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## ***Understanding Colored Concrete Common Problems, Why They Occur, and How to Avoid and Fix Them.***

*By Chris Sullivan, QC Construction Products*

Becoming proficient at the basics before moving on to more difficult tasks is important in most everything, especially when it comes to decorative concrete. Success in this business is built on a concrete foundation, literally and figuratively. Read on to find out how to avoid colored concrete problems. [Continue >](#)



This comes from experience and an in-depth understanding of the products and process. Nothing is more basic to architectural or decorative concrete than integrally colored concrete. Becoming familiar with integral color, how it works, factors that affect final color, and methods for fixing colored concrete issues are important steps toward becoming an expert in all aspects of decorative concrete.

## ***Decorative concrete is forecasted to continue to lead all other segments of concrete construction in growth well into the future***

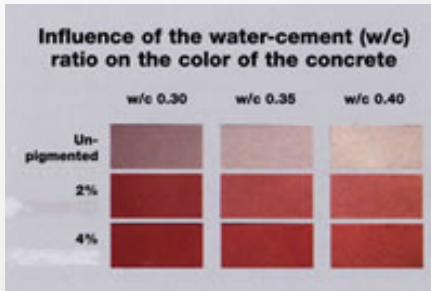
### **Background of Colored Concrete**

In the early 1950's, the F.D. Davis Company introduced contractors in Southern California to the idea of adding synthetic iron oxide, at the time a waste product from chemical manufacturing, to their gray concrete mix. By adding this colored powder to traditional gray concrete, it became possible to achieve a wide range of earth tone colors. Fast-forward fifty years, where in 2004 more than 204 million pounds of synthetic iron oxide were used to color cement-based products in North America alone. While we may not repeat that kind of growth over the next fifty years, decorative concrete is forecasted to continue to lead all other segments of concrete construction in growth well into the future. Since iron oxide pigments are used in most every decorative concrete product, and integrally colored concrete is in itself the largest decorative concrete market segment, doesn't it make sense to take some time to understand this popular and key building block of our industry?



## How Concrete Gets Colored

Understanding how to avoid and fix problems starts with understanding how the product works, as well as major factors that affect the final outcome. First, we need to use the right terms. Color for concrete is not a dye, stain or paint. They are pigments, either mined from the ground, or most often manufactured in huge chemical plants around the world. They are available in powder, liquid and granular forms, with no one form better than the other. To understand how concrete gets colored, you need only know that iron oxide pigment particles are ten times smaller in size than a particle of cement. When color is added to any cement based mix, the smaller pigment particles cover the larger cement particle. This is why color is dosed based on cement content (sack mix) and nothing else.



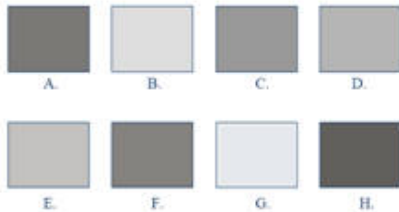
Water to cement ratio chart.  
Courtesy of Lanxes Corp.

## Water Cement Ratio is critical factor to producing consistent color

When it comes to major factors that affect color, the most critical is water to cement ratio. Controlling the amount of water added to the concrete mix is critical to producing consistent color. The addition of water permanently changes the concrete, typically lightening the final color. For example: The first concrete truck arrives and is placed as is. The second one has 5 gallons of water added. At noon the last truck has 15 gallons added. – you now have three different colored slabs! Use slump control admixtures available from ready mix suppliers. Or use the powdered form for use on the jobsite from manufacturers such as Fritz Pack. These products make your job easier while eliminating jobsite added water! This is not only true when additional water is added to the concrete mix, but also when water is added to the surface during the finishing process.



## N. California Gray Cement



*Changing cements mid-job will result in a color difference.*

If the surface is drying out, or the weather is hot and windy, don't use water! Instead, use a surface evaporative control agent. Available at most concrete distributors, these surface evaporative control chemicals are a must for anyone placing any type of decorative concrete. While all of these surface evaporative chemicals slow the hydration of concrete in hot windy conditions, some are even designed to help finish wetting out color hardeners if the concrete is drying out too fast.

### **The role that the gray cement plays in the final color**

The second key factor to consider is the role that the gray cement plays in the final color. Consider that the color you add to the mix has to overpower the gray base color of the concrete. These two colors come together to form the final color we see. This is why colors (in gray cement) are all darker earth tone shades. You can achieve lighter color shades in concrete, but that requires the use of expensive white cement. Another important consideration regarding gray cement is that they are not all the same shade of "gray". In a recent comparison study of Portland type I Cement from multiple suppliers in Northern California, color ranged from almost white to battleship gray.

This reinforces the practice of maintaining batch-to-batch consistency. Deal with reputable ready mix suppliers that take steps to control these variables, and never switch ready mix suppliers in the middle of a colored concrete project! Make sure your RM supplier understands colored concrete and that they use cement from the same lot (or at least the same cement company!) for the entire job. If a job starts with light cement and then the RM supplier "tops off" with another color of cement – expect color differences. *Second only to water related issues, cement is a major culprit of color differences in large pours.*



## Proper Curing Required

The remaining factors, while not as critical, are important and need to be considered and controlled: The proper curing of concrete is important to reduce surface shrinkage cracking and obtain the proper strength. It is even more important in colored concrete because lack of curing produces inconsistent color. Slight color or shade differences in gray concrete are seldom noticed.

Those same slight color differences can more often than not hold up your payment or even result in concrete removal and re-pour. To help avoid this potential problem, the use of a matching colored curing compound or colorwax is always recommended when pouring colored concrete.



Inconsistent cure produces inconsistent color which is much more noticeable in colored concrete versus gray concrete.



Close-up of curing differences.



Half the project was cured with a colored curing compound; the other half was not.



In fact some manufacturers color cards and colored samples are based on a finish with a colored curing compound. Several “Cure and Seal” (meets ASTM 1315) products are available on the market as well. Make sure they say they are “non yellowing”, “blush resistant” or “for decorative concrete”. Regular “C-309” cures will discolor colored concrete, and “non C309” cures (i.e. penetrating cures) will not hold in the moisture uniformly. Do not use polyethylene sheeting. Wrinkles not in contact with the slab will cure (color) differently than areas in solid contact.



Combine different colors and textures. Break up large, integral color projects with different color and texture bands.

## When Placing Large Areas of Colored Concrete

The last of the key factors that affect color are sub base preparation, placement, finish and maintenance. As with most issues in architectural concrete, color tends to magnify the above issues that are overlooked or unnoticed in gray concrete. When placing large areas of colored concrete over days, weeks or months, take into consideration the ability to maintain color consistency.

Consider breaking up the large areas with bands of different color and or texture. For large pours of one color, it might be worthwhile considering the use of dry shake color hardener that takes most color related surface variables out of the picture.





## Offer maintenance services for the colored concrete you install

The issue of maintenance in regard to colored concrete often never comes up when the product is sold or promoted. This comes from the fact that gray concrete is considered a maintenance free material. Once again, add color to concrete and you can expect the people writing the check to scrutinize the final product from the day it is poured and for years to come. Without periodic cleaning and resealing, the color will change. Notice how I said change, not “fade”. If you use pure iron oxide pigments, which most reputable suppliers do, these colors will not fade. Years of surface effects such as efflorescence, pollution, dirt and traffic take their toll on the concrete surface giving the appearance of fade. Remember how we discussed how color surrounds particles of cement in order to overpower the gray and impart the chosen color? As these color-coated particles of cement are worn away you start to see bits of sand and other small non-colored aggregate in the concrete. Those natural colors will make the color look faded. Typically a good cleaning and sealing brings back the original color even after years of neglect and lack of maintenance. In an effort to avoid future callbacks and client discontent, clever applicators around the country have begun to offer maintenance services for the colored concrete they install. Each year, or as needed, they charge an agreed upon fee to return to reseal their work. This not only keeps their name fresh in client’s minds for future work, but also generates a nice stream of revenue on repeat basis.



Controlling all the variables can produce large, integrally colored concrete projects.



## Techniques that may save a slab with inconsistent color

Unfortunately I tend to get a lot of calls after the concrete has been poured where one or more of the above-mentioned factors are at play. When inconsistent color becomes a problem on your project, one or more of the following techniques may save the slab from having to be ripped out and replaced.

The most common and cost effective method for dealing with blotchy, inconsistent, or a wrong color is hiding it with a tinted sealer. Adding color to sealers has been used for years to cover color problems. What most applicators are not aware of is that tinted sealers are available in water and solvent bases, as well as multiple levels of gloss and opacity. You can buy a pre mixed colored sealer, or add tint concentrates to clear sealers on site. Key factors that need to be considered in the decision making process of what type of tinted sealer to use are based on the surface to be coated (sealed or un-sealed) level of “hide” or “opacity”, and type of gloss desired. While piling on multiple coats of any colored sealer will eventually create a totally opaque coating, this is not recommended or desired. Typically one or two coats are sufficient to provide the desired effect. The solids content and type of carrier tend to determine the translucency (how much you can see through the tinted sealer) of the sealer. Higher solids and water-based sealers tend to be more opaque than lower solids solvent-based sealers. Also solvent-based sealers are always higher in gloss than water based sealers. I recommend that you do some research and testing as well as talk with your local distributor or manufacturer’s representative about their offering of tinted sealers. Depending on type of tinted sealer, typical material cost per square foot runs \$0.07 to \$0.25.



After it is cleaned and sealed, the proper color in the concrete comes to life.







As a side note, I want to warn against using color hardener and release powder to create homemade tinted sealers. These dry powders can effect the film development of most sealers, which can result in a whole new set of problems.

Another proven method for changing color is the use of water-based stains. Either topical acrylic stains or water based penetrating stains have been used to shift lighter colored concrete to a darker color. Because these types of stains typically are very translucent this method is limited to slabs where there are broad areas of slightly varying colors, not where the color is botchy or containing streaks. Depending on the type of stain, material cost will run \$0.02 to \$0.07 per square foot. The one down side to this fix is that it will require the same type of maintenance as the sealers mentioned above.

The last, and most costly method for fixing inconsistent color is the use of polymer modified thin section toppings. These “micro thin toppings” have come a long way in the last few years in regard to adhesion, strength, freeze thaw resistance, and durability. They are available in both interior and exterior grades, in virtually any color, and can be finished to look exactly like concrete. Most require minimal surface preparation (over clean, sound concrete) and last for years with minimal maintenance. Depending on the type of overlay, material cost per square foot will run \$0.70 to \$1.50.

Integrally colored concrete remains a staple in the world of decorative concrete. While the technology has changed little in the last 50 years, its uses and popularity continue to grow. While Sun Belt regions of the country have known the benefits and money making potential of colored concrete for years, other areas are just now discovering its many uses and aesthetic value. Whether you are an established decorative concrete professional, or thinking about getting into architectural concrete, understanding the basics of integrally colored concrete, and how to troubleshoot common problems is a key building block to becoming an expert!





## *Sherpa info*

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### **ABOUT THE AUTHOR**

Chris Sullivan writes feature articles for The Concrete Network ([www.concretenetwork.com](http://www.concretenetwork.com)). He is the National Technical Director and Regional Sales Manager for QC Construction Products, a leading systems manufacturer of decorative concrete systems.

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## SUMMIT DATE

This document reached the summit (was created) on August 30, 2005 and is based on the best information available to the Sherpa at that time. To check for updates please click here <http://www.ConcreteSherpa.com/color>.

## NAVIGATION & USER TIPS

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## ABOUT THE CONCRETE SHERPA

The Concrete Sherpa is a team of people that represent the experience, teaching and learning of our team members and other industry leaders *on a mission to make life better for the concrete contractor*. We are an idea center striving to deliver thought provoking ideas based on “Concrete Advice for Business and Life” to stimulate you to reach new heights. As a user, you should remember to consider all information you receive, here at the Concrete Sherpa or elsewhere, not as a *cast in concrete* recommendation, but rather as an idea for you to consider and ponder.



## *Sherpa info*

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### THE JOURNEY LEADING TO THE CONCRETE SHERPA PROJECT

The Concrete Sherpa Project (A [Sherpa](#) is a “guide”) was born at The Concrete Network in mid 2004. Here is how it happened:

The biggest surprise, or gift, since starting The Concrete Network in 1999 has been the concrete contractor friends from around the country we’ve made and witnessing the passion they have for what they do. These people include Dave Pettigrew, up in the San Francisco Bay Area, or the Verlennich brothers in Minnesota, or Bob Harris in Georgia, the list goes on and on. It’s quite inspiring.

We were once asked, “How are you so excited every day about concrete?” Well the answer is simple, it is impossible to not be excited about concrete when you have the job we do—interacting with hundreds of concrete contractors from every state in the country.

The thing we’ve learned about concrete contractors is that most are passionate *craftsmen*—they are often less passionate and experienced in the “office stuff”. Human nature channels us to do what we are most comfortable with; learning how to use a new saw-cutting tool is comfortable; learning and implementing a new estimating strategy, or job management tool, is not so comfortable.





## *Sherpa info*

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### THE JOURNEY CONTINUES...

So Sherpa was born to provide FREE and easy to use information on topics many contractors are not too comfortable with.

- Concrete Sherpa is here to provide help to contractors who are often 'Lone Rangers' and don't have anyone to get solid business advice from.
- Concrete Sherpa is here to provide help for contractors who have to work too hard and too many hours in their business, and one day realize they need to work *on their business, not in their business*.
- Have fun with Concrete Sherpa and go faster towards reaching success than you might have on your own.
- To skeptics who think something free can't be valuable, or there must be a trick- visit Concrete Sherpa and decide for yourself.

We hope you make great use of the Concrete Sherpa and it helps you to become an awesome success for yourself, your family, your church, and your community.

### VISIT THE CONCRETE SHERPA

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