

Finished Concrete Floors: Lean, Green & Sharp



The Valley Art Gallery's concrete floor was installed in the '20s, but its new lustrous surface belies its age.

Exposed concrete flooring is on the rise. In the past 20 years, it has gone from industrial, to industrial chic, to just plain chic, all the way to mainstream. Now, it can be done more sustainably because of the availability of a more eco-friendly densifier.

Concrete floors are enjoying a boom as owners and architects increasingly recognize it's an attractive, sustainable solution at an affordable price. In fact, it's a case where sustainability and affordability go hand-in-hand. The slab is usually "already there" as a subfloor: using it as the floor means no additional flooring materials are consumed. It lasts for decades. Maintenance tends to be fast, easy and environmentally mild—and it excludes the need for solvents and other harsh chemicals.

Densification has been a big factor in this success. Densifying the surface—also referred to as hardening—minimizes dusting, makes the slab less permeable to liquids, and improves its ability to take a polish.

Ironically, the densifying process itself has long been a flaw in a concrete floor's sustainable profile. Sodium-silicate and potassium-silicate densifiers are very alkaline, in the pH range 11-12, and produce a caustic residue. The residue has to be removed by flooding and scrubbing, a messy process

that poses exposure-risk for workers. The caustic slurry is typically alkaline enough to class as a hazardous waste disposal in some localities. Workers, understandably, dislike handling the residue, and many environmentally responsible contractors are uneasy about generating it.

Another applicator concern associated with silicate residue—although not a sustainability concern—is "whiting," a hard, tenacious, discoloring deposit that can occur on the slab surface if the silicate residue is not scrubbed off absolutely scrupulously. Whiting is the polisher's nightmare because it often requires regrinding the slab to remove it.

One route to address these issues was the development of lithium silicates, which eliminate residue removal. However, lithium silicates are even more caustic than the other silicates, so they still pose an exposure risk. They are also prone to whiting if over-applied. In addition, lithium silicate products tend to be significantly more expensive.

A more sustainable, cost-effective and efficient solution has been found in a non-silicate densifier. Colloidal silica is a purer form of silica that reacts very quickly in concrete. The first colloidal silica densifier, Lythic Densifier, is faster, easier, safer, and more economical to use than

traditional densifiers. It is less alkaline, safer to handle, and has no removal and disposal. It cuts densifying time by about 90%, labor cost by about 95%. To the delight of contractors, it also eliminates the risk of whiting.

Moreover, the colloidal silica in Lythic Densifier can bond to itself, a property not shared by silicates. This makes possible increased densification via multiple applications, opening the door to alternative finishing techniques.

HOW IT WORKS

Densification is the process of building up additional cementitious material in the surface layer of new or old concrete. Silica in the densifier reacts with excess lime (calcium oxide) in the slab, forming compounds similar to those made by portland cement, filling in the concrete's surface pores.

Sodium- and potassium-silicate compounds must be worked into the slab by vigorous scrubbing for an hour to initiate reaction. On a 1,000-sq-ft. work area, this would require two workers for one hour, or two man-hours. Most densifier manufacturers then recommend allowing a long reaction time—generally overnight—for best results.

Colloidal silica is a water suspension of nearly pure silica. It reacts within minutes. It is applied by spraying the surface until saturation, usually about 15 minutes for one worker, so colloidal silica cuts application labor by about 88%.

No scrub-in is needed with colloidal silica. Densification is complete when the slab dries, usually about an hour. There is no scrub-off, no disposal. Silicate scrub-off and disposal would take an additional 3.5 man-hours for a typical small or medium-sized job. In all, colloidal silica reduces elapsed time for densification by about nine hours.

A densifying process that's fast and clean is especially valuable in remodels and currently occupied facilities. It's possible to grind, densify and polish a floor in sections overnight with no interruption of normal daytime business. A 24-hour supermarket in Kent, Wash. had its floor polished to 800 grit—64,000 sq. ft. in 22 nights—without ever closing the store.

SUSTAINABILITY

Lythic Densifier has alkalinity in the pH range 9.5-10.5, below the EPA's designation of a hazardous material. Workers have minimal exposure risk. There is also far less risk of water damage and contamination of adjacent areas of the jobsite, since there is no wet slurry to contain. There is no hazardous material disposal, and no risk of an irresponsible applicator dumping caustic goop into a sewer or storm drain.

Faster densification minimizes jobsite trips, reducing transportation-related energy consumption and greenhouse gas emission. Lythic ships its products as concentrates, reducing weight and volume and transportation-related impact by 75%.

by David Loe, CSI
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COST

Happily, there is no green premium to pay. Materials cost for Lythic Densifier is competitive with sodium- and potassium-silicate densifiers, and considerably lower than lithium-silicates. Lower shipping cost of concentrates can be significant, too. Labor cost reduction is about 95%. Further savings are realized by eliminating expenses of an autoscrubber and hazardous waste disposal. It is estimated to save \$489-\$1,047 per 1,000 sq. ft. on small- and moderate-sized jobs.

ADVANCING THE INDUSTRY

The colloidal silica molecule is capable of bonding to itself, making it possible to build up silica in the concrete surface by additional applications, even after all the lime in the slab surface has been fully reacted. Lythic Densifier is part of a suite of products for concrete finishing and maintenance including Lythic Protector and Lythic Cleaner. Each application adds silica to the floor, maintenance can actually improve slab hardness over time.

Although the product is still new, this self-bonding property has already encouraged innovation. Applicators are offering an economical burnished finish that rivals polished concrete in performance without the labor-intensive process of diamond polishing. The floor is densified two times in rapid succession, the second time using Lythic Protector, a colloidal silica formula with a thin added polymer layer. The floor is burnished with an autoscrubber using diamond-impregnated burnishing pads, heat-curing the polymer. The floor achieves a lower gloss than polished concrete, but retains the performance advantages. □



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