



# Flood Testing Procedures

## TDS 169

In many cases, where complete waterproofing is required (e.g. showers), flood testing of the membrane is recommended and may be required by applicable plumbing code. The practice of flood testing tile and stone installations which will be subjected to continuous submersion (e.g. swimming pools, fountains, etc...) or a significant amount of water flow (e.g. showers) is a critical step to ensuring that no damage is done to a structure due to water leakage. All too often this vital step is not performed due to time constraints, is performed improperly, or any results are not recognized for what they are. The purpose of this Technical Data Sheet is to provide a guide to properly conduct a flood test for installations to receive tile or stone as a finish material. Conducting a flood test properly can provide a measure of confidence that the waterproofing system performs as expected and provides a watertight installation for the service life of the system. Please note that ASTM D5957 "Flood Testing Horizontal Waterproofing Installations" is the ASTM method from which this Technical Data Sheet draws much of its information. For a more complete reference please visit [www.astm.org](http://www.astm.org) to purchase a copy of the complete standard. Please note that design professionals, engineers and others who are contractually obligated to a specific project may devise or require other means and methods to conduct a flood test.

Prior to flood testing a large area, ensure that the load bearing capacity of the structure to be flood tested is capable of supporting the water used to conduct the flood test. This step should be conducted by a licensed structural engineer who can ensure that building code and design restrictions are met. Lateral loads will be placed on curbs, walls and /or temporary containment assemblies, and the effect of the water load must be accounted for on these elements. Keep in mind that 1 gallon of water weighs 8.34 lbs (1.0 kg per L), or, approximately 1,685 lbs/yd<sup>3</sup> at 72°F (1,000kg /m<sup>3</sup> at 22°C). The loads imposed upon the structure while flood testing may affect the deflection of the structural system. Please note that minimum deflection requirements, as stated by the Tile Council of North America, must be met during the entire flood testing procedure.

To properly perform any type of flood testing it is critical that water is completely contained within the vessel being tested and that no water is allowed to escape through drains or other openings in the system. To this point, the following are acceptable devices for preventing water flow through the drain;

- pneumatically inflatable devices consisting of a rubber ball, draw chain and ring, and a preset, built-in pressure relief valve
- compression plug which has a screw
- other acceptable plumbing device

If required, temporary containment assemblies should be constructed using;

- nominal 2" x 4" (50mm x 100mm) wood members,
- 6 mil (minimum) polyethylene sheeting (sacrificial membrane\*)
- sandbags or other suitable ballast
- duct tape
- adhesives or sealants (as required)

Temporary containment may be required on open floors, ADA compliant showers, decks, patios and any other open areas where water may flow into adjacent spaces. Containment systems assemblies must be made to be non-destructive, non-penetrating of the waterproofing system and easy to remove. If a protection board or material is required prior to flood testing, the protection material must be loose laid and completely removed prior to commencing flood test procedure.

### **SHOWER PANS AND HORIZONTAL APPLICATIONS**

The purpose of this section is to provide a procedure for flood testing a horizontal waterproofing installation having a slope which is not greater than ¼" per foot (19mm per m), or 2% slope. These applications would include shower pans, patios/decks, parking garages, or most slopes to drains in commercial or industrial applications.

Flood testing should be performed prior to installation of any materials on top of the waterproofing membrane or material. Prior to beginning the flood testing, inspect the waterproofing membrane (e.g. HYDRO BAN®, HYDRO BAN Cementitious Waterproofing Membrane or 9235 Waterproofing Membrane) or other approved material type for any voids, pinholes or other imperfections. Repair any observed problems as stated by membrane manufacturer's installation instructions. Plug all drains within the area to be tested with suitable plugs, as stated previously. Fill the area around the plug and drain to check for leaks around the plug and drain installation before proceeding with the full test.

Flood the area being tested with potable water to a minimum depth of 1" (25mm) to a maximum depth of 4" (100mm) at the low point of the test area. The mean water depth should not exceed 2 1/2" (65mm). Water added to the area to be tested must be at a pressure that will not damage the membrane and will not flow onto any lapped edges. In case of any leaks it may be best to have a contingency plan in effect to deal with the water. If the flood test is being performed in an exterior environment, the testing should not be performed if rain is anticipated to occur during the test period.

For accurate measurement of water loss due to environmental conditions (evaporation, wind, etc...) it would be a good idea to place a watertight, flat-bottom, vertical-sided shallow pan to the approximate depth of water in an adjacent area which will be subjected to all of the same environmental conditions as the test area. At pre-determined points, in both the area being tested and the shallow pan, measure the water at the beginning and end of the test. Calculate any changes in water depth in the area being tested and the shallow pan. If the difference in depth in the area being tested is substantially greater than the shallow pan, then membrane leakage is probable.

Flood tests should be conducted within a time range of 24 – 72 hours, with the time for testing to begin when the water has reached its maximum test depth. It is important that flood testing be constantly monitored, so plan accordingly. If unexpected rain or water addition takes place during the test period, the test should be discontinued prior to the water flowing above the containment edges. The addition of any water after testing has commenced will also render the flood test as inaccurate and should be stopped. Monitor any spaces below the area being tested for signs of water infiltration at 1 – 2 hour intervals until completion of flood test. If any leakage occurs during the flood test, the water should be immediately drained, the leak source found, and repairs made as recommended by membrane manufacturer.

If repairs are made to the waterproofing system, it will be necessary to conduct another flood test to ensure that complete waterproof integrity is achieved. A flood test is successfully completed if no leaks are determined to exist during the test period, and, the membrane and any flashing are considered to be intact.

## **SWIMMING POOLS AND LARGE SCALE WATER FEATURES**

While the basics of flood testing swimming pools, fountains and other water features is basically the same in methodology as compared to showers, there are some major differences.

First, the basic scale of the flood test is much greater than a shower pan or horizontal application. Where a typical 3' x 4' (900mm x 1200mm) shower pan holds approximately 2 – 3 ft<sup>3</sup> (0.06 – 0.09 m<sup>3</sup>) of water, a 20' x 40' (6m x 12m) swimming pool which averages 6' (1.8m) deep holds 4,800 ft<sup>3</sup> (136 m<sup>3</sup>) of water which weighs over 300,000 lbs (136,000 kg).

Second, there are typically more penetrations through the walls of the pool or water feature structure which provide their own set of unique rules or circumstances when it comes to waterproofing. Swimming pools, fountains and water features have penetrations through floors and walls for drains, water inlets, outlets, lights, skimmers, overflows, and lane marking hooks. Each penetration requires specialized treatment to maintain the waterproofing integrity of the entire system, and the materials used to waterproof these penetrations must be compatible with the primary waterproofing material.

Third, the time it takes to properly flood test a swimming pool or large water feature is easier to measure with a calendar rather than a watch. To properly flood test a swimming pool, fountain or other large vessel a large amount of time may be required.

Lastly, the importance of properly flood testing a swimming pool, especially one that is located where water can penetrate into adjacent spaces and cause major damage, cannot be understated.

Allow the waterproofing membrane to cure for a sufficient amount of time based on the membrane manufacturer's instructions based on temperature and humidity. LATICRETE® products ideal for these installations include; HYDRO BAN®, a single component, self-curing, load bearing liquid rubber polymer waterproofing/crack isolation membrane that does not require the use of a reinforcing fabric. HYDRO BAN can be flood tested in as little as 2 hours @ 70°F (21°C) or higher †. Refer to LATICRETE DS 663.5, available at <https://laticrete.com> for more information.

HYDRO BAN Cementitious Waterproofing Membrane, a one component, polymer fortified, cement based waterproofing material that mixes with water. Allow HYDRO BAN Cementitious Waterproofing Membrane to cure fully before flood testing, typically 2 hours after final cure at 70°F (21°C) and 50% RH. Cold and/or wet conditions will require a longer curing time. For temperatures 50 – 69°F (10 – 21°C) allow 24 hours after final cure prior to flood testing. Refer to LATICRETE DS 386.2 for more information. Allow HYDRO BAN Cementitious Waterproofing Membrane to cure fully before flood testing, typically 2 hours after final cure at 70°F (21°C) and 50% RH. Cold and/or wet conditions will require a longer curing time. For temperatures 50 – 69°F (10 – 21°C) allow 24 hours after final cure prior to flood testing.

9235 Waterproofing Membrane, a self-curing, load bearing, liquid rubber polymer and reinforcing fabric which forms a flexible, seamless waterproofing/crack isolation membrane. 9235 Waterproofing Membrane requires 7 days cure time at 70°F (21°C) or higher. Cooler temperatures require a longer cure time.

LATAPOXY® Waterproof Flashing Mortar is a 3 component, epoxy-based, trowel applied waterproofing membrane which is specifically designed for use under ceramic tile and stone and can be flood tested in 24 hours at 70°F (21°C) or higher.

Prior to beginning the flood test procedure, conduct visual inspection of the waterproofing surface and look for pinholes, voids, uneven membrane coat thickness, creases, or other defects which may cause a leaking problem. Inspect around penetrations for any defects in sealant and/or membrane as well. If areas which may be compromised are noticed, it will be easier to affect repairs at the time of observation rather than after flood testing has commenced. If repairs are made, please allow the repair membrane to cure sufficiently prior to commencing flood test procedure.

To flood test, begin filling the pool, fountain or vessel with water at the rate of 1" (25mm) per hour to a depth of 2" to 4" (50mm to 100mm). Allow the water to remain at this depth for 24 – 72 hours to make sure that any drains, returns or other penetrations are not leaking. In effect, a phased/staged flood test will isolate specific elements (e.g. drains, pipes, windows portals, or other penetrations through the membrane) at various water depth levels. This approach makes it easier to identify leaks and to make appropriate repairs. For accurate measurement of water loss due to environmental conditions (evaporation, wind, etc...) it would be a good idea to place a watertight, flat-bottom, vertical-sided vessel (test vessel) with the approximate depth of water in an adjacent area which will be subjected to all of the same environmental conditions as the test area. At pre-determined points in both the areas being tested and the test vessel, measure the water at the beginning and end of the test. Calculate any changes in water depth in the area being tested and the test vessel. If the difference in depth in the area being tested is substantially greater than the test vessel, then membrane or penetration leakage is probable. If areas of leakage are observed then drain the pool, allow the membrane installation to dry completely and conduct repairs.

Pay special attention to sealants around any penetrations or in movement joints in the pool. Improperly installed or improperly used sealants may not be able to handle any loads or pressures exerted by the water. To better understand the pressure of water refer to the following; 2" (50mm) of water exerts 10.5 psi (72.5 kPa) of static fluid pressure; 6" (150mm) of water exerts 31.25 psi (215 kPa) of static fluid pressure; and 96" (2,440mm) exerts 500 psi (3,450 kPa) of static fluid pressure on all surfaces within the water. These pressures, especially at greater depth may be too much for a poorly installed sealant to handle and a leak may be the end result. This is just one reason why properly conducted flood tests require 24 – 72 hours.

If at this point, there appear to be no leaks, then slowly fill the pool to slightly above the next level of penetrations (e.g. water jets, inlets, etc...) and repeat the procedure as stated above. If there are any leaks then drain the pool to a point below the area that requires repair, allow the membrane to dry completely and conduct repairs.

If there are no leaks then continue filling the pool or vessel to slightly above the next level of penetrations (e.g. skimmers, lights, lane marker hooks, etc...) and repeat the process.

It is important to constantly monitor the flood testing procedure to better handle any situations, as they arise, and prevent possible water damage to adjoining spaces.

Currently, there are alternate types of testing that will evaluate a system for waterproofing integrity of large areas which are non-destructive and require little or no water. Some of these test methods include; Electrical Capacitance Testing, Nuclear Moisture Testing, Infrared Thermography, and Electric Field Vector Mapping. But let there be no mistake, the best way to ensure that a waterproofing system is installed properly and functions correctly is to use the highest quality, industry approved waterproofing materials and make sure that these products are installed properly and all time guidelines are followed.

It is important to note that tile adhesives, underlayments, grouts, sealants, tile, stone, or brick are not replacements for waterproofing materials and should not be considered as such. To make sure that a tile or stone installation system will provide protection from water penetration, a waterproofing membrane will be required.

\* Sacrificial membrane - a material used to form a temporary seal between a containment assembly and the waterproofing system.

† HYDRO BAN® can be flood tested in 2 hours after full cure at 70°F (21°C) or above and 50% RH. It can be flood tested in 24 hours after full cure at 50°F to 69°F (10° to 20.6°C) and up to 70% RH. The time to flood testing starts when the second coat has cured from a light sage green to a darker olive green color.

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