



Waterproofing and Vapor-proofing Tile Assemblies in Showers

The wettest place on Earth is probably the standard American shower. Typical shower heads have a flow rate of 2.5 gallons of water per minute. If the shower is used by two people each day for 10 minutes each, 50 gallons of water fall on the floor. In a typical 3' x 4' shower, this equates to nearly 7 inches of water pouring on the floor every day. That's more than 2,500 inches of water falling on that shower floor in a year's time! Despite the average U.S. annual rainfall of only 30 inches, construction codes give more attention to waterproofing relatively dry rooftops than soaked shower floors.

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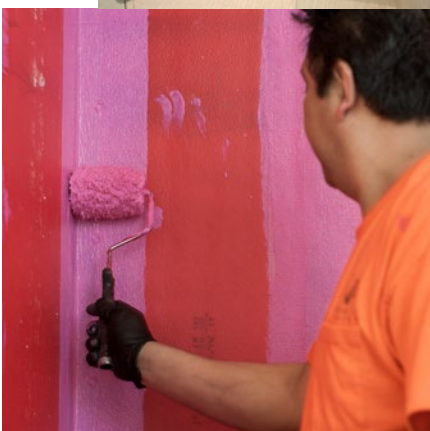
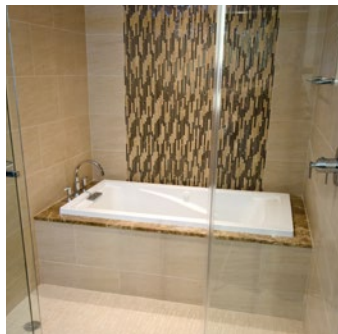


CUSTOM[®]

TILE INSTALLATION SYSTEMS



ANSI A118.10 not only assures that the membrane is waterproof, but that it has the strength to hold up for the life of the tile assembly.



Codes and Standards

The International Building Code (IBC) details roofing construction and the need for weatherproofing. The complete structure of the roof and the materials needed are identified to ensure that water does not enter the house. Chapter 27 of the IBC details the requirements for installation of a shower and describes the materials needed for the shower pan in section 2709, but little else about the construction of the shower. It is even more vague on waterproofing the walls of the shower for tiles and any surrounding areas that may get wet. However, it is critical that showers are completely waterproof considering the amount of water hitting the floor.

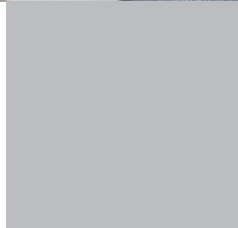
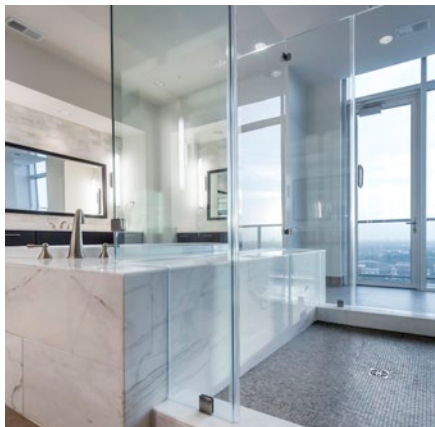
The tile industry has responded to the shortcomings of the codes and has established recommendations for waterproofing not only typical showers in residential applications, but also commercial gang showers and popular steam showers. Tile Council of North America (TCNA) establishes the ANSI standards used for tile installation in showers through a consensus process involving manufacturers of tile and tile installation products. These recommendations are compiled in the TCNA Handbook for ceramic, glass and natural stone tile installation. The Ceramic Tile Education Foundation, an offshoot of TCNA, trains and certifies installers in the proper way to construct a tiled shower and prevent the structural damage that can be caused by leaks in the assembly.

Combating Moisture Intrusion

Tile is generally installed in showers precisely because those areas are routinely exposed to excessive amounts of water. Water migration into wall cavities and through the shower flooring can cause expensive damage to the building's structure and create an environment that invites mold growth. This can lead to Sick Building Syndrome and health issues to those living or working in that area. It is increasingly important in today's structures to thoroughly waterproof wet areas to protect the building and its occupants.

There is a common misconception that ceramic tiled surfaces are waterproof, but they are not. If a cement-based grout is used, the water will penetrate the grout and work its way to the substrate through the micro-capillaries that are found in all cement grouts. Even treating the grout joints with penetrating sealers will not eliminate water intrusion completely. The grout is not the only area for water migration, as the tile itself can have enough porosity to allow water to penetrate through. Over time, grout can also separate from the edge of the tile due to substrate movement and allow water to seep through the minute spaces between the tile and grout. To assure that the tile assembly is waterproof, it is important to install a waterproof membrane before the tile is set. Install the membrane just below the tile bonding mortar as close to the tile as possible. This will minimize the amount of water in the assembly and immediately stop moisture penetration into the substrate and beyond.

Waterproof membranes that are used in the installation of tile per one of the many details in the TCNA Handbook must meet the requirements of ANSI A118.10. This standard not only assures that the membrane is waterproof, but that it also has the strength to hold up in the tile installation for the life of assembly. ANSI A118.10 states the requirements for a "Load Bearing, Bonded, Waterproofing Membrane for Thin-Set Tile and Dimension



Stone Installation.” It applies to “trowel applied, liquid and sheet membranes.” This language can cause uncertainty when selecting a waterproofing membrane. All conforming membranes will waterproof the tile assembly to the industry standards. In many cases, it comes down to an installer’s familiarity with the method and the amount of time available to complete the project. It is even more important that the selection meets the demands of the actual tile project and expectations of the owner.

Sheet Membranes

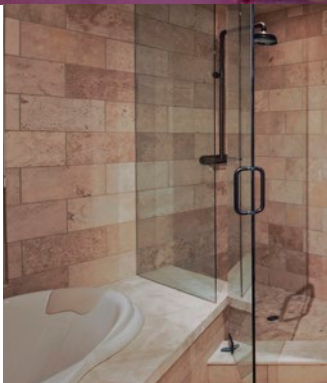
Prefabricated sheet waterproofing membranes are available in many different compositions and styles, and each has a unique method of installation. It is important to become familiar with the particular membrane and how it is installed before beginning the installation project. The most common sheet membranes are plastic or elastomeric sheets that have to be bonded to the substrate prior to the installation of tile to their surface.

Some membranes are coated with a pressure-sensitive adhesive backing, while others are installed with a separate adhesive or cement mortar. While prefabricated sheet membranes may seem fast and easy, care must be exercised to make sure the membrane is installed properly. Be sure to allow time for all required steps and factor that into the membrane decision.

Nearly all pressure-sensitive, adhesive-backed membranes require a primer be applied to the substrate before adhering the membrane to the surface. These primers are generally water-based polymer dispersions. They are rolled or brushed on the surface and must be completely dry before bonding the membrane to the primer. Depending on environmental conditions, drying the primer can take an hour or more.

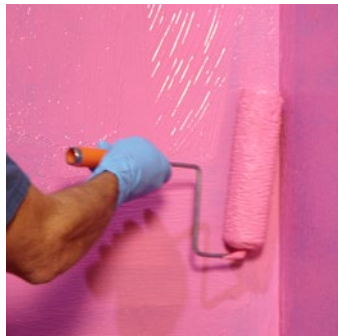
Membranes that do not have a pressure-sensitive adhesive backing must be bonded to the substrate with an adhesive. Most commonly, this is a cement-based thin-set mortar which can take some time to cure depending on site conditions. The thin-set mortar is spread on the substrate with a notched trowel, and the membrane is rolled into the wet thin-set mortar. If the mortar skins over before the membrane is rolled into place or the membrane is walked on before the thin-set mortar has cured, the bond between the membrane and substrate can be broken. This can lead to hollow-sounding spots and the possible failure of the tile assembly. Generally, the installed membrane should remain undisturbed for 24 hours to allow the thin-set mortar under the membrane to fully cure.

Since a prefabricated sheet membrane is not produced to fit the area of the tile installation in one piece, smaller strips (generally 36" wide) have to be pieced together on large projects. To maintain waterproofing, it is important that the seams where the sheets come together are properly treated and sealed. There are various ways to do this, and the manufacturer’s directions must be followed. It is also important to follow directions when transitioning surface planes (horizontal to vertical), fitting the membrane into corners or around plumbing protrusions. If uncertain about making properly fitting corners from a sheet membrane, some membrane manufacturers offer preformed corners to satisfy the need for properly fitted membranes. Remember that water can get through the smallest opening. If the seams are not properly treated and all gaps filled with the appropriate sealant, water may leak through and damage surrounding areas.





A liquid-applied waterproofing membrane eliminates much of the hassle of installing prefabricated sheets.



Brushing, troweling, rolling and spraying are all appropriate methods for applying RedGard®.

Prefabricated sheet membranes are typically not as fast and easy to install as advertised. The contractor must gather all of the components (membrane, preformed corners, bonding mortar, primer and sealant), each piece must be cut, and then a significant number of steps must be performed to assure a watertight assembly. Sheet membranes are also typically more costly than liquids. Application labor is extended and there is waste from scraps when fitting the membrane into the space and around intrusions into the space. Be sure to allow for the increased labor and materials during the planning phase of the project.

Liquid Membranes

A liquid-applied waterproofing membrane eliminates much of the hassle of installing prefabricated sheets. There are no primers to apply, no seams to treat and all transitions up walls and through corners are continuous. The liquid-applied membrane is simply brushed, rolled or sprayed onto the substrate and allowed to dry. To assure a continuous film with no voids, a second coat is applied over the first. There is no need to purchase special pieces for corners and waste is minimal since all the liquid is applied to the surface to be waterproofed. With the use of a liquid-applied waterproofing membrane, you are guaranteed a monolithic membrane throughout the tile installation with no seams that require extra labor.

RedGard® Waterproofing and Crack Prevention Membrane is a ready-to-use, liquid-applied, elastomeric membrane. RedGard easily creates a continuous waterproofing barrier with outstanding adhesion. It bonds directly to clean metal drains, PVC, stainless steel and ABS drain assemblies for use in any shower application. RedGard meets the requirements of ANSI A118.10, is IAPMO approved and also meets Uniform Plumbing Code specifications for use as a shower pan liner.

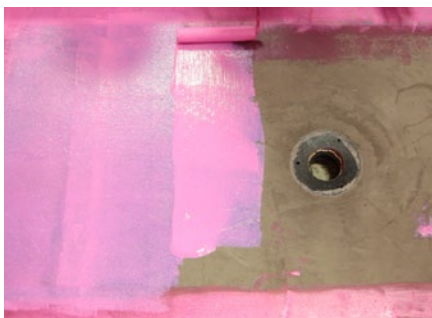
Brushing, troweling, rolling and spraying are all appropriate methods for applying RedGard. If using a trowel, spread the material with the trowel held at a 45° angle, and then flatten the ridges. If using a roller or brush, apply a continuous, even film with overlapping strokes. For extra protection, embed a 6" wide fiberglass mesh into the membrane for changes of plane and for gaps 1/8" or greater. Depending on site conditions, it typically takes 1-1.5 hours to dry and turn from pink to red. After the first coat turns red, inspect the film for integrity and fill any voids or pinholes with additional material. Apply a second coat of RedGard at right angles to the first coat.

For general waterproofing, apply half a gallon of RedGard over 55 SF. Once dry, apply the remaining half-gallon as a second coat. To meet IAPMO standards as a shower pan liner, apply each coat to cover 40 SF per half-gallon, or one gallon total per 40 SF.

For information about using liquid membranes to treat large or exterior areas efficiently, see our White Paper titled *Benefits of Liquid Membranes*.



The use of spray equipment can greatly speed the installation of liquid-applied membranes on larger projects.



Vapor-proofing

RedGard can also be used to effectively vapor-proof steam rooms and gang showers. The TCNA Handbook requires a waterproofing membrane with vapor permeance less than 0.5 perms (per ASTM E96 E) for continuous use steam showers to protect adjoining surfaces. RedGard exceeds this requirement and can be safely used toward waterproof and vapor proof steam room or steam shower installations. TCNA detail SR613 and SR614 both show the need for a surface mounted waterproofing membrane on floors, walls and ceilings.

It is important that both floor and ceiling are pitched to evacuate water. The floor should be sloped the standard $\frac{1}{4}$ " per foot, but the ceiling should be sloped 2" per foot and the slope should be to the walls to prevent occupants from being dripped on with scalding water. Because of RedGard's low moisture permeance, a moisture barrier is not needed behind the cement backerboard or mortar bed in hollow wall construction.

For information, see our Technical Bulletins titled *RedGard Exceeds Waterproofing Requirements for Steam Showers*

Spray Application

The use of spray equipment can greatly speed the installation of liquid-applied membranes on larger projects. The membrane can be applied to the surface in less than a third of the time required to roll, brush or trowel on the liquid, with even more time saved over cutting and placing a sheet membrane. The concept of airless sprayers has become commonplace; it is simply applying the materials without conventional air-powered spray systems. This eliminates the need for air compressors and bulky hoses. Appropriate airless spray equipment can be purchased or rented. For additional details, see our Technical Bulletin titled *Spray Application of RedGard Membrane* on the use of airless sprayers.

Waterproofing Drains

It is important to tie the waterproofing membrane into the drains in the shower. All floors should be pitched to the drain at the recommended $\frac{1}{4}$ " per foot to assure evacuation of all water. Standing water in a shower can lead to premature failures in the shower system. The TCNA Handbook details many shower receptors and shows how to properly tie a membrane into a drain. For instance, TCNA details B414 and B415 show the waterproof membrane as the shower pan liner that is clamped into a traditional drain. The waterproof membrane is placed under the mortar bed and applied directly to the lower flange of the drain; it is important to keep the liquid membrane out of the weep holes.

In B421, the waterproofing membrane is applied over the mortar bed. The membrane is diverted to the lower drain flange near the drain and a small amount of mortar is placed over the membrane to fill the void at the drain. The advantage with this method is that the entire mortar bed under the tile is not exposed to water. This reduces the moisture in the mortar and the room, which reduces the risk of mold growth. A third option uses a drain with an integrated bonding flange and is detailed in F422. This method eliminates the last remaining mortar above the membrane and directs all water straight down the drain. This minimizes any saturation in the tile assembly that can evaporate into the environment.



While there are many ways to waterproof your shower installation, there is one product that can guarantee success.

Crack Isolation

Many waterproofing membranes fulfill multiple functions in the tile installation. The most common secondary purpose is crack isolation to protect tile from cracks due to movement in the substrate below. The elastomeric quality of RedGard also makes it an ideal choice as a crack isolation membrane to isolate the tile assembly from cracks in a concrete substrate. For general crack isolation, apply a single coat at a coverage rate of 100 SF per gallon. RedGard meets the requirements of ANSI A118.12 Crack Isolation Membranes with two coats applied at 25 SF per coat, per half-gallon.

To help protect the tile, be sure to accommodate for movement at all changes of plane. Soft joints every 8-10 feet are insurance against cracks in larger commercial showers and steam showers where the high temperatures can swell the tiles enough to cause them to crack or come unbonded. This is even more important with glass tile that exhibits significantly more thermal expansion. Proper installation of movement joints can be found in the TCNA handbook in section EJ171. CUSTOM's Commercial 100% Silicone Sealant meets the ASTM C920 requirements and aids in the overall waterproofing of the shower while resisting the growth of mold.

The monolithic membrane formed by liquid RedGard Waterproofing and Crack Prevention Membrane ensures that no voids will allow water through. When RedGard is used with qualifying mortars and grouts, the project may be eligible for CUSTOM's Lifetime System Warranty. See www.custombuildingproducts.com for details and limitations to the warranty.



About the Author

Steve Taylor is Director of Architecture and Technical Marketing for Custom Building Products and has more than 30 years of experience developing products for the construction industry.

Steve is a member of the Tile Council of North America (TCNA) and Materials & Methods Standards Association (MMSA). In these roles, he helps to determine proper tile installation methods and standards. This includes simplifying the tile installation process to save tile professionals time and money.

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