

Light-coloured floor surfaces

“Lighter-coloured dry-shakes make more demands on the workmanship and practice – and quality becomes more critical.”

In response to market demand, developments have occurred in materials available to achieve very light-coloured floor surfaces for retail warehouses and for improved curing of dry-shake and concrete power-trowelled floors. This article discusses the testing, environmental and safety implications.

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A development prompted by a retail DIY warehouse customer has been to produce the new ultra-light-coloured dry-shake hardener (Silver Birch) for concrete floors. In a retail environment, sales and business go better if the sales space has a light and airy ‘feel’. The use of a very light coloured floor minimises both the cost of lighting, energy usage and the environmental impact. Also dry-shake coloured and hardened concrete floors are monolithic and ultra-durable. They have long maintenance-free lives requiring only routine housekeeping and there are examples of these dry-shake floors still performing perfectly after more than 20 years in demanding environments.

Permaban has commissioned light-reflectance testing of Silver Birch colour to the new (draft) BS 8493⁽¹⁾. Results are quoted on a scale from 0 to 100 where utter black is 0 and perfect white is 100. The company can’t achieve such a light colour with real concrete so the introduction of its ‘Perfect White’ colour will have to wait! The average of 36 values achieved by a light-coloured Natural dry-shake was 33.50 and for Silver Birch 50.97, an improvement of 52% in light reflectance. The introduction of Silver Birch to the floor would provide the end user with a reduced lighting level requirement and, consequently, reduced electricity cost.

Following the development work, the recently opened B&Q Flagship store at New Malden, Surrey (see Figure 1 – exterior of this store), had floors installed by Stuarts Industrial Flooring under main contractor Simons Construction. The concrete floor surface was hardened and coloured by Permashake Quartz Silver Birch. The project also used another Permaban material, Aquacure,

which had been developed to help retail DIY warehouse customers improve the carbon footprint of new stores and also to reduce the incidence of surface crazing.

Crazing

The process of repeat power-trowelling a concrete floor is highly beneficial to the properties and performance of the floor surface. The vast majority of high-performance concrete floors these days are constructed with repeat power-trowelled surfaces and this will surely continue to be the case.

High surface temperatures are created during the final trowelling operation at a time when the slab itself is beginning to generate heat through the cement hydration. This causes the surface to lack moisture. Once the conventional (solvent dispersed) acrylic curing agent is applied, this lack of moisture will be compensated by moisture rising from within the depth of the slab.

Crazing is a network of visible cracks. These are not considered to have structural significance, have minimal depth but are visually unattractive. An article in *CONCRETE* September 2002 discussed this effect⁽²⁾. The authors suggest a number of factors contributing to the incidence of crazing but were of the opinion that curing was only a minor factor. They did, however, say that the “predominant mechanism is drying shrinkage”.

Customers operating retail warehouses had asked for assistance to reduce or eliminate the occurrence of surface crazing in their floors and Permaban developed a new type of acrylic curing agent in 2007. Aquacure is a water-based membrane forming liquid – a spray-applied, quick-drying, high-efficiency curing agent that imparts a sheen to the floor surface. It has been specifically developed as a VOC compliant curing and sealing product and also comprises 50% more acrylic resin, in this case as an emulsion dispersed in water. The company has formulated this product so that the water content will have a beneficial effect on the tendency of power-trowelled concrete floors to show crazing. This material has been used for over a year now and no significant crazing on the floor slabs has been observed. In fact the company has now rewritten its specifications to call up Aquacure for curing all its coloured and natural dry-shake floor hardeners.

Permaban’s recent experience is that applying this high-efficiency water-based curing agent immediately after finishing does seem to eliminate crazing. This is because one is applying water (the acrylic–water emulsion) to the surface at this very early age, ensuring it does not lack moisture and of course achieving good curing conditions thereafter. Concrete needs moisture at all stages to cure properly and the temporary lack of moisture at the surface causes a danger of surface crazing. Rising moisture under a curing membrane continues for many months but may not prevent the effects of the initial lack of moisture in the very top surface becoming apparent in due course.

Figure 2 shows floor areas in a new flagship DIY warehouse store. The floor has been cured with Aquacure and the concrete floor surface was hardened and coloured with the new Silver Birch dry-shake colour.

Environmental factors

The use of water-based, high-efficiency, non-silicate curing agent has reduced emissions resulting from the construction process and thereby improved the carbon footprint.

Figure 1: Exterior of the B&Q Store, New Malden.



(Photos: Permaban.)



There are also safety and transport advantages of this approach and the construction of concrete floors in building extensions need not cause the employees in the buildings to be evacuated on account of solvent smells.

Curing agents for power-trowelled concrete floors are usually spray-applied late at night and sometimes in poor visibility. It has long been felt that it would be helpful if the curing agent was light-coloured to ensure no areas are missed. This is achieved by using a water-acrylic emulsion (the liquid sprayed being milky white) and the surface dries, in an hour typically, to a clear resin membrane similar in appearance to the solvent-based acrylic.

Figure 3 shows a self-storage unit in Twickenham, Middlesex, where Aquacure was used in conjunction with Permaban Alloy Mid Grey dry-shake floor hardener. The company has supplied Aquacure to cure its dry-shake in several buildings for this client. The buildings have substantial basement areas where the use of the solvent-based curing agent would have been hazardous and unpleasant.

Concluding remarks

Recent developments have assisted retail clients to make atmospheric and environmental improvements at low cost. Permaban always recommends that new clients considering dry-shake should view the actual colours under consideration in service elsewhere. It should be remembered that lighter-coloured dry-shakes do make more demands on the workmanship and practice – eg, steady and consistent concrete supply rate and quality become more critical. High-efficiency water-based acrylic spray-applied curing membrane is now available and this also reduced the incidence of surface crazing. ■



Figures 2 and 3 far left: Interior floor area in a new flagship DIY store. The floor has been cured with Aquacure.

Figure 4 above: A finished floor at B&Q New Malden.

References:

1. BRITISH STANDARDS INSTITUTION, BS 8493. *Light reflectance value (LRV) of a surface. Method of test.* BSI, 2008.
2. SIMPSON, D. and WATSON, N. Crazing in power-trowelled concrete floor slabs. *CONCRETE*, Vol.36, No.8, September 2002, pp.25–26.

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