



# Concrete Curing Compounds and Surface Hardeners

## TDS 154

### CONCRETE CURING COMPOUNDS:

Curing compounds and surface hardeners are used to seal the surface of fresh concrete and prevent rapid loss of moisture. These consist of liquids containing film-forming polymers (curing compounds) and metallic and non-metallic materials (surface hardeners).

There are basically two types of curing compounds: 1) permanent, impervious curing compounds and 2) temporary curing compounds, also known as chemically dissipating or oxidizing compounds.

Permanent curing compounds will inhibit the bond of any mortar used for installing ceramic tile and stone because the curing compound has filled all of the pores of the concrete; this means the mortar gets little or no mechanical bond to the concrete. Complete removal of the permanent curing compound is the only way to ensure a successful ceramic tile installation using a portland cement based setting material. The only way to achieve complete removal of the permanent curing compound is to scarify the concrete down to a level below the penetration of the curing compound. The scarifying action opens pores of the concrete so that the mortar can achieve a strong mechanical bond. Some examples of mechanical scarification include shot blasting, bead blasting, high-pressure water blasting, and abrasive blasting.

Temporary curing compounds (also known as chemically dissipating or oxidizing curing compounds) will gradually dissipate through chemical reaction or oxidation from solar exposure when allowed to do so. Relying on oxidation is not a feasible alternative unless it is exterior concrete construction that is exposed to the sun for an extended period of time. Temporary curing compounds can leave behind a film even after the compound has fully dissipated. The film that is left behind from the curing compound must be completely removed before attempting to install ceramic tile with a mortar. Mechanical abrasion can be used to get rid of temporary curing compounds. Some examples of mechanical abrasion are bush hammering, planers and grinders and if these methods do not remove the curing compounds adequately; there will be a need to resort to mechanical scarification.

There is one type of concrete curing compound and sealer which is based on sodium silicate liquids. When this type is applied to a concrete surface there is a chemical reaction between the sodium silicate in the solution and the free calcium salts released by the hydration of Portland cement. The sodium reacts with the calcium to form a calcium silicate which is insoluble, hard, and chemically part of the concrete. Consult with the manufacturer of the curing compound products to verify compatibility of their products when installing tile or stone with the direct bond, thin bed method. LATICRETE recommends mechanical scarification to remove ALL curing compounds or surface hardeners.

There is one simple field test that can tell if there is potentially a curing compound or sealer on concrete. One can place drops of water on the concrete and see if the water beads up. If the water does not readily absorb, there will be a need to scarify or abrade the concrete before starting a ceramic tile or natural stone installation. It is always recommended to conduct a small test area to determine the quality of adhesion onto the concrete substrate.

Chemical removal of curing compounds using acids is not recommended because the chemicals must be completely neutralized prior to installing ceramic tile or stone with a mortar. Improper removal techniques could cause failure of a ceramic tile or stone installation. Acids should not be allowed to go into public water drainage systems when attempting to remove them.

Prior to the installation of tile or stone over a properly prepared concrete substrate, certain subsurface tolerances must be met. As stated in the Tile Council of North America Handbook for Ceramic, Glass, and 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 1/4" in 10' (6mm in 3m).

## CONCRETE SURFACE HARDENERS:

These are divided into two categories:

1. Non-metallic hardeners usually consist of graded quartz or silica aggregate, dry portland cement and chemical additives.
2. Metallic surface hardeners consist of fine chippings of clean iron filings, mixed with anti-corrosion chemicals and sometimes a small amount of portland cement. These are extremely heavy in weight with a specific gravity similar to iron.

Non-metallic hardeners may be used on interior or exterior applications and are usually dusted on the surface of fresh concrete at the rate of approximately 1 lb/ft<sup>2</sup> (4.9 kg/m<sup>2</sup>). These are applied to the surface when the initial set is taking place, and then are troweled mechanically into the surface to absorb excess water, reduce laitance, and provide a hard, dense surface which is resistant to abrasion and vehicular traffic.

Metallic hardeners can be used only on interior, dry areas. Use in exterior or interior wet areas could cause the metallic hardener to rust, expand and cause problems. They are usually preferred on factory floors subjected to extremely heavy-wheeled traffic, such as forklifts, steel pallets containing metal castings that may be dropped on the floor, and wagons with iron wheels. The iron hardener does give the surface of the concrete the ability to absorb physical shock without damage.

Application of iron hardeners is similar to non-metallic (i.e. dusting of the surface), working it in with a trowel and polishing the surface to a hard, smooth finish. Hardeners, non-metallic or metallic, are not curing compounds and consequently such floors must have a curing compound or be covered and wet cured to develop maximum strength.

Hardened floors are not offered as a substrate for ceramic tiles.

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