



Tile Installation & Maintenance Guide

APPROVED AREAS OF INSTALLATION

Please refer to each product specification sheet for your tile selection.

SURFACE PREPARATION

Substrate Requirements

Floor systems, whether wood framed or concrete, over which the tile will be installed using the appropriate TCNA method, according to the Floor Tiling Installation Guide shall be in conformance with the international residential code (IRC) for residential applications, the international building code (IBC) for commercial applications, or applicable building codes.

Natural Stone Tile Installations on Post-Tensioned Concrete

Because dynamic movements of post-tensioned slabs have proven problematic for directly adhered natural stone, F111 is the only method of installing natural stone tile over post-tensioned slabs, on-ground or above-ground.

Proper Spacing for Wood Subflooring and Wood Underlayment's

Plywood subflooring, OSB subflooring, and plywood underlayment shall be installed with proper spacing between the sheets (typically 1/8" except if specified otherwise by the wood manufacturer). If the subfloor or underlayment is installed without proper spacing, this condition cannot be corrected by the tile installer. If expansion takes place in the wood subflooring or underlayment installed without proper spacing, the tile installation could fail.

Natural Stone Tile Installations Over Wood Substrates

Two layers of structural wood panels are required on floors to receive stone tile when backer board will be used as the tile substrate. The MIA prohibits installation of stone tile over single-layer wood floor systems under backer board because of the discontinuity of the system at seams between the subfloor panels. If an unbonded mortar bed will be installed as the tile substrate, a single layer of wood subflooring is permitted.

Natural Stone Tile Installation Over Frame Construction

Strongbacks, bridging, or other load-sharing members may be required within a wood framed system to reduce differential deflection between adjacent framing member: project design professional is responsible for determining the necessity of such. Without the use of such load-sharing members, deflection may differ significantly between adjoining members. Accordingly, for framed construction, an L/720 requirement has been specified while an L/360 requirement can be accepted for concrete/masonry substrates.

Mortar Coverage for Ceramic Tile

Average contact area for dry areas is 80% and for wet areas is 95%. Mortar coverage is to be evenly distributed to support edges and corners.

Mortar Coverage for Natural Stone Tile

Mortar coverage must be sufficient to prevent cracks in the stone resulting from voids in the setting bed. In dry and wet areas, the minimum coverage is 95% with no voids exceeding 2 square inches and no voids within 2" of the tile corners. All corner and edges of the stone tiles must be fully supported, and back-parging, or back-buttering, is recommended in all areas. Coating the back of the tile, however, does not constitute coverage, which is the area where the mortar makes contact with the tile and the substrate. It is not possible or practical to achieve 100% coverage consistently and such should not be specified.

Directional Troweling

To ensure proper coverage of the bonding surface of 8"x8" and larger tiles and to provide full support of edges and corners, select a notched trowel sized to facilitate the proper coverage. Key the mortar into the substrate with the flat side of the trowel. Comb with the notched side of the trowel in one direction. Firmly press tiles into the mortar and move them perpendicularly across the ridges forward and back to flatten the ridges and fill the valleys. This method can produce maximum coverage, with the corners and edges fully supported, without back-buttering or beat-in. Periodically remove and check a tile to ensure proper coverage is being attained.

High-Porosity Stone Tile

Installing high-porosity tones in hot, dry climates may require that the stone be presoaked prior to installation to prevent the stones from wicking excessive amounts of water out of the mortar and inhibiting hydration of the cement needed for bonding. Alternately, rapid-setting mortar can be used.

FLATNESS AND LIPPAGE

Flatness for Ceramic and Stone Tile Installations

The finish flatness requirement for ceramic tile installations is 1/4" in 10' from the required plane according to the ANSI A108.02. The finish flatness requirement for stone tile installations is 1/8" in 10' from the required plane according to MIA.

Lippage in Natural Stone Tile Installations

Lippage is a condition where one edge of the tile is higher than an adjacent tile, giving the finished surface an uneven appearance. Lippage in stone tile flooring is accentuated from what would be perceived in a ceramic tile installation for several reasons. First, natural stones tend to be installed with tighter joints, particularly because some stones require narrower joints to allow for the use of unsanded grout. Second, natural stones typically have slight or no chamfer at their edges. Third, many natural stones have a high-gloss, polished finish. Industry standards limit lippage between adjacent units of smooth-finished natural stone flooring to 1/32". When this is not achieved, there is the option of grinding the stone tiles in place to eliminate the lippage. This



work must be done by skilled, experienced technicians, with care taken to avoid a wavy-looking finished floor.

Lippage in Ceramic Tile Installations

Lippage is inherent in all ceramic installation methods and may also be unavoidable due to the tile tolerances, in accordance with ANSI A137.1.

Tile Type	Tile Size (in.)	Joint Width (in.)	Allowable Lippage (in.)
Glazed Wall/Mosaics	1x1 to 6x6	1/16 to 1/8	1/32
Quarry	6x6 to 8x8	¼ or greater	1/16
Pressed Floor and Porcelain Tiles	All	1/16 to less than ¼	1/32
Pressed floor and Porcelain Tiles	All	¼ or greater	1/16
Gauged Porcelain Tiles (GPT) and GPT Panels/Slabs	All	All	1/32*

***NOTE:** Due to the lack of warpage in Gauged Porcelain Tiles (GPT) and GPT Panels/Slabs, only the value in the chart shall be used as a guideline for identifying acceptable lippage. No additional calculation is needed when evaluating GPT or GPT Panels/Slabs.

GROUT JOINT SIZE, LAYOUTS, AND PATTERNS

Minimum Grout Joint Width

The minimum required joint width for ceramic tile and natural stone tile is 1/16". Setting ceramic or stone without a grout joint of at least 1/16", often referred to as a butt joint, does not provide sufficient accommodation for dynamic building movement, differential thermal expansion, or allowable variation in fabrication or manufacturing.

To accommodate the range in facial dimensions of the tile supplied for specific project, the actual grout joint size may, of necessity, vary from the grout joint size specified, the actual grout joint size shall be at least three times the actual variation of facial dimensions of the tile supplied. Example: for tile having a total variation of 1/16" in facial dimensions, a minimum of 3/16" grout joint shall be used. Nominal centerline of all joints shall be straight with due allowances for hand-molded or rustic tiles. In no circumstance shall the grout joint be less than 1/16".

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For running bond/brick joint patterns utilizing tiles with any side greater than 15", the grout joint shall be, on average, a minimum of 1/8" wide for rectified tiles and, on average, a minimum of 3/16" wide for non-rectified tiles. The grout joint width shall be increased over the minimum requirement by the amount of edge warpage on the longest edge of the actual tiles being installed. For example, for a rectified tile exhibiting 1/32" edge warpage on the longest edge, the minimum grout joint for a running bond/brick joint pattern will be 1/8" + 1/32" or 5/32", on average. Of necessity, in any installation, some grout joints will be less and some more than the average minimum dimension to accommodate the specific tiles being installed.

For running bond/brick joint and any offset patterns (i.e. non-continuous grout joints) utilizing tiles (square and/or rectangular) where the side being offset is greater than 15" (nominal dimensions), only patterns with an offset of 33% or less shall be specified. If a pattern with an offset greater than 33% is desired, the specifier and owner must approve a mock-up and the resulting lippage.

Tile Layout Considerations

Basic provisions for tile layout are given in ANSI A108.02 Section 4.3, however such may not be practical or applicable under the following conditions:

- The size and configuration of the room and the size of the tile make it impossible to center the layout in all aspects or avoid cut tiles less than ½ tile.
- The tile layout is continuous, flowing into multiple spaces, making it impossible to center the layout in all aspects to avoid cut tiles less than ½" tile.
- The overall layout and/or aesthetics are improved by laying out the tiles such that the layout is not centered in all aspects and/or not all cut tiles are at least ½ tile, for example to place a full tile or larger cut tile, or decorative element, in a high visibility location.
- Tile waste can be dramatically reduced using a layout that is not centered in all aspects and/or does not have any cut tiles less than ½ tile.

FINISHED TILEWORK & MAINTENANCE

Protecting New Tilework

To avoid damage to finished tilework, schedule floor installation to begin only after all structural work, building enclosure, and overhead finishing work, such as ceiling, painting, mechanical, and electrical work, are completed. Keep all traffic off finished tile floors until they have fully cured. Builder shall provide up to ¾" -thick plywood or OSB protection over nonstaining kraft paper to protect floors after installation materials have cured. Covering the floor with polyethylene or plywood in direct contact with the floor may adversely affect the curing process of grout and latex/polymer modified Portland cement mortar.



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Maintenance

All tile installations (especially exterior installations, which include the movement joint sealant) require periodic inspection and maintenance by the owner. Consult material manufacturers and maintenance product manufacturers for recommended procedures.

Visual Inspection of Tilework

When visually inspecting finished ceramic, stone, and glass tile installations, do so without magnification under the permanent intended lighting and without the use of additional lighting such as flashlights, spotlights, or temporary lights. View the installation 36" from walls and 60" or normal standing height from floors. Recognizing the hand-built aspect of tile installations, any aesthetic concerns not visible at these distances (but appear at closer distances) are acceptable under industry best practices.

WET AREAS GUIDELINES

Incorporation of a Drain/Slope to Drain

To fully evacuate water, shower pan membranes and bonded waterproof membranes must slope to and connect with a drain. Plumbing code typically requires membranes to be sloped a minimum of ¼" per foot and extend at least 3" above the height of the curb or threshold. Account for the perimeter floor height required to form adequate slopes. Membranes must be installed over other horizontal surfaces in wet areas subject to deterioration, like shower seats. They must be sloped and configured so as to direct water to the membrane connected to the drain.

Open Weep Holes

The weep holes of clamping drains enable water to pass from the membrane into the plumbing system. Crushed stone or tile or other positive weep protectors placed around/over weep holes prevent their blockage.

Membrane Connection with Drain or Integrated Bonding Flange

To form a watertight seal, membranes must have adequate contact with the clamping ring of the drain or with the bonding area of an integrated bonding flange.

In-Corners, Out-Corners, and Seams

Shower pan membrane in-corners should be folded not cut. For out-corner, such as where the shower curb meets the jamb, membrane manufacturers typically offer preformed out-corners to better enable wrapping of the membrane at the curb/jamb interface. For sheet-type bonded waterproof membranes applied topically, pre-made in-corners and out-corners enable waterproofing of corners without excessive material thickness that would result from folding. Sheet membranes in large areas are seamed, bonded, or otherwise welded together to form a continuous membrane.

Performing a Water Test

Where complete waterproofing is required such as in showers, water testing of the membrane, by the installing contractor, is recommended and may be required by applicable plumbing code.

**All information in the above Tile Installation & Maintenance Guide is sourced directly from the TCNA (Tile Council of North America) Handbook. All additional information needed can be found in the handbook. Please visit their website <https://www.tcnatile.com/> for more information. **