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DCS TECH–NOTES

THE BASICS OF IRON OXIDE PIGMENTS

The great majority of pigments used to color concrete are iron oxide pigments. All pigment grade iron oxides are water insoluble, sunfast, limeproof, and fade resistant. Pigment grade iron oxides are generally divided into two catagories based on their origins. These two classes are naturally occurring (natural) and manufactured (synthetic) oxides.

Synthetic pigments are manufactured through chemical processing. The resulting pigments are used extensively in the coatings industry. These are relatively expensive pigments with high tinting strength (see Definitions). Natural iron oxide pigments are produced by excavating ores from the earth and size reducing them. Natural pigments generally have lower tinting strength and therefore produce earthtone pastel hues. They are dramatically less expensive than manufactured pigments.

It is important to consider the saturation point (see Definitions) for each pigment because increasing pigment addition rates beyond this point is unnecessary and expensive. The saturation point for all pigments, both manufactured and natural, varies because of the different tinting strengths of the pigments involved. The graph below illustrates saturation points for various pigments.

The saturation point for manufactured oxides is generally between five and eight percent based on the weight of the cement. In concrete, addition rates for the manufactured oxides typically range from one quarter to five percent. Additions seldom go over five percent because the result at this higher addition is a color that is more intense than what is customarily desired.

DEFINITIONS

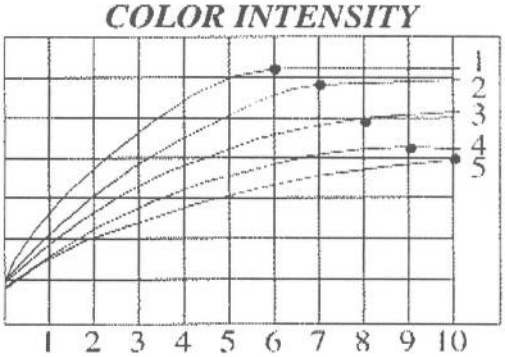
Tinting Strength: The ability of a pigment to change the color of a given mix. i.e.—if a pigment changes the color of a mix substantially with a small addition of color, that pigment is said to have a high tinting power. The tinting power of a pigment depends on the iron oxide content and the fineness of that particular pigment.

Saturation Point: The point at which color intensity stops rising proportionally to the rate of addition of the pigment.

Addition rates of as much as ten percent can be used with natural pigments without surpassing the color saturation point. Generally an addition rate of one to ten percent of natural oxide will produce a color in the desired earthtone color range.

A third class of pigments used in the colored concrete industries are blends of manufactured and natural oxides. These blends, depending on their respective ingredients have maximum addition rates of five to ten percent. Blended pigments allow the end user to be more selective and creative in his designs by increasing the number of possible shades he has to work with, without compromising quality.

It has been our experience that natural iron oxides and blends of natural and manufactured oxides produce the best results in general. This is due to many interrelated factors. Greater color addition rates generally reduce blending and dispersion problems and therefore reduce color variations in the finished product. Since it is quite common for a batch of concrete to contain as much as 5,000 pounds of cement, sand and aggregate, it is not surprising that many plants find it very difficult to evenly disperse as little as only one to five pounds (1/4% to 1%) of manufactured oxide in a batch. Natural oxides, on the other hand, since they generally have higher addition rates are normally easier to evenly disperse. Finally, due to their substantially lower unit cost, natural oxides, even when used at higher addition rates, will normally not increase and often will decrease total color cost per batch.



• — Saturation Point
1 — Synthetic Black Iron Oxide
2 — Synthetic Red Iron Oxide
3 — Synthetic Yellow Iron Oxide
4 — Natural Red Iron Oxide
5 — Natural Yellow Iron Oxide