

# INSTALLATION GUIDELINES

## PLEASE READ THESE INSTALLATION INSTRUCTIONS CAREFULLY BEFORE BEGINNING INSTALLATION!

VILLI makes high-quality, architectural building materials. Installation of large format glass tiles requires skillful techniques and training, and it is essential to adhere strictly to the relevant instructions for installation. For this reason installation should only be carried out by properly trained professionals. The owner or end user of the tiles is responsible for determining the acceptability of the product for the particular installation being considered. If the customer has any doubt as to whether the tile is suited to the application being considered it is strongly suggested a call be made to Villi USA to discuss the concern.

### COLOR / SHADE

Glass always has its own natural coloring, which increases as the thickness/density increases. The color of the final consignment may deviate slightly from the color of the original sample. This is referred to as a shade variation and does not constitute any reason to return the goods. This color variation is reduced with Opti-Glass, but is not completely eradicated. We strongly recommend that all tiles should be dry-laid and examined for variation and shading prior to installation. VILLI USA assumes NO responsibility for problems related to product installation and No adjustments will be made after installation.

Important factors for a successful Villi installation:

### PREPARATIONS

The contractor is to examine substrates and advise the General Contractor and Architect of existing conditions and surface contamination requiring correction before work commences. Before starting, substrates are to comply with deflection requirements as defined by International Building Code (IBC), International Residential Code (IRC), or applicable local building code. Substrates are to be cleaned to remove curing compounds, sealers, soil, mortar, dirt, dust, etc. Curing compounds and sealers are to be mechanically removed (e.g. metal bead-blasting, grit / sand blasting, diamond wheel grinding with vacuum attachment). After removal of the curing compounds and sealers, all rough and uneven substrates are to be brought into required tolerances. For tiles with edges shorter than 15 inches (375mm), maximum allowable variation is ¼ inch in 10 feet (6 millimeters in 3 meters) from the required plane, with no more than 1/16 inch variation in 12 inches (1.5 millimeters variation in 300 millimeters) when measured from the high points in the surface. For tiles with at least one edge 15 inches (375 millimeters) in length, maximum allowable variation is 1/8 inch in 10' (3 millimeters in 3 meters) from the required plane, with no more than 1/16 inch variation in 24 inches (1.5 millimeters variation in 600 millimeters) when measured from the high points in the surface. For modular substrate units, such as exterior glue plywood panels or adjacent concrete masonry units, adjacent edges cannot exceed 1/32 inch (0.8 millimeters) difference in height. Use LATICRETE 3701 Fortified Mortar. Dry, dusty concrete or masonry surfaces must be water washed and excess water removed just prior to the application of LATICRETE installation materials.

### EXPANSION AND CONTROL JOINTS

Existing joints in substrate must be carried through the tile work and conform to architectural details. Expansion joints to be installed where tile work abuts restraining surfaces, such as perimeter walls, curbs, columns, corners, etc. Expansion joints to be installed at all "changes of plane" in tile work. Refer to Tile Council of North America (TCNA) Detail EJ-171 (Current Year) for industry recommendations.

### INSTALLATION OF CRACK SUPPRESSION MEMBRANE

Install HYDRO BAN® over all hairline cracks ( $\leq 1/8"$  or 3mm) in surfaces, prior to installing tiles, in accordance with the LATICRETE® written installation instructions. Refer to LATICRETE DS 663.0 and DS 663.5 for complete information.

### MIXING

Mix according to LATICRETE printed product instructions included with each product package.

### THINSET INSTALLATION OF TILES

Ensure that the backs of the glass tiles have been thoroughly washed, rinsed, and completely dried prior to installation. Use LATICRETE Glass Tile Adhesive Mortar to install tiles, via thin-set method. Installation is to comply with current revisions of ANSI A108.02 (3.1.1), A108.1B and ANSI A108.5. Use an appropriate sized notched trowel to facilitate full coverage of the thinset mortar to the backs of the tiles. Use the flat side of the trowel to firmly apply LATICRETE Glass Tile Adhesive Mortar onto the substrate. Next, apply LATICRETE Glass Tile Adhesive Mortar in a horizontal direction using notched side of the trowel. Use the flat side of the trowel to knock down the ridges and create a smooth setting bed. Check for voids and fill in where necessary. Next, back butter each clean, dry tile using LATICRETE Glass Tile Adhesive Mortar. Verify that 100% coverage has been achieved by removing a tile while the thin-set mortar is still fresh. The face of the glass tile can also be checked before setting to verify the appearance of full coverage. Tiles must be dry prior to installation to avoid the appearance of water spots on backs of tile. Apply glass tile into the wet thin-set mortar using firm, even pressure to establish contact and eliminate any voids. Remove excess thin-set mortar from in between tile edges. If voids or water spots in the thin-set mortar are visible through the tiles, remove the tile and correct the installation at this point. Allow the tile installation to cure a minimum of 48 hours at 70°F (21°C) prior to grouting. Clean excess thin-set mortar from the face of the glass tiles and joints between pieces while fresh, before it hardens.

### EPOXY GROUTING

Store liquid components of SPECTRALOCK® PRO Premium Grout† for 24 hours @ 70-80°F (21-27°C), prior to use, to facilitate mixing and application. Substrate temperature must be 40-95°F (4-35°C). Verify joints are free of dirt, debris, thin-set mortar or grout spacers. Sponge or wipe dust/dirt off glass and remove all water standing in joints. Cut open pouch and pour SPECTRALOCK PRO Premium Grout Part A Liquid into a clean mixing pail. Then open pouch and pour SPECTRALOCK PRO Premium Grout Part B Liquid into the mixing pail. Mix by hand or with a slow speed (<300 rpm) mixer until the two liquids are well blended. Then, while mixing, add SPECTRALOCK Grout Part C Powder and blend until uniform. For narrow joints, it is acceptable to leave out up to 10% of the SPECTRALOCK Grout Part C Powder to produce a more fluid mix. Install SPECTRALOCK PRO Premium Grout in compliance with current revisions of ANSI A108.02 (3.13) and ANSI A108.6 (3.0 - 4.0). Spread using a sharp edged, firm rubber float and work grout into joints. Using strokes diagonal (at 45° angle) to the grout lines, pack joints full and free of voids/pits. Then hold float face at a 90° angle to grouted surface and use float edge to "squeegee" off excess grout, stroking diagonally to avoid pulling grout out of filled joints. Once excess grout is removed, a thin film/haze will be left. Initial cleaning of the remaining film/haze can begin approximately 20 minutes after grouting (wait longer when temperatures are cooler). Begin by mixing one cleaning additive packet with 2 gallons (7.6 L) of clean water in a clean bucket to make cleaning solution. Dip a clean sponge into the bucket and then wring out cleaning solution until sponge is damp. Using a circular motion, lightly scrub grouted surfaces with the damp sponge to loosen grout film/haze. Then drag sponge diagonally over the panel surfaces to remove froth. Rinse sponge frequently and change cleaning solution at least every 50 ft<sup>2</sup> (4.7m<sup>2</sup>). Discard sponges as they become "gummy" with residue. Check work as you clean and repair any low spots with additional grout. One (1) hour after finishing first cleaning, clean the same area again following the same procedure but utilizing a clean white scrub pad and fresh cleaning solution. Rinse scrub pad frequently. Drag a clean sponge diagonally over the panel surfaces to remove froth. Use each side of sponge only once before rinsing and change cleaning solution at least every 50 ft<sup>2</sup> (4.7m<sup>2</sup>). Allow cleaned areas to dry and inspect panel surfaces. For persistent grout film/haze (within 24 hours), repeat scrubbing procedure with undiluted white vinegar and clean pad. Rinse with clean water and allow surface to dry. Inspect grout joint for pinholes/voids and repair them with freshly mixed LATICRETE® SPECTRALOCK® PRO Premium Grout†. Caution: Do not use acid cleaners on epoxy grout less than 7 days old.

### PORTLAND CEMENT GROUTING

Verify grout joints are free of dirt, debris, thin-set mortar and grout spacers. Sponge or wipe dust/dirt off all surfaces. Remove all water standing in joints. Surface temperature must be between 40-90°F (4-32°C). Mixing: Pour approximately 64 oz. (1.9 L) of clean, potable water into a clean mixing container. Add a 25 lb. (11.3 kg) bag of LATICRETE PERMACOLOR™ Grout to the container while



mixing. Mix with a slow speed mixer to a smooth, stiff consistency. Allow to slake for 5 minutes and remix. Install grout per current revisions of ANSI A108.1A (7.0 Grouting of tile), ANSI A108.02 (4.5 Cleaning tile) and ANSI A108.10. Dampen dry surfaces with clean water. Spread using a sharp edged, hard rubber float and work grout into joints. Using diagonal (at 45° angle to direction of grout line) strokes, pack joints full and free of voids/pits. Hold float face at a 90° angle to panel surface and use float edge to “squeegee” off excess grout, stroking diagonally to reduce pulling grout out of filled joints. Initial cleaning can begin when grout has become firm, typically 15-20 minutes after grouting @ 70° F (21°C). Higher temperatures may require faster time to initial cleaning; wider joints or lower temperatures may require a longer time to initial cleaning. Begin initial cleaning by lightly dampening the entire grouted area with a damp sponge. Then, wash clean the entire area with a damp (not wet) sponge. Drag a clean, dampened sponge diagonally over the panel surfaces to remove grout haze left after “squeegeeing.” Rinse towel/sponge frequently. Change rinse water at least every 200 ft<sup>2</sup> (19m<sup>2</sup>). Repeat this cleaning sequence again if grout haze is still present. Allow grout joints to become firm. Buff surface of grout with clean coarse cloth. Inspect joint for pinholes/voids and repair them with freshly mixed grout. Within 24 hours, check for remaining haze and remove it with warm soapy water and a nylon scrubbing pad, using a circular motion, to lightly scrub surfaces and dissolve haze/film. Do not use acid cleaners on latex Portland cement grout less than 10 days old.

## PROTECTION

The contractor must take precautions to protect the finished work from damage by other trades. Allow the cement grout to cure for a minimum of 7 days at 70° F (21° C) before aggressive cleaning.

## COLD WEATHER NOTE

The curing of installation materials is retarded by low temperatures and finished work should be protected for an extended period of time. Typically, for every 18° F below 70° F (10°C below 21°C), installation materials take twice as long to cure.

## GROUT JOINT WIDTH

VILLI glass tiles should be set with a minimum of 1/8 inch grout joint. We also recommend non-sanded grout to prevent any scratching on the tile surface. If applications call for sanded grout, we recommend the use of a soft rubber float to minimize the possibility of scratching the tile. After installation, it is recommended that the tile be cleaned with a commonly accepted grout cleaner, e.g. Aqua Mix (1-800-366-6877) or TEC (1-800-832-9023).

## CUTTING VILLI TILES

There are various ways to cut Villi tiles. These include:

### SCORING AND BREAKING

Scoring can be done using a glass cutter (tile cutter, e.g. hand cutter 6 or 8 mm carbide wheel housed in a ball bearing casing). The breaking is then done evenly, applying a constant pressure, using glazier's pliers. The cut edges should then be sanded with sanding pads, to minimize risk of injury. The lighter you score (apply the least amount of pressure to score the tile) the better it snaps – the glass tile does not break because of the force, it breaks because of the heat generated from the carbide wheel.

### USING A WET SAW

Using a wet saw may result in chipping on both the top and bottom of the tile causing an irregular edge and some color loss. Using a wet saw is only recommended when the cut area will be covered by more than ¼” of switch plate or molding. Wet saws generally are not recommended for cutting VILLI tiles. Most wet saws cannot cut the tile without excessive vibrations, which cause chipping. If you do use a wet saw, use a Glass Blade 10” wet saw blade which is made specifically for glass. In addition, the tile has to be cut extremely slowly: Example: One piece of 4x4 glass tile should take approx. 1-1/2 to 2 minutes to cut. Use masking tape or blue painters tape all the way around the tile when the cut is being made and cutting the tile upside down will prevent the backing from chipping as much and will put the worst edge on the front of the tile. This edge should then be sanded and re-polished if needed.

## USING A WATER-JET MACHINE

A water jet machine is an excellent option for cutting Villi products, especially for more difficult cuts. There is a difference in cutting glass versus stone. The water jet machines are set to 50-60,000 psi. For glass, it must be reduced to 18-20,000 psi. Also, there should either be a change to the metering disc to restrict the amount of sand that is used or a vacuum assist pump should be used. The water jet company can contact Villi for any further questions.

## TO CUT OUT A SECTION OF THE TILE E.G. FOR POWER OUTLETS

First, mark out the piece which needs to be cut out. Where the mark-out lines intersect, drill a hole with a diameter of at least 5mm. Using a wet drill bit designed for drilling glass tile, drill half way through the tile from the front, turn it over and then drill half way through from the back, meeting in the middle. This is necessary to avoid chipping and stress fractures once the tile is set. The cutting should then be done using a water-cooled glass saw. The saw should be positioned at right angles to the tile.

## DRILLING HOLES

Holes with a smaller diameter can be drilled using a diamond drill suitable for drilling glass, while constantly using cooling water. When drilling holes starting from a 10 mm diameter, care must be taken to drill on both sides. First drill on the colored side halfway through the tile, then drill on the glass side. This is necessary to avoid chipping the color and potential breaking due to stress. It is advisable to use a rabbet or similar aid. While drilling, it is essential to use cooling water.

## INSTALLATION OF BATHROOM FIXTURES & FITTINGS

When installing bathroom fixtures/fittings (e.g. toilets, sinks, mirrors, etc.) by means of screws, place suitable plastic washers between the screws/bearing surface and the glass tile. When you tighten the screws, the plastic washers ensure an even distribution of pressure and prevent the tiles from breaking under the stress.

## PLACING HARDWARE AND ACCESSORIES

- All hardware anchors or blocking for heavy objects must be set directly into the structure. Do not put any weight loads on the immediate substrate (cementitious board, greenboard, hardbacker, etc.) and never on to the glass tile itself.
- Shower doors and glass panel hardware should be set before setting glass tile. Do not set heavy items directly onto the glass. Blocking is required where doors attach to the wall. This reduces stress to the wall.
- The glass must be physically separated from towel bars, light fixtures, hooks, or any other hardware. Use cork material or 1/16” rubber sheeting to separate hardware from the glass tile. Cut to size and shape as needed.

## CLEANING INSTRUCTIONS FOR GLASS TILES

### GENERAL INFORMATION

Market research, studies and, above all, practical experience confirm that glass scores excellently well in comparison with other covering materials. The decisive criteria include, above all, long-lasting beauty and easy cleaning, together with high functionality, in both private homes and public areas. When using cleaning agents, please observe the instructions for use and the danger warnings given by the manufacturers. We cannot accept any liability for damage caused through failure to follow these instructions and warnings. Never use cleaning agents which contain hydrofluoric acid or any of its compounds (fluoride). Even when heavily diluted, these will corrode the glass tiles.

**Important: When cleaning, always also take the surrounding materials into account!**

### BASIC GUIDELINES

There is an old saying which has not lost its wisdom: “dirt which is never carried inside need never be cleaned away!” Shoe-scraper grids, doormats and walk-off areas in front of the entrance area stop a great deal of dirt from getting in. Optimal cleaning results can be achieved using clean water and a microfiber cloth: simply dampen the cloth and polish the glass tiles/mosaics – and finished! In the event of heavy soiling, glass should always be rinsed with clean water beforehand, to remove dust and silica sand. If cleaning agents must be used, then these should



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contain a small amount of alcohol or acid, and be used with a microfiber cloth. CAUTION: Please do not use any blades or lambskin – both of these cleaning aids can damage the glass! All cleaning devices must always be free of “grainy” elements.

## CLEANING

A distinction is made between the final building cleaning, basic cleaning and maintenance cleaning (daily cleaning).

### Final building cleaning or first cleaning

This refers to the cleaning at the end of building work, immediately after completing the surface. After the heaviest dirt has been rinsed off, the thorough cleaning is carried out using a suitable cleaning agent.

### Grout joints

Grout joints must always be protected by wetting them with water beforehand. Once they are saturated with water the joint sealer cannot absorb any further liquids (cleaning agents), and therefore cannot suffer corrosion. Acidic cleaning agents corrode the (cement-based) joint sealer. After use, rinse thoroughly and neutralize if necessary.

- Cement-based joint sealer: clean with cement residue remover
- “Epoxy” joint sealer (clinics): clean with silicone remover

### Tiles / Mosaics

Usually cleaned using basic sanitary cleaning agents (phosphoric acid – pH 0.5 – in a concentrated form: 5 – 10%), to achieve the highest possible degree of cleanliness.

### Facades

Each facade must undergo a final cleaning after being laid or mechanically mounted. Mechanically-held facades preferably require a neutral cleaning to remove oily and greasy dirt produced during assembly, while conventionally cemented facades require acid-based cleaning to remove the cement residue.

### Basic cleaning (precision building cleaning)

This is usually carried out using basic sanitary cleaning agents (phosphoric acid – pH 0.5 – in a concentrated form: 5 – 10%), to achieve the highest possible degree of cleanliness.

### Maintenance cleaning, cleaning for daily use

The “everyday cleaning” is trouble-free and will be necessary at varying intervals, according to the amount of dirt and use: weekly, daily, or several times a day in the event of especially intensive use. Generally, water and a microfiber cloth suffice for maintenance cleaning. We recommend cleaning with citric acid cleaning agents (pH 2 – 2.5) in sanitary facilities. Cleaning agents containing special care agents are not necessary and may even cause problems if continually used: sticky layers of grease, wax and plastic can build up, which not only look unsightly, but are also bad for hygiene, safety (danger of slipping) and cleaning.

### Sanitary areas

If cleaning agents are used, these should contain a small amount of alcohol, be free of tensides or be slightly acidic.

### Living areas

Normal dirt can be most easily removed using slightly alkaline (up to pH 10) or neutral cleaning agents.

### Cleaning in clinics

Surface disinfectants can be recommended with no problem: alcohol-based, spray-on and pour-on disinfectants, hand disinfectants, wound disinfectants.

## CLEANING DIFFERENT VILLI SURFACES

### Glossy and Matte

Clean using clean water and microfiber cloth, alcohol-based / tenside-free cleaning agent – acidic maintenance cleaning agent (sanitary areas). The “Matte” surface is virtually non-porous (i.e. grease- and oil-resistant) and should be cleaned in the same way as glass or a mirror surface.

CAUTION: DO NOT USE aggressive LIME-SCALE REMOVERS!

PLEASE NOTE: Do not use any cleaning agents which have a sealing effect or add a surface layer.

### Fossil, Structured Relief

The same method as in the final building cleaning is recommended, but in addition it is essential to thoroughly clean the surface “grooves”. Immediately rinse with a lot of water and clean the surface using cement residue remover. Clean using clean water and microfiber cloth, alcohol-based / tenside-free cleaning agent – acidic maintenance cleaning agent (sanitary areas)

### Skid Resistant (floor tile)

Clean using clean water and microfiber cloth, alcohol-based / tenside-free cleaning agent – acidic maintenance cleaning agent (sanitary areas)

### Deco Matte

CAUTION: Do NOT USE aggressive LIME-SCALE REMOVERS!

PLEASE NOTE: Do not use any cleaning agents which have a sealing effect or add a surface layer. Clean with clean water and microfiber cloth, alcohol-based / tenside-free cleaning agent.

### River Mosaic (mosaic pieces)

The toughened safety glass used for the manufacture of mosaic pieces is basically more “delicate” than float glass. The important thing is that, immediately after laying, the River Mosaic should be cleaned (see recommended final building cleaning) to remove any joint sealer residue from the fine surface lines.

Afterwards, thoroughly rinse with water. Clean with clean water and microfiber cloth, alcohol-based / tenside-free cleaning agent – acidic maintenance cleaning agent (sanitary areas).

## CONSULT RECOMMENDED ADHESIVE AND GROUTED PRODUCTS ON FOLLOWING PAGE.

## LIMITED WARRANTY

VILLI glass products are produced using a worldwide patented procedure. The organic color pigments are melted into the glass therefore no corrosion can occur and change the color. VILLI products are produced from homogeneous glass slates; they don't absorb water and are therefore frost resistant. VILLI products can be installed in and outdoors. VILLI products are manufactured in accordance with industry standards, and they are warranted to be reasonably free of defects in materials and workmanship. When properly handled and correctly installed, VILLI glass tiles are guaranteed to conform (within accepted industry standards and tolerances) to the manufacturer's declared specifications. Villi USA cannot accept responsibility for the performance of these products after they are installed. Except for the warranties set forth above, Villi makes no other warranties, expressed or implied, including but not limited to any implied warranties of merchantability or fitness for a particular purpose.

Additional information is available at [www.villiusa.com](http://www.villiusa.com)

## Physical Properties

Weight	8 mm Thickness • 4.1 lbs/sq.ft
Water	absorption 0%
Frost-proof	✓
Color-fast, no corrosion	✓
Light-fast	✓
Surface resistant to acid and lye	e.g. chlorine
Pigments are fused in and are therefore color-fast and do not corrode	✓
Scratch hardness on the Mohs scale	6
Break strength of tiles	795 lbs/sqi
Required for ceramic	280 lbs/sqi
Thermal expansion on temperature change of 100°C	1 mm/m
Electrical conductivity	0

## Tile Council Of North America - Product Test Results

Tests Run	Required Minimums		Test Results—Villi Glass Products
ANSI A137.2-2012 Section 7.9: "Thermal Shock Resistance of Glass Tile" (a.k.a. immersion test)	Visible defects? No		Observations? None
ASTM C648-04 (2009): "Standard Method for Breaking Strength of Ceramic Tile"	Mosaic and porcelain tiles = 250 lbf		Average of 640 lbf
	Glazed wall tiles = 150 lbf		
	Fused or Low temperature Mosaic Glass tiles = 250 lbf		
	Cast Mosaic Glass tiles = 350 lbf		
ANSI A137.1-2012 Section 9.6.1: "Wet Dynamic Coefficient of Friction (DCOF)"—Matte Finish	0.42 or higher		3 tiles tested Tile 1 = 0.82   Tile 2 = 0.84   Tile 3 = 0.72
ISO 10545-4: "Determination of Modulus of Rupture and Breaking Strength"	Fused Large Format Glass Tile	Min av breaking strength = 600 N	2767 N
		Min av MOR = 12 N/mm²	MOR = 68 N/mm²
Mohs' Scratch Hardness	No minimum		6 (same as Feldspar)
ANSI A137.2-2012 Section 7.7: "Shear Bond Strength of Glass Tile"	Large Format Glass Tile	28 Day dry: Min 150 PSI	Average = 392 PSI
		21 Day dry + 7 Day Submerged: Min 100 PSI	Average = 220 PSI
ASTM C372: Standard Test Method for Linear Thermal Expansion of Porcelain Enamel and Glaze Frits and Fired Ceramic Whiteware Products by the Dilatometer Method.	There is no standard for glass tiles		Test results are available on request

## Recommended adhesive and grouting products

VILLI recommends the use of the following LATICRETE products:

**Latex Portland Cement Thick Bed Mortar:** LATICRETE® 3701 Fortified Mortar  
**Crack Suppression Membrane:** HYDRO BAN®  
**Latex Portland Cement Thinset Mortar:** Glass Tile Adhesive Mortar  
**Stain-Resistant Epoxy Grout:** SPECTRALOCK® PRO Premium Grout  
**Polymer-Fortified Cement Grout:** PERMACOLOR® Grout

**Latex Portland Cement Unsanded Grout:** LATICRETE 1600 Unsanded Grout mixed with LATICRETE 1776 Grout Enhancer (*for joint widths less than or equal to 1/8 inch [3mm]*)  
**100% Silicone caulk:** LATASIL™

For questions relating to setting materials, please contact **LATICRETE International, Inc.**, Bethany, CT, USA

**Telephone:** 1 (203) 393-0010

**Fax:** 1 (203) 393-1684

**E-mail:** [technicalservices@laticrete.com](mailto:technicalservices@laticrete.com)

**Website:** [www.laticrete.com](http://www.laticrete.com)

Care should be taken when using light colored Villi products or light colored grout. Use a white colored adhesive to prevent shadowing through the tile and visible thinset bubbles in the grout lines. Back-buttering each piece of tile with the flat edge of the trowel will help to provide a void free installation; good contact with the mortar bed is also recommended – 100% coverage is needed! Larger tiles may require a larger notched trowel. Refer to current TCNA Handbook for Ceramic Tile Installations.