another reprise – colour durability

When it was suggested that I tackle the above subject, my knee jerk, plaintive reply was "but I have already covered that subject". When the archivist advised me that was back in 1984, I agreed that the boss had a point!

Architecture is a strange amalgam of art and practicality and the role of paint in architecture aptly reflects this dichotomy. Colour schemes play a major part in the area of aesthetics and consequently, the ability for paints to retain colour 'fastness' can determine the longevity of the original, aesthetic concept.

Colour in paints is provided by pigments (we will include black and white, even though they are not strictly colours) of which, in this highly technological world, there are literally hundreds. It is the ability of all these various chemistries to interact with light, absorbing some wavelengths and reflecting others, that produces the phenomenon of colour.

Drilling deeper into the chemistry of pigments, it is found that only specific 'linkages' in their molecules are involved in this interaction, which gives each of these pigments its characteristic shade. These groups are called chromophores. As long as the chromophore remains intact, the colour stays true – if it becomes damaged, the colour loses its integrity.

The major aggressors are chemical (including atmosphere chemicals such as oxygen, and, in thermal areas, hydrogen sulphide) and physical (primarily U.V. and visible light).

The most stable of chromophores are produced by metal oxides, especially chromium III (green) and iron (red and yellow ochres). These pigments are almost impregnable even though they are sometimes accused of 'fading'. The full 'richness' of any coloured pigment is only achieved when it is fully encapsulated in a binding resin. In an exposed paint, this resin layer will slowly erode away, leaving some unbound pigment on the surface. In this unbound state, the pigment loses some of its perceived 'richness' and appears to have faded. The fact that it hasn't can be shown by the observation that the original colour can be 'restored' when wetted with water. This, indeed, is a good test to see whether any suspected 'fading' is truly fading or simply film erosion.

There are virtually no technical or commercial draw backs with the above pigments – the only issue is a very limited colour palette.

Stepping a little down from these 'bullet proof' pigments (in which can be included oxides of titanium (white) and carbon (black)) are a range of sophisticated, durable and expensive materials called 'mixed metal oxides' which typically involves 'doping' titanium, chromium, cobalt, or iron oxides crystals with other exotic metal atoms. While these extend the existing colour range (at quite a price penalty) it still remains limited.

The dramatic expansion of colour shades came with the discovery of organic dyes and pigments; starting with Perkins Mauve in 1856 and followed by a veritable explosion of colour technology around the turn of the 20th century, which subsequently provided the basis of the modern chemical industry. The most efficient, innovative and feared chemical company the world has seen was called I.G Farben which is one of the conglomerates that underpinned the scientific and industrial efforts of Hitler's Third Reich. I.G (Interessen-Gemeinschaft) Farben literally means "those with a common interest in colour".

The organic chemical industry developed many new chromophores that produced a hitherto unknown range of brilliant colours. The stability of these new chromophores was not always great (some were reported as fading in a full moon) and the thrust of the pigment industry has been to find more and more stable chromophores or to build protective, umbrella groups around less stable chromophores to improve their stability.

The commercial reality today is that there is available a wide range of pigments with an equally wide range of price and quality. Take the BS5252 colour 04E53. There would be at least 20 different ways of formulating this colour, which, judged from the initial hue, would be indistinguishable from each other. The quality of the pigments used only becomes evident with time. A poor pigment selection would see dramatic colour change within two years; the Resene colour used on the façade of the School of Architecture building in Wellington is still (relatively) true to colour after 18 years.

All pigments are classified by international colour standard testing for light and weather fastness and Resene is happy to supply this data on each of the pigments used in their colour system, on request.

Looking back over this memo (on my second G&T), I realise that it has barely skimmed the surface of a tricky subject – please come back to us if we can usefully expand.