

The Portland Cement Association and Discoloration of White Cement

onBalance – Que Hales, Doug Latta and Kim Skinner

There has been some question as to whether the landmark Portland Cement Association (PCA) study “Surface Discoloration of Concrete Flatwork” (PCA publication RX203) applies to white cement products, and further to swimming pool plaster utilizing white Portland cement. To show that there has been a conscious effort to apply the findings in RX203 to white cement, including pool plaster, we provide for your review excerpts from three official PCA documents. We have highlighted some of the text in red to point out specific additions tailoring the text to include white cement products.

Greening & Landgren, *Surface Discoloration of Concrete Flatwork* (1966): “Extreme discoloration is caused by trowel burning, a blackening of the surface resulting from attempts to hard trowel concrete after it has become much too stiff to trowel properly. Trowel metal rubbed off onto the stiff concrete is a conventional explanation for trowel burns. Some of the trowel burn discoloration undoubtedly is due to abraded metal. However, since a troweled surface can be “burned” by rubbing it vigorously with plate glass, densifying a paste by troweling to a point where the water-cement ratio is drastically reduced appears to be the most important cause of trowel burning.” “To minimize trowel burns: (1) have an adequate finishing crew, (2) reduce evaporation losses with sunshades and windbreaks, and (3) avoid the use of calcium chloride where possible.”

Freedman, *White Concrete* (1971): “Attempts to hard trowel concrete after it has become much too stiff to trowel properly causes a “burning” or blackening of the concrete surface *which may be more obvious on white concrete*. Trowel metal rubbed in the stiff concrete is a conventional explanation for trowel burns. Since some of the trowel burn discoloration undoubtedly is due to abraded metal, *a plastic trowel should be used on white concrete*. However, since concrete can be burned by rubbing it vigorously with plate glass, trowel burning appears to be caused primarily by troweling concrete to the point where the water-cement ratio is drastically reduced. To minimize trowel burns the contractor should have an adequate finishing crew, should use sunshades and windbreaks to reduce evaporation losses and should avoid the use of calcium chloride where possible.”

Farney, *White Cement Concrete* (2001): “Concrete needs to stiffen before troweling can begin. But if too much stiffening occurs, attempts to hard trowel concrete can cause a burning or blackening of the surface. A conventional explanation for trowel burns is that metal is abraded from the tool face as it is rubbed over the stiff concrete. Concrete, however, can be burned simply by rubbing vigorously with a plate glass. Therefore, the primary cause of trowel burning appears to be overfinishing concrete (to the point where the water-cement ratio is drastically reduced). Using non-metal trowels removes the concern about abraded metal. Depending on the type of finish required, finishing tools can be made of plastic or wood. To minimize trowel burns *on white and colored concrete flatwork*, the contractor should:

- time the finishing operations properly
- use non-metal tools
- have an experienced finishing crew

- use sunshades and windbreaks to reduce evaporation losses
- not use calcium chloride (on architectural concrete)
- eliminate the troweling pass if floating is sufficient

1. Greening, N.R. and Landgren. "Surface Discoloration of Concrete Flatwork." Portland Cement Association Publication RX203, 1966, p. 42
2. Freedman, Sidney, "White Concrete" Portland Cement Association Publication IS175.01A, 1971, p. 5
3. Farney, James A. "White Cement Concrete." Portland Cement Association Publication EB217.01, 2001, p. 5
(Note: The cover of this document has a picture of a pool being plastered, and a finished pool is pictured on page 4. Swimming pools are mentioned specifically on page 2 of the text.)