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EPOXY & FIBERGLASS FLOORING, SEAMLESS FIBERGLASS WALL SYSTEMS, SEALERS, HIGH PERFORMANCE COATING SYSTEMS, AND INDUSTRIAL CLEANERS

INDUSTRIAL FLOORING TECHNOLOGY SERIES- #11 PORIOSITY AND SURFACE ABSORBTION

"Makes water wetter" is the commercial's claim. Well.. Ahhh .. actually in a simple way this is about right. In the simplest terms if a liquid "wets" the surface it is likely to stick and if it wets a porous surface it is likely to also sink in. Having an understanding of both situations will be useful.

Liquids "wet" a surface because their surface tension is less than that of the surface. If the liquid beads up into a ball on the surface or crawls apart into what we call "fish eyes" it is not wetting the surface. If it spreads out on the surface it is wetting the surface.

We if want to wet the surface we need either a liquid that has a lower surface tension than the surface or we need to modify the liquid so its surface tension is reduced. The first is normally achieved with using solvents. Most solvents have a surface tension of 30-40 Dynes. This is very low. Water has a surface tension of 72 Dynes. This is very high. Surfactants, wetting agents, detergents, etc all work to lower this number so water is "wetter" i.e. wets better. For most water based epoxy and urethane products such wetting agents are essential for the materials to adhere to whatever substrate they go on. There is a whole science to this and much formulation work is directed to get a nice balance between surface tension, recoatability, flow, and leveling of the product. There is also a whole science of using titanium and zirconium coupling agents that chemically react with the liquid's resin component and the surface to get a chemical attachment. Making a two component urethane stick to nylon 6 -eg golf balls- requires this technology, but this is usually WAY beyond architectural coating needs.

It stands to reason that if the liquid beads up in a ball on the surface it is not wetting the surface and certainly it will not penetrate the surface even if the surface is somewhat porous. Conversely if it wets the surface it may or may not penetrate the surface depending on the surface openness or porosity. So if we are coating or sealing concrete it might be useful to know to what degree the surface is open or closed and be able to measure its porosity.

For most situations this is irrelevant though for some it's essential. If we have an outside concrete slab and it is very porous it will absorb water when it gets wet and then evaporate water when it is dry out. If this happens in the colder times water might get absorbed into the surface and if the temperature drops to below freezing, the water turns to ice, expands, and breaks chunks of concrete off. This is bad. Contractors routinely "seal" the concrete to keep this from happening but it is a hit or miss proposition with expensive fix-ups if they guess wrong.

For inside concrete the issue is usually staining. Oil, transmission fluid, grease, food stuffs, and other materials can get onto and into the concrete and leave a stain that is nearly impossible to remove. Again to prevent this, concrete is often "sealed" or a high performance epoxy or urethane material is applied as a barrier.

The coating option ordinarily solves the staining issue. Vs the "sealing" option this is relatively expensive so often contractors "seal" the concrete as an inexpensive way to try to get the same result. We frequently see situations where this did not work and the customer is very disappointed. Whether the concrete has absorbed water which froze and popped off sections, or whether stains have gone in and found a home the customer is still angry. Ok so how do we get ahead of this problem and understand what to do ahead of time?

Well first we need to have a reliable and quantative way of determining concrete porosity. Rielm tubes seem a simple idea. These are graduated glass tubes that you put onto the concrete with putty, fill with water

and measure how much water is absorbed into the concrete over an hour's time. See figure 1. If a lot of water gets absorbed, the concrete is very porous if only a little gets absorbed it's quite tight. Simple.

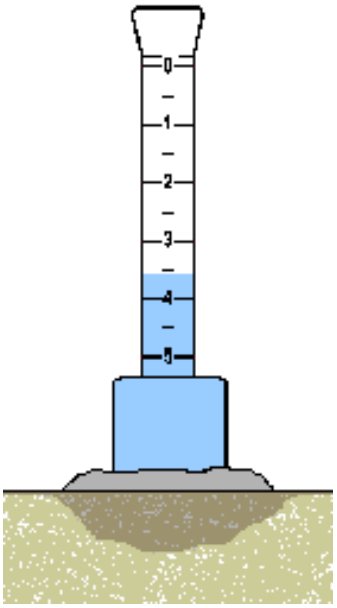

FIGURE 1: RIELM TUBE

So we next compare this reading with what is needed to fill and "seal" the surface. I say "fill" also because simply putting something "on" the surface that can wear off is not a long term solution.

We use a reactive silicone material FLORIDYNE™ and FLORIDYNE™ TOP BLOCKER as our choice of a material to "fill and seal" the surface. Depending on the concrete porosity we may need 1-5 coats of these materials to complete the job. Since concrete porosity is up the concrete finisher we can specify that we want a "typical industrial finish, troweled tightly but not burnished" but we nonetheless get what they give us.

In one case, we investigated a nicely troweled fiber mesh concrete, which was staining. The contractor had applied one coat of Ashford formula to "seal" the concrete. Not only does this product not provide a barrier to staining – it's a dust proofer- the concrete was so porous, that this material had sunk so far into the concrete there wasn't even a hint it had been applied. We applied our FLORIDYNE™ TOP BLOCKER as the "sealer" of choice to be an effective barrier against staining and it worked very well. (see Grand Chute FD) We also needed 4 coats at the usual application rate to "fill" this rather open and porous top concrete surface. About 2 miles from this site we "filled and sealed" a concrete surface (see letter from Tri County Machine) with 2 coats of FLORIDYNE™ TOP BLOCKER and actually put a bit too much on as the concrete was VERY tight.

Interestingly enough products like Diamond Hard by the nature of their application- it is applied to an overfill condition and scrubbed in- will "fill" the surface almost regardless of the porosity (within reason). They do not give an excellent stain barrier but the application of one coat of FLORIDYNE™ TOP BLOCKER finishes off the "seal" and gives the added stain resistance (see Fox Valley Metal Tech)

So to put an effective barrier on and into the concrete it's a good idea to test the surface porosity before you apply a sealer, especially a silicate type penetrating sealer. If you want dust proofing and water resistance our FLORIDYNE is a good choice if you want the additional stain barrier properties use the FLORIEYNE™ TOP BLOCKER, the number of coats needed being dependent on the surface "openness or porosity".

Tom Hennessy, ChE
C.D. Products Inc.

TESTING RESULTS

We are currently testing a number of surfaces either with or without “sealers” on them with the Rilem tubes. The results are interesting and as expected. A listing of results is below. As mentioned when the surface is porous more water is absorbed into it in an hour’s period of time. This is measured in inches. The more inches the greater the absorbtion, ie the less “sealed” the surface.

	INCHES DOWN
Grand Chute FD- nicely finished fiber mesh concrete with one coat of Ashford formula applied to it	1 3/4
Grand Chute FD as above with 4 coats of FLORIDYNE TOP BLOCKER	0.00
North Woods Paper Converters 2(?) coats diamond hard over fiber Mesh concrete	3/8
Tri County Machine nicely troweled and tight unsealed concrete	7/16
Tri County Machine two coats of FLORIDYNE TOP BLOCKER	0.00