Architects Memo

No. 47

MORE ON DURABILITY

In the world of Surface Coatings, people's expectations of durability naturally vary from situation to situation. Whilst a week would be considered a useful life for a coat of nail varnish, centuries can be expected from traditional Chinese lacquer work. However, even such durable material as Chinese lacquer would have its life drastically shortened if it were used in a hostile environment for which it were not designed.

Even the notion of useful life varies with the observer. To an engineer a coating may be considered to be performing perfectly satisfactorily as long as it is preventing corrosion, even though it may have lost all gloss and semblance to it's original colour. In an architectural situation however, the most sophisticated multicoated system can be deemed to have failed if the first few exposed microns of film, which govern gloss and appearance, break down.

The agents working towards breakdown of exposed surface coating are U.V. light, water, and oxygen, in this order of importance. These agents not only work individually, but can gang up against the coating creating unholy synergisms. Thus a coating receiving the same amount of U.V. radiation will retain its good looks much longer in Central Otago's dry climate than in Auckland's more humid airs. A useful picture is of U.V. light striking the paint films like a rifle bullet, breaking part of the molecular structure; if ater is around it will 'infect' the break and prevent any possibility of self-healing.

Although there are several components in a paint which affect durability (some of which have been covered in other memos), the major influence is the binder, or the material that holds all the other components together. All paints end up, after application, with a more or less clear layer of binder right at the very top surface of the film. The thickness of this layer depends on the style of paint and the amount of pigment present. Flat paints (containing high levels of pigment) have a very thin layer of binder over the top, whilst glossy paints (with low pigment levels) have a thicker layer.

The onset of 'chalking' occurs when this thin top layer of binder is eroded away by the action of U.V. light etc. Chalking will be retarded if the top layer of binder is more 'bullet-proof' and if the layer is made thicker.

The inherent resistance to degradation is fundamental to the type of binder chosen. Among the more durable binders available for architectural coatings are poly vinyl fluorides, silicones, urethane-acrylics, aliphatic urethanes and pure acrylics. Although there will be some variations within grades and from various suppliers, this list of high performance binders is in approximate order of durability and, incidentally, cost.

The aspect of the thickness of the clear binding layer can be substantially affected by formulation. As has been stated, flat finishes have a thinner binder layer than gloss finishes and it is a general rule that, for the same binder system, flat paints will chalk much more rapidly than their glossier analogues. What happens then if the clear coat thickness is deliberately increased by the use of glazes of similar binders? Precisely the same as what happens with high quality motor cars finished with the latest basecoat/clearcoat systems - much higher durability.

Let us imagine that a semigloss acrylic has a clear binder layer of 2.5 microns and this layer erodes at the rate of .5 microns per year. After 5 years, pigment will be exposed and gloss will decrease, with the onset of chalking very shortly after. If a glaze of 10 microns were applied over this which had the same erosion rate, the onset of chalking would be delayed by, theoretically, 20 years. Results approaching these theoretical results have been obtained in practise.

The cost performance benefits of the use of glaze coats is exceptional and largely without drawbacks. Consideration must be given to the long term compatibility of the glaze coats with the base coats and this will be dealt with in a later memo.