

IMPROVED AESTHETICS FOR PRECAST BRIDGE COMPONENTS USING COLORED MASONRY STAINS

Shawn Carney, Architectural Business Development, Greenacres, WA
Clint Whitsett, Marketing Coordinator, Greenacres, WA

ABSTRACT

Industry trends indicate that the use of precast concrete in bridge construction has risen steadily over the past several years.

For these structures to blend with other design elements and the surrounding landscape, color consistency is crucial. When applied to exposed concrete surfaces, masonry stains can provide an efficient and economical alternative to integral coloration.

It is important that architects and specifiers select a quality coating manufacturer whose products have been independently tested and time-proven. All pre-project submittals should include extensive technical information, case histories or references, and a detailed explanation of the product warranty.

Keywords: Precast, Flexibility, Alternative Coloring, Water Repellency, Dampproofing, Moisture Vapor, Uniform Appearance, Unlimited Color Palette, Reduced Maintenance, Graffiti Resistance, Easy Application, Fade Resistance.

INTRODUCTION

The use of precast components in bridge construction has increased significantly over the past several years. This is due in large part to the flexibility precast offers in maintaining over-all design consistency, both structurally and aesthetically. Not only is demand high for bridge components to meet specific structural requirements, but the engineering community is also under pressure to solve difficult design & aesthetic challenges in a manner that is acceptable to the taxpayer.

INTEGRAL COLOR VS MASONRY STAIN

Color consistency is a key factor in designing structural components that are intended to blend with other design elements as well as the natural environment. In some cases, integral coloration is effective. It's an expensive option given that only a limited amount of colorant is actually visible, yet the very benefit of integral coloration is that the color extends throughout the substrate. However, color development can be difficult to control from batch to batch. This creates a potential for color variations in the finished concrete, which can lead to customer dissatisfaction and rejection. For this reason, product literature typically includes numerous disclaimers relating to color consistency. In addition, integral coloration has no affect on blocking efflorescence and typically requires a clear coat sealer, further adding to the project budget.



Crooked River Bridge, Bend, OR

Integral color selection is generally limited to a handful of earth tone shades. Multiple colors and brighter accents, with elaborate design schemes, are becoming more and more popular. To meet the demand for more elaborate color and design, precast component producers have been forced to become more creative, while continuing to control material and production costs. Designers are also combining various construction methods to create unique design elements. Precast, cast-in-place, and grouted concrete can be economically finished to produce consistent results.

Masonry stains offer an economical and versatile alternative for coloring the visible area of structural concrete components, and are available in virtually any color. These stains, made

from modified acrylic resins, remain permanently flexible, enabling them to withstand thermal movement and thus eliminate cracking and peeling. Excellent water-repellency provides resistance to moisture penetration and staining, while chloride ion and pollution resistance further extends the life of the structure. High quality masonry stains also breathe, allowing moisture vapor to escape from within the concrete, reducing the likelihood of spalling due to freeze/thaw cycling.

Associated design elements can often make or break a bridge project, especially in aesthetically sensitive areas. The use of a concrete stain ensures that all components will be uniform in color, even if the stain is not applied at the same time or even at the same location. Another key advantage is that adjoining structural elements can be treated as well, providing an attractive appearance to an entire project.



Pennsylvania DOT

CASE IN POINT:

The Pennsylvania DOT has retained the services of Newcrete Products a division of New Enterprise Stone & Lime, Inc. for the restoration of a historic bridge structure in Bedford County. The significance of this particular project is that this is one of the first concrete bridges of its kind to have been built in the United States. The project involves the production and installation of 20 high strength precast bridge beams each constructed from 37 cubic yards of concrete. These beams must achieve 8,000 psi compressive strength, as required by the Pennsylvania D.O.T. standard.

Frank Kliewer, Plant Manager for Newcrete's Roaring Spring PA plant, states the use of masonry stains has resulted in significant cost savings. The total cost to coat each beam is \$1,565.00 using an acrylic stain, which was custom tinted by the manufacturer to match the existing structure. The calculated cost to produce the same results with integral color was \$2,125.00 per beam — a difference of \$560.00. Kliewer also points out that the use of integral color makes it considerably more difficult to achieve the 8,000 psi. standard required by the Pennsylvania D.O.T. adding more expense to the manufacturing process.

With an unlimited color palette, and the ability to reveal or conceal the existing color and/or texture of a precast component, design professionals enjoy a broader range of design possibilities than were previously available. The use of masonry stains also makes it possible to maintain a common, uniform color throughout a transportation infrastructure system. This can be especially useful on components that are commonly moved for use in a variety of different sites, such as “K-Rail”.

The use of a high quality, acrylic based masonry stain helps to reduce the overall maintenance cost for a bridge. Should touch-up become necessary, or graffiti removal be required, a sealed surface with uniform color reduces the time and materials necessary to perform the repair. Application of a clear, sacrificial or non-sacrificial topcoat can also increase graffiti resistance.

Application of the masonry stain can be performed after the component has been installed or while it is still in the casting yard awaiting delivery. In colder climates, the option of indoor application often allows production to continue even during unfavorable exterior conditions. Advances in water-based technology include “Quick-Set” formulations that utilize radiant heat to speed cure times, minimizing delays prior to storing or shipping the component.

As color choices increase, so does the need for improved fade resistance. Touch-up and minor maintenance become major problems when repair materials don’t match. Producers must look for harsh real world testing, such as ASTM G 90 – “Standard Practice for Performing Accelerated Weathering of Nonmetallic Materials Using Concentrated Natural Sunlight”. The Emmaqua Sunlight Concentrator test device tracks the sun across the horizon, concentrating heat and ultraviolet exposure on the sample panel. Stain manufacturers should also be asked to provide referrals or a project list, which include applications with similar criteria to your current specification.



Emmaqua Testing of Canyon Tone W.

CONCLUSION

When specifying a masonry stain, one must consider performance values such as fade resistance, water and pollution repellency, and moisture vapor transmission rates. Look for a coating manufacturer with a successful history and proven international track record. Ask to see the range of colors tested as well as the particular test methods. Don’t be fooled by performance claims on light gray or off-white colors that have a natural tendency to resist fading. Be certain that the masonry stain manufacturer can independently verify their results with a reputable

testing laboratory. Seek out a dependable company with proven products and extendable warranties, along with the resources to back them up. Finally, solicit project references that match well with the customer's particular needs.