

Adding Color to Masonry

The use of color in Concrete Masonry has become a mainstay item to Concrete Block, Paver, Retaining Wall, and Brick projects worldwide. Color has transformed gray concrete products into an architectural marketable building product. Color has been and always will be a design tool. The key is for Architects and building owners to understand the 'limitation' of color when selecting a concrete product color shade.



Synthetic and Natural Iron Oxide Pigments have historically been the primary color used in concrete masonry. In addition, Chromium Oxide is used to produce shades of Green. Cobalt Blue is used for the blue shades. Iron Oxide's, Chromium Oxide, and Cobalt Blue are permanent, inert, stable to atmospheric conditions, and sunfast. They all comply with standards set by ASTM C979 "Pigments for Integrally Colored Concrete".

The primary colors of iron oxides are Reds, Yellows, and Black. By blending two or three of the red, yellow or black colors, shades of buff, tan, brown, orange, maroon, goldenrod, and so on are possible. Yellow iron oxide particles are needle shape. The particle shape of Red is more rounded, while the Black has a cubicle particle shape. Iron oxide color manufacturers control the color shade to a Delta E color difference of 1.5 between lots. This amounts to less than a 1 % color difference.

Synthetic iron oxides are relatively high tint strength colors which can produce a colored product by adding 1% to 5% color to the weight of the gray or white cement used. The amount of color added is dependent upon the desired color. A deep strong color would require 5 lbs of pigment per 100 lbs of gray cement while a less intense color shade can be produced by adding 2 lbs of pigment per 100 lbs of gray cement. A color level of 7% is the color saturation point. Color added in excess of 7% will not provide additional benefits. Conversely, a level of color below 1% can cause irregular coloring and a general "washed out" appearance.

In a concrete mix design the color is a very small item incorporated in the mix, but the change color creates is very dramatic. A typical block mix design using 3% color would have only 3 LBS iron oxide color with 100 LBS gray portland cement and 500 LBS aggregate.



The inorganic colors of iron oxide, chromium oxide, and cobalt blue, color the cement and aggregate by surrounding the cement particles and aggregate in a concrete mix design. The pigment particles do not have any bonding characteristics and are therefore dependent upon the bonding characteristics of the cement to lock the pigment particles into the mortar or concrete product. The particle size of the iron oxides, chromium oxide and cobalt blue are typically 99% minus 325 mesh.

Carbon Black or Lamp Black pigment is still used in mortar and concrete due to its high coloring power and darker black color shade that can be produced. Due to the carbon black being much finer and lighter than iron oxides, the bond of the cement in a mortar or concrete product mix is not tight enough to keep the carbon black particles locked in. Therefore, in exterior applications, carbon black gradually weathers out of the surface giving an appearance the black has faded. Since the weathering problem is widely recognized among concrete producers, rarely will you find carbon black used. I would strongly recommend specifying only black iron oxide for your project.

With the increase use of color in masonry products, reputable block producers and mason contractors have learned the proper procedures to assure a consistent product. One of the first things I do when I visit a concrete block producer is to look at the gray non-colored block. If they are consistent, then more than likely the color units will also be consistent. The following are four key areas that can directly effect the final color in a concrete product or mortar joint.

(1) Cement Shade

Gray and white cement is not the same shade from manufacturer to manufacturer and from location to location. Changes in the shade and fineness of cement used will alter the shade of colored concrete products. Using a lighter colored gray cement will allow clean buff colors, using the same buff pigment with a darker cement will result with a dirty looking buff color.

(2) Aggregate Shade and Fineness

As with cement, the shade of aggregate will change the shade of a mortar joint and concrete product. A clean light colored aggregate will allow a brighter more intense color. Conversely, a darker aggregate will mute the color shade. An aggregate mix with more fines will also mute the color shade due to the increased surface area the pigment is required to coat with pigment particles.

(3) Water to Cement Ratio

A mix design with more water will lighten the color of the masonry product due to the pigment particles being spread farther with the extra water. Conversely, a mix design with less water will be darker in color shade.

(4) Curing

The rate of hydration effects the final shade of cement, which in turn effects the final color. A minimum pre-set time of approximately 2 hours is recommended for all colored products before activating the curing system. Since the curing of smooth face block is not even during the curing process it is more difficult to maintain a consistent smooth face block. I would recommend utilizing regular split face or fluted block when color control is critical. When tooling a mortar joint, the joints should be tooled at the same time preferably at thumb print hardness. Tooling a wet mortar joint will result in a lighter mortar color.



The use of color is not terribly difficult, but it takes some care and consistency to assure a uniform product. Many times Solomon Colors is asked to match an existing building material or color piece sent to our lab. We can easily accommodate the request, but as I have just discussed, pigment is just one piece which effects the final color. Our lab stores aggregates and cements from block producers all over the U.S. so that we can develop a color with reasonable accuracy. If we can be of assistance with your color needs, or answer any of your questions regarding the use of color, please feel free to contact us.

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