Defining the Mechanism Integrally Troweled Concrete

Substrate finished with a GreenIce ITC product. Though under construction, note floor resilience.

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ITCP defined: *"A mechanical and chemical process to consolidate the surface through a…troweled finish for maximum containment of moisture within the slab…resulting in architectural concrete finish options not previously available"*

There have been several products on the market that offer to cure the concrete. One worth consideration is Green Umbrella's GreenIce Cure System. It is an Integrally Troweled Concrete Placement (ITCP) product. It is defined as a mechanical and chemical process to consolidate the surface through a panned, combo blade and steel troweled finish for maximum containment of moisture within the slab as curing occurs. While also allowing placement of secondary floor coverings, its surface results in various architectural concrete finish options not previously available utilizing conventional finishing practices.

The following helps to understand how the ITCP floor works.

A Conventional Concrete Cure

Traditionally, a variety of means have been used at the initial and intermediate stages of placement and finishing.

Fogging, evaporation retarder, final stage curing measures, water curing, wet covering, moisture-retaining coverings, polyethylene (plastic) film, waterproof paper, and liquid membrane-forming curing compounds. The ACI-308-16* Guide to External Curing of Concrete outlines many of these.

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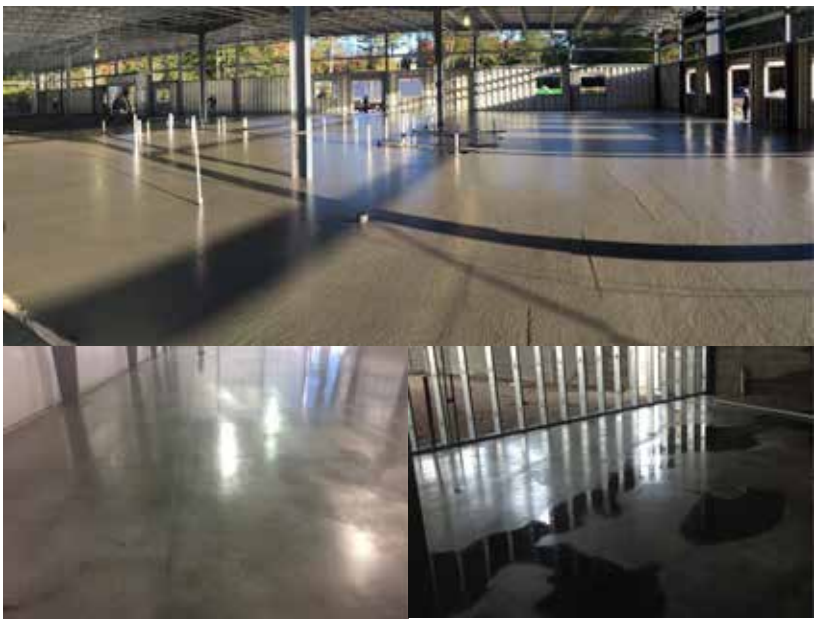

A Mechanically Densified Cap Method

This is a hard-troweled surface with alternate or non-traditional curing. A mechanically densified concrete has been proven in field studies to meet the curing requirements of holding back and maintaining internal moisture content. (Howard Kanare and Joe Nasvik, August 2010, “Making Cure Membranes in the Field*.)

What is the Integrally Troweled Concrete?

Integrally troweled concrete placement uses a two-part chemical formulation; a cure and a fixative that fills the voids and closes capillaries within the slab with nano-sized silica particles. This action refines the slab surface while retaining most of the placement water, significantly minimizing volume loss, cracking, and curling. This extends material life by closing capillaries within the slab, reducing surface abrasion, and creating a sustainable surface profile.

The first step in the application of this cure method is called IceStart. It is applied several times in the finishing process, protecting the surface from crusting during this phase of cure. It is creating a superior, initial near-surface moisture barrier. Though it reaches various depths in different substrates, testing has revealed it is often greater than 20 mm. With such depth, there are several benefits.

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Unlike gel-forming products, Amorphous silica is one component of the products. It is characterized as pH neutral, reactive, and not hydrophilic. As a result, it travels through the natural capillaries of the concrete matrix, using the pre-existing mix design water. In the near-surface area affected by the mechanical trowel action, the cure is acting as a lapping compound that allows the trowel to mill the paste substantially smaller than conventional methods. Additionally, it has been shown to provide lubrication to the matrix to allow for tighter compression.

The net water vapor transmission rate of ITCP concrete is about 4 grams/hr/sq meter, which compares favorably with the water retention requirements in ASTM C309 and C1315 for curing compounds while also compliant with E-96 testing. All of which qualify this system as a cure process.
The ITCP system creates a surfaced membrane so ‘closed-off that it qualifies as superior to any standard ACI 308 cure or ASTM 309 qualifying products.

As noted, it is not hydrophilic. So when the substrate is whetted, the product will not escape from the substrate. This is unique in concrete treatments.

The second step in the ITCP system is the fixative, IceStop. Once the concrete finishing is done, the fixative is applied to stop the chemical reaction and begin the hardening process. This treatment is hydrophobic and cross-links with the cure to provide an additional moisture barrier. For industrial floors not requiring a polished look finish, the application of these two treatments could be necessary to cure the concrete.

*American Concrete Institute, www.concrete.org

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***ASTM, American Society of Testing Materials, www.astm.org

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