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 codes. The practice of flood testing tile and stone installations that 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 in ensuring that no damage occurs to a structure due to water leakage.

All too often, this vital step is not performed due to time constraints, is performed improperly, or the results are not properly interpreted. The purpose of this Technical Data Sheet is to provide guidance on properly conducting a flood test for installations that will receive tile or stone as a finish material. Conducting a flood test correctly can provide a measure of confidence that the waterproofing system performs as intended and delivers a watertight installation throughout the service life of the system.

Please note that ASTM D5957, *"Flood Testing Horizontal Waterproofing Installations,"* is the ASTM standard from which this Technical Data Sheet draws much of its information. For a more complete reference, please visit www.astm.org to purchase a copy of the full standard. Design professionals, engineers, or other parties contractually obligated to a project may require alternative means and methods for conducting a flood test.

Prior to flood testing a large area, verify that the load-bearing capacity of the structure is sufficient to support the water used during testing. This determination should be made by a licensed structural engineer to ensure compliance with applicable building codes and design limitations. Lateral loads will be imposed on curbs, walls, and/or temporary containment assemblies, and the effects of these loads must be accounted for.

Keep in mind that 1 gallon of water weighs approximately 8.34 lbs (1.0 kg/L), or about 1,685 lbs/yd^3 at 72°F (1,000 kg/m^3 at 22°C). The loads imposed during flood testing may affect the deflection of the structural system. Minimum deflection requirements, as stated by the Tile Council of North America (TCNA), must be maintained throughout the entire flood testing procedure.

To properly perform flood testing, it is critical that water is fully contained within the test area and that no water escapes through drains or other openings. Acceptable methods for blocking drains include:

- Pneumatically inflatable test plugs (rubber ball with chain and pressure relief valve)
- Mechanical/compression plugs with threaded expansion
- Other approved plumbing test devices

If required, temporary containment assemblies may be constructed using:

- Nominal 2" x 4" (50 mm x 100 mm) wood members
- Minimum 6 mil polyethylene sheeting (sacrificial membrane*)
- Sandbags or other suitable ballast
- Duct tape
- Adhesives or sealants (as required)

Temporary containment may be necessary for open floors, ADA-compliant showers, decks, patios, and other areas where water could migrate into adjacent spaces. Containment assemblies must be non-destructive, must not penetrate the waterproofing system, and must be easily removable.

If protection boards or materials are required prior to flood testing, they must be loose-laid and completely removed before beginning the 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 not greater than 1/4" per foot (19 mm per m), or 2%. These applications include shower pans, patios/decks, parking garages, and most sloped-to-drain conditions in commercial or industrial applications.

Flood testing should be performed prior to the installation of any materials over the waterproofing membrane. Before beginning the flood test, inspect the waterproofing membrane (e.g., HYDRO BAN®, HYDRO BAN 1, HYDRO BAN Cementitious Waterproofing Membrane, or 9235 Waterproofing Membrane), or other approved material, for voids, pinholes, or other imperfections. Repair any deficiencies in accordance with the membrane manufacturer's installation instructions.

Plug all drains within the test area using suitable devices, as previously described. Initially fill the area around the drain and plug to verify that there are no leaks at these locations before proceeding with the full test.

Flood the test area with potable water to a minimum depth of 1" (25 mm) and a maximum depth of 4" (100 mm) at the low point. The average (mean) water depth should not exceed 2-1/2" (65 mm). Water should be introduced at a rate and pressure that will not damage the membrane or cause water to flow over or into lapped seams. If leakage occurs, a contingency plan should be in place to manage water removal. For exterior installations, do not conduct flood testing if rainfall is anticipated during the test period.

To account for environmental water loss (e.g., evaporation, wind), place a watertight, flat-bottom, vertical-sided shallow pan filled to a similar depth in an adjacent area exposed to the same conditions as the test area. Measure water levels in both the test area and the control pan at the beginning and end of the test. If the water loss in the test area is significantly greater than in the control pan, membrane leakage is likely.

Flood testing should be conducted for a duration of 24 to 72 hours, beginning once the maximum test depth has been reached. Continuous monitoring is required throughout the test period. If unexpected rain or additional water enters the test area, the test should be discontinued before water exceeds containment limits. Any addition of water after the test has begun will invalidate the results.

Inspect areas below the test surface for signs of leakage at 1- to 2-hour intervals throughout the test period. If leakage is observed, immediately drain the water, identify the source, and perform repairs in accordance with the membrane manufacturer's recommendations.

If repairs are made, a new flood test must be conducted to verify the integrity of the waterproofing system. A flood test is considered successful when no leaks are detected during the test period and the membrane, including all flashing, remains intact.

SWIMMING POOLS AND LARGE SCALE WATER FEATURES

While the basic methodology of flood testing swimming pools, fountains, and other water features is similar to that used for showers, there are several important differences.

First, the overall scale of the flood test is significantly greater than that of a typical shower pan or horizontal application. A standard 3' x 4' (900 mm x 1200 mm) shower pan holds approximately 2–3 ft^3 (0.06–0.09 m^3) of water. In contrast, a 20' x 40' (6 m x 12 m) swimming pool with an average depth of 6' (1.8 m) holds approximately 4,800 ft^3 (136 m^3) of water, weighing over 300,000 lbs (136,000 kg).

Second, there are typically more penetrations through the walls and floors of pools and water features, each presenting unique waterproofing challenges. These penetrations include drains, water inlets and outlets, lights, skimmers, overflows, and lane marker anchors. Each penetration requires specialized treatment to maintain the waterproofing integrity of the system, and all materials used must be compatible with the primary waterproofing membrane.

Third, the time required to properly flood test a swimming pool or large water feature is extensive—often better measured in days rather than hours.

Lastly, the importance of properly flood testing a swimming pool, especially in areas where water intrusion could affect adjacent spaces, cannot be overstated.

Allow the waterproofing membrane to cure for the duration specified by the manufacturer, taking into account temperature and humidity conditions. LATICRETE® products suitable for these installations include:

- **HYDRO BAN®**: A single-component, self-curing, load-bearing liquid rubber polymer waterproofing and crack isolation membrane that does not require reinforcing fabric. It can be flood tested in as little as 2 hours at 70°F (21°C) or higher†. Refer to LATICRETE DS 663 for more information.

- **HYDRO BAN Cementitious Waterproofing Membrane**: A one-component, polymer-fortified, cement-based waterproofing material mixed with water. Allow full curing prior to flood testing. Under typical conditions (70°F / 21°C and 50% RH), flood testing may begin approximately 2 hours after final cure. For temperatures between 50°F and 69°F (10°C to 21°C), allow at least 24 hours after final cure. Cold or damp conditions will require longer curing times. Refer to LATICRETE DS 386.2 for more information.

- **HYDRO BAN 1**: A single-component, self-curing liquid rubber polymer waterproofing and crack isolation membrane applied in a single coat to form a flexible, seamless barrier. It is designed for extreme performance across a wide range of environmental and substrate conditions, including temperatures as low as 35°F (2°C), and is suitable for submerged applications such as swimming pools, fountains, and water features, as well as steam showers and steam rooms. HYDRO BAN 1 does not require reinforcing fabric in the field, coves, or corners and bonds directly to a wide range of substrates. It features a high-visibility green color with a color-change cure indicator to confirm readiness for flood testing. Under typical conditions (70°F / 21°C and 50% RH), it can be flood tested in as little as 2 hours after full cure†. At lower temperatures (35°F–69°F / 2°C–21°C), allow approximately 24 hours after full cure prior to flood testing. Refer to LATICRETE DS-65452 for complete details.

- **9235 Waterproofing Membrane**: A self-curing, load-bearing liquid rubber polymer system used with reinforcing fabric to form a flexible, seamless waterproofing and crack isolation membrane. Requires a minimum of 7 days curing at 70°F (21°C) or higher; cooler temperatures will extend cure time. Refer to LATICRETE DS 236 for more information

- **LATAPOXY® Waterproof Flashing Mortar**: A three-component, epoxy-based, trowel-applied waterproofing membrane designed for use under ceramic tile and stone. It can be flood tested after 24 hours at 70°F (21°C) or higher.

Prior to initiating the flood test, conduct a thorough visual inspection of the waterproofing surface. Check for pinholes, voids, inconsistent membrane thickness, wrinkles, or other defects that could result in leakage. Inspect all penetrations to ensure proper sealing and membrane continuity. Address any deficiencies before beginning the test, as repairs are more easily completed prior to flooding. If repairs are made, allow sufficient curing time before proceeding.

To begin flood testing, fill the pool, fountain, or vessel at a controlled rate of approximately 1" (25 mm) per hour to an initial depth of 2" to 4" (50–100 mm). Maintain this level for 24–72 hours to verify that drains, returns, and lower penetrations are watertight. This staged approach helps isolate potential leak sources at various elevations (e.g., drains, piping, window portals, or other penetrations).

To account for environmental water loss (e.g., evaporation and wind), place a watertight, flat-bottom, vertical-sided test container filled to a similar depth in an adjacent area exposed to the same conditions. Measure water levels in both the test area and the control container at the beginning and end of the test period. If the water

loss in the test area exceeds that of the control container, leakage in the membrane or penetrations is likely. If leakage is detected, drain the pool, allow the system to dry completely, and perform necessary repairs.

Special attention should be given to sealants at penetrations and movement joints. Improperly selected or installed sealants may not withstand hydrostatic pressure. For reference:

- 2" (50 mm) of water exerts approximately 10.5 psi (72.5 kPa)
- 6" (150 mm) exerts approximately 31.25 psi (215 kPa)
- 96" (2440 mm) exerts approximately 500 psi (3450 kPa)

These pressures, particularly at greater depths, can exceed the capabilities of improperly installed sealants and result in leakage. This is one reason why extended flood testing durations (24–72 hours per stage) are necessary.

If no leaks are observed, continue filling the pool to just above the next set of penetrations (e.g., inlets, jets) and repeat the testing process. If leaks occur, drain the water below the affected area, allow the membrane to dry completely, and perform repairs before retesting.

Continue this staged filling and testing process until all penetrations—including skimmers, lights, and lane anchors—have been tested.

Continuous monitoring throughout the flood testing process is essential to identify issues early and prevent damage to adjacent areas.

Alternative non-destructive testing methods are available for large-scale waterproofing evaluation, including electrical capacitance testing, nuclear moisture testing, infrared thermography, and electric field vector mapping. However, flood testing remains the most reliable method for verifying waterproofing system integrity when properly executed.

It is important to note that tile adhesives, underlayments, grouts, sealants, tile, stone, and brick are not substitutes for waterproofing materials and should not be relied upon as such. A dedicated waterproofing membrane is required to ensure protection against water intrusion.

*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.