

Finish Notes

The newsletter of architectural finishes investigation
from Frank S. Welsh company

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Frank S. Welsh, P.O. Box 767, Bryn Mawr, PA 19010
Tel: 610-525-3564 Fax: 610-525-1333

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WELCOME TO OUR NEWSLETTER

There are many interesting topics related to the restoration of historic structures and conservation of artifacts. We feel it is valuable to discuss and share our thoughts and discoveries with our many colleagues and clients around the country. Because historic bridges share with buildings the common need to be painted, both for protection and coloration, they too require paint analysis for their restoration.

Three Painted Bridges

The word bridge is both a noun and a verb; its linguistic use reflects many dimensions. Bridges may be visually ornamental or workmanlike, but the root of their collective appeal seems to be the fact that, by spanning a void, they offer access to the "other side."

Bridges, whether over bodies of water or ravines, are, literally, battered from all sides by wind and weather. Metal components are subject to rust, deterioration and damage by vehicle. Repairs, and even routine maintenance, are costly and dangerous. Added problems occur as dramatic changes in transportation requirements or traffic patterns render many bridges inadequate or obsolete. Restoration projects are a recent phenomenon.

At the Frank S. Welsh Company we are asked to assist in analysis of bridges as historic structures and these projects offer an opportunity to participate in a slightly different aspect of historic preservation. As is customary with buildings, we need to know the bridge's early history in order to understand the paint archeology. Bridges, however, present unique problems with respect to gathering samples.

Generally, bridges are more easily corroded and more susceptible to paint loss than other structures, which makes gathering samples a challenge. Decorative ironwork, for example, is especially difficult to sample, and on a bridge project it is critical to gather representative samples from the least weathered, protected areas, such as the underside of a guardrail or behind ornamental detail.

Despite a possible paucity of samples, laboratory procedures remain the same. The stereomicroscope is especially valuable in helping us pinpoint a chronology of paint or finish layering. We employ the polarized light microscope to ascertain the components of individual paint/finish coats and use the spectrophotometer to assist in the evaluation of color. Our results are submitted in a comprehensive report.

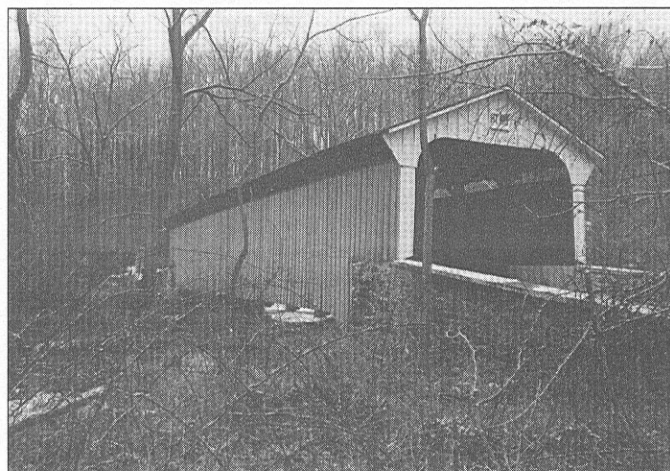
Abstracts of three very different bridges in Pennsylvania and Florida, demonstrate our firm's interest and participation in this aspect of historic preservation. The following two 19th century bridges in Southeastern Pennsylvania could not be more dissimilar.

Chester County (PA) Bridge #26

This is a late 19th century wooden covered bridge over Big Elk Creek in Elk and New London Townships. The bridge was scheduled for repainting and we were asked by the County Engineer to "evaluate the original coating system." Paint samples were gathered from well

protected areas (meaning least exposed to sunlight) on the gable ends and from the board and batten siding over the creek.

Microscopical analysis showed the full complement of all five paint layers ever applied to the bridge on the more protected and better maintained gable ends. But the more exposed siding over the creek retained only two layers. There were traces of the earliest white (lead-based) paint plus the still-showing early 20th century yellow. We analyzed the original color of both the white and the yellow and supplied color samples for each.



Covered Bridge in Chester County Pennsylvania.
Originally painted white in the late 19th century.

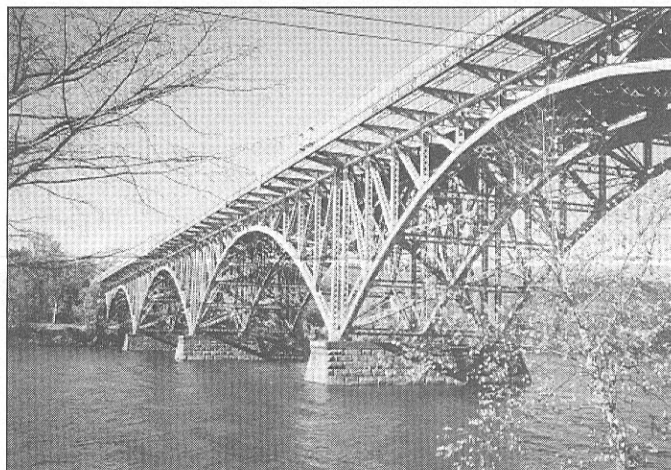
Philadelphia's Strawberry Mansion Bridge

While horse drawn conveyances used the covered bridge over the Big Elk Creek, their Philadelphia counterparts had access to the Fairmount Park Trolley Bridge over the Schuylkill River. This bridge opened in June 1897 and was an important link between East and West Fairmount Park. Built by the Phoenix Bridge Company, it was described as a "substantial and ornamental structure." Known in the 20th century as the Strawberry Mansion Bridge, it underwent major "rehabilitation" projects so it could accommodate bus traffic. The bridge, with its decorative railings and graceful arches, is a National Historic Landmark and an important visual feature for travelers on the roadways along the river's banks and also for those who row its waters.

The bridge is presently closed to vehicular and pedestrian traffic, but its repair and adaptive reuse is part of a comprehensive plan to, once again, link East and West Fairmount Park with a roadway and paths for bicyclists and walkers. As part of this project, we consulted to the engineering firm A.G. Lichtenstein & Associates to determine the paint history of all the structural and ornamental metalwork.

Seventy-seven samples were gathered from seventeen different areas on the bridge, including railings, posts, trusswork, and remaining trolley supports. All samples initially were analyzed under the stereomicroscope.

The best samples were mounted in crossection for evaluation of layers. The original finishes were analyzed for original color and pigment composition. Every sample showed that all structural and ornamental iron and steel features were primed (a shop coat) with a red iron oxide, oil paint. The original finish paint on all features was a dark olive green, gloss finish, oil paint. The pigments used to make this very typical late 19th century exterior (building) color were: white lead, chrome yellow, burnt sienna, yellow ochre, red iron oxide and lamp black.



Strawberry Mansion Bridge in Philadelphia.
Originally painted in dark olive green.

Through its nearly one hundred year history, the bridge was finish painted eleven times, with a combined total of eighteen layers, counting all prime and finish coats. For documentary purposes, and to verify our findings, we took several crossectional photomicrographs of the best samples. (See inserted card with color photomicrograph.)

Tampa's Hillsborough Avenue Bridge

Expansion of a different sort prompted the Florida Department of Transportation to undertake the building of the Hillsborough Avenue Bridge (T.N. Henderson Bridge) in Tampa in 1938. Linking the rapidly developing areas of Clearwater and St. Petersburg with Tampa, the bridge also had to provide shipping access to Old Tampa Bay. The steel frame is supported by concrete pilings and the ninety-four foot vertical lift span, or drawbridge, is hoisted on parallel steel towers.



Hillsborough Avenue Bridge in Tampa, Florida.
Originally finished with aluminum paint in 1938.

We were asked by Fleischman Garcia Architects in Tampa to sample, analyze and evaluate the original 1938 finish for original color and composition. Twenty-one samples were gathered from all representative features, such as beams, braces, guard and hand rails, rivet plates, and tower ladders. Our investigation found that the bridge was sandblasted in the recent past which removed most of the original paint evidence, but with careful investigation we were able to retrieve very good samples for analysis from hard to reach and protected areas.

The painted surfaces were originally primed with a reddish orange oil paint made primarily of red lead with a small amount of red iron oxide. The finish was a new, fashionable yet extremely durable, coating—aluminum paint. The later overpaints, ten in all, were mostly aluminum finish with red lead primers. Only recently had the bridge been painted grey.

Aluminum paints, along with aluminum leaf were popularized in the Art Deco period. Before the 1880's, when Charles Martin Hall invented a process to inexpensively extract aluminum from bauxite ore, aluminum was a very precious metal. To make aluminum paint, tiny flakes of aluminum, made by stamping machines, are dispersed in an oil medium. After application, they settle on the surface in a flat, overlapping fashion, similar to fish scales, and give excellent coverage, resistance to heat and sulphur compounds, and have a brilliant appearance imitating a continuous aluminum sheet. Our readers might be surprised to learn that entire buildings, such as two story frame homes, were finished with nothing but aluminum paint in the 1920's and 30's.

Similarities: Engineering – Architecture

Perhaps one might not expect such similarities in the paints, colors and finishes used on historic bridges compared to historic buildings. In the case of the bucolic covered bridge in Chester County, the use of white (originally) and later yellow may be contrary to the romantically held vision of the barn-red, antique, covered bridge. And with the Strawberry Mansion bridge, those who were initially skeptical about finding some odd shade of Strawberry pink were comforted by the obvious logic behind the original selection of a dark olive green because it was so consistent with the "green space" mission of Fairmount Park in the 19th century. In Tampa, engineering design at the Hillsborough Avenue bridge kept pace with fashionable modes in architecture by selecting the up-to-date and lustrous finish of aluminum—very durable yet very modern.

[For additional information on aluminum and other metallic finishes, see Frank S. Welsh's article "Architectural Metallic Finishes in the Late 19th and Early 20th Centuries: The Great Imitators: Aluminum and Bronze", published in *The Interior's Handbook for Historic Buildings*, 1988, or call us for a copy.]

DO YOU NEED A COLOR SAMPLE?

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FRANK S. WELSH COMPANY

The Frank S. Welsh Company specializes in the microanalysis of old and modern coatings such as paints, varnishes, wallpapers, and fabrics on all substrates from buildings as well as from historic artifacts. The company analyzes and evaluates color and composition. We have performed coatings, pigment, fiber and media analyses along with color evaluations on hundreds of restoration/conservation projects across the U.S. and in foreign countries since 1974. Our experience in color services as well as our laboratory expertise using stereomicroscopy and polarized light microscopy can provide unequalled accuracy and results in coatings analysis.