

Waterproofing Disasters



by Dave Gobis

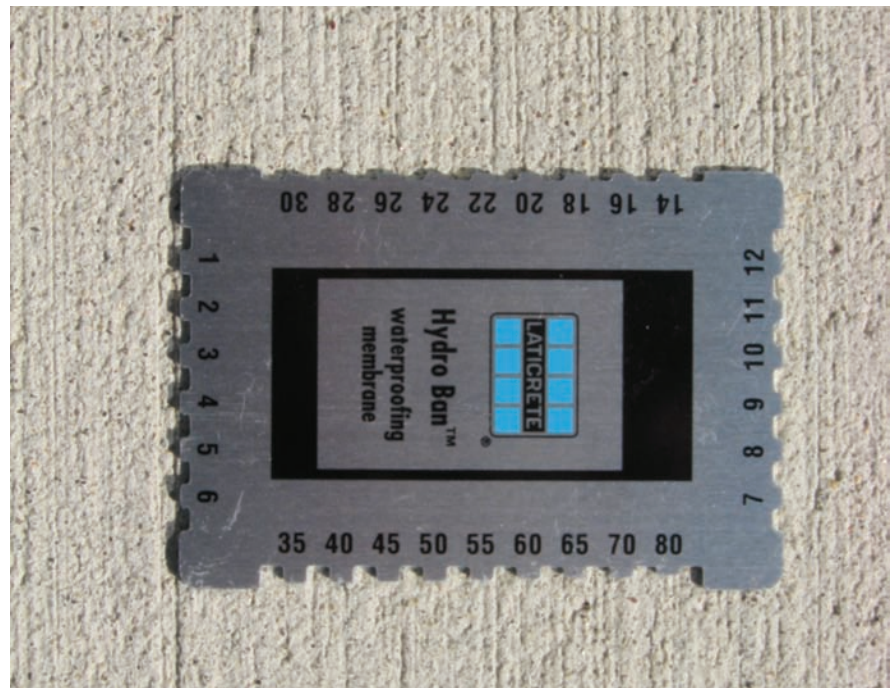
Good functional waterproofing systems and applications seem to be as elusive as ever if you're the one answering my phone and email. As I have mentioned in a few articles past, starting work this year as an independent consultant has been an eye-opening experience. Having been a trade educator, I knew things were less than perfect before starting this consulting job. I have been busy doing claims and consulting beyond my wildest imagination. Being on a different jobsite almost every week in various parts of the country, often to witness the carnage of tile work caused by poor waterproofing, has been a reawakening of sorts. The lack of knowledge, misunderstanding and field re-engineering of otherwise viable waterproofing systems seems to be vast.

One major international hotel group recently told me they are going to discontinue using ceramic tile in showers because they consistently have water leakage problems within months of opening their new or remodeled properties. Let me lend some perspective to how dramatic this has problem has become. I personally have been involved in claims on properties that represent over 2,900 leaky showers and floors so far this year. Tomorrow I board a plane once again to look at, you guessed it, leaky showers. 200+ leaky, moldy

smelling, efflorescing marble showers that were installed at a cost of \$1.2 million only 12 to 14 months ago. Not one of these jobs I have looked at thus far has been a product failure. They were all either misuse, abuse, or they used some of the famous and classic installer field engineering, because they know so much more about than the company that makes the product,

that we often find in failures. I thought it would be interesting to take a look at a real world situation I am currently involved in and how product selection can negatively affect both your finances and the owner's stress levels on income loss.

Most of the waterproofing products on the market today do exactly what they represent they will do if you follow



Liquid waterproofing products require sufficient thickness to be waterproof. This is done with a film thickness gage, which should be available from your selected manufacturer. If not, check with your local paint store. Photo courtesy of LATICRETE International.

About the Author

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This glass mat water-resistant gypsum backer board was installed over the shower pan liner into the mortar shower base. The panel's acrylic coating provides waterproofing properties. However, the instructions are very specific that it is to be placed above the mortar and sealed with a sealant. This shower failed after 8 months of use because the instructions were not followed.

the instructions and know the limitations of the product. The old adage of if it sounds too good to be true it remains alive and well. Many people gravitate towards liquid waterproofing products for their unmistakable ease of use. While that is undoubtedly true, liquids are some of the most widely abused waterproofing products. There are vast differences among products in both performance levels and application. Something that costs \$150 a pail is not the same as something that cost \$300 and just a different color despite the insistence of what is often a less-than-educated salesperson wanting to make a sale. Setting materials are very competitively priced. On the face of things, it is hard to say what is different about one product that is half the cost of another but rest assured, there is a difference. It may be the drying time, the application thickness requirement, the degree of waterproofing provided, or whether a reinforcing scrim is required among other possibilities.

On my current project there were three product choices submitted, all meeting the tile industry product standard ANSI A118.10. Product A costing \$320 per pail, provides the holy grail of waterproofing to tile installers, only two coats required, no reinforcing scrim necessary, and flood testing may be done in 12 hours, not days. Product B cost \$250 plus the cost of the polyester scrim reinforcing for a similar size unit (an additional \$125), requires pretreatment of all intersections, a minimum of 2 coats over reinforcing scrim and offers 24-hour flood testing. Product C costing \$175 installs in a similar fashion but requires a total of 3 coats and 72 hours prior to flood testing and the addition of the polyester scrim IF the product is required to meet industry standards. The tile guy of course likes the \$175 product which the distributor has misrepresented as being the same as the \$320 product which does not require a reinforcing fabric. Evidently despite his insistence that he has 14 years of experience

working for a national distributor of tile and related products, he has diminished reading ability because the manufacturer of the product clearly indicates that fabric reinforcing is required to meet standards, as required on this project. He also relayed that the consultant (that would be me) was stupid and didn't know what he was talking about. Unfortunately the tile guy bidding the job took the erroneous advice of his distributor, and elected to "save money" with the cheaper product. Let's take a look and see how this decision will affect his and the owner's schedule, keeping in mind as always, time is money.

The schedule for replacing these 200+ showers allows for 3 1/2 days per shower as agreed to by the contractor and owner. Several two-man crews will be used. On the current shower walls, the marble and gypsum panel must be removed back to the metal studs. On the floor they must remove the moldy paper-mounted mosaic tile, the 1 1/2" unreinforced concrete floor, the backer board curb nailed through the unsealed and too short leaky unsealed shower pan, then clean all the silicone off the top of the clamping ring which plugged the weep holes. Then, they have to put it all back together again the right way. Oh by the way, these upper end marble showers are only a year old and first started leaking about 6 months after installation. The showers will be rebuilt using cement backer board on the walls with a 90 degree mud curb and base. The owner desires a topically applied waterproofing as there is very low air flow in the rooms and they desire to reduce the amount of water entering and being held in the otherwise conventionally constructed shower system using a cement backer and mortar base. That will reduce the humidity level in the guest rooms and result in better air quality. So, let's go back and look at how the contractor's selection affects his bid and the owner's schedule. Keep in mind, this is rework on failed showers and damages are being assessed for each day the room remains unoccupied. Whether these damages will be paid by the contractor or an insurance company remains to be

For really big waterproofing projects many of the current liquid products can be sprayed on. The specific spray recommendations vary with each manufacturer but application is fast.





Some products lend themselves well to trowel application. The advantage of troweling is that the product is firmly engaged in the substrate and unlike rolling, the notches assure that adequate product is applied during each of the required layers.

determined. Both the owners schedule and the contractors bid assume 276 showers at 3 ½ days per shower or 966 man days for the contractor. Based on his estimate and rounding up to full days, that is 1,104 days of lost use for the owner. Can it be done? We will take a look at the variation in requirements for each product and how the contractor’s selection will affect the schedule of manning the job for the contractor and the loss of income for the owner.

The only commonality that the three approved liquid waterproofing products share is that they are in fact liquid. After that the individual requirements for each vary in application for a shower installation. Product application instructions for all products require that concrete or the mortar shower base and curb be adequately cured prior to application of the waterproofing. Depending on product, there is a recommended vapor emission rate of either 3 or 5 pounds per thousand square feet per manufacturer’s instructions. This is a term for vapor emission measurement commonly used for concrete slab construction. A specific test method is not called out in any of the waterproofing instructions. There are three common test methods for measuring moisture vapor emission in concrete. They are ASTM-F1869-04 Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using

Anhydrous Calcium Chloride, ASTM F2170-02 Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using In-Situ Probes and ASTM D4263-93 Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method. Keep in mind these methods as well as various electronic gauges available are primarily designed for and based on calculations for concrete slabs, not mortar beds. There are some electronic measurement devices available for mortar/plaster that is calculated on a percentage of moisture. When using Relative Humidity probes, moisture is expressed in percentage and 75% is considered an acceptable level. It is also generally accepted that mortar will dry sufficiently to meet that level for application of liquid waterproofing products 48 to 72 hours after installation of the mortar.

All of the products under consideration require multiple coats to provide effective waterproofing. Two of the products under consideration also require the use of a reinforcing polyester scrim throughout the installation if they are to meet the American National Standard Specifications for Load Bearing, Bonded, Waterproof Membranes for Thin-set Ceramic Tile and Dimension Stone Installation (ANSI A118.10). One product notes that if the standard need not be met, no reinforcing fabric is necessary; however this project is required to meet standards. These products also have minor variation in the minimum thickness, referred to as film thickness, to achieve the required waterproofing properties. This requires use of a film thickness gage. There is a recommended level of both wet and dry film thickness; this is referred to as mil thickness. One mil equals one thousandth of an inch. Wet film thickness varies on the approved products from .029 to .043 thickness and dry film (when cured) from .020 to .030. If enough material is not applied the waterproofing abilities of the product are limited. Sufficient product must be applied in multiple layers until the thickness requirement is met when checked with a film thickness gage for effective waterproofing. Insufficient coverage (film thickness) does not necessarily result in actual leaks until the area exposed to moisture becomes saturated. This could be days, weeks, or months before a leak would become apparent.

Any time you go to all the time and expense of waterproofing it should always be tested for waterproofness; this is called flood testing. It requires putting in a stopper or air bladder down in the shower drain pipe and filling with lower portion with water to a predetermined level. After a 24 hour period, you can return and measure for water loss. This vital step is often omitted for several reasons. One; the membrane must fully cure prior to

Product A requirements	Product B requirements	Product C requirements
2 day mortar cure	3 day mortar cure	3 day mortar cure
1 day membrane cure	2 day membrane cure	3 day membrane cure
1 day flood test	1 day flood test	1 day flood test
4 additional days	6 additional days	7 additional days



When fabric application is required, it is required that all corners must be pretreated. Smaller strips of fabric are applied to and then coated with a generous application of the waterproofing product.

flood testing. In this case, over a new mortar bed, that means the membrane needs to cure per manufacturers recommendations, a minimum of 24 hours at 70 and 50% RH for Product A (rather than the 12 hours for application over a cured slab) , 48 hours over new mortar for Product B, and 72 hours for Product C. If the temperature is any colder, or the humidity any higher, additional time will be required. The second reason flood testing is often omitted is it means even more time after one to three days of no activity in the shower while waiting for a product to cure. As can be expected, everyone is anxious to get the job completed and get the rooms rented once again.

As you may also suspect, both the contractor's work schedule and owner's occupancy schedule did not include adequate time to properly facilitate this portion of the project. The actual time of 3 ½ days to perform the reconstruction work itself seems adequate for a two-man crew with the right equipment. However, they have not allowed any drying time for the mortar bed prior to application of the waterproofing or cure time for the membrane prior to flood testing. This is where product selection can make a difference of days in time spent waiting for proper drying. Under manufacturer's recommendations the time not budgeted in the job varies per each product.

From a labor point of view, the additional amount of time required is minimal, probably the other half of the fourth day. However from an owner's point of view the additional time is quite substantial. The original lost income estimate based on the contractors submitted completion schedule at \$139 per room night was \$153,456. However, even using the fastest curing liquid waterproofing from the approved product list, product A, that figure would to double \$306,912 with the drying times required. The contractor also did not go with Product B which

would have resulted in \$383,640 in additional damages from lost revenue. Instead, the contractor went with the lowest-cost product available, Product C which brings the owners lost revenue (which he is responsible for) to \$422,004. How about that material cost savings which was most important to the contractor in calculating his price for the rework? He saved \$17,940 on materials but increased the owner's lost revenue damages by \$422,004. So, in his quest to save money on products and by not providing accurate information to the owner on the time need for curing or drying, the total dollar loss above the amount budgeted and submitted to the insurance carrier (who has not decided they will pay yet) was \$268,548.

This is a real job currently in progress. There are more than a few ironies here. For one, use of a different waterproofing system meeting standards but not submitted therefore not considered, could have actually brought the project in fairly close to budget. For another, due to being in a rush, poorly informed, or pure carelessness, not enough time was budgeted to properly complete the job. Unfortunately this year has taught me that re-work of this magnitude, while not commonplace, cannot be called

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exceptional. In the past month I have been at several properties that were in similar situations and facing the same type of repairs. All of these could have been avoided if instructions were followed the first time and proper installation techniques were used. As the old saying goes, never enough time or money to do it right the first time, but always enough time and money to fix it later. There is a plethora of waterproofing products available that provide varying degrees of protection from water intrusion. They are very specific in both their abilities and requirements for successful installations. Take the time to learn your favorite or selected product well and install it correctly and avoid financial disaster later. Work may not be currently plentiful in your local area, but I still have not heard of a truly good tile setter that cannot find work. Work will always be there to some degree for true craftsman of their trade. **FCI**