TECHNICAL BULLETIN – TB224

FIXING THIN AND LARGE FORMAT SHEET PORCELAIN TILES

AUGUST 2024

INTRODUCTION & SCOPE

This bulletin discusses installation issues with various large-format, wafer-thin porcelain tiles and recommendations for adhesive systems. The tiles originated in Italy and are manufactured on specialised machines, which have since been exported to other areas.

PROPERTIES

These tiles are very dense, hard, and relatively brittle. They are supplied in large format, including field dimensions of up to 3m x 1.2m at 3mm to 4.5mm thick.

The tiles can be used on walls and floors. Some available types are made by double layering, so they are 7mm thick, and others are supplied up to 9mm thick, making them stronger and similar in handling to medium-thickness porcelain tiles.

Many other tiles, mainly intended for floors, have heavily resin-coated and bonded mesh on the back face as reinforcement. This can be either mesh fully embedded in the resin or mesh bonded to the tile back with an adhesive such as urethane and the mesh rear face bare. With some of the more recent clone versions, this mesh is poorly bonded to the rear face and comes free with little applied force.

The unbacked types require adhesives typically used for dense porcelain or glass. On the other hand, the mesh-backed versions create some issues, the complexity of which depends on whether the embedding resin is epoxy or polyester-based and how well the mesh is bonded to the tile back face.

FIXING AND HANDLING ISSUES

These tiles are so large (the smaller ones being 1m x 1m) that they are handled like glazing and require the same sort of suction-cup fitted frames used by glaziers to place plate glass. The following are all things that must be considered when laying these tiles, and the manufacturers' instructions can be crucial to achieving a good result.

a) The substrate must be almost dead level (typically, the maximum variation from the plane is not more than 3mm in 3m), and floors usually require installing smoothing cement first.

b) Floor tile coverage must be 100% effective, as any voids can result in areas where point loads can punch through tiles. Placement of the tiles and applying pressure to obtain the required adhesive spread and coverage are also problematic.

c) Once placed on wet adhesive, the suction is so high that the tile can be almost impossible to lift and reposition, so accurate positioning before placement is vital.

d) Flexible substrates could easily crack the tiles, even allowing for their nominally high flexural strength (hence, requests to install on timber floors seem almost ludicrous and will not be entertained).

e) The Drying of the adhesive can be delayed significantly, and while damp, the adhesive does not develop full strength. This can be critical for flooring applications or wind-loaded facades.

f) There is a risk of alkalinity from cement C class adhesives degrading any bare fibreglass mesh the cement contacts.

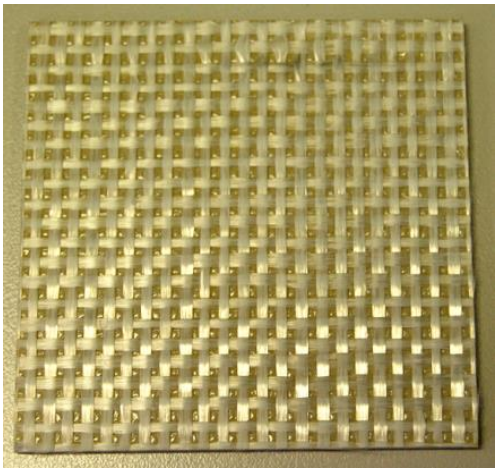
RESIN BACKINGS

The purpose of the resin and mesh backing is to make an otherwise intrinsically weak tile strong enough for more heavy-duty installations. Two types of resin seem to be commonly employed for mesh embedding. While both do their job of improving the flexion resistance of the tile, they also then create a difficult bond to the surface, so neither assists with the long-term adhesion of the tiles onto the adhesive bed.

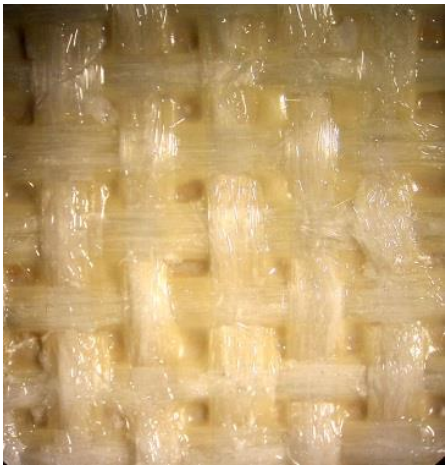
Polyester resin has a second problem: the polyester bonds are attacked by alkalinity in cement-based adhesives. This is far more severe where moisture (such as from the slow-drying adhesive) is present (another problem is that it acts as a bond breaker).

Cured epoxy resins are difficult to bond to because of the glassy and chemically inactive surface they present to the adhesive.

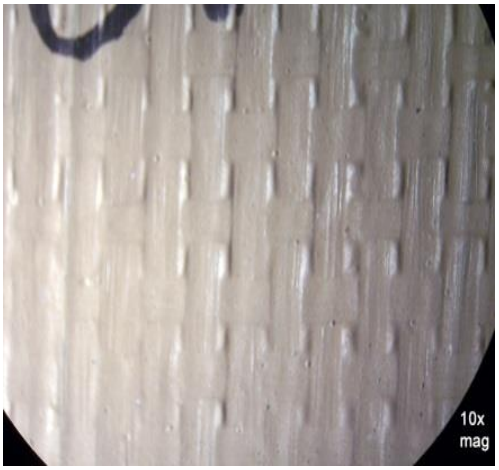
Mesh-backed tile with the mesh fully embedded in resin. Epoxy resins are difficult to bond to, while C-class tile adhesives can attack polyester resins.



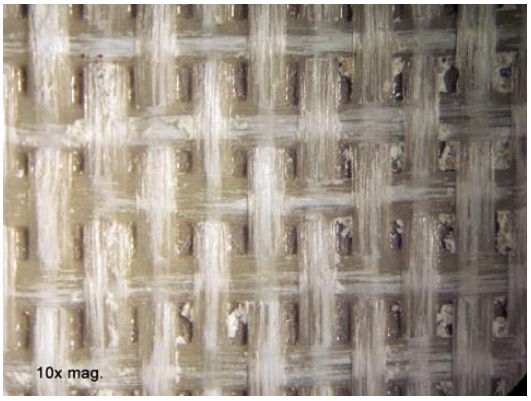
Mesh-backed tile with mesh adhered to the tile back with resin but not embedded (bare mesh). The fibreglass must be alkaline resistant, where C-class tile adhesives will be used.



Bare mesh-backed tile in which the glass has been degraded by contact with alkaline lime water over several months.



Bare mesh-backed tile where the rear face of the mesh has been protected by a primer coat (WPM368) before several months of exposure to lime water.



Mesh-backed tile showing some degradation after several months of immersed exposure and bonded to concrete with X77 adhesive.

The bare mesh-backed tile and its rear face have been protected by a primer coat (WPM368) and bonded with X77 to concrete. The sample was immersed in water for several months, and the coating has protected the surface.

ADHESIVE RECOMMENDATIONS

All floor recommendations are for masonry, such as straight concrete or smoothing cement-covered concrete surfaces. Walls should also be masonry, like blocks and brickwork; they must be rendered to achieve flatness. Sand-cement screed beds are not recommended unless laid to almost dead-level smoothness and flatness.

Tiling suitable fibre-cement or plasterboard sheeting may be feasible on internal walls; however, caution is required to obtain a smooth and flat surface beforehand and not to tile over any movement or expansion joints. Given the size of these tiles vs. the size of the sheets, this may be problematic in the design sense. The walls must also be stiff enough to support these thin tiles and resist impact or movement damage.

***Note** – For external fibre-cement sheet wall and façade applications, ARDEX has a specific system recommendation in place, **SRO Large Format Porcelain with or without Mesh Backing to External Wall Sheeting**, which details the systems requirements.*

Currently, only two types of external fibre-cement façade sheets are recommended for tiling, but these sheets are physically smaller than some sheet tiles. That means special consideration is required for the sheet joints and any expansion joints in the façade/fascia.

External lightweight facades require movement joints and are subject to higher degrees of deflection and flexing due to diurnal temperature changes and wind loadings. There is a degree of risk that movement can produce cracking in the tile that follows the underlying joints where these relatively thin tiles are placed over sheet joints. In this situation, it is a preferred option that the size of the tiles does not exceed the individual sheet dimensions to avoid bridging the sheet recessed and set joints.

We also point out that these fibre-cement sheet facades have specified dead loads and waterproofing requirements, which require the system design to conform to the sheet suppliers' and ARDEX's requirements.

WARNING: For the 'normal' types of tiles, those without mesh backing, rapid cure F-rated C class cement-based adhesives commonly used with porcelain tiles will work.

ARDEX GmbH has done extensive adhesive testing with the European-sourced versions of these tiles and noted that it is also feasible to use certain non-F-rated C class adhesives; however, the physical drying of the adhesive (that is, loss of excess moisture, NOT cure time) can be adversely affected, especially where the substrate is also non-porous (for example, with a membrane). This means that the strength properties are inhibited for a considerable time after installation, which can cause issues with the load performance of the installation.

Floors and wind-loaded facades are of particular concern in this case. The slow drying and the need for maximum contact coverage make adhesive choice critical for floor tile installations.

Delayed drying also impacts the development of alkaline attacks on glass mesh because the extended presence of moisture permits the leaching of alkaline materials from cement-based adhesives.

There are also issues with obtaining full adhesive contact coverage, which must be considered carefully when installing these tiles. Flow bed-type mortars will always perform better than relatively rigid anti-slump adhesives for flooring situations.

Where the embedded mesh-backed tile types are used, the choice of adhesives is restricted because of the embedding resin properties. In contrast, the bare (exposed) mesh-backed tiles can use a back face coat application of primer/moisture barrier to improve the bond performance and protection of the glass mesh from alkaline attack. As we have noted, the mesh can be protected with a coating of the ARDEX primer/moisture barriers ARDEX WPM300 or WPM368 applied at around 3sqm/litre, or for internal situations a generous coating of ARDEX P9 – Abaprime is applicable.

The installation of a moisture barrier on the substrate may be required where ARDEX S28N is used on internal floors that are defined as damp (as per AS1884-2012) because these large-format tiles can act as an impermeable surface (like sheet vinyl) and could create moisture stability problems for the adhesive.

All adhesives listed can be used with ARDEX waterproof membranes for internal wet area applications. As we have noted, external façade systems on fibre-cement sheets require waterproofing as part of the system, and the required membrane is ARDEX WPM002.

ARDEX reserves the right to modify these recommendations occasionally based on internal testing and advice from ARDEX GmbH. Installation of dark-coloured tiles on external walls needs to be considered from thermal aspects, such as heat retention.

Non-mesh-backed tiles

FLOORS – INTERNAL

ARDEX S28 Neu ± ARDEX E90* (*internal only – dry area floors*)

ARDEX WA100*

ARDEX Quickbond ± Abalastic*

*Smaller tile sizes are recommended to allow sufficient pressure to be applied and achieve fuller adhesive bedding when the tiles are laid.

WALLS – INTERNAL

ARDEX S28 Neu ± ARDEX E90* (*internal only*)

ARDEX WA100* and WA epoxy adhesives

ARDEX Quickbond ± Abalastic*

ARDEX X77 ± ARDEX E90* (this adhesive is non-F rated and can be subject to delayed drying)

ARDEX X18 ± ARDEX E90* (this adhesive is non-F rated and can be subject to delayed drying)

ABA Powerstik Plus (this adhesive is non-F rated and can be subject to delayed drying – use an 8mm notch trowel. This adhesive is S1, so it is less suitable where an S2 rating is required).

*Smaller tile sizes are recommended to allow sufficient pressure to be applied and achieve fuller adhesive bedding when the tiles are laid.

Embedded mesh and bare mesh-backed tiles

WALLS AND FLOORS INTERNAL

Embedded in Polyester Resin

ARDEX S28 Neu + ARDEX E90* (*dry only*)

ARDEX WA100* and WA epoxy adhesives

Embedded in Epoxy Resin

ARDEX WA100* and WA epoxy adhesives

Bare mesh backed

Primer/barrier coats - applied to the rear face of the mesh and allowed to dry.

Applied at 3m^2/litre -ARDEX WPM300 / WPM300+broadcast sand or ARDEX WPM368

Applied at 4-6m^2/litre-ARDEX P9

Adhesives-

ARDEX S28 Neu ± ARDEX E90* (*internal only*)

ARDEX WA100* and WA epoxy adhesives

ARDEX Quickbond ± Abalastic*

Wall - ARDEX X77 ± ARDEX E90* (this adhesive is non-F rated and can be subject to delayed drying)

Wall - ARDEX X18 ± ARDEX E90* (this adhesive is non-F rated and can be subject to delayed drying).

Aba Powerstik Plus (this adhesive is non-F rated and can be subject to delayed drying—use an 8mm notch trowel. This adhesive is S1, so it is less suitable where an S2 rating is required).

*Smaller tile sizes are recommended to allow sufficient pressure to be applied and achieve fuller adhesive bedding when the tiles are laid.

WALLS AND FLOORS EXTERNAL – Any type

ARDEX reserves the right to make recommendations, or none, on a site-by-site basis.

Any cementitious-based adhesives with polyester resin-backed tiles should be strongly discouraged due to the potential for decomposition of the polyester resin in damp external situations.

The specific systems associated with specific fibre-cement sheets designed for **tiled** facades and fascias are described in SRO1375.

Masonry surfaces are less problematic and can be dealt with using adhesives recommended for external façade usages, but noting the issues related to drying times for non-F-rated adhesives.

GROUTS

Standard grouts can be used with these tiles; however, it needs to be recognised that the 3mm tiles are at the bottom end of the recommended minimum grout thickness, and colour variations are more likely to occur due to the presence of any voids in the adhesive coverage. In other words, all joins to be grouted should be raked free of adhesive to achieve a uniform depth for the grout.

ARDEX FS-DD may be more desirable for obtaining smoother grout lines using the non-sanded grout.

QUALIFICATIONS

ARDEX reserves the right to modify these recommendations occasionally based on internal testing and advice from ARDEX GmbH.

The installation of dark-coloured tiles on external walls needs to be considered in terms of thermal aspects, such as heat retention.

IMPORTANT
This Technical Bulletin provides guideline information only and is not intended to be interpreted as a general specification for the application/installation of the products described. Since each project potentially differs in exposure/condition, specific recommendations may vary from the information contained herein. For recommendations for specific applications/installations, contact your nearest Ardex Australia Office.

DISCLAIMER
The information presented in this Technical Bulletin is to the best of our knowledge true and accurate. No warranty is implied or given as to its completeness or accuracy in describing the performance or suitability of a product for a particular application. Users are asked to check that the literature in their possession is the latest issue.

REASON FOR REVISION-ISSUER
Content review, change of company slogan and address

DOCUMENT REVIEW REQUIRED
24 months or whenever third-party suppliers change their recommendations.

Australia: 1300 788 780
New Zealand: 643 384 3029

Web: www.ardexaustralia.com
email: technical.services@ardexaustralia.com
Address: 2 Buda Way, Kemps Creek NSW 2178