Preparation of Cast-In-Place Concrete

TDS 168

Every day, the tile and stone installation community run into a common occurrence; namely, the preparation of cast-in-place (poured in place) formed concrete walls. These can be any poured concrete walls and can be found in, but are not limited to, foundations (basements), swimming pools, walls, tilt-up concrete walls, and pre-cast concrete planks.

Keep in mind that if concrete walls, or other pre-cast concrete building element, are cast-in-place, they had to be formed. Therefore, if they are formed, then we must assume that form release oils were used to coat the forms. The form release oils allow the forms to be easily removed from around the concrete after it has hardened. We must assume that form release oils or other potential bond breakers exist in **ALL** of these conditions and must therefore proceed accordingly. For the benefit of everyone involved (tile contractor, GC, owner, etc…) we **MUST** ensure that the proper steps have been taken to prepare the substrate to receive LATICRETE® installation materials. This information is also appropriate for pre-cast tilt up concrete walls that may be treated with form release agents and curing compounds during the casting process.

In addition, note that the comments and suggestions in this document can be applied to all substrate types that may have bond breaking or bond inhibiting materials present (i.e. curing compounds, surface hardeners, sealers, etc…).

The following is a typical statement on the preparation of substrates found in our product data sheets, how to install guides, specifications and execution statements generated from the LATICRETE Architectural Guidebook: **"All substrates must be structurally sound, clean and free of dirt, oil, grease, paint, laitance, efflorescence, concrete sealers or curing compounds".** This means that anything that may inhibit the bond of any material directly adhered to the surface must be removed from the surface prior to installation.

Please note that it is not, and should not be, the responsibility of LATICRETE International to provide the "means and methods" to achieve this requirement. In the LATICRETE statement for surface preparation; we typically state what needs to happen in order to have a suitable surface to achieve a bond. It is ultimately the contractor and others contractually obligated to the project to employ suitable methods and means to make it happen.

Therefore, our suggestions to prepare formed concrete on this matter (as excerpted from the Technical Design Manual for Direct Adhered Ceramic Tile, Stone and Thin Brick Facades) are as follows:

Water Blasting

High pressure water blasting, using pressures from 3,000 psi - 5,000 psi (20.6 MPa - 34.5 MPa) will remove the surface layer of concrete and expose aggregate to provide a clean, rough surface. Thorough rinsing of the surface with water after water blasting is necessary to remove any weakened cement paste (laitance) residue. Water blasting is only recommended on concrete because the high pressure will damage surfaces of thin, less dense materials such as cement boards or brick masonry.

Mechanical Chipping, Scarifying and Grinding

For preparation of walls, this method is recommended only when substrate defects and/or contamination exist in isolated areas and require bulk surface removal greater than ¼" (6mm) in depth. Chipping with a pneumatic square tip chisel or grinding with an angle grinder are common techniques.

Shot-blasting

This is a term for a surface preparation method which uses proprietary equipment to bombard the surface of concrete with pressurized steel pellets. The pellets, of varying diameters, are circulated in a closed, self-contained chamber which also removes the residue in one step. This is the preferred method of substrate preparation when removal of a thin layer of concrete surface is required, especially removal of surface films or existing painted concrete. However, only hand held equipment is currently available for vertical concrete, so preparing large areas with this method is inefficient.

Sandblasting/Grit-blasting

The coatings industry now employs a new generation of cleaner, safer, and less intrusive grit-blasting which employs water soluble low-silica grit materials (sodium bicarbonate). Sandblasting is acceptable if other safer and less intrusive methods of bulk removal are not available.

Dustless Blasting

Dustless blasting utilizes water to moisten dust that is usually created from sand or other blasting media fragmenting when it hits a product's surface. This can be done in a variety of ways from mixing water and sand inside the blast pot to injecting water into the sand at the tip of the blast nozzle. Whichever method is used, it will reduce dust when sandblasting. This method is generally preferred for applications used in conformance to current OSHA regulations

In addition to the above mentioned methods, other methodologies which mechanically abrade contaminants from concrete also exist. After the substrate preparation has been performed, a final cleaning is also necessary. Note the following excerpt from the same technical design manual:

Final Surface (Residue) Cleaning
The final and most important step of substrate preparation is the final cleaning, not only of the residue from contamination and bulk removal processes described above, but also cleaning of loose particles and dust from airborne contamination. It is recommended to use a water pressure washer with a pressure of between 1,000–3,000 psi (6.9 – 20.6 MPa). The final cleaning is considered the minimum preparation for all substrates. Wall substrate surfaces to receive direct adhered cladding will always be exposed to varying degrees of airborne contaminants, especially normal construction site dust. Therefore, minimum preparation by washing with pressurized water (or standard pressure water and some agitation if pressurized water is not available) is required to eliminate the bond breaking effect of dust films. In some cases, airborne contamination is constant, requiring frequent washing just prior to installation of cement leveling plaster/renders or adhesive mortars. There is no exception from this general rule; and the only variation is the drying time of the substrate prior to application of the adhesive. Building sites located near the sea, deserts, or industrial areas may be subject to airborne salt, sand, or acidic rain/pollution contamination, especially if there is a significant lapse of time between the completion of the substrate work and adhesion of the cladding or cement plaster/render.

Once the concrete surface has been cleaned of any potential bond breaking materials it is required that certain subsurface tolerances must be met to facilitate a tile installation. As stated in both the ANSI standards (ANSI A108.01 2.6.2.2 and TCNA Handbook for Ceramic, Glass, Stone Tile Installation; for thin-bed ceramic tile installations when a cementitious bonding material will be used, including medium bed mortar: maximum

allowable variation in the tile substrate – for tiles with edges shorter than 15” (375mm), maximum allowable variation is ¼” in 10’ (6mm in 3m) from the required plane, with no more than 1/16” variation in 12” (1.5mm variation in 300mm) when measured from the high points in the surface. For tiles with at least one edge 15” (375mm) in length, maximum allowable variation is 1/8” in 10’ (3mm in 3m) from the required plane, with no more than 1/16” variation in 24” (1.5mm variation in 600mm) 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” (0.8mm) difference in height. Should the architect/designer require a more stringent finish tolerance (e.g. 1/8” in 10’ [3mm in 3m]), the subsurface specification must reflect that tolerance, or the tile specification must include a specific and separate requirement to bring the subsurface tolerance into compliance with the desired tolerance.

For thick bed (mortar bed) ceramic and stone tile installations and self-leveling methods: maximum allowable variation in the installation substrate to be ¼” in 10’ (6mm in 3m).

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