

INSTALLATION CHALLENGES AND SOLUTIONS: TILE WITH REINFORCING BACKING OR COATINGS

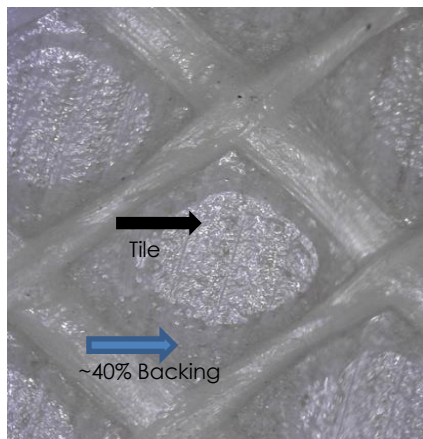
Note: The recommendations within this document are common industry standards and Custom Building Products' requirements. Additional limitations or specific recommendations may be listed within the Technical Data Sheets of products used in an installation assembly. When those instructions conflict with this document, the most stringent requirements and limitations shall apply.*

Tile manufacturers and natural stone fabricators commonly adhere reinforcing mesh or apply coatings to their products. Adding these materials helps prevent breakage of dimensionally weak and highly veined natural stone tiles and assists in aligning ceramic/stone mosaic patterns, controlling joint spacing, and easing installation.

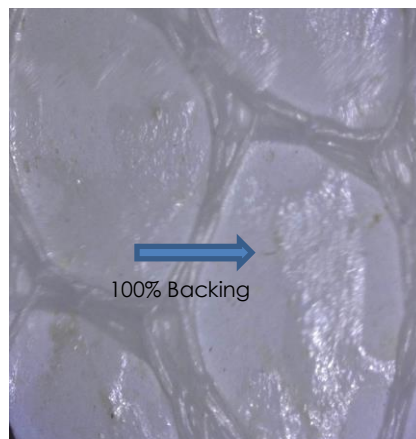


In today's glass tile manufacturing, coatings are applied as backings to transparent or translucent glass tiles to prevent discolored mortar or trowel marks from showing through after installation. Gauged Porcelain Tile and Gauged Porcelain Tile Panels (ANSI A137.3) at a range of thicknesses are also reinforced with back-layers to provide strength during fabrication, transportation, and installation. Unfortunately, there are only a few safeguards in place within the tile and stone industry governing physical properties related to bonding requirements of these types of backings or coatings. For the most part, as Forrest Gump said about a box of chocolates, "you never know what you're gonna get." At times, tile samples are chosen in the design phase, yet upon arrival are back-layered or coated. This situation calls for diligence with creating a successful specification and being aware that different and more costly adhesives are required. Please consider some of these installation challenges and solutions.

Installation Challenges



Mosaic Tile Underside with Backing



Mosaic Tile Underside with Backing



Glass Tile Coating Peeling

Adhesives used to bond reinforcing mesh to tiles or stone are typically (PVA) Poly Vinyl Acetate, polyester resin, epoxy or urethane based coatings. Generally, PVA is not soluble in water, but with an absence of standards, it's not uncommon to see adhesives that loosen or dissolve in contact with mortars or with water...yet some of these tiles are recommended for showers or pool applications.

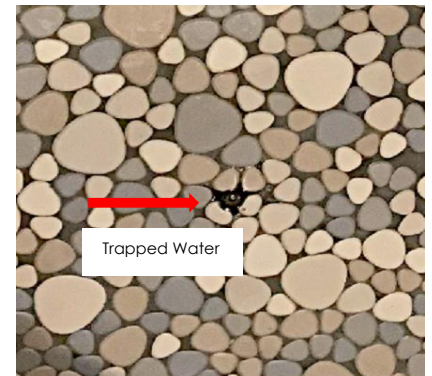


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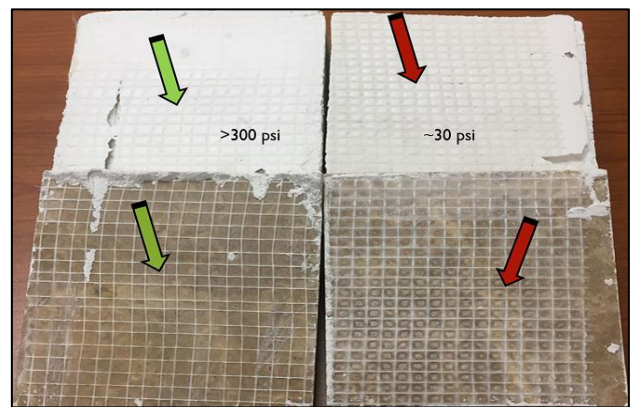
When backings limit the area of adhesion to the tile or stone (as shown) the reduced coverage of the mortar to the tile will produce lower shear bond values, thus increasing the potential for bond failure during the life cycle of the tile assembly. Required mortar coverage to the tile underside is $\geq 80\%$ in dry areas and $\geq 95\%$ in exterior and wet areas. This is impossible to achieve with backings that limit access to the tile.



When adhesives are soluble from moisture or water, complete bond loss can occur. When used on a shower floor, water can be trapped above the adhesive thus extending exposure to water and affecting drainage (as shown).

With complete coverage over the tile's underside, the strength of these adhesives is relied upon to hold tiles and grout in place instead of the mortar or other approved ANSI (American National Standards Institute) bonding adhesive. Some of these adhesives are so weak that they delaminate during shipping in very dry or high humidity conditions. Coatings for glass tile have similarly been of various compositions that can adversely affect the ability of mortars to bond. Some peel from the glass very easily as well.

Polyester resin backed tiles can at times be adhered with high performance, polymer-modified cement mortars, but due to resin composition variabilities, not all backings will perform successfully. Not only is the type of the resin a factor but testing shows that the thickness of the applied resin can create a glossiness and affect laboratory bond strengths. As shown, two stones from the same project, using the same cement-based mortar, have extremely different bond strength results. With these circumstances on a project installation, the possibility of bond failure will dramatically increase in wet/hot areas from thermal growth when bonding mortar to a slick surface.



Effects of Backings in Shear Bond Testing

Epoxy or urethane coatings are stronger than polyester resins but should not be installed using cement mortars but require epoxy adhesives. At times, coarse sand is broadcast into epoxy and if exposed, a mortar can be used. If the epoxy encapsulates the sand, this provides a measure of mechanical bond but still may not be sufficient.

Reinforcing mesh recommended for ANSI A118.9 cement-based tile backerboards is required to be alkali-resistant due to the high pH of cement within the board and the cement mortars used to adhere tile to them. Similarly, mesh attached to the underside of a tile or stone will be in contact with cement mortar or be placed over a concrete slab. Unfortunately, no standards are in place for these products when used for tile manufacturing or in natural stone fabrication and some reinforcing mesh has broken down in forensic evaluations when placed in an alkali solution. On a project, this can result in bond failure.

Addressing Challenges – Specification

The performance of applied backings is directly related to the manufacturer's diligence to consistently meet industry requirements. When the manufacturer provides installation specifications that include products by name and their corresponding standards, it's more likely that tests were performed to confirm suitability. While project specifications material manufacturer or an independent laboratory such as the Tile Council of North America (TCNA), can not only



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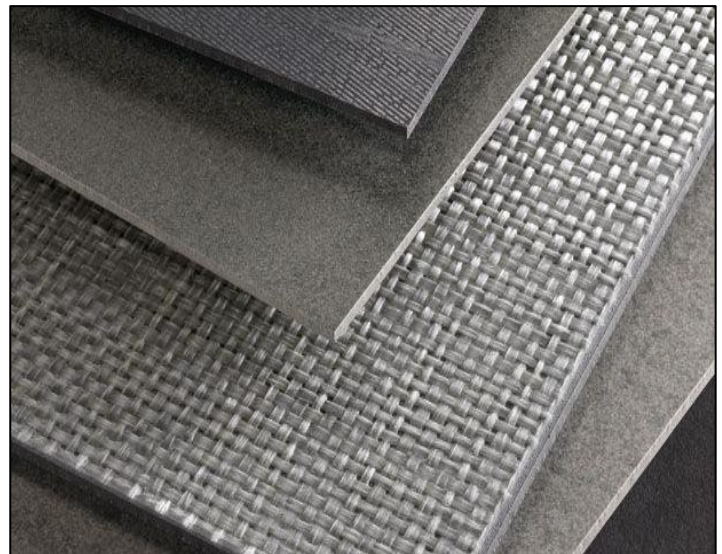
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verify bond strengths that can be achieved with certain adhesive mortars, they can also conduct testing to determine the types of applications for which the tile assemblies in question may be suitable (e.g. interior, exterior, water-submersion, etc.). A simple 48-hour water immersion test (shown below) has saved many projects from using tiles with backings in wet areas that would fail.



In the development of the ANSI A137.3 standard for Gauged Porcelain Tile Panels/Slabs, it was determined that dry shear bond adhesion strength to back-layered panels was adequate at ≥ 150 psi and ≥ 80 psi wet using cement-based mortars. These results may be useful in determining suitability for other backings. To achieve these strengths, ANSI A118.15 High Performance Modified Dry-Set Mortars are recommended. If there is any concern for adhering to a backing, epoxy adhesives meeting ANSI A118.3 are very reliable when the backing is stable and well adhered to the tile.

However, while epoxy adhesives may achieve the best bond strengths, if the epoxy adhesives are not in direct contact with the tile and achieving industry minimum coverage requirements, the installation will not conform to industry standard requirements, and the adhesive manufacturers comprehensive warranties will likely NOT apply.



Gauged Porcelain Tile Panels – With and without back-layering

Specialty tiles, tiles not conforming to ANSI A137.1, A137.2 or A137.3, are often mounted on backings. These tiles may be composed of various metals, mirrors, quartz, wood and plastics. Some may have reactions to cement mortars and grouts adding to the additional need for evaluation, mockups and ANSI bond strength testing.

Based on the composition of the backing, a latex bonding primer or an epoxy primer with a sand broadcast to-rejection over the backing may allow for using mortar as an adhesive. Often, these backings were applied as a precaution to prevent breakage and it may be more cost-effective to grind the backing from a stone tile or remove smaller tiles from sheets and sand the underside.



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Until standards are developed, due to the complexities associated with tile backings, involve your installation material representatives early in the project to review the specification, assist with product selection, warranty requirements, mockup evaluations and technical support at the project startup.

For best results on your project, specify the use of a qualified installation company as described below:

A. Installer Qualifications:

- 1) Company specializing in performing the work of this section with minimum five years documented experience.
- 3) Installer shall be a five-star member of the National Tile Contractors Association or a Trowel of Excellence member of the Tile Contractors' Association of America.
- 4) Installer's on-site supervisor shall hold the International Masonry Institute's Foreman Certification.
- 5) Installer shall employ Ceramic Tile Education Foundation Certified Installers or installers recognized by the U.S. Department of Labor as Journeyman Tile Layers.
- 6) Installer employs at least one installer for Project that has completed the Advanced Certification for Tile Installers (ACT) certification for installation of **[mud floors] [mud walls] [membranes] [shower receptors] [gauged porcelain tile/gauged porcelain tile panels and slabs] [and] [large format tile]**.

Product Selection*

CUSTOM® products have been successfully used in specifications for millions of tiles and have lasted for decades. Please consider these options for your project:

Adhesive Mortars

[EBMLite™ Epoxy Bonding Mortar](#)

[MegaLite® Crack Prevention Mortar](#) (650-725psi bond strength)

[ProLite® Tile & Stone Mortar](#) (400-500psi bond strength)

- *Both mortars available in rapid-setting versions*

[MBP - Multi-Surface Bonding Primer](#)

[TechPrime™ E 100%-Solids Epoxy Primer](#) (broadcast coarse sand to rejection)

CUSTOM® Limited Installation System Warranties are available for assemblies using these products covering labor and material replacement.

Note: Project conditions will vary and may affect product recommendations. Consult individual product Technical Data Sheets (TDS) for specific recommendations and limitations regarding project conditions. Assembly mockups can determine suitability for these conditions on specific projects. For project specification review, onsite technical assistance, product, specification & warranty details contact CUSTOM architectural services or technical support at (800) 282-8786 [Custom Building Products - Contact us](#)

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