

# natural but not naked

Let's face it! Nature has never been fair! Some things simply age well – even improve with age. Stonework, brick, paint chemists are some examples that readily spring to mind. However, for the majority of things, the showroom, 'fresh out of the box' newness is the best it gets, with age bringing a steady deterioration.

The current trend and desire for 'naturalness' in architecture is often undermined by the loss of aesthetics and performance on ageing. This memo will focus on how surface treatments can be used as cosmetics to slow down the ageing process of concrete and wood.

To prevent the ageing process one must firstly try to understand it, as the two materials mentioned deteriorate in quite different manners. Both are susceptible to moisture and mould growth but, while wood is attacked by oxygen and U.V. light, concrete is impervious to these aggressors. Concrete on the other hand, is sensitive to carbon-dioxide, which has no effect on wood.

Carbon-dioxide, as a gas, can penetrate into concrete and convert the lime content into calcium carbonate, with a corresponding drop in the alkalinity. While this is of no great significance in solid concrete, alkalinity is crucial in reinforced concrete for preventing re-bars from corroding. Rain dissolves carbon dioxide forming the weak acid, carbonic acid. This can erode the binding power of the concrete, leaving loose mineral particles on the surface, again with reduced alkalinity, and with increased porosity that will harbour fine dirt particles. This surface now looks like a much more desirable residence for moulds and fungi.

The least intrusive cosmetics for concrete are the siloxane-based masonry water-repellents. These non-film forming materials form a completely invisible, ultra-thin layer on the surface of all the pores on and in the concrete surface, which is not wetted by water, i.e. the water droplets simply roll off. With the rain water/carbonic acid not being able to wet the surface, it cannot effect the damage noted above.

These materials do not, in any manner, seal the pores and water, under high pressure, can still find a way through. This lack of sealing also leaves the surface open to graffiti attack and to attack by gaseous carbon-dioxide.

A reduction in porosity does demand a film-forming cosmetic to be used. To maintain a natural, uncoated look the film former should be transparent, water-white and with a gloss level that matches that of natural concrete. It is also beneficial if the coating does not penetrate into the concrete (highlighting defects that are only seen in the rain) but still adheres firmly to the surface.

There are waterborne acrylic glazes on the market that can satisfy these needs and with these two classes of product, a sustainable answer to a natural look for poured concrete can be achieved. The pores in concrete masonry are considered to be too large to sealed

by the above approach (further information on this subject and the dangers of efflorescence can be found in memo 76).

Timber is attacked by water, U.V. light, oxygen, moulds and fungi; with different species being more or less susceptible. The denser timbers are more resistant to water and U.V. while some contain natural preservatives giving extended resistance to fungi. Indoor climates are sufficiently benign that a variety of excellent products have long been available to maintain the natural beauty of timber – outside is a different story!

The paint industry has a hatful of products that can provide durable clear films over U.V. stable substrates but protecting U.V. sensitive materials like wood remains a challenge. Two distinctly different approaches have been tried.

One approach is to start with durable polymers; load them with U.V. absorbers and put on plenty of coats. The most natural look is achieved using water-white organic U.V. absorbers but these are the least effective. There are available excellent inorganic U.V. absorbers but which are coloured. The colour imparted is not noticeable when used over dark timbers but is characteristic over light coloured timbers.

The higher the loading and the higher the colour, the greater the longevity but, no matter the loading, there will always be sufficient U.V. getting through to the substrate to cause eventual flaking. Preparation of a flaking surface is a seriously difficult and costly business and many people will simply not accept this manner of failure, no matter how long a service they get out of the original application.

The other approach is to design materials that substantially penetrate into the timber leaving only very thin layers on the surface. Natural oils such as linseed can do this job but they degrade rapidly under U.V. and also support mould growth.

Such products still need to be designed with durable polymers and, additionally, water repellents, fungicides and U.V. absorbers. Inorganic U.V. absorbers and pigments give the best protection and the darker the colour that can be tolerated; the better will be the durability. Even so, the very thin layers of protective material cannot give very long term protection.

The major benefits of these low/no build treatments are that, not only do they look very natural, but preparation for recoating is facile. Interestingly second and third applications can last significantly longer than the first. The weathering process can 'open' the surface of the timber and allow a greater uptake of the subsequent treatment.

Regardless of the technological route taken, the preservation of a fresh, natural look is assisted by finishing with the right coating rather than leaving it bare, and does require a planned amount of regular maintenance – just as my wife!

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