at pipe penetrations to the finished floor level.
- Avoid chasing of walls and floors. Drain pipes should connect directly to waste pipes. Pipes/pipe sleeves should be cast with the floor slab, avoiding leaving an opening.



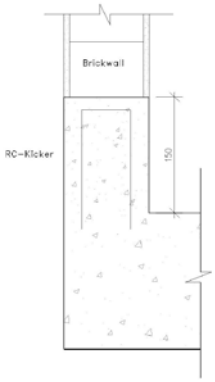
Typical detail of pipe penetration through the slab

2.2.5 RC Kerb/Kicker, Monolithic Casting and Construction Joints

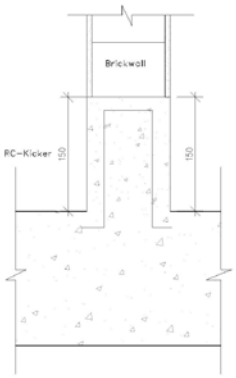
- A 150mm raised RC kerb should be constructed along the perimeter of walls to act as barrier to lateral movement of water.
- It is a good practice to cast the kerb monolithically with the concrete slab to prevent debonding of the kerb.
- No construction joints are to be allowed.
- Details are to be provided as per the designer's recommendations and proposals



Typical detail on waterproofing upturn at kerb/kicker



Detail of kerb/kicker for edge beam



Detail of kerb/kicker for brickwall

2.3 Specification Guidance

Specifications play a vital role in defining performance expectations, minimizing ambiguity, and preventing misapplication or cost-driven compromises that often result in premature waterproofing failures. Clear, coordinated, and performance-based specifications ensure workmanship quality and long-term durability of the waterproofing system.



2.3.1 JKR Standard Specification for Building Works (Concrete Work)

The JKR Standard Specification has long served as a primary reference for construction projects in Malaysia, owing to its comprehensive scope. In line with the latest edition published in July 2025, the following requirements apply to concreting works for toilet floors (Section E: Concreting, Clause 11.5 – Toilet Floors):

11.5.1 The Contractor shall ensure that all suspended floor for toilet areas are constructed to be watertight and leak proof. All construction method or alternative details proposed by the Contractor must be based on his acceptance of and compliance with the requirements for watertightness. The Contractor shall ensure that holes and fixings are properly constructed

11.5.2 The floor must be concreted in one sequence of operation. No construction joints for toilet floor are to be allowed. All pipes and fittings encased in the concrete floor shall be provided with sleeves to the approval of the S.O and shall be built in-situ. No holes shall be left for later incorporation of fittings and no subsequent hacking of floor shall be made. Notwithstanding whatever shown on the Drawings, all toilet floor slabs shall have a minimum thickness of 150mm.

11.5.3 Testing for Watertightness
The toilet floor areas shall be ponded with minimum 25mm depth of water and shall be maintained continuously over a period of 24 hours. During this period, the exposed soffit shall show no signs of leakage and remain dry. If any area is found not to be watertight, the Contractor must repair at his own expense

Consequently, the project consultant or designer retains the authority to adopt more stringent requirements or adopt the JKR standard specification to ensure watertightness and meet project-specific requirements.

2.3.2 Performance-based Product Specification

Specifications should emphasize measurable performance criteria rather than solely referring to proprietary brands. Key properties to be included are:

- Congruent and compatible to concrete cracks of up to 0.3 mm based on MS EN1992-1-1 Table 4.1 Class XC4
- Tensile strength (e.g., ≥1.5 N/mm² for solvent-based elastomeric membranes, ASTM D412).
- Elongation at break (typically >100%) and compatible with concrete cracks of up to 0.3 mm
- Adhesion to substrate (≥0.5 N/mm², ASTM D4541).
- Crack bridging ability (able to bridge cracks up to 2.0 mm).
- Initial hardness (Shore A ≥25, ASTM D2240).

Table 2.3.2: Key Characteristics of Liquid-Applied Waterproofing Systems:

Typical Characteristics	Rubber Based Systems	Polyurethane Systems	Acrylic Based Systems	Cementitious Systems
Chemical based	Solvent based	Solvent based	Water based	Water based
Main characteristic	Highly flexible with excellent resilience to cyclic extension and contraction.	Good flexibility, excellent adhesion to concrete and good tearing strength	Good UV resistance, flexible and good tearing strength (due to fiberglass reinforcement).	Easy application, excellent compatibility with concrete and good vapour permeability.
Dry film thickness	Generally, between 0.8 to 1.5 mm is recommended.	Between 1 to 1.5 mm.	Minimum 1.2 mm due to fiberglass reinforcement.	Between 2 to 3 mm.
Application method	Brush, roller or airless spray.	By brush, squeegee or broom. Vertical grade by brush or trowel.	Application is normally by rollers, to work material into fiberglass reinforcement.	Brush or spray followed by trowelling.
Tensile Adhesion Strength, N/mm^2 EN14891	≥ 0.5 – 1.0 N/mm^2	≥ 1.0 – 2.0 N/mm^2	≥ 0.5 – 1.5 N/mm^2 (higher when reinforced)	≥ 0.5 – 1.5 N/mm^2
Crack-Bridging Ability (Clause A.7) EN14891 ≥ 0.75 mm Class O at +23 °C Class A at -5 °C	Crack-bridging: ≥ 1.5 – 2.0 mm Usually Class A (-5 °C)	Crack-bridging: ≥ 1.25 – 2.0 mm Often Class A (-5 °C)	Crack-bridging: ≥ 0.75 – 1.25 mm Typically Class O (+23 °C) unless reinforced	Crack-bridging: ≥ 0.75 mm Normally Class O (+23 °C)
Elongation at Break (%)	300 – 800 %	200 – 600 %	100 – 300 % (higher when used with fiberglass mesh)	5 – 20 % (up to ~50 % for polymer-modified grades)

Typical Characteristics	Rubber Based Systems	Polyurethane Systems	Acrylic Based Systems	Cementitious Systems
Tear strength N/mm	5 – 15 N/mm	10 – 25 N/mm	5 – 12 N/mm	< 3 N/mm
Method of curing & drying time	Air-drying. About 1 hour in exposed condition. 3–4 hours in enclosed areas. 72 hours before flood test.	Normally moisture-cured. Contains solvent therefore requires ventilation. Recommended 24 hours curing time. Most systems recommend 72 hours before flood test. For coal tar based systems, 7–10 days is required.	Air-drying. Within 1 hour, but requires minimum 4 to 5 coats due to reinforcement. Total system therefore requires longer drying time. 48 hours before flood test.	Normally 1–2 hours. Requires curing similar to concrete, Flood test within 24 hours to assist in curing.
Adhesion to concrete substrate and bedding mortar	Generally good adhesion. May be improved by appropriate priming.	Solvent based is sensitive to moisture. Adhesion may be affected if applied onto damp substrate.	Good adhesion to concrete. Vertical application to exclude fiberglass reinforcement, for better bonding.	Excellent bonding to concrete for both slabs and vertical walls. Not affected by surface dampness.

2.3.3 Substrate and Surface Preparation

Specify minimum substrate requirements, including:

- Concrete compressive strength minimum C25/30.
- Curing period (at least 14 days for normal concrete).
- Moisture content of ≤4% before application.
- Surface preparation (Sound, clean, free of laitance, oil, and dust) with Concrete Surface Profile CSP3 and below.

Table 2.3.3: Dew Point (°C) — Typical Malaysia Site Conditions

Air Temp (°C) \ RH (%)	60	65	70	75	80	85	90	95	100
22	13.9	15.1	16.3	17.4	18.4	19.4	20.3	21.2	22.0
23	14.8	16.1	17.2	18.3	19.4	20.3	21.3	22.2	23.0
24	15.8	17.0	18.2	19.3	20.3	21.3	22.3	23.1	24.0
25	16.7	18.0	19.1	20.3	21.3	22.3	23.2	24.1	25.0
26	17.6	18.9	20.1	21.3	22.3	23.3	24.2	25.1	26.0
27	18.6	19.9	21.1	22.3	23.3	24.3	25.2	26.1	27.0
28	19.5	20.8	22.0	23.2	24.2	25.2	26.2	27.1	28.0
29	20.4	21.8	23.0	24.1	25.2	26.2	27.2	28.1	29.0
30	21.4	22.7	23.9	25.1	**26.2**	27.2	28.2	29.1	30.0
31	22.3	23.6	24.9	26.0	27.1	28.2	29.2	30.1	31.0
32	23.3	24.6	25.8	27.0	28.1	29.2	30.2	31.1	32.0
33	24.2	25.5	26.8	28.0	29.1	30.1	31.1	32.1	33.0
34	25.1	26.5	27.8	28.9	30.1	31.1	32.1	33.1	34.0
35	26.1	27.4	28.7	29.9	31.0	32.1	33.1	34.1	35.0
36	27.0	28.4	29.7	30.9	32.0	33.1	34.1	35.1	36.0

Notes

- Values are calculated using the Magnus approximation (field-usable).
- If your surface temperature is close to Dew Point, condensation risk is high (blistering/adhesion failure).
- For critical PU/epoxy works, check conditions morning/evening and after rain events.

Acceptance criterion: Substrate surface temperature ≥ Dew Point + 3 °C

Example calculation for Air Temperature of 30 °C and Relative Humidity of 80%:

26.2 °C + 3 °C = 29.2 °C, minimum acceptable substrate surface temperature = 29 °C

2.3.4 Application and Detailing

- Define application method (roller, spray, trowel-applied, or torch-on) and coverage rates according to the system type.
- Mandate CAD details, section drawings, and isometric views within the construction documentation to show junctions, terminations, and penetrations.
- Coordinate detailing with architectural, structural, and M&E designs to ensure waterproofing continuity and prevent interface conflicts.
- Recommend mock-ups at the site to verify workmanship, sequencing, and compatibility with adjoining trades.





2.3.5 Testing, Warranty, and Quality Control

- Specify on site performance tests such as ponding tests (24 hours), adhesion/peel tests (for membranes), and visual inspection criteria. Tests are to be conducted during surface preparation, after application of waterproofing system and after final floor finishes.
- State clear Defects Liability Period (DLP) responsibilities and warranty durations for both materials and workmanship depending on product warranty.
- Refer to EN 1504 for concrete repairs if any.
- Wet film thickness test for liquid applied membranes using Wet Film gauge.

2.3.6 Screed and Wall Plaster Specification

Specifications must define performance expectations and coordinate with succeeding trades.

- A minimum 20mm screed thickness is normally adequate to provide the watertightness. For better site control of the mix quality, pre-packed waterproofing screeds, which are dry mixed and packed with the waterproofing additive in the factory, are recommended. Workers need only to add the correct amount of water to the pre-packed mix on site using a mechanical mixer to produce the desired mix.
- A protective layer of screed should be laid over the membrane after the curing of the membrane. It is not recommended to lay tiles directly bonded to the waterproofing membrane.
- For waterproofing applications to wall upturns or shower areas, apply a layer of 20mm thick plaster to protect the membrane before laying the tiles.

2.4 Material Compatibility and Concurrency

Prior to finalizing any system, the 'project consultants' are responsible for verifying the compatibility and bonding performance of the selected waterproofing barrier with the intended substrate and all adjoining materials. The system must have good adhesion and cohesion strengths. It is also important to note that the following products may be components of or used in conjunction with a waterproof membrane system. They do not have waterproofing properties on their own and are not waterproof membranes.

- Sealers due to their films are too thin and discontinuous
- Adhesives as these are discontinuous
- Grouts do not have waterproofing capability
- Grout sealers rely upon the continuity of the grout
- Floor levelling and smoothing compounds due to their porosity
- Coatings/paints are usually permeable decorative coatings, unless specifically stated as fully waterproof
- Concrete treatments such as colloidal silicates



2.5 Interfacing with Other Services and Finishes

Interdisciplinary coordination among structural, architectural, and mechanical & electrical (M&E) disciplines is crucial in wet area design to ensure functional integrity, prevent water-related failures, and streamline construction.



- Wet areas such as bathrooms, kitchens, and service zones require precise alignment of structural elements (e.g., slab recesses, beam placements), architectural finishes (e.g., tiling, slopes), and M&E systems (e.g., plumbing, drainage, waterproofing membranes). Coordination ensures these components work harmoniously without clashes or rework for an integrated design solution.
- For effective water management, proper placement of floor traps, pipe routes, and waterproofing layers depends on early collaboration. Misalignment between disciplines can lead to water seepage, pooling, or inefficient drainage.
- Coordinated drawings help avoid impractical detailing, inaccessible service points, or structural compromises for buildability and maintenance access. This improves construction sequencing and long-term maintenance.
- Mitigate risk by early detection of design conflicts such as penetrations through structural members or incompatible finishes which affects the continuity of the waterproofing membrane and increases the probability of leakage.
- Harmonized design ensures adherence to building codes, waterproofing standards, and client expectations for performance and aesthetics.

2.6 Waterproofing System Selection

Choosing the right waterproofing system depends on several factors, including the application area, exposure level, substrate condition, expected movement, application methods, construction sequencing, and maintenance needs.

The selection should also consider life cycle cost-performance criteria, which encompasses the initial installation cost and the potential costs of premature failure, system replacement, and related consequential expenses.

2.6.1 Classification of Internal Wet Area Systems

Waterproofing systems used in internal wet areas are generally classified into three main types:

i. Preformed membrane systems - factory-manufactured sheets or rolls designed to form a continuous waterproof barrier. These are typically joined by torching, self-adhesive bonding, or hot-air welding
ii. Liquid-applied membrane systems - generally preferred for internal wet areas due to their seamless continuity, ease of detailing, and full substrate adhesion. When properly applied, they form a monolithic and fully bonded waterproof barrier
iii. Integral Systems - These systems (such as concrete admixture or crystalline systems) become part of the reinforced concrete structure, which helps in isolating leaks and preventing lateral movement of water. However, the effectiveness of the systems is compromised if the crack width in the concrete exceeds a certain, specified measurement.

For internal wet areas constructed using an RC slab with walls in either RC or masonry, the recommended waterproofing systems are liquid-applied membranes that exhibit proven flexibility, are elastic enough to handle movement between different materials, and possess strong adhesion and cohesion to the substrate. Compatibility with tile adhesives and substrates must be ensured.

2.6.2 Selection Criteria

The selection of a waterproofing system is heavily influenced by the construction method used. Local concrete construction methods prevalent in Malaysian construction further influence the substrate integrity and subsequent membrane performance. Selection criteria for the waterproofing system should include:

a. Type of substrate (Cast in-situ wall, Precast walls, Dry wall/partitions, AAC Block)
b. Exposure (hydrostatic pressure, thermal movement)
c. Adhesion & Cohesion (Strong bond substrate to resist delamination)
d. Buildability (ease of application, access constraints)
e. Compatibility with substrate and other trades (e.g., EN 14891)
f. Maintenance (easy inspection and repairability)
g. Compliance certifications (e.g., CIDB COA, PPS listing)

Early engagement with suppliers and waterproofing specialists is recommended to validate system suitability and coordinate with site conditions.

a) Type of substrate

The selection of a waterproofing system is influenced by the typology of substrate. Cast in-situ slabs have fewer joints and are suited for bonded liquid-applied membranes. Pre-cast slabs, PBUs, drywall partitions, and AAC blocks introduce more joints, movement, and substrate variability, requiring systems with higher elasticity, reinforcement, or additional base layers.

The correct choice ensures durability, minimizes leakage risks, and simplifies future maintenance. Waterproofing systems must be chosen to accommodate these conditions, with reference to performance standards (EN 14891, SS 345, ASTM C836/D4068) and local specifications (JKR, CIDB).

Table 2.6.2a: Typology of Substrate vs. Waterproofing System Selection

Typology of Substrate	Key challenges	Recommended Waterproofing System	Relevant Standards / Norms
Cast-in-situ RC slab (toilet, balcony, wet room)	Few joints, but risk of shrinkage cracks & cold joints	Flexible cementitious (2K) / Polymer-modified liquid-applied membranes, fully bonded	EN 14891 (liquid-applied), ASTM C836 (elastomeric membranes), JKR Specs

Typology of Substrate	Key challenges	Recommended Waterproofing System	Relevant Standards / Norms
Pre-cast slab (balcony, corridor, service yard)	Multiple panel joints, thermal expansion gaps	High-elasticity liquid-applied / (PU, cement-polymer) / Flexible cementitious / Sheet membrane + Joint tapes; or sheet membranes at joints	EN 14891 crack-bridging, ASTM D4068/D4069 (bituminous), SS 345
Prefabricated Bathroom Unit (PBU/IBS)	Numerous construction joints, pipe penetrations, movement between modules	Highly elastic PU / Flexible Cementitious membranes + Reinforcement at joints; prefabricated pipe collars	SS 345:2000 (wet area waterproofing), EN 14891 flexibility, JKR IBS specs
Drywall / Lightweight Partition (internal bathrooms, kitchens)	Substrate movement, differential expansion, weak adhesion zones.	Fast-cured liquid-applied membranes + Joint tapes at junctions / Uncoupling polyethylene sheet membranes embedded with tile adhesive + Joint tapes	EN 14891 adhesion & crack-bridging, ASTM C920 (sealants), CIDB guidelines
AAC (Autoclaved Aerated Concrete block walls)	Porous, absorbs water, risk of shrinkage cracks; weak surface finish if untreated	Base plastering layer (per manufacturer) before waterproofing; then Flexible cementitious / Fast-cured liquid membrane.	EN 14891 immersion resistance, SS 345, JKR Specs

b) Exposure

The waterproofing system must be able to withstand hydrostatic pressure, thermal movement, and cyclic wetting without loss of integrity when exposed to the various conditions. For standard internal wet areas such as bathrooms, the exposure level is generally moderate.

However, specific areas such as saunas, steam rooms, or certain wet kitchens may be subjected to elevated temperature and humidity, and the selected waterproofing system shall therefore demonstrate adequate thermal resistance and dimensional stability under such conditions.

Table 2.6.2b: Exposure vs. Waterproofing System Selection

Exposure Level	Typical Application Areas	Recommended Waterproofing Type	Key Performance Requirements
Normal / Light Exposure	Bathrooms, toilets, internal wet kitchens, laundry areas	Cementitious or acrylic-modified liquid-applied membranes	Moderate flexibility, good adhesion, compatible with tile adhesives and screeds
Moderate Exposure	Balconies, planter boxes, external wet kitchens	Flexible cementitious or polyurethane (PU) membranes	Higher elasticity, UV stability, ability to bridge minor cracks and withstand limited thermal movement
High Exposure / Thermal Areas	Saunas, steam rooms, hot kitchens, or service areas exposed to elevated temperature and humidity	Polyurethane (PU), Polyurea, or high temperature resistant Epoxy membranes, Roll form membrane.	Excellent thermal stability, high elongation, vapor-tolerant, and resistant to temperature cycling

c) Adhesion & Cohesion

The waterproofing system must be able to demonstrate strong bonding to the substrate and internal cohesion to prevent delamination or failure. It shall exhibit strong adhesion to the prepared substrate and adequate internal cohesion to prevent blistering, delamination, or film rupture. Adhesion strength shall comply with the performance requirements of EN 14891 or equivalent standards (e.g., ≥ 0.5 N/mm² for Class 1 systems). Proper substrate preparation including removal of laitance, dust, and contaminants is essential to achieve the required bond strength.

Primer or bonding agents shall be used where recommended by the manufacturer. Select systems tested and certified in accordance with EN 14891, or equivalent norms to ensure verified adhesion and cohesive performance under site conditions. The system should permit proper bonding of subsequent finishes and accommodate movement between different materials without loss of performance.







d) Buildability

The waterproofing system shall allow efficient installation and effective coordination with other trades. Key considerations include accessibility, application sequence, curing time, and compatibility with subsequent works such as screeding, tiling, and plumbing. The system should be easy to apply in confined spaces, adaptable to irregular surfaces, and have reasonable curing times to prevent site delays.

It should also permit localized repair if damaged during later stages. For most internal wet areas, liquid-applied membranes (cementitious or acrylic-modified) are preferred for their flexibility, ease of detailing, and quick installation. Preformed membranes may be considered for larger, uniform, and easily accessible areas.

e) Compatibility with substrate and other trades

The waterproofing system shall be fully compatible with the substrate and adjoining construction materials to ensure long-term adhesion and watertightness. It must not react adversely with screeds, plasters, tile adhesives, sealants, or M&E components. Compatibility shall be verified in accordance with EN 14891 or equivalent standards.

Select products with documented compatibility testing under EN 14891 or manufacturer cross-system approvals, particularly where multiple materials or trades interface within wet areas.

f) Maintenance

The waterproofing system shall allow easy inspection and localized repair throughout its service life. It should permit identification of defects and enable partial reinstatement without compromising the integrity of adjacent areas. The system shall retain its performance after minor mechanical damage or re-coating, ensuring long-term durability and watertightness.

Select systems that offer proven recoatability and local repair capability, with maintenance procedures supported by the manufacturer's technical documentation and compliance with EN 14891 or equivalent maintenance performance standards.

g) Compliance certifications

The waterproofing system shall comply with relevant national and international standards, ensuring verified performance, safety, and durability. All materials shall be supported by valid product certifications and independent test reports. Applicable certifications may include EN 14891, CIDB Certificate of Approval (COA), and PPS Product Listing, or other equivalent recognized standards.

Select systems that are fully certified and tested under accredited laboratories, demonstrating conformity to the above standards for adhesion strength, flexibility, water tightness, and overall performance.

3. INSTALLATION

The successful installation of a waterproofing system depends on proper surface preparation, appropriate application methods, and careful attention to detailing. Equally important are the processes of quality control and protection during and after installation. Consistent inspection and adherence to standards safeguard against defects, while protective measures help maintain the integrity of the system until the area is fully operational.



3.1 Surface Preparation

Proper surface preparation is one of the most critical steps in ensuring a durable waterproofing system, where inadequate or inconsistent preparation may cause system failure. All substrates must be inspected and approved before membrane installation.

3.1.1 Concrete and Screed Substrates

- All concrete or screed surfaces must be cleaned and freed from all forms of contaminants (scale, laitance, dust, mould, foreign materials, oil, wax, curing agents).

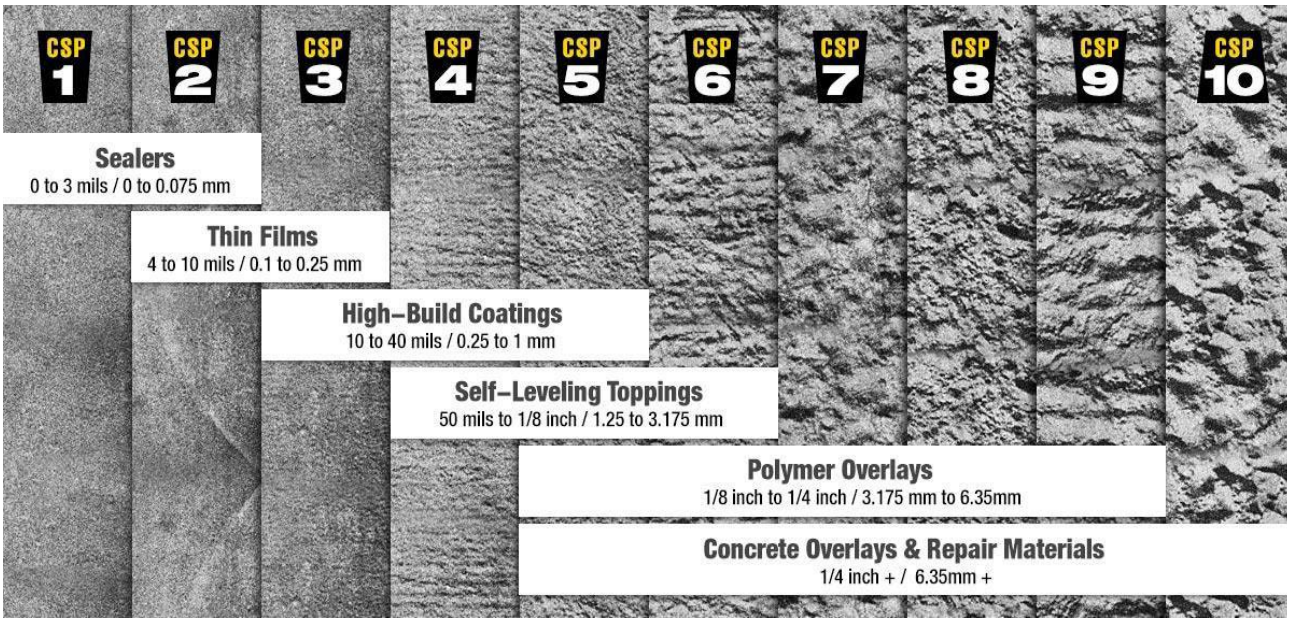




Dusty concrete surface laitance

- For concrete surfaces receiving new waterproofing shall comply with the ICRI Concrete Surface Profile (CSP) classification, which defines ten roughness levels (CSP 1–10) based on peak-to-valley depth.

This system provides an industry benchmark to ensure proper surface texture for effective adhesion, where lower CSP values indicate smoother finishes and higher values denote rougher profiles.



Concrete Surface Profile (CSP) classification

- All substrate shall be CSP 3 and below prior to application of waterproofing. This approach ensures the monolithic integrity of the concrete substrate, allowing the new waterproofing system to bond effectively without compromising adhesion performance.
- Surface defects (holes, voids, cracks, honeycombs, rough surfaces, sharp protrusions) must be repaired using suitable materials and methods before membrane application.
- Defective concrete (e.g., honeycombs, loose areas, sharp protrusions) shall be mechanically removed using tools that do not damage adjacent areas, and repaired using compatible, non-shrink repair mortars approved by the manufacturer.
- For brick or block walls, all mortar joints shall be flush-pointed and rendered with a cement-sand mix before applying the membrane.



Removal of weak cementitious substrate

3.1.2 Moisture Content and Dew Point

- Cementitious waterproofing systems commonly used in Malaysia require a properly damp substrate to achieve optimal adhesion. This is ensured through a saturated surface-dry (SSD) condition, where the substrate is uniformly dampened with water but free of standing moisture.

SSD is a critical surface preparation process that maintains the substrate in the ideal state so that the waterproofing system can effectively bond and perform within the specified application timeframe.

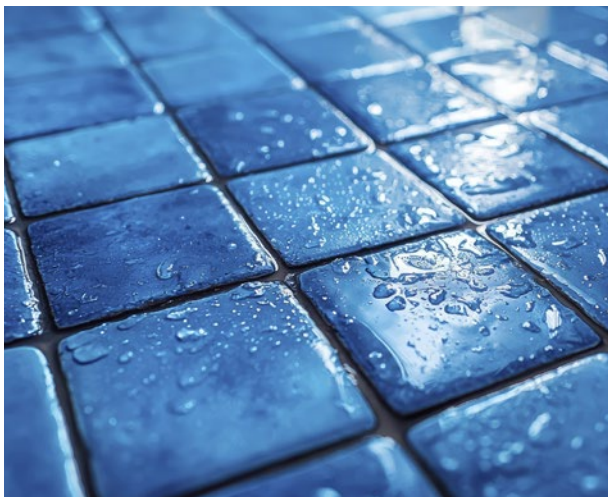


Dampening substrate to achieve optimal adhesion

- For certain types of membranes (such as solvent-based elastomeric), good ventilation should be provided to enable the substrate to dry sufficiently.
- The substrate must achieve a moisture content of ≤4% (verified using a calibrated concrete moisture meter) depending on the product to be used, unless the membrane system is designed for damp application (e.g., cementitious coatings).
- Dew point is the temperature at which moisture in the air condenses into water on a surface. A floor may appear dry, but if its surface temperature is close to the dew point, a thin film of moisture can form. This surface condensation behaves like high moisture content and will negatively affect moisture-sensitive coatings, adhesives, and membrane applications.
- Dew point relates to surface moisture, not internal moisture.
- Even if the substrate moisture content is acceptable, applying coatings when the floor temperature is at or near dew point means:
  a. The surface behaves as if it has high moisture.
  b. The coating will not bond properly.
- Therefore, both internal moisture content and dew point conditions must be checked before recoating or applying waterproofing systems
- Wall moisture content is equally critical, especially when recoating with moisture-sensitive systems such as solvent-based polyurethane. In such applications, the substrate moisture level must generally not exceed 4–5% to ensure proper adhesion and long-term performance.

3.1.3 Falls, Slope, and Surface Regularity

- Verify that all horizontal surfaces are properly graded before membrane application.
- Achieve a minimum fall of 2 % for bathroom floor.
- Any ponding or uneven areas shall be rectified with a levelling screed to achieve proper falls and ensure effective surface drainage, thereby preventing water accumulation.



3.1.4 Cleaning Preparation

In general, two cleaning methods may be used: Mechanical and Chemical.

Mechanical cleaning techniques such as compressed air, industrial vacuuming, sweeping, abrasive blasting, high-pressure water jetting, or grinding are effective for removing laitance, dust, efflorescence, loose plaster, and weak surface materials.



Cleaning with a water jet



Sweeping using a hard bristle broom



Removing loose material

Chemical cleaning is suitable for eliminating oil, grease, and other contaminants. Efflorescence or leached salts on masonry surfaces should be treated with approved cleaning agents appropriate to the specific masonry type.

3.1.5 Priming and Adhesion Preparation

- Apply the manufacturer's specified primer to all porous substrates such as screed or blockwork to enhance adhesion and minimize pinholes.
- Allow the primer to dry as per product data before proceeding with waterproofing.

Note: Do not proceed with membrane application if the substrate does not comply with the above requirements. All defects must be rectified prior to installation to prevent adhesion failures and ensure system integrity





Concrete surface level to receive waterproofing

3.2 Application Methods

The right application techniques and sequencing are essential to achieve the intended waterproofing performance. Poor sequencing, inconsistent workmanship, or premature covering are common causes of system failure.

All waterproofing works shall be executed by trained applicators under suitable weather and site conditions. Recommendation practices include:

3.2.1 Mixing and Material Preparation

- Waterproofing material must be stored in its original, sealed and undamaged packaging in a dry and well-ventilated area, protected from direct sunlight, rain, water or moisture.
- All waterproofing products shall be mixed in a clean, controlled, and sheltered environment to prevent contamination by dust, moisture, or debris.
- Machine mixing is mandatory for liquid-applied systems to achieve full homogeneity; Using timber stick for manual mixing is permitted only where specifically allowed by the manufacturer.
- Follow exact mixing ratios and duration stated in the product data sheet avoid overmixing or partial mixing, which may cause segregation or incomplete curing.
- Always mix complete units as supplied unless otherwise approved. Do not alter, dilute, or combine materials from different batches without written consent.
- Verify substrate condition prior to application ensure moisture content is ≤ 4% unless using a moisture-tolerant or cementitious-based membrane.



Material weighing for correct mixing ratio



Use a clean and dry bucket for mixing



Use a mechanical mixer for liquid-applied systems to achieve full homogeneity



Mixing in a clean, controlled, and sheltered environment to prevent contamination by dust, moisture, or debris.



A homogenous mix is achieved

3.2.2 Wall and Floor Junctions

- Application normally begins with the minimum 300mm upturns at wall floor junctions, proceeding to apply the membrane diagonally to the entrance of the stepping-on area.
- Provide a minimum upturn of 300mm along wall bases, extending horizontally across the floor slab.
- For brick walls, the mortar joints should be flush pointed and rendered with cement/sand mix to receive the membrane.
- Reinforce all junctions, corners, pipe penetrations, and fillets with fibreglass mesh or compatible reinforcement fabric embedded into it.



300mm upturn along wall bases



Reinforcement layer for pipe penetration

3.2.3 Application Coating

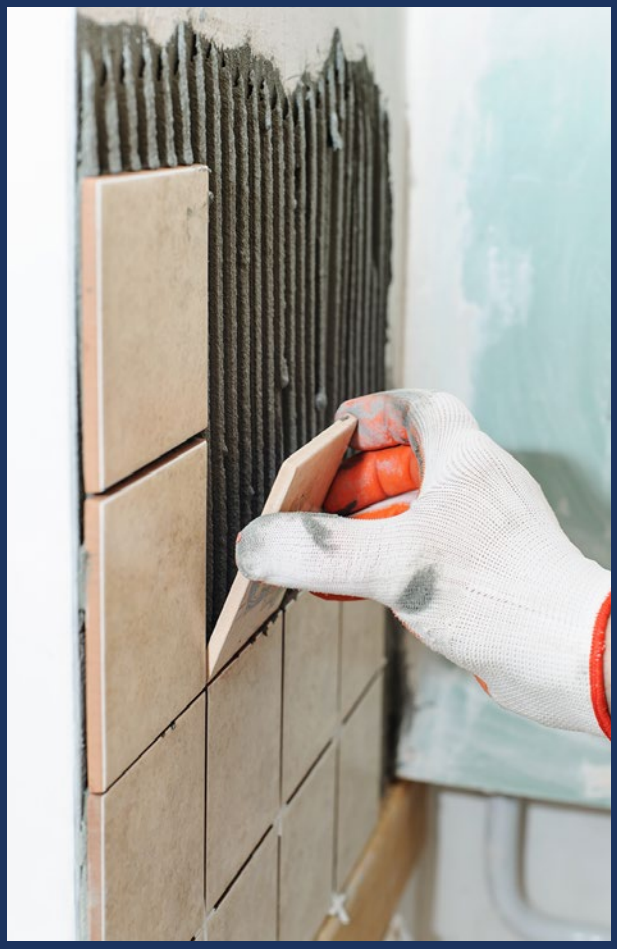
- For liquid applied membranes, it is a good practice to apply several thin coats to achieve the required wet film thickness (WFT), rather than applying one thick layer.
- Apply coatings diagonally or in cross directions to ensure even film build up and continuity across transitions. Use a calibrated WFT gauge to verify each coat's application thickness and confirm dry film thickness (DFT) upon full curing, as per manufacturer's specification.
- Maintain uniform spreading rate throughout the area over-application can lead to surface cracking, while under-application reduces long-term watertightness.
- Ensure consistent coverage with no pinholes, air pockets, or thin spots, especially near upturns, outlets, and edges.

3.2.4 Curing and Quality Monitoring

- The curing period for each coat prior to subsequent coats should be monitored to follow the manufacturer's specifications.
- It is recommended to conduct intermediate inspections during and after application to verify the following:
  - Number of coats and cumulative thickness
  - Mixing uniformity and application consistency
  - Spread rate and curing duration
  - Overall workmanship and membrane continuity
- All inspections, test results, and photographic records shall form part of the project QA/QC documentation for consultant verification prior to subsequent works as referred to in the Inspection Check list.
- No trades shall proceed over waterproofed surfaces until the membrane is fully cured, inspected, and protected in accordance with site quality control procedures.

3.2.5 Coordination with Screeding and Tiling Works

- Screeds should be laid over the cured waterproofing membrane to protect it from mechanical damage.
- Avoid direct tiling onto the membrane unless the system is specifically designed for such use. For direct tile installation over waterproofing, the selected waterproofing system shall comply with EN 14891, and the tile adhesive shall conform to EN 12004-1. Cementitious or dispersion-type waterproofing membranes must achieve a minimum adhesion strength of 0.5 N/mm² or a pull out strength test ranging from 0.25 – 0.5 N/mm2 for the screed with a screed mix ratio of 1:3
- A protective screed or plaster of less than 20mm should be applied to cementitious waterproofing membrane prior to tile installation



3.2.6 Prevention of Common Errors

- Do not alter or dilute waterproofing materials beyond the manufacturer's approved formulation. Unauthorized modification may compromise chemical stability and long-term performance.
- Avoid application over damp, contaminated, or poorly prepared substrates. Surfaces must be clean, sound, and dry, free from laitance, dust, oil, or release agents to ensure proper adhesion.
- Do not proceed with membrane works during unsuitable weather conditions, such as rainfall, direct sun exposure, or high ambient humidity, as these can cause blistering, incomplete curing, or adhesion failure.
- Never overlay screed, tiling, or protective finishes until the membrane has been fully cured and inspected for continuity, thickness, and adhesion.
- Prevent access by other trades until the membrane has achieved its specified curing time. Walking or placing heavy loads on uncured membranes can cause tearing or delamination.
- Do not leave completed membranes unprotected. All waterproofed surfaces must be covered with approved protection layers (e.g., geotextile, protection boards, or screed) to avoid mechanical or chemical damage during subsequent construction activities.

Note: Always monitor weather forecasts. Sudden tropical rainfall can compromise freshly applied areas and require full re-application.

3.3 Junction and Penetration Detailing

Junctions, corners, and service penetrations are the most important and vulnerable points in any waterproofing system. Improper detailing or incomplete treatment frequently leads to leakage at these interfaces. Proper preparation, reinforcement, and sequencing are mandatory.

- Gaps between dry walls to RC concrete floors shall be filled with compatible sealant, prior to application of waterproofing.
- Application normally begins with the upturns at wall-floor junctions. Using a roller with the same width as the upturn provides an even and uniform application. Depending on the manufacturer's requirements, reinforcement like fiberglass mat may be installed at corners.



Filling gaps between dry walls to RC concrete floors

3.3.1 Wall Floor Junctions and Corners

- Provide a **45°** angle fillet (25mm x 25 mm) at all wall-to-floor and wall-to-wall joints using non-shrink mortar or a compatible 1:3 cement sand mix with bonding agent and water (1:3 ratio).
- Reinforce with fibreglass mesh, polyester scrim, or fabric band embedded into the first coat to strengthen the junction area if they are subjected to movements. Ensure smooth transition without sharp edges that could puncture the membrane.





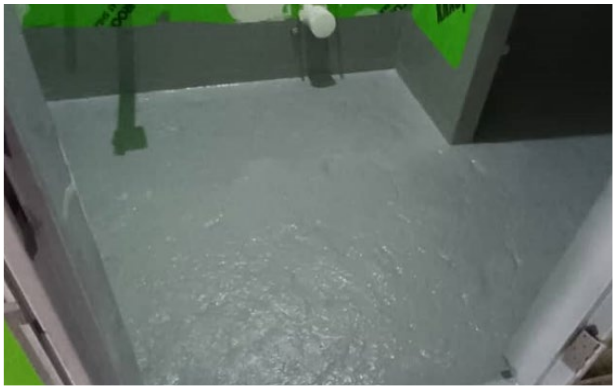
Angle fillet at wall-to-floor junctions



Non-woven laminated thermoplastic elastomer coving sealing tape



Waterproofing sealing tape embedded to strengthen the junction area



Completed area with final coat of waterproofing

- Extend waterproofing membranes minimum 300mm vertically up adjoining surfaces or as specified.

3.3.2 Drainage Outlet

- Ensure that the portion of the pipe in the slab does not have joints to reduce the risk of water leakage at floor penetrations
- A slight upward sloping profile (fillet for membrane upturn) should be created surrounding pipe protrusions.
- Pre-drill 5-10mm diameter holes in 4 directions positioned at the same level as the concrete waterproofing level, to mitigate any trapped water around dressed pipe.
- The waterproofing membrane used should be compatible with the pipe material and the subsequent membrane applied on to it.
- For water outlets, pipes should be cast to flush with the floor level to facilitate membrane dress down.



Waterproofing treatment for the floor trap

- Use pre-formed or site-fabricated collars compatible with both membrane and pipe materials.
- Provide a slight fillet slope (upturn around the pipe) to prevent water ponding at pipe bases.
- Avoid joints in embedded pipe sections within slabs; where unavoidable, use double clamping or boot details.



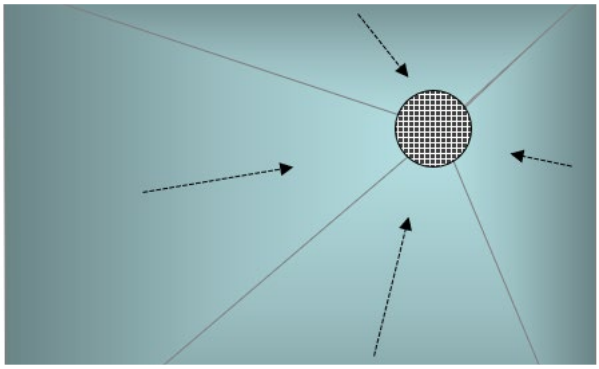


Non-woven flexible membrane waterpipe flexicollar

- Wrap membranes around penetrations and terminate into a groove line or clamping flange.
- Floor outlets and drains should be cast flush with finished level to facilitate membrane dressing and watertight sealing.
- Integrate membranes into drain flanges; avoid butt joints against edges.
- Maintain a positive slope toward outlets to eliminate ponding.



Use a clamping flange to terminate wrapped membranes around penetrations



Fall gradient of substrate to drainage outlet

3.3.3 Door Frame, Upturns, Drop Area and Edges

- Continue membrane over toilet drop area along door frame or terminations where exposure is likely.
- Seal gaps below door frame with compatible sealant or non-shrink grout.





Seal gaps below door frame with non-shrink grout



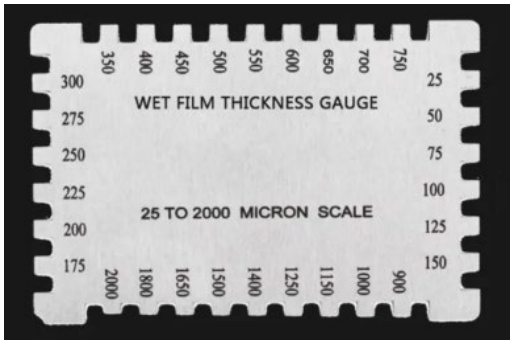
Seal gaps below door frame with compatible sealant

Good Practice: Always prepare a mock-up of junction and penetration details on site for consultant approval prior to full application.

3.4 Quality Control and Protection

3.4.1 Visual Inspections and Thickness Checks

- Visually ensure that air is not trapped in the membrane, which could cause pinholes.
- Joint inspections should be held to check on the minimum number of coats required and the wet film thickness (WFT) and coverage.
- Use a WFT gauge to verify the applied thickness of liquid membranes immediately after application while it is still wet. Place the gauge vertically on the wet surface, press until the outer teeth touch the substrate, then remove and read the thickness between the last coated and first uncoated tooth. Take several readings to ensure uniform coverage and confirm compliance with the specified target thickness. Clean the gauge after each use.



- Once cured, check the Dry Film Thickness (DFT) by multiplying the WFT with the product's solid content (%) in the product technical data sheet as follows:

$$DFT = WFT \times \left(\frac{Solids\ Content\ (\%)}{100}\right)$$

- For example, a 1.0 mm WFT with 70% solids content yields approximately 0.7mm DFT.

3.4.2 Water Ponding Tests

The Contractor shall conduct watertightness tests at the following mandatory stages to ensure full integrity of the waterproofing system:

Stage 1 – Pre-Installation Test (Substrate condition verification)
A ponding / watertightness test shall be performed upon completion of all surface preparation works and before installation of the waterproofing membrane. This test is to verify that the substrate is structurally sound, free of leakage paths, and suitable to receive the membrane system.

Stage 2 – Post Membrane Application Test (Membrane integrity verification)
A second watertightness test shall be carried out immediately after completion of the waterproofing membrane application. This is to confirm that the installed membrane forms a continuous, defect-free barrier with no seepage, pinholes, or system discontinuities.

Stage 3 – Post-Screed / Final Finishes Test (System integrity verification)
A final watertightness test shall be conducted after the application of screed or completion of final floor finishes, where applicable. This stage ensures that subsequent layers and workmanship have not compromised the waterproofing performance of the overall system.

All tests shall comply with the project's testing duration requirements (typically 24 hours) and shall be jointly inspected, recorded, and certified by the Contractor, Consultant, and relevant project stakeholders.



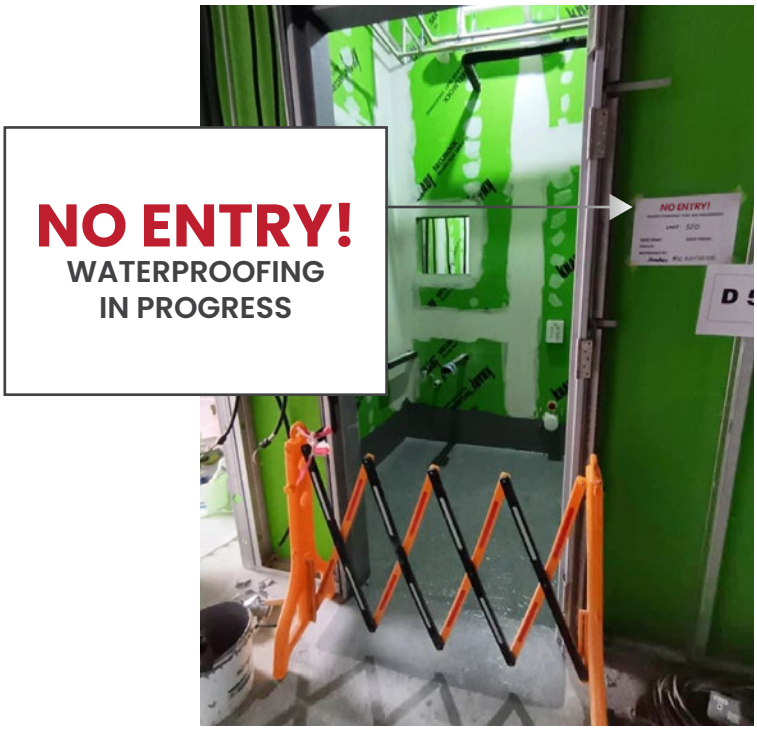
The procedure for all watertightness tests shall be carried out as follows:

- Temporarily seal all outlets, floor traps, pipe penetrations, and drainage points to facilitate a controlled ponding environment.
- Flood the entire test area to achieve a minimum water depth of 25 mm, measured from the highest point of the substrate or finished surface.
- Ensure the water level rises above the membrane upturn at wall perimeters to confirm the continuity and effectiveness of vertical terminations.
- Maintain the water ponding for a minimum period of 24 hours, or as otherwise required by the project specification, local code, or Consultant.
- Inspect the underside of the concrete slab and adjacent accessible areas for any signs of damp patches, seepage, or active leakage during and after the ponding period.
- All test findings shall be jointly inspected, recorded, and certified by the Contractor, Consultant, and relevant stakeholders.

3.4.3 Protection During Screeding, Tiling, and Other Works

Protection of waterproofing

- Upon completion of waterproofing application, the Contractor shall ensure the treated area is cordoned off and access restricted until the protective covering or screed has been properly installed. Appropriate warning signage or barricades (e.g., at door entrances such as toilets) shall be displayed to prevent unauthorized entry.
- The Contractor shall be immediately notified of any damage to the waterproofing membrane and given adequate time to perform necessary repairs prior to the installation of subsequent finishes or protection layers.
- All works must be carried out under controlled site conditions to prevent contamination or mechanical damage to the membrane. During and after application, suitable temporary protection measures such as geotextile sheets, protection boards, or a thin cementitious slurry coat shall be applied to safeguard horizontal membrane surfaces from impact or abrasion.
- All subsequent trades shall execute their works with care to avoid puncturing or delaminating the membrane. In wet areas, all pipe penetrations and floor outlets shall be securely capped to prevent debris ingress or blockage during ongoing construction activities.



Cordoned off waterproofed areas and clearly display warning signage

Screeding work & final finishes

- After completing the watertightness test, a protective screed shall be applied immediately over the membrane to prevent damage. Level pegs shall be set as reference points to verify correct slope and falls toward outlets.
- The screed shall comply with JKR and relevant MS standards and be mechanically mixed for uniformity and workability.

- Recommended mix:
  - 1 part cement: 3–4 parts washed sand (by volume)
  - Water–cement ratio ≤ 0.40
  - Additives as per manufacturer's instructions
- Strict supervision is required to ensure correct mix proportions, additive dosage, and consistency. Pre-packed waterproofing screeds may be used to reduce site errors and supervision needs.
- Take care to avoid damaging the membrane during screeding. Any remedial work shall be approved by the Waterproofing Specialist before proceeding.
- Final finishes shall follow the Architect's details and Good Industry Practices, Ceramic Tiling (MS/CIDB). The Finished Floor Level (FFL) of wet areas shall be lower than adjacent dry zones to prevent water migration.



Cement level pegs set to verify slope and fall

4. POST-INSTALLATION



4.1 Documentation and Sign-off Procedures

The Sample Inspection and Test Plan (Appendix D) outlines submission activities required, including system type, technical data, test report, method statement, shop drawings, working programme, and warranty.

4.1.1 Common Testing Methods

Test Method	Application	Remarks
Ponding Test	Wet areas	Minimum 24 hours. Ensure outlets are temporarily blocked. Mark water lines for leak observation.
Water Spray Test	Vertical wall Shower	Simulate wind-driven rain; minimum 30 mins spray using calibrated nozzle at specified pressure.
Peel Adhesion Test	Liquid membranes, tapes	Conduct on test panels or site samples to confirm adhesion strength to substrate.
Dry Film Thickness Test	Liquid-applied systems	Use electronic thickness gauge to verify cured membrane thickness per specification.
Visual Inspection	All systems	Check for pinholes, wrinkles, incomplete coverage, or improper terminations.
Infrared Scanning / Electronic Leak Detection	Wet areas	For high-spec projects or inaccessible areas; detects moisture retention or membrane breaches.

All testing must be witnessed and documented by the main contractor or consultant. For flood tests, photographic records and signed test reports should be submitted as part of the waterproofing closeout package.

4.1.2 Commissioning and Handover

A successful commissioning process should include:

- Final inspection and sign off by contractor, consultant, and waterproofing specialist.
- Verification that all terminations, upstands, and penetrations are properly sealed.
- Confirmation that membranes are not damaged by following trades.
- Inclusion of as-built drawings, product datasheets, warranties, and method statements in the manufacturer's manual.
- Training or briefing of building management personnel on areas with waterproofing systems and their maintenance needs.

4.2 Basic Maintenance Tips for Building Owners

Upon project handover, the long-term performance and durability of the waterproofing system rely significantly on proper usage practices and routine preventive maintenance. It is therefore essential that building owners, facility managers, and maintenance personnel are informed and mindful of the following requirements:

Warranty and Rectification Protocols

- Leakage is likely to occur over time due to deterioration of the waterproofing membrane/floor screed, degradation of pointing between tiles/wall/floor joints, and deterioration of concrete infill/grout around pipes.
- If leakage is observed during the structure watertightness test, repairs should be made to honey-combed and defective concrete areas using suitable materials such as shrinkage compensated grout or polymer modified mortar.
- If leakage is found after membrane application, the preferred method is to re-apply the membrane to the entire wet area. If leakage is localised, re-apply the membrane at the localised area and test until water leakage is addressed.
- Rectification methods include re-screeding (using pre-bagged waterproofing screed) and injection of chemical grout. Chemical grouts are materials that react with water to form a waterproof solid.
- Using approved applicators by the manufacturers are recommended

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APPENDICES

- Appendix A : Sample Material Safety Data Sheet (structure for chemical identification, hazards, handling, storage, and safety)
- Appendix B : Sample Inspection & Test Plan (template covering submissions, incoming materials inspection, substrate preparation, membrane application, and final inspection)
- Appendix C : Sample Checklist for In-Process Inspection
- Appendix D : Final Inspection Checklist Certificate

REFERENCES

Specifications and performance testing should refer to the following relevant standards and norms:

1.	MS 1583	Suitability of non-metallic products for use in contact with water intended for human consumption with regards to their effect on the quality of the water
2.	MS 1063	Plastic piping systems for soil, ventilation and waste discharge (low and high temperature) within the building structure – unplasticised poly (vinyl chloride) (pvc-u) – specifications for pipes, fittings and the system
3.	MS 2529:2013	Malaysian Standard for Flexible sheets for waterproofing
4.	MS EN1992	Design of Concrete Structures
5.	CIDB PPS and COA	Product Conformity and Approval references
6.	EN14891	European Standard for liquid-applied water impermeable products for use beneath ceramic tiling bonded with adhesives - Requirements, test methods, assessment and verification of constancy of performance, classification and marking
7.	EN12004-1	Adhesives for ceramic tiles - Part 1: Requirements, assessment and verification of constancy of performance, classification and marking
8.	EN1504	European Standard (a multi-part document) for products and systems used in the protection and repair of concrete structures
9.	ASTM D412	Standard test method for evaluating the tensile properties (strength, elongation, stress-strain behaviour) of vulcanized rubber and thermoplastic elastomers (TPEs) using a universal testing machine
10.	ASTM D2240	Standard test method for measuring the indentation hardness of rubber, elastomers, and some plastics using a durometer, often called "Shore hardness"
11.	ASTM D4068	Standard specification for Chlorinated Polyethylene (CPE) Sheeting for Concealed Water-Containment Membrane
12.	ASTM D4069	Standard specification for impregnated activated carbon used to remove gaseous radio-iodines from gas streams
13.	ASTM D4541	Standard test method for measuring the pull-off strength (adhesion) of coatings on rigid substrates like metal, wood, or plastic using portable testers, determining the force needed for detachment
14.	ASTM C836	Standard specification for high solids content, cold liquid-applied elastomeric waterproofing membrane for use with separate wearing course
15.	ASTM C920	Standard Specification for Elastomeric Joint Sealants
16.	DIN 1048	German Standard for testing hardened concrete, including compressive strength, flexural strength, tensile splitting strength, modulus of elasticity, and water permeability.
17.	SS345	Singapore Standard specification for algae-resistant emulsion paints for exterior/interior decoration.

Sample Material Safety Data Sheet (MSDS)

1. Product Identification
Product Name: Waterproofing Compound (General Use)
Recommended Use: Surface protection against water ingress in construction works
Manufacturer/Supplier: [Insert company details]
Emergency Contact: [Insert phone number]

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2. Hazard Identification
Classification:
Flammable liquid (for solvent-based products)
Irritant to skin and eyes
Hazard Statements:
May cause skin/eye irritation
Harmful if inhaled in poorly ventilated areas
Precautionary Statements:
Keep away from heat, sparks, and open flames
Use only with adequate ventilation
Wear protective gloves, goggles, and mask

---

3. Composition / Information on Ingredients
Bitumen / Polyurethane / Acrylic polymer (base material)
Organic solvents (if applicable)
Additives and fillers (cement, silica, etc.)

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4. First Aid Measures
Inhalation: Move to fresh air; seek medical attention if symptoms persist
Skin Contact: Wash with soap and water; remove contaminated clothing
Eye Contact: Rinse cautiously with water for several minutes; seek medical advice
Ingestion: Do not induce vomiting; seek immediate medical attention

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5. Firefighting Measures
Suitable Extinguishing Media: Foam, dry chemical, CO_2
Special Hazards: Vapours may form explosive mixtures with air
Protective Equipment: Firefighters should wear self-contained breathing apparatus

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6. Accidental Release Measures
Personal Precautions: Use PPE; avoid inhalation of vapours
Environmental Precautions: Prevent entry into drains or watercourses
Clean-up Methods: Absorb with sand/earth; collect in suitable containers for disposal

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7. Handling and Storage
Handling: Avoid contact with skin/eyes; ensure good ventilation
Storage: Store in cool, dry, well-ventilated area away from ignition sources

---

8. Exposure Controls / Personal Protection
Engineering Controls: Local exhaust ventilation recommended
Personal Protective Equipment (PPE):
Gloves (nitrile or neoprene)
Safety goggles
Respiratory protection (mask with organic vapor filter)
Protective clothing

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9. Physical and Chemical Properties
Appearance: Viscous liquid / paste
Odor: Mild solvent or bitumen smell
Flash Point: > 40°C (solvent-based)
Solubility: Insoluble in water

---

10. Stability and Reactivity
Stable under normal conditions
Avoid heat, sparks, and incompatible materials (oxidizers)

---

11. Toxicological Information
May cause irritation to skin, eyes, and respiratory tract
Prolonged exposure may cause dermatitis

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12. Ecological Information
Harmful to aquatic life if released in large quantities
Not readily biodegradable

---

13. Disposal Considerations
Dispose of in accordance with local regulations
Do not pour into drains or watercourses

---

14. Transport Information
UN Number: [Insert if applicable]
Hazard Class: Flammable liquid (if solvent-based)
Packing Group: III

---

15. Regulatory Information
Complies with OSHA / DOSH Malaysia requirements
Refer to MS 1294 and CIDB guidelines for local compliance

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16. Other Information
This MSDS provides general guidance. Always refer to manufacturer-specific MSDS for exact product details.

Sample Inspection and Test Plan

Project : _____

Scope of Work: Waterproofing to Wet Areas

No	Activity	Respon sibility	Inspection Method	Requirement Reference	Acceptance Criteria	Stage / Frequency	Records
1	**SUBMISSION**						
1.1	System type	Main Contractor (MC)	Review	-	Approved	Initially	Approved submissions
1.2	Technical data	MC	Review	-	Approved	Initially	Ditto
1.3	Test report	MC	Review	-	Approved	Initially	Ditto
1.4	Method Statement	MC	Review	-	Approved	Initially	Ditto
1.5	Shop drawing	MC	Review	-	Approved	Initially	Ditto
1.6	Working Programme	MC	Review	-	Approved	Initially	Ditto
1.7	Warranty	MC	Review	-	Approved	Initially	Ditto
2	**INCOMING MATERIALS INSPECTION**						
2.1	System type	MC	Visual	Visual	As per approved samples	Each delivery	Delivery dockets
2.2	Manufacturer/ supplier/ agent	MC	Visual	Visual	As per approved samples	Each delivery	Delivery dockets
2.3	Area of application	MC	Visual	Visual	As per approved samples	Each delivery	Delivery dockets
2.4	Shelf life	MC	Visual	Visual	Conform to manufacturer's data sheet	Each delivery	Delivery dockets
3	**SUBSTRATE PREPARATION**						
3.1	Carry out structure watertightness test	MC	Visual	Section 3	No leakage	Before surface repairs	Appendix C
3.2	Concrete repairs if required (repeat watertightness test)	MC	Visual	Section 3	Approved	Before surface preparation	Appendix C
3.3	Preparing and testing surface	MC	Visual/ measure	Section 3	Conform to manufacturer's data sheet	Before application	Appendix C
3.4	Rendering for membrane upturn (bath, shower, etc.)	MC	Visual	Section 3	Conform to shop drawings	Before application	Appendix C
3.5	Angle fillet/cant	MC	Visual	Section 3	Conform to shop drawings	Before application	Appendix C
3.6	Protection to wet area	MC	Visual	Section 3	Approved	Before application	Appendix C

No	Activity	Respon sibility	Inspection Method	Requirement Reference	Acceptance Criteria	Stage / Frequency	Records
4	**MEMBRANE APPLICATION**						
4.1	Application procedure	MC	Visual	Section 3	As per approved samples	Before application	Appendix C
4.2	Tools and equipment	MC	Visual	Section 3	As per approved samples	Before application	Appendix C
4.3	Primer application (if required)	MC	Visual	Section 3	Conform to manufacturer's data sheet	Before application	Appendix C
4.4	Treatment to pipes, floor traps, etc.	MC	Visual	Section 3	Conform to shop drawings	Before application	Appendix C
4.5	M&E clearance	MC	Visual/ measure	M&E requirement	No pipe leak, no joints concealed	Before concealing	Test results
4.6	Membrane application	MC	Visual	Method statement	Conform to manufacturer's data sheet	Before application	Appendix C
4.7	Check membrane thickness, number of coats & curing	MC	Visual/ measure	Section 3	Conform to manufacturer's data sheet	During application	Appendix C
4.8	Carry out watertightness test	MC	Visual	Section 3	No leakage	100% wet areas (After application)	Appendix C
4.9	Protective screed/slurry coat	MC	Visual	Section 3	Conform to manufacturer's data sheet	After application	Appendix C
5	**FINAL INSPECTION**						
5.1	Screed mix and laid to fall	MC	Visual/ measure	Section 3	Conform to shop drawings	During screeding	Appendix C
5.2	Floor finishes	MC	Visual/ measure	Tiling Guide	Conform to shop drawings	At completion	Appendix C

Sample Checklist for In-Process Inspection

Project : _____
Location : _____

No	Checklist	Requirement	Duration	Date of inspection	Remarks
	SURFACE PREPARATION				
1	Carry out watertightness test prior to waterproofing	No leakage			Rectify till leakage is arrested
2	Rectify surface defects	Surface defects repaired; other foreign materials removed			
3	Rendering for membrane upturn / shower/bath etc.	Refer to extent of membrane specified in drawings, or as described in Section 3.1			
4	Angle fillet	All internal corners			
5	Surface cleanliness & dryness	In accordance to product requirements			
6	Primer application	In accordance to product requirements			
7	Preparation & clearance for M&E services	As specified in drawings			
	MEMBRANE APPLICATION				
8	Tools and equipment	Use clean tools as specified in product specifications			
9	Mixing	Homogeneous, lump free & workable liquid achieved			
10	Treatment to pipes, floor traps, corners, groove lines, etc	Apply membrane to correct upturn & lapping			
11	Membrane application	- Correct membrane type - Adequate thickness - Coverage - Uniform & even application - Sufficient membrane overlap			
12	Check membrane thickness	As per manufacturer's requirement			
13	Number of coats and curing period	As per manufacturer's requirement			
	PROTECTION & COMPLETION				
14	Carry out watertightness test	No leakage			
15	Cordon area	Proper barricade set up			
16	Level pegs	Gradient as per drawings			
17	Screeding	To fall towards drainage outlet			
18	Final finishes	As per drawings			

Inspected by : _____
Date : _____

Final Inspection Checklist Certificate

1. PROJECT INFORMATION

Project Name : _____
Contract No. : _____
Location : _____
Waterproofing Area : _____
Waterproofing System : _____
Contractor Company : _____
Manufacturer Company : _____
Applicator Company : _____
Date of Completion : _____

2. PRE-APPLICATION VERIFICATION

Inspection Item	Requirement	Status (Passed/Failed)	Remarks
Approved system & materials	As per approved submission		
Substrate condition	Sound, clean, dry		
Surface preparation completed	As per Method Statement		
Angle fillet/coving installed	All internal corners		
Primer applied (if required)	As per manufacturer's consumption		
M&E penetrations treated	Proper detailing completed		

3. MEMBRANE APPLICATION VERIFICATION

Inspection Item	Requirement	Measured Value	Compliance (Yes/No)	Remarks
Membrane type	As approved			
Number of coats	As specified			
Wet film thickness (WFT)	As per specification	Specific thickness		
Dry film thickness (DFT)	As per specification	Specific thickness		
Coverage rate	As per manufacturer			
Upturn height	As per drawings	150/300mm		
Lapping/overlap	As per specification			
Curing period observed	As per manufacturer			

4. WATER TIGHTNESS TEST RESULTS

Test Description	Requirement	Test Duration	Test Date	Result
Ponding/Flood Test	No leakage			
Visual Inspection (Below Slab/Adjacent Area)	No dampness / seepage			
Repair Rectification (if any)	Completed & retested			

Final Water Tightness Status:

☐ CODE 1. SATISFACTORY – No leakage observed
☐ CODE 2. RECTIFIED & PASSED
☐ CODE 3. NOT ACCEPTED (Further rectification required)

5. PROTECTION & FINISHING

Inspection Item	Requirement	Status (Yes/No)	Remarks
Protection screed applied	As per specification		
Screed gradient	To falls towards outlet		
Floor finishes completed	As per approved drawings		
Protection measures maintained	No damage to membrane		

6. FINAL ACCEPTANCE DECLARATION

We hereby certify that the waterproofing works have been inspected in accordance with the approved Method Statement, Manufacturer's Technical Data Sheet, Inspection & Test Plan (Appendix B), and In-Process Checklist (Appendix C).

MAIN CONTRACTOR

Company Name: _____
Name: _____
Designation: _____

Signature: _____
Date: _____

Company Stamp:

APPROVED WATERPROOFING APPLICATOR

Company Name: _____
Name: _____
Designation: _____

Signature: _____
Date: _____

Company Stamp:

CONSULTANT / CLIENT VERIFICATION

☐ Code 1. Accepted
☐ Code 2. Accepted with remarks
☐ Code 3. Not accepted

Name: _____
Company: _____
Designation: _____

Signature: _____
Date: _____

Company Stamp:

CIDB MALAYSIA

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