NEXT GENERATION LININGS

Substrates and Waterproofing Systems for Tiled Walls (Internal Wet Area Applications)

GTEK™ PREMIUM GYPSUM TECHNOLOGY

INTRODUCTION

According to the Australian Institute of Waterproofing, waterproofing makes up 1% of a building's construction costs, yet water leaks and the resultant damage account for 80% of all building defect costs in Australian buildings.[1] This disparity can be attributed to issues with current construction waterproofing practices, from limited product knowledge and ineffective quality control measures to poor workmanship and installation practices.

Informed product selection is a major component to the waterproofing performance of tiled wall applications in internal wet areas. Waterproofing systems in internal wet areas are a combination of different materials and components working in unison including membranes, substrate, and tiling. In many cases, tiled walls fail due to incorrect combinations of materials or the way the system was installed or used.

The substrate plays an important role in waterproofing systems, lengthening their lifespan and performance. Architects and builders who specify substrate products for tiled walls in residential and commercial projects want to have confidence that the system they are installing will perform to expectations and is totally waterproof. Current substrate products, such as cement and fibre-cement boards, are difficult and costly to install, leaving a higher risk of installation errors and defects. There is limited awareness of new substrate alternatives that offer superior waterproofing performance alongside tile adherence, durability, fire-resistance and ease-of-use.

In this white paper, we take a look at the waterproofing requirements for tiled walls in internal wet areas, as well as the consequences of waterproofing failure. We also cover choosing the right substrate for your waterproofing system, highlighting new technologies that help architects, specifiers and builders achieve compliance.

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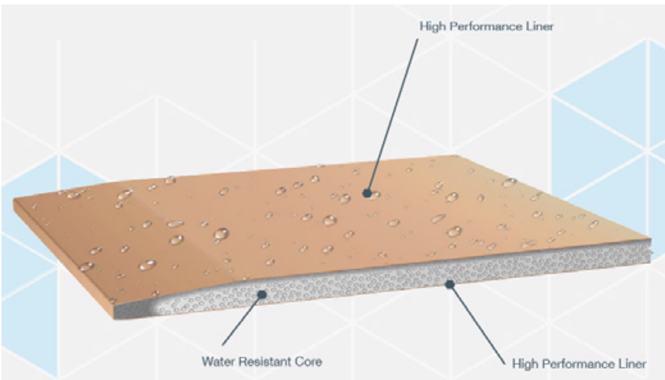
WHERE IS WATERPROOFING REQUIRED?

The National Construction Code (NCC) sets the minimum health, safety and sustainability requirements for new builds. For both commercial and residential builds, all internal wet areas must be designed and constructed in accordance with the NCC. According to the NCC, waterproofing is required in the following areas:

- shower stalls;
- bath areas;
- bathrooms in general (depending on other materials used);
- laundries;
- wet areas in kitchens; and
- around all penetrations in areas (e.g. taps and drains).

Waterproofing involves putting a secure "envelope" around the wet area. The design specifications for waterproofing are set out in AS3740:2010 "Waterproofing of domestic wet areas". The components of a waterproofing system for tiled walls include:

- the **wall frame** design;
- **waterproofing membranes**, referring to liquid applied waterproofing membranes approved to the requirements of AS/NZS 4858:2004 "Wet area membranes";
- **water-resistant substrates** approved to the relevant Australian Standards including concrete, fibre-cement sheeting, water-resistant plasterboard sheeting, masonry, flooring-grade particle board sheeting and structural plywood for use on walls and floors;
- **water-resistant surface materials**, which are products installed on the substrate and approved to the relevant Australian Standards, including thermosetting laminated sheet, water-resistant vinyl or linoleum, and tiling;
- **preformed shower bases and enclosures**, manufactured with materials that make the finished product waterproof; and
- **jointing, sealants, adhesives and sheet fastenings** where required.



THE IMPORTANCE OF WATERPROOFING

In residential and commercial settings, proper waterproofing in internal wet areas such as bathrooms is vital to the lifespan of the building. Water leaking into floors and wall spaces can lead to expensive and complicated repairs, as well as make the building a dangerous one to reside in. It also contributes to poor living conditions that can impact the health and wellbeing of occupants.

Moisture Damage

Tiled walls with defective waterproofing are susceptible to water damage. Water penetrating behind tiles can damage the tile adhesive, causing tiles to come loose and possibly fall off the walls altogether. In multi-storey buildings, leaks may also seep into areas below the tiled area, causing widespread damage.

Water leaking into floor and wall spaces can lead to degradation of the building's structural elements. This type of damage is difficult to notice until the worst of the damage has already occurred. Wood or metal within the building structure will rot or rust when exposed to moisture. Concrete structures, typically reinforced with steel bars or mesh, are susceptible to "concrete cancer", where air and water corrodes the steel within thus compromising the surrounding concrete.

Mould and Mildew

Defective waterproofing can result in damp and mould to build within surfaces behind tiles. Excess moisture within the building structure provides the ideal environment for mould to grow. Mould growth can not only accelerate decay within the building, but also negatively impact indoor air quality and the health and wellbeing of occupants.

Mould issues are synonymous with damp buildings. Prolonged exposure to mould can trigger nasal congestion, sneezing, cough, wheeze, respiratory infections and worsen asthma and allergic conditions. People with existing health issues may suffer more serious complications such as severe asthma, or chronic, obstructive, or allergic lung diseases.[2]

Numerous studies have also established that poor indoor living conditions can affect the quality of life and cognitive performance of individuals. For example, poor indoor air quality in buildings is linked to reduced productivity.[3]

Economic and Business Reputation

As noted earlier, waterproofing defects are among the most expensive issue to rectify for building owners. Water damage can also have a flow-on effect and make buildings uninhabitable, leading to loss of rental income for owners. Diagnosing and rectifying water damage often involves destructive investigation, exacerbating the cost of remedial works.

For architects and builders, waterproofing defects can severely damage their business reputation. The cost and inconvenience caused by such issues can sour the relationship with the building owner. In some cases, contractors may also be held financially responsible if the issue is determined to be their fault.

COMMON CAUSES OF WATERPROOFING FAILURE

Waterproofing can fail for a variety of reasons. In multi-storey buildings, poor waterproofing from the upper levels can lead to water damage downstairs. Issues like defective plumbing work or a poor performing facade can also contribute to issues across the building.

In some cases, waterproofing failure may come down to lack of maintenance. Ongoing maintenance, building checks and remedial waterproofing is usually required to ensure the system is performing as expected and any issues are identified early. Water issues can escalate quickly, even small issues can become major problems if left unaddressed.

However, the root cause of the majority of waterproofing defects is poor design, specification and installation of waterproofing systems. Tiled walls specifically can fail due to the incorrect combinations of materials and/or the incorrect use of the specified system. Often, this is due to a failure to consider all the materials and components of the system as a cohesive solution. Poor choice or preparation of the substrate, for example, can cause issues when the waterproofing membrane is applied, increasing the risk of complications over time.

CHOOSING THE BEST SUBSTRATE FOR WATERPROOFING

Design Considerations

Architects and specifiers want to be sure the substrate provides the required waterproofing performance, but this is not the only criteria for substrate specification. The material used in the waterproofing of internal wet areas must be fit for purpose – the substrate must not only be waterproof but also readily accept compounds, adhesives and paint. Practical considerations such as ease of use, cost and design flexibility must also be considered.

Dimensional stability and durability of the substrate are vital. Tiling materials, such as ceramic tiles, are relatively hard and brittle, so the integrity of the tiled wall is dependent on the stability of the surface the tiles are bonded to. Any cracks in the tiling caused by movement in service could make the wall vulnerable to water penetration. For this reason, wood-based boards are generally avoided as they are susceptible to shrinking and/or expanding, especially in conditions where moisture, humidity and temperature fluctuate. The substrate should also be able to support the tiling and resist wear and tear for the levels of traffic it will be subject to in service.

The substrate's fire performance should not be overlooked. The NCC includes requirements for the fire performance of walls and ceiling. Specifiers should look for non-combustible options to ensure they meet the stringent fire performance requirements of the NCC.

Assessing Substrate Materials

While AS3740:2010 provides a list of acceptable substrate materials for use in waterproofing applications, not all are created equal. Standard practice prefers the use of cement or fibre-cement as the substrate for tiles instead of plasterboard, the latter not generally designed for this purpose. A closer examination reveals some issues with current substrate materials.

Cement is a common and well-used backer board. It is not necessarily waterproof, but it is resistant to water damage and will not fall apart. As such it provides reliable performance in waterproofing applications. However, cement is heavy and difficult to cut, resulting in more complex and expensive installation. Cutting concrete onsite can also leave abrasive residue that can damage tubs and shower bases.

Fibre cement is a composite material made of sand, cement and cellulose fibres. It is advantageous for waterproofing applications as it is resistant to water damage and does not need to be treated before tiling. However, like cement boards, fibre cement boards are heavy and difficult to cut. They are also more brittle than cement board, so extra care is required during installation to avoid damaging the board.

Plasterboard, while a very common indoor wall surface, is not suitable for tiling without waterproofing. The face of the board is paper, so it offers low impact resistance and may deteriorate when subjected to moisture. In any case, plasterboard has numerous benefits for construction as it is easy to install and lightweight, reasonably priced, fire resistant and has a relatively low environmental impact.

New plasterboard alternatives are emerging that combine the best of all worlds – water resistance, ease of use, high durability and non-combustibility. This is due to advancements in technology and the use of alternative materials, such as celluloic glass fibre scrim, that combine hydrophobic properties with resistance to wear and tear.

HIGH PERFORMANCE SUBSTRATE FOR COMMERCIAL AND RESIDENTIAL APPLICATIONS

GTEK™ Barrier

GTEK™ Barrier from BGC Plasterboard is ideal as a substrate under tiles in both residential and commercial applications. It has superior abrasion resistance also making it ideal for high traffic areas when not tiled. The qualities of this innovative board are due to the celluloic glass fibre scrim on the face and back which provides superior moisture and humidity resistance.

GTEK™ Barrier has an orange high performance facer specifically designed for water resistance. It is made like plasterboard, but it has a water-resistant plasterboard core with a celluloic glass fibre scrim on the front and the back. The scrim is a composite of cellulose and glass fibre filaments which enable hydrophobic behaviour meaning water is repelled off the surface and it cannot penetrate the face, however compounds, adhesives and paint can adhere to it.

Unlike standard plasterboard, the face of the board is not paper, increasing the impact, abrasion and water resistance of the board and making it ideal for high traffic areas as well as a substrate for tiles.

Key Benefits

- High performance celluloic glass fibre scrim on the face and back provides superior moisture and humidity resistance.
- Suitable for wall applications as a substrate under tiles.
- Provides superior tile adhesion.
- High performance liner means that has superior abrasion resistance making it ideal for high traffic areas when not tiled.
- Naturally fire-resistant and is classified as non-combustible according to NCC Section C1.12.
- Excellent dimensional stability when compared to other building materials.
- Lightweight and installed in the same method as traditional wet area plasterboard.
- Easier to cut, fasten and install penetrations for pipes and taps than other wet area tile substrates.
- 35kg/m² tile carry weight capacity.

About BGC Plasterboard

Whether your project is commercial or residential, BGC Plasterboard has a solution for you. We provide builders, developers and architects with a range of design alternatives and innovative products such as GTEK™ Premium Gypsum Technology. With our Australian GTEK™ range of interior lining solutions, you benefit from sustainable quality-tested technology, full BGC systems compatibility and our class-leading service network.

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REFERENCES

[1] Australian Institute of Waterproofing. "Australian Institute of Waterproofing." AIW. https://www.waterproof.org.au (accessed 9 July 2021).

[2] Victorian Government. "Mould and your health." Better Health Channel. https://www.betterhealth.vic.gov.au/health/conditionsandtreatments/mould-and-your-health (accessed 9 July 2021).

[3] Wyon, DP. "The effects of indoor air quality on performance and productivity." Indoor Air, Vol. 14, Supp. 7 (2004): 92-101.

All information provided correct as of August 2021

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