



***A Manufacturer's and Contractor's Guide  
to Coloring Ready Mix Concrete with  
Bayferrox® C Iron Oxide Pigments***



**LANXESS**

## Recommendations for the Ready Mixed Producer

- Do not use calcium chloride with color pigments. It tends to cause discoloration/blotches.
- When using disintegrating/repulpable bags, add as described earlier except when mixing times are short or the aggregates are especially small. It is then recommended to pour the pigment from the bag into the mix in the sequence above.
- Keep all raw materials – cement, sand and aggregates especially – as consistent as possible throughout the entire project. Any change can affect the final color of the project.
- Be sure concrete loads have consistent mix times, and that delivery and discharge times are as quick as possible. Overmixing, longer than 1½ hours, affects color consistency.
- Air content, especially in freeze/thaw climates, should be 5-7%. Air entrainment is only necessary if your climate dictates.
- Slump should be consistent, and less than five inches (125mm). It is recommended to use plasticizers instead of adding more water to achieve a slump of greater than five inches.
- Water has a tremendous effect on final color. Too much water tends to lighten the color of the project – it looks “pale” or “washed out.” If better flowability is required, use a plasticizer or water-reducing admixture instead.
- Clean mixer thoroughly at the end of the job. Begin each new color with a clean drum.
- Do not overload the mixer as this reduces mixing efficiency. By the same token, mixer should be loaded to a minimum of 40% capacity for a good color mix.

## Recommendations for the Contractor Using Colored Ready Mix

Follow normal procedures regarding base preparation, use of vapor barriers, plus placement of forms, reinforcement and joints, for colored and uncolored concrete. Here are some additional guidelines that should be observed.

- Be sure to use an experienced ready mixed supplier who consistently follows the recommendations provided above.
- Do not sprinkle dry concentrated pigment (either powders or Bayferrox C granules) onto the surface of “green” concrete.
- Give yourself enough time and adequate labor to do the job right.
- Stop floating the concrete when surface becomes wet. Then begin troweling after bleed water evaporates. If you wait too long, burns or dark spots are likely.
- Avoid adding extra water at the job site. Also, don’t wet finishing tools or sprinkle any water onto the surface of the colored concrete.
- Final finishes, such as broom, swirl, rough or imprinting, usually result in a more uniform color appearance than smooth surfaces.
- Do not fog or cover final project with plastic sheets. This creates uneven colors.
- Curing compounds are recommended but extreme care must be taken in their selection and application. Also, surface retarders during finishing may be necessary in dry, windy weather. For both products, consult your local ready mixed concrete or admixture supplier for information on products recommended for colored concrete.
- Efflorescence is a naturally occurring phenomenon. It is that white powdery substance, and unfortunately it is more visible on colored concrete products. Sometimes the whole project looks lighter due to an even layer of efflorescence. Other times, it occurs in spots or in areas around the edges where faster setting occurred. If efflorescence happens, care should be taken for its removal. Use a reputable product and follow manufacturer’s recommendations carefully, using all safety precautions.

# A Manufacturer's and Contractor's Guide to Coloring Ready Mix Concrete

## Bayferrox® Pigments for Concrete Made by LANXESS Corporation www.Bayferrox.com ISO Certified

LANXESS Corporation was formed when the Bayer Group combined most of its chemicals businesses with large segments of its polymers activities. The company began doing business as a new legal entity in the United States on July 1, 2004. LANXESS will continue manufacturing Bayferrox® iron oxide pigments, which is a registered trademark of Bayer AG, Germany.

Bayferrox synthetic iron oxide pigments are used worldwide for coloring concrete products, and LANXESS produces Bayferrox pigments in the United States, Brazil and Germany. All locations have ISO certification. Therefore, whatever location the material is shipped from, this is your assurance that Bayferrox will be the most consistent color and quality pigment possible. See our website [www.Bayferrox.com](http://www.Bayferrox.com) for more information on our pigments.

Bayferrox iron oxide pigments are among the most consistent raw materials that go into the concrete mix. However, variations in water-to-cement ratios, color of aggregates, cement, mixing time, weather and workmanship, have a tremendous effect on final color. Therefore, care should be taken to keep them as consistent as possible. This brochure is intended to assist the ready mixed concrete producer and the contractor who places colored concrete with some guidelines to help assure color consistency.

### Call 1-800-526-9377 for Product Information, Order Placement, and Technical Service.

Other product literature and technical information is available from LANXESS. Call us at 1-800-526-9377 and ask for a Bayferrox technical representative for assistance in the application and proper use of our pigments. In addition to unparalleled technical support conducted out of laboratories in the United States and Germany, LANXESS sales representatives service accounts across North



America. These sales persons are extensively trained and work with a network of independent agents who also represent Bayferrox for LANXESS.

## The Bayferrox Advantage

We have over 85 years of experience in the production and use of iron oxide pigments. Regardless of the end-use application, the same quality control applies to every pound of Bayferrox produced.

Bayferrox pigments comply with ASTM C-979 Pigments for Integrally Colored Concrete. They are pure synthetically produced iron oxide pigments that are insoluble in water, weather resistant, alkali and lime resistant, and stable under exposure to sunlight and ultraviolet radiation.

## Uses, Forms of Supply, Service and Availability

Bayferrox is suitable for all types of concrete products: ready mixed and stamped concrete; concrete blocks, bricks and paving stones; segmental retaining wall units and architectural precast products; colored mortar cement, stucco and grout.

The most common form of pigment used by the ready mixed concrete industry to give color to their product is powder pigment that comes in a wide range of colors. The primary particle size of these pigments is 10 times finer than cement particles. During mixing they become permanently bound into the concrete matrix.

Bayferrox powder pigments are typically packaged in 50-pound bags. For the ready mixed industry, select grades are prepackaged in special sized disintegrating bags that are added manually to the mixer to achieve a specific color per yard of concrete.

## Bayferrox C Pigments. An Alternative to Powders and Liquid Colors

Our parent company produces Bayferrox C pigments in Germany. These are compacted granular pigments ideal for coloring ready mix concrete. These pigments are specifically engineered for the producer who wants to automate pigment metering in their plant. Right after the standard Bayferrox pigment powders have been made, multiple pigment particles are compacted together to create the Bayferrox C granule. Unlike powder pigments, however, these granular pigments are free flowing and low dusting, and can be metered automatically.

There are two basic methods of automatically metering Bayferrox C.

1. All dry metering where the granules are weighed and conveyed to the concrete mixer in their dry state; and
2. Dry-to-wet metering, where the granules are weighed dry, then they are mixed with your own water. The color slurry is then pneumatically conveyed to your mixer.

For coloring ready mix concrete, the recommended method of metering Bayferrox C pigments is the dry-to-wet approach mentioned above. This process is significantly less expensive than buying premanufactured liquid colors because you are buying a dry product that is 100% pure pigment. Premanufactured liquid colors or slurries, on the other hand, are 60-70% pigment and 30-40% water.

### The Real Cost of Buying and Using Liquid Colors

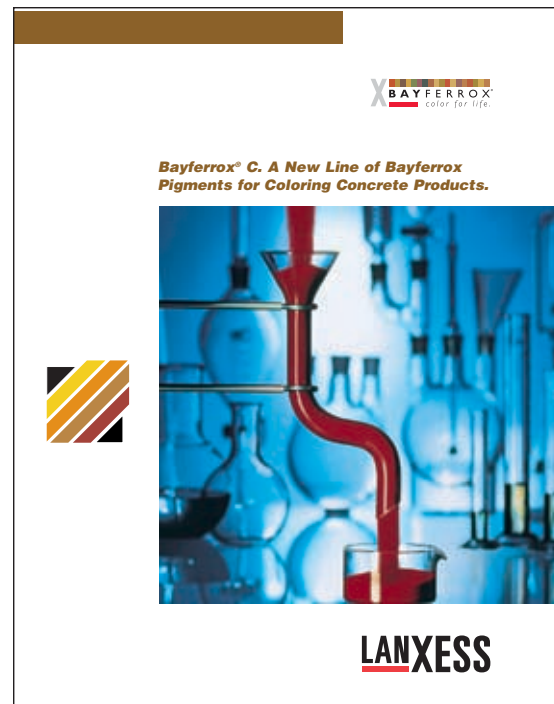
The actual cost for a pound of dry pigment in a premanufactured slurry (PMS, or also referred to as liquid color) can be determined using the formula:

$$\frac{\text{Price per pound of PMS}}{\text{Percent pigment in PMS}} = \frac{\text{price for a pound}}{\text{of dry pigment}}$$

Using this formula, if premanufactured slurry is \$0.85 per liquid pound and the pigment solids content is 65%, the price for a pound of pigment in that slurry is \$1.30, or:

$$\frac{\$0.85 \text{ per pound of PMS}}{65\% \text{ pigment solids}} = \frac{\$1.30 \text{ for a pound of}}{\text{pigment in the slurry}}$$

Water does not make concrete colorful. Only the pigment particles impart color in



the concrete. Therefore, one pound of liquid color will not yield the same color as one pound of dry pigment. Rather, 1.54 pounds of liquid color that is 65% pigment (solids) is required to make the same color as one pound of dry pigment. Here's the formula:

$$1.54 \text{ pounds of PMS} \times 65\% \text{ pigment solids} = 1 \text{ pound of dry pigments}$$

### Some Advantages of Bayferrox C Granules in an Automated Dry-to-Wet Color Metering System

- **Lower freight costs.** Since you are purchasing a dry pigment, you will not be shipping water. Therefore, your freight costs would be significantly less. Considering the formula above where you would need 1.54 pounds of liquid color to equal one pound of dry pigment, your freight costs would increase 54% since you are shipping that much more weight.
- **Improved dispersion and better color consistency.** Bayferrox C pigment granules have been tested and proven to disperse throughout the concrete mix easier and faster than dry pigment powders or granular pigments made using spray-dry technology. When tested compared to premanufactured liquid colors, the Bayferrox C pigments – when metered either dry, or from a dry-to-wet system – dispersed just as quickly. This improved dispersion leads to more thorough color development and therefore better color consistency from batch to batch.

- **Fewer problems.** Bayferrox C is a dry product. Therefore the pigment can not freeze, its shelf life is unlimited if stored dry, and there's no pigment wasted. Liquid colors, however, will freeze and - if they sit for a relatively short period of time without agitation - the pigment will settle and harden in the bottom of a tote, and it can not be used.

## The Key Advantages of Automation

- **Reduces batching errors.** Automation is your assurance that the pigment will be weighed accurately, and metered to your mixer or truck at the precise time. For your use and assurance, a ticket is printed for each batch of color made.
- **Color flexibility.** Hundreds of earth tone colors are producible. That's because metering systems are based on using four primary colors, with the final color developing in the mixer due to the combined forces of the aggregates and mixer dispersing the pigment particles throughout the mix.
- **Better housekeeping and inventory management.** Stocking four primary colors is easier and cleaner than inventorying numerous powder pigments in various size bags.
- **Reduces labor costs and compensation claims.** Since no one is carrying bags up a ladder to the ready mix truck, there are fewer backaches and pains. Safety is improved. And though a system may not completely eliminate the need for a person, it will reduce the time it previously took to add color to your product.

## Adding and Mixing Bayferrox into the Concrete

The shades on the Bayferrox color card for the ready mix industry have been selected because of their popularity in the ready mixed concrete industry. Numerous other shades are also available. Just pick your favorite grade of Bayferrox and specify it by name, color number and amount. These and numerous other colors can also be produced by your color metering system using our Bayferrox C granules.

Either our standard powders or the Bayferrox C granular pigments should be added into the concrete mix, not sprinkled or dusted onto the surface of the concrete. Also, you will notice on the color card that the amount of color ranges from one-half of a pound up to seven pounds per 94-pound sack of cement. The lower amount provides colors that are very subtle, while colors using greater amounts of pigment are much richer. ASTM limits the amount of color per batch to 10% of the cementitious materials in the mix. Any additional pigment will not provide any additional "coloring power" and may in fact reduce the strength of the concrete.

The most important thing to remember when using color pigments is that once the specific mix design and sequencing of raw materials has been established, they should not be altered. Consistency of raw materials, and in all phases in manufacturing, are the most important element in making quality colored concrete.

Our Bayferrox powders and C grade pigments use the physical action of the concrete mixer, and the action of the raw materials against the pigment particles, to disperse the color throughout the mix. As such, the recommended sequence for adding pigment using batch mixing is:

- Add carefully weighed aggregates (sand, stone, gravel, etc.)
- Add 1/2 to 2/3 of total batch water to mixer
- Add exact amount of pigment (dry or slurry form) and begin mixing at charging speed for a minimum of one minute.
- Add accurate amount of cement, approved admixtures, and remaining water. Mix for five minutes minimum at high speed.

At a fully automated batch plant, the Bayferrox C pigment slurry produced by the dry-to-wet color metering system is added automatically right into the truck. When adding preweighed bags of powder, the pigment is typically added manually, after the truck has pulled away from the batch station. This is a suitable practice, as long as it is done consistently and the truck has sufficient mixing time before arriving at the job site.

The manner in which you use and the purpose to which you put and utilize our products, technical assistance and information (whether verbal, written or by way of production evaluations), including any suggested formulations and recommendations are beyond our control. Therefore, it is imperative that you test our products, technical assistance and information to determine to your own satisfaction whether they are suitable for your intended uses and applications. This application-specific analysis must at least include testing to determine suitability from a technical as well as health, safety, and environmental standpoint. Such testing has not necessarily been done by us. Unless we otherwise agree in writing, all products are sold strictly pursuant to the terms

### Health and Safety Information

Appropriate literature has been assembled which provides information concerning the health and safety precautions that must be observed when handling the LANXESS products mentioned in this publication. Before working with any of these products, you must read and become familiar with the available information on their hazards, proper

of our standard conditions of sale. All information and technical assistance is given without warranty or guarantee and is subject to change without notice. It is expressly understood and agreed that you assume and hereby expressly release us from all liability, in tort, contract or otherwise, incurred in connection with the use of our products, technical assistance, and information. Any statement or recommendation not contained herein is unauthorized and shall not bind us. Nothing herein shall be construed as a recommendation to use any product in conflict with patents covering any material or its use. No license is implied or in fact granted under the claims of any patent.

use, and handling. This cannot be overemphasized. Information is available in several forms, e.g., material safety data sheets and product labels. Consult your LANXESS Corporation representative or contact LANXESS's Product Safety and Regulatory Affairs Dept., Pittsburgh, PA.

Note: The information contained in this bulletin is current as of November, 2004.  
Please contact LANXESS to determine if this publication has been revised.

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