UNITED COATINGS
RESEARCH DEVELOPMENT

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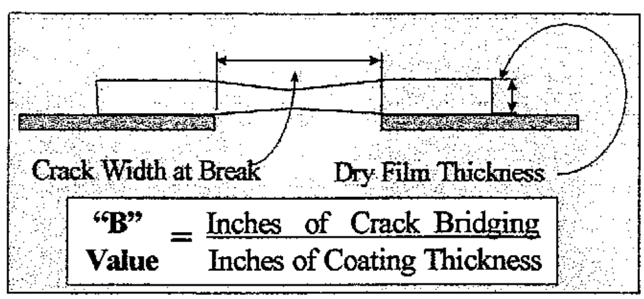
Why Use An Elastomeric Wall Coating Instead of a Conventional Paint

The key benefit of an Elastomeric Wall Coating is best realized on older concrete or any concrete application were a waterproof barrier is required. While paints work well for decorative purposes that can't bridge cracks. Even newer concrete structures may have many hairline cracks or even larger structural cracks. Unless the coating system is able to maintain a continuos, defect free film over the concrete under all conditions the concrete will be exposed directly to rain, CO_2, freeze thaw stress and biological attack.

The case for an elastomeric system turns on one question: can it provide a better barrier. The answer is pretty clear from a materials science perspective. Two effects dominate the way concrete ages, first is its' expansion and contraction cycles, and second is the chemistry behind its break down, called carbonation. Concrete will age in the short term in direct relationship to the temperature range it experiences in both a single day and over the entire year. On the long term, the carbonation of concrete, and eventually the rusting of reinforcing steel, will produce the greatest damage.

Lets cover the material science side first: In the warmer parts of North America a hairline crack will expand to 1/8" inch to 3/16" inches. In the coolest areas, like Spokane, a hairline crack can expand to more than 3/8ths of an inch. A paint film at 4 mils DFT can bridge around 1/32 to 1/100 of an inch. This means it would take between 4 to 8 thick coats of paint to bridge a hairline crack in fairly stable environment like Florida. The diagram to the right is an attempt to explain the concept, some chemist call it "B" value in the elastomerics field. In contrast to paints, our Aquathon, sporting its exceptional low temperature flexibility (down to -40°F) can bridge even a 1/8th wide crack in Minnesota when applied to a DFT of about 25 mils. In warmer markets 10-16 mils DFT can do the trick. Since Aquathon has high solids (50%



by volume) this can be accomplished in two coats. Since our coating can stay intact the entire mechanism of concrete surface crazing, spalling, and paint peeling is for stalled.

Bigger, is the long term concern of carbonation. Cycles of moisture, drying, and the penetration of CO_2 gas (yes that the same greenhouse gas) form calcium carbonate with the concrete. This problem is causing premature aging worldwide in urban areas due to rising CO2 levels in all the worlds cities. Elastomerics significantly halt this process, with paints, they just crack and the aging goes on and on. EWC's are much more extensively used in Europe because of their greater emphasis on masonry preservation. The final blow to modern concrete is the rusting of rebar or other structural steel elements. When the metal rusts, its expand greatly and literally blows the concrete structure apart. Elastomerics are effective in providing long term water proofing.

—— Summary ——

1. Concrete cracks because ice, carbonate, and rust can all form within it, and all these processes crack concrete when they expand.
2. Concrete expands and contracts too much for paint to be an effective barrier.
3. An elastic moisture barrier is needed to preserve concrete.

—— Why United? ——

I know of only two weaknesses of elastomerics. One is their priming ability. We do recommend a primer to enhance the bond to the surface, ours is called Primer 708 and it is a very competent product. The other weakness is Dirt Pick-Up Resistance. Our product is based on R&H EC technology which has a surface crosslinking technology that puts them in a different class. EC binders are comparable to paints in dirt pick-up resistance. I have enclosed a brochure from the supplier of our elastomeric binder to detail this point.

I hope you will consider these points when specify your next concrete building, and we hope you will consider United's products line. We consider ourselves the originator of the technology in the US. Our first product for this application was Super Aqua Butyl which we made in the '70's, We now provide Aquathon as high performance, high value coating system for exterior walls.

Yours Truly,
Steve Heinje

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There are three, perhaps four key measures, in providing an engineering basis for a 100% Acrylic Elastomeric Coating like Aquathon. Number one is crack bridging because there can be no reliable protection without a sound membrane. The permeances, both CO_2 and water vapour, are next – but I don't think we can expect it to make improperly set concrete to perform like steam cured concrete. A good repair regime needs to be part of preservation or remediation. Fourth would be chloride resistance, in areas near a deicing situation. Since our product is vertical applications this is a small role. The basis of my assessment is larely from Rohm and haas' European Office since they lead the world in most areas of masonry preservation. The studies on crack bridging are from North American work since we have more severe thermal cycles. While I won't disclose composistion, a system very much akin to our Aquathon was used to generate these numbers, Morover, the variation between several variants of pure acrylic elastomers were small compared to the requirement being addressed.

Our EWC, Aquathon should have **carbon dioxide diffusion** resistance coefficient ($\mu CO2$) between 280,000 and 320,000, based on testing by the University of Dortmund. This means that a 400 µm (~16mils) thick dry film gives a diffusion equivalent air layer of 112 to 128 meters. According to Euoperan experience it is accepted that a fully satisfactory concrete protection is achieved with diffusion equivalent air layers of at least 50 meters. So this requiement is easily met.

Water vapor permeance must fulfill a **vapor diffusion** equivalent air layer of less than 2 meters. At 400 µm dry film thickness, we are around 1 meter. A comfortable margin again.

Based on work at Taywood Engineering, I can add **Chloride ion diffusion** also. Using 5 molar NaCl solution at 40°C for 3 months. No Chloride passed through the films (applied at 2 coats of 500 g/m^2 each or in imperial units two coats at 1 gallon per 100 sqft). This was considered outstanding by the euopean concrete experts.

Very important in concrete protection: the coating must not crack, even if the concrete itself does crack. Our EWC meets this requirement, provided that they are applied at films thick enough. Crack bridging is film thickness dependant, and is not based on just elongation. Taking the example of a hair line crack in Seattle, with a temperature range of –10C to 30C, a crack will go from anywhere 1.1 mm to 4.8 mm, so a gap of 3.7 mm (~1//7^{th} inch). My work with Aquthon using the Rohm and Haas protocol shows that a 27 mil DFT film is required to protect a building in Seattle.

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