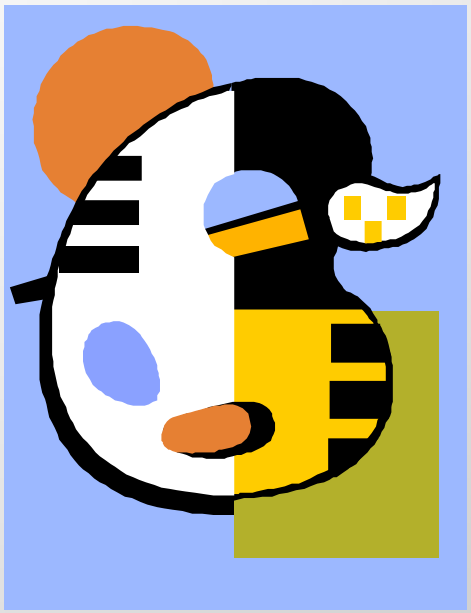
Guide to Buying Integral Color and Color Hardener for Concrete



By Anne Balogh

Two of the most popular methods for coloring newly placed concrete are integral coloring admixtures and dry-shake color hardeners. Both infuse concrete with rich, long-lasting, fade-resistant color, and in the case of color hardeners, even improve surface hardness and durability. Continue >

Stamped concrete contractors often use one or both of these coloring mediums to produce a backdrop for contrasting accent or antiquing colors, such as pigmented release agents and stains or dyes. This layering of color is what enables them to so closely replicate the variegated, multi-tonal appearance of natural stone. Other applications for these products include interior floors and concrete surfaces requiring extra wear and abrasion resistance.

So which is the best method to use to take your next project from bland to technicolor? Here's a primer on the differences between integral color and shake-on color hardener and some of the advantages and limitations of each. We also give you tips for buying and using these products as well as pointers for achieving consistent color.

Photo Courtesy of Davis Colors.

Integral Color

Integral coloring admixtures are typically a blend of synthetic or natural iron oxide pigments and surfactants (or wetting agents) that are mixed thoroughly into fresh concrete before placement to achieve uniform, homogeneous color. Integral colors are available in powdered, granular, or liquid forms. For convenience, contractors can order the color directly from the ready-mix supplier for addition at the batch plant. However, many manufacturers have made it easier than ever for contractors to add the color to the truck mixer at the jobsite by packaging their dry pigments in premeasured quantities in disintegrating bags that can simply be tossed unopened directly into the mixer. Liquid pigments, which typically come in pails or buckets, are also easy to add onsite to the concrete mix.

Alabama Pigments Company, LLC

Advantages

The biggest advantages of integral color are convenience and labor savings, says Bob Harris, president of The Decorative Concrete Institute and author of Bob Harris' Guide to Stamped Concrete. Because the integral color is mixed into the concrete, you can simply place and finish the concrete as usual. There's no need to dust the color onto the surface and float it in during finishing, as is the case with shake-on hardeners.

Another plus: Integral color is permanent because it extends throughout the entire concrete slab. So even if the slab surface is accidentally chipped, scratched, or abraded, the color will remain, unlike with surface-applied treatments. Manufacturers also say that the pigments in integral coloring admixtures are chemically stable and won't fade over time from exposure to the weather or ultraviolet light.

Limitations

The chief disadvantage of integral color is that the hues are more subtle and less intense than what you can achieve with color hardeners. You're generally limited to soft earth tones or pastel shades. In fact, iron-oxide-based integral colors are only produced in three basic hues: red, yellow, and black. Manufacturers concoct all the other shades, such as browns, tans, and mauves, by blending the basic hues in different ratios, says Chris Sullivan, national sales manager for QC Construction Products. The exception is blue and green tones, which are possible to produce but typically cost at least two to three times more than iron-oxide pigments because different mineral oxides are used, according to Sullivan.

Cost can be another hindrance. Because you're coloring the entire batch of concrete, rather than just applying color to the surface, you'll generally pay more for integral color than for a shake-on color hardener. Manufacturers also warn that due to the graying effect of most cements, some integral colors should only be added to concrete mixtures containing very light or white cement, which can further boost your overall costs.

What to consider before buying

• Only use products that meet or exceed ASTM C 979 standards for pigments for integrally colored concrete. You can usually find this information on the technical data sheet for the product.

• Most integral pigments on the market today are made from synthetic rather than natural iron oxides. While you can still buy the natural form, synthetics offer two to three times the tinting strength, says Sullivan.

• When it comes to powdered versus liquid forms of integral color, one is really no better than the other, according to Sullivan. “They are really the same product and offer the same tinting strength. One just happens to be suspended in water,” he says. A downside of liquid pigments is that you’ll end up paying more because they contain 30 to 40 percent water. “One pound of dry pigment equals 1.3 to 1.4 pounds of liquid pigment,” he says. Liquid pigments may offer advantages during mixing, however, because they are less messy to handle than bulk powders and they blend in faster. They also can be dispensed with computer-controlled metering systems, which some ready-mix producers use in their plants for more precise dosing and to simplify the blending of custom concrete colors.

Photo courtesy of Brickform.

• Ask your ready-mix producer or integral color supplier about the effects other admixtures could have on the workability, set times, and color consistency of integrally colored concrete. Manufacturers say that most admixtures have no detrimental effects on colored concrete, with the exception of calcium-chloride-based accelerators, which can cause discoloration and blotchiness. Some admixtures, however, may shift the color slightly lighter or darker.

• Because the dosage rate of integral color is based on the cement content of the concrete, some manufacturers warn against using cement substitutes, such as pozzolans and fly ash, because the final color could be affected.

• In addition to straight integral pigments, you can find “engineered” integral colors that contain admixtures such as water reducers, set retarders, and conditioners. These products are designed to improve the finishability of the colored concrete. Examples include Chromix Admixtures from L.M. Scofield and Color Tech-E from QC Construction Products.

• If you plan to add the integral color to the concrete mix yourself, be sure to consult with the color supplier for guidance on the proper dosage per sack of cement and the required mixing times. Most suppliers offer dry pigments in disintegrating bags of various sizes, ranging from 1 to 25 pounds or more, so you can buy the exact quantity needed for a particular project.

• Ready-mix producers generally use integral color from one supplier, which may limit your options somewhat. However, Sullivan says that shouldn't be a big concern because the integral colors from the various manufacturers are chemically similar and there's a lot of overlap in color options. "What it comes down to is service and availability," he emphasizes.

Dry-Shake Hardeners

Most shake-on color hardeners are a blend of pigments, portland cement, finely graded silica sand, and wetting agents. They come in powdered form, packaged in bags or pails, and are tossed or hand broadcast onto the fresh concrete. After the hardener wets up, a wood bull float is used to float the hardener into the surface before the concrete hardens. Unlike integral pigments, which color the entire concrete matrix, hardeners color only the top 1/8 to 3/16 inch of the slab. Decorative contractors often use dry shakes to color stamped concrete flatwork or concrete overlays, because the rich surface paste helps to produce sharper imprints.

Advantages

Dry-shake hardeners come in a wider array of hues than integral colors, including various shades of blue and green. And because the color is concentrated on the surface, it tends to be more intense. As the name implies, color hardeners also densify the concrete surface because they contain hard mineral aggregates and portland cement. The result is a surface that's stronger, more wear resistant, and less permeable to moisture and deicing chemicals than standard concrete.

Photo courtesy of L.M. Scofield Company.

Limitations

The two main disadvantages of color hardener are the labor and the mess, according to Jeff Potvin of Architectural Concrete Consultants. Most manufacturers recommend applying color hardener in two separate applications, or “shakes,” instead of applying the entire recommended dosage all at once. This gives the hardener a chance to “wet out,” or absorb water. After each application, the hardener must be worked into the surface with a float. Potvin says that it usually takes six man-hours to spread color hardener on approximately 500 square feet of concrete.

Because of their shake-on application, dry shakes generally are limited to use on horizontal surfaces. However, Harris says that you can apply them to step faces by combining the hardener with a bonding agent and water and then plastering this mixture onto the vertical faces with a trowel.

What to consider before buying

• As with integral pigments, make sure the color hardener meets ASTM C 979 standards for color stability. If abrasion resistance is a priority, look for products that produce surfaces meeting the abrasion-resistance standards of ASTM C 944.

• Always follow the manufacturer's recommendations for color hardener dosage rates. Most suppliers package hardener in 60-pound buckets or bags that will cover approximately 100 square feet of surface area (or about 2/3 pound of material per square foot). But lighter colors often require a heavier application, ranging from 90 to 120 pounds (or two containers) of hardener per 100 square feet.

• Consult with your ready-mix producer and explain that you will need a mix design appropriate for use with a dry-shake hardener. Some admixtures, such as air-entraining agents and water reducers, can reduce or minimize the amount of bleed water available for absorption by the color hardener. Some manufacturers recommend limiting the air content of the concrete to 4%.

• If you want to use a dry-shake hardener to color an overlay, ask the manufacturer of the overlay system if hardeners are a viable coloring method. A dry-shake hardener must absorb some moisture from the overlay so you can work it in properly. Some overlay systems, however, don't contain enough moisture to wet out the hardener.

Weighing the Options

When making side-by-side comparisons of integral colors and dry shakes, here are some additional factors to evaluate before making a decision:

Photo courtesy of Brickform

Cost vs. labor savings

Generally, integral color will cost more than a dry-shake hardener because you are coloring the entire concrete slab rather than just the surface. But a dry shake may not always be the most economical choice if you factor in the additional labor involved to apply it and work it into the surface. Also remember that when using lighter shades of color hardener, you will need to use more product to get good results.

Desired color effects

If you want a greater selection of colors and more vibrant hues, then a color hardener will provide more options. With dry shakes, you can also apply accent colors of hardener to achieve contrast, using one shade as a base topped with as many as four or five different accent colors. Harris recommends using this technique on stamped concrete projects to replicate the subtle color variations you would see in natural stone.

Although it's possible to obtain more vibrant pastel shades with integral color, doing so could be cost prohibitive because you would need to use a white cement and a higher dosage of pigment. Another option is to use integral colors in conjunction with surface-applied treatments—such as color hardeners and chemical stains—to create layers of color.

If you can't find just the right color for your project, ask the manufacturer about the possibility of custom color matching. Suppliers of both integral color and color hardeners are often able to match existing color tones or formulate custom hues to suit your design scheme.

Creating Samples

Clark Branum, director of technical services for Brickform Products advises that creating samples or mock-ups of the work to be done are critical to the success of any colored concrete application. "Mock ups with integral color are typically expensive since a minimum of 3 cubic yards must be used to produce consistent color, partially due to the amount of cement paste it takes to coat the drum of a cement mixer. With color hardener, it is much easier to create small panels and mock ups that can easily be reproduced on a larger scale, making it much more cost effective during the front end phase of a project," says Branum.

Jobsite considerations

Dry-shake hardeners are not only labor-intensive, they also are messy to apply. Because some of the material goes airborne during broadcasting, it's necessary to protect adjacent buildings, landscaping, and existing slabs with plastic sheeting. This airborne powder can also be harmful to breathe, so it's important to wear a respirator or dust mask when working with these products. These issues aren't concerns when using integral color, since the pigments are mixed right into the concrete.

When applying dry-shake hardeners on extremely hot or windy days, you will also need to take measures to prevent moisture in the surface from evaporating too fast. Not only can this rapid moisture loss lead to surface crusting and cracking, it will make it impossible for you to properly wet out the color hardener. However, you can use an evaporation reducer, such as ConFilm from Degussa Admixtures and Eucobar from Euclid Chemical, to help slow surface moisture loss on hot, windy days.

Performance

Because color hardeners improve the strength and density of the concrete surface, they often are a good choice for exterior slabs exposed to freeze/thaw cycles and deicing salts and for interior floors exposed to heavy traffic and abrasion.

Integrally colored concrete will have the same surface strength as standard concrete, but the color is permanent because it penetrates the entire slab. So even if surface abrasion occurs, the color will not wear away.

Tips for Achieving Consistent Color

• Don't rely on the color charts or cards provided by the color supplier to precisely represent what the final results will be on your project. These color samples generally show what can be expected when using a "generic" mix made with a medium-gray shade of cement. The only way to verify the final color for your project is to perform a trial placement with the actual mix you'll be using. Most color suppliers will provide samples of their products so you can conduct preconstruction trials. Be sure to prepare a sample for each color and mix design you plan to use.

• Inconsistencies in finishing practices, timing of operations, choice of release agents, and curing and sealing methods can also result in slight color variations. Keep things status quo throughout the project.

• Keep the mix design consistent for every batch of concrete used on the job, including cement type and brand, aggregates, and water-cement ratio. If using supplemental admixtures or cement substitutes, make sure they are added to all the batches of concrete on the project.

• Whether you're using an integral color or a dry-shake color hardener, note the specific color used, amount, and the name of the manufacturer. This will permit you to duplicate the same color effects on a different project, assuming you stick with the same mix design and placement methods.

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SUMMIT DATE

This document reached the summit (was created) on June 30, 2006 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/integral.

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.

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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

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.

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