



SUBSTRATE REQUIREMENTS

For Tile

Properly preparing a substrate is one of the most important steps in a tile installation. The best installation is only as good as the substrate beneath it. Taking the time to properly prepare a substrate and address job-site conditions should be a priority. For best results, see individual Chembond Product Data Sheets and this document for substrate compatibility.

Environmental Requirements

- a. Maintain environmental conditions and protect work during and after the installation. Comply with trade and industry standards as well as the manufacturer's printed recommendations.
- b. When necessary, build a temporary shelter and use indirect auxiliary heaters to maintain an adequate temperature within the working environment and on the installation surfaces.
- c. Exhaust temporary heaters to the exterior to prevent damage to the installation, or injury to personnel from carbon monoxide emissions.
- d. In tiled areas, maintain substrate and ambient temperatures at no less than 10°C (50°F) and no greater than 35°C (95°F) during installation and for at least 7 days after completion, unless otherwise indicated in the product instructions and/or ANSIA108 installation standards.

Job-Site Examination

Before work commences, examine the areas to be covered and report any deficiency or adverse condition in writing to the general contractor, owner, developer or architect. Do not proceed with work until surfaces and conditions comply with requirements indicated in the manufacturer's instructions and in ANSIA108. For details, refer to the TTMAC Handbook for ceramic tile installation.

Substrate Requirements

1. GENERAL

- a. All surfaces must be structurally dry, sound, solid, dimensionally stable, clean and free of any substance or condition that may reduce or prevent the adhesive's bond to the substrate. These include, but are not limited

to, concrete sealers or curing agents, dirt, wax, tar, paint and loose toppings. If the surface contains these substances, they must be mechanically removed.

Note: The use of solvents, adhesive removers or acid etching is not recommended.

- b. Unless sanding or scraping a slab can produce a clean substrate that is free from contamination, more aggressive methods such as grinding, shotblasting and scarification should be considered.
Note: It is important to follow safety guidelines for the specific substrate, as well as local, provincial and federal regulations.
- c. All supporting surfaces should be structurally sound, solid, stable, level, plumb, and true to a tolerance in plane of 3 mm in 2,44 m (1/8" in 8 ft.) for walls and 6 mm in 3,05 m (1/4" in 10 ft.) for floors. (See current TTMAC guide and ANSI guidelines for details.)
- d. Substrates should be free of deflection that could damage the flooring or installation materials. These are industry standards required by most floor-covering manufacturers. In all cases, the structural design of the floor should not allow a deflection greater than 1/360 of the span (1/720 for natural-stone installations) when measured under a 136-kg (300-lb.) concentrated load (see ASTM C627).
- e. If installation over a radiant-heating system is approved, the system should be turned off at least 24 hours before and until 48 hours after the installation. Prior to installation, check with the ceramic tile manufacturer regarding the radiant-heating system compatibility. Follow current TTMAC Detail 301MJ.

2. CONCRETE

- a. Concrete surfaces should be dry and fully cured (for at least 28 days), and conform to ACI 302 standards. They also should have a minimum density of 1,601 kg per m³ (100 lbs. per ft.³) as well as a compressive strength greater than 20,7 MPa (3,000 psi) for residential installations and 30 MPa (4,350 psi) for commercial installations.

- b. Per ASTM F1869, water vapor emission from all slabs should not exceed 1,36 kg per 92,9 m² (3 lbs. per 1,000 ft²) over 24 hours unless otherwise stated. ASTM F2170 is also a method of detecting moisture (relative humidity) in a concrete slab. Moisture meters are useful in verifying moisture's presence and determining where to set up calcium chloride tests. Though an accurate test, the floor-covering industry as a whole has not determined an acceptable percentage of relative humidity. Floors with greater than 1,36 kg per 92,9 m² (3 lbs. per 1,000 ft.²) over 24 hours or with relative humidity greater than 75% should be pretreated with a compatible moisture-reduction barrier.
- c. On-grade and below-grade concrete slabs must be installed over an acceptable and effective vapor barrier, per industry standards.
- d. Concrete porosity should be noted. It is always a good practice to perform bond tests before large-scale installations.
- e. New concrete surfaces should be wood-floated or broom-finished, because a smooth steel-troweled finish can reduce adhesion and greatly extend the products' setting times. If needed, mechanical shotblasting can be used to roughen an excessively smooth surface. Mechanically prepare a concrete substrate to a minimum ICRI CSP #3 profile for setting mortars, and an ICRI CSP #5 profile for levelers and toppers. Overtroweled slabs (that is, slabs with an extremely smooth finish due to excessive power-troweling) are not acceptable.
- f. Excessively absorbent (porous) concrete surfaces can pull moisture from setting materials too rapidly. Surface grinding can be used to smooth an excessively porous or rough surface. If surface grinding is unfeasible, keep the concrete substrate continuously moist for at least 24 hours before work begins. Then remove all excess water or standing water, allowing the surface to become almost dry to provide an SSD (saturated surface-dry) condition before installing the setting mortar.
Note: Self-leveling products and their primers should not be installed over porous concrete.
- g. Safe pH levels range from 5 to 9 on the pH scale. Use distilled water and litmus paper or a pH pencil to identify the pH. Neutralize pH levels that are too high or too low by removing surface salts through sanding or scrubbing with clean water.
Note: A high-alkali slab (with 10 to 14 pH) can signify a moisture problem. If a pH problem is found, the slab should be tested for moisture.

3. CEMENT BACKER UNITS

Cement backer units (CBUs) should conform to the quality standard requirements of ANSI A118.9. They must be installed per the instructions of the CBU manufacturer and in strict accordance with ANSI A108.11 standards for interior installation of cement backer units.

4. EXTERIOR WALL SURFACES

When surface waterproofing is required, apply a manufacturer's approved thin load-bearing waterproofing membrane with a flat trowel. If necessary and prior to waterproofing, apply a thin coat of a manufacturer's approved flexible acrylic Portland-cement mortar about 1,5 to 3 mm (1/16" to 1/8") thick to cover the entire concrete, masonry or CBU substrate. Allow the coating to dry and cure for at least 24 hours before installing tiles. (See respective Product Data Sheets for details.)

5. WOOD

Quality wood substrates are typically acceptable for residential and light commercial applications in dry areas. All wood subfloors shall be properly ventilated and acceptable to local codes and requirements. Local building codes as well as TTMAC guidelines should be followed for installing a wood substrate.

Note: It is important to know and understand underlayment grading. Ensure that your choice of substrate is an approved underlayment grade.

- a. **Plywood underlayments** must be of Group 1 exterior-grade plywood, CC plugged or better, conforming to CSA 0121.
- Plywood and flooring manufacturer's approved subfloor and underlayment should not be used in wet areas.
 - Plywood should not be used as a substrate on walls.
 - Plywood subfloors and underlayments should consist of at least two layers, each of a nominal 16 mm (5/8") in thickness, allowing a minimum total thickness of 32 mm (1-1/4") vs. a minimum 38 mm (1-1/2") for installing natural stone.
 - Plywood surfaces should be installed with the smooth side facing upward, with the face grain running perpendicular to the framing.
 - When using a latex-modified thin-set mortar or ceramic-tile adhesive for floor-tile installations, leave a gap of 3 mm (1/8") between sheets.
 - When using an epoxy mortar for floor tile installation, leave a gap of 6 mm (1/4") between plywood sheets.

- Leave a gap of 6 mm (1/4") around drainpipes, conduits, posts, columns, and along wall and curb bases.
 - Stagger (offset) individual sheets of subfloor and underlayment per industry standards.
 - All layers should be fastened per the manufacturer's recommendations over a joist span of 40,6 cm (16") on center (see Product Data Sheets for any alternatives). Contact Technical Services when joists are spaced greater than 40,6 cm (16") on center.
 - Plywood should be screwed 15 cm (6") around the perimeter and 20 cm (8") on center in each direction throughout the panel's body.
 - Underlayments should be properly acclimatized (for at least 24 hours) to in-service conditions. Moisture content should be between 8% and 10% at the time of surface preparation and ceramic-tile installation.
- b. **Strip and plank wood flooring** are not approved as primary substrates for ceramic tile. These floors produce considerable movement with moisture or humidity. Many flooring manufacturers require removal or covering of these floors with an approved underlayment. Therefore, plank or board floors should be covered with one layer of exterior-grade plywood that is 19 mm (3/4") thick. Each sheet should be fastened with screws 20 cm (8") on center in all directions and around the perimeter. Leave proper spacing between the plywood sheets and between all materials they abut.
- Adjacent edges of the plywood underlayment sheets should not deviate more than 1 mm (1/32") out of plane.
- c. **Other approved underlayments and substrates** are those approved and warranted by the flooring manufacturer and/or the underlayment manufacturer for the specific type of installation.

6. GYPSUM WALL SURFACES (for interior dry areas only)

Unless specifically approved by Technical Services, the use of any setting material directly over gypsum floor underlayments is not recommended, as they do not meet the requirements set by ASTM F710 (at least 24,1 MPa [3,500 psi]).

- Gypsum levelers and gypsum patching compounds are not acceptable substrates for installing ceramic tile.
- Prime all gypsum drywall and plaster wall surfaces with the tile manufacturer's approved primer before installing ceramic wall tile. Allow drywall or plaster primer to dry completely before applying an approved adhesive for ceramic wall tile or an approved latex-modified thin-set mortar.

7. EXISTING RESILIENT FLOORING

- a. Vinyl composition tile (VCT), vinyl asbestos tile (VAT) and noncushioned felt-backed sheet vinyl are the only approved resilient floorings for installing ceramic tile over and only when they are properly prepared. These must be completely clean (free of dust, wax, grease, sealer, soap residues and all substances that may reduce or prevent adhesion), well-adhered and slightly scuffed on the surface (VCT and noncushioned felt-back sheet vinyl only) to enable good adhesion. See the most recent TTMAC 323RW and 324F details.
- b. For installations of ceramic tile over existing resilient flooring, always follow the flooring manufacturer's guidelines.
- c. Caution: Follow the RFCI's "Recommended Work Practices for Removal of Resilient Floor Coverings" as well as any local, provincial and federal regulations if you even suspect the flooring or adhesive involved contains asbestos fibers or crystalline silica. Do not affect the structure of the material in any way in a dry state. For best results, contact an asbestos removal specialist.
- d. Resilient floor coverings other than those stated above should not be installed over.

8. EXISTING ADHESIVES

- a. Any existing adhesives, including cut-back from previous flooring installations, should be completely removed so that only an "adhesive residue" (which is no more than a surface discoloration) remains. An "adhesive residue" is left when the existing adhesive has been mechanically removed, as with a razor scraper, from a substrate without actually removing the substrate surface. Again, follow the RFCI's "Recommended Work Practices for Removal of Resilient Floor Coverings" as well as any local, provincial and federal regulations as noted above.
- b. Solvents and adhesive removers should not be used, as traces of them may remain before a tile installation. A sharp scraper and some effort will remove any existing adhesive.
- c. If an existing adhesive cannot be properly removed from a wood substrate, an approved wood underlayment may need to be installed over the existing adhesive.

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9. OTHER SUBSTRATES

- a. Pavers, quarry tiles, masonry block, cement terrazzo, cement-based mortars and leveling coats all must be installed per the manufacturer's recommendations.
- b. Gray cement terrazzo, ceramic and porcelain tile should be completely secure, well-bonded and clean, with the surfaces mechanically profiled through sanding or grinding.
- c. Metal substrates must be solid, stable (see Section 1.d.) and free of oxidation, oil, paint and any substance on the surface that may reduce adhesion. A rough profile will increase bond strength. Call Technical Services for details.
- d. Walls should be free of dirt, dust, wall coverings, paint and any substance that may prevent or reduce adhesion.

10. NONAPPROVED SUBSTRATES

- Presswood, particleboard, chipboard, Masonite, Lauan, solid wood planks, engineered hardwood floor, oriented strand board (OSB), asbestos board, poured epoxy floors and any dimensionally unstable materials are not acceptable substrates.
- Fire-treated plywood, pressure-treated plywood and marine plywood are not approved substrates, as the chemicals that they contain may prevent or reduce a proper adhesive bond.

Expansion and Controls Joints

- a. Chembond setting materials should not be applied over expansion joints, control joints, cold joints or any moving joint in a substrate. These joints are designed for movement to prevent damage within the slab. Consult the tile manufacturer's recommendation for addressing all joints.
- b. Do not cover or bridge expansion joints with tile.
- c. Provide for expansion and control joints within the tile work where specified or where necessary. Refer to current TTMAC Handbook, Detail 301MJ.
- d. Cut tiles on both sides along the edges of expansion joints or control joints, or design the layout to accommodate continuation of the joint through the finished floor. Protect the tilework with metal strips along both edges of structural building expansion joints.
- e. Install the specified compressible bead and sealant in all expansion and control joints.

This guide has been created to help you achieve a successful installation. The best way to confirm a successful installation method is to perform site tests for bond and compatibility. For details or information regarding circumstances not listed, call Technical Services at 1-888-243-6263.

Important Notice

Before using, user shall determine the suitability of the product for its intended use, and user alone assumes all risks and liability whatsoever in connection therewith. Any claim shall be deemed waived unless made in writing to us within fifteen (15) days from date it was, or reasonably should have been, discovered.

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