

LEAD INDUSTRIES ASSOCIATION, INC.

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August 19, 1965

SUBJECT: REPRINT ON FRISCO BRIDGE
PAINT JOB

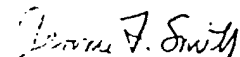
To Members of the Lead Industries Association, Inc.:

Attached is a copy of an article reprinted from the July, 1965 American Painting Contractor. The article, on the painting of the San Francisco - Oakland Bay Bridge, is a refreshing testimonial for red lead paint systems and emphasizes the fact that major port authorities, institutions, and highway commissions are continuing their dependence on performance proven lead pigmented paints.

The story states that currently more than 15,000 gallons of paint, most of it red lead, is used annually on the 32-year old structure.

Nearly 7,000 copies of this reprint were mailed to our entire painting contractor and corrosion engineer lists. Upon request, you may obtain additional copies of this reprint while they last.

Very truly yours,


Jerome F. SmithJFS:df
Attachment

Look Ahead with Lead

It Takes a 'Lifetime' To Paint the 'Frisco- Oakland Bay Bridge

By Kenneth and Katherine MacDONALD

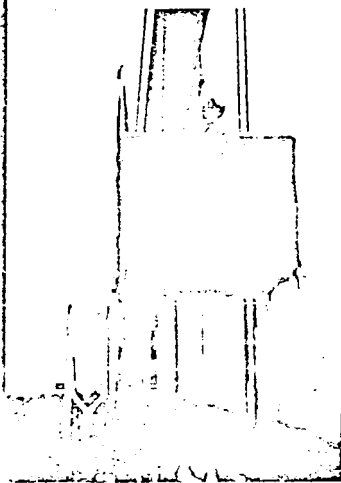
ON July Fourth, the world-famed San Francisco-Oakland Bay Bridge celebrated the 32d anniversary of the start of its construction.

During the intervening years, the bridge has become one of the longest continuous painting jobs in history, furnishing full-time employment and lifelong careers for a crew of 66 painters. As many as 15,252 gallons of paint may be used in a single year in first, second and finish coats.

Two major West Coast metropolitan cities are connected by the 8 1/2-mile span, which proceeds through an island tunnel in mid-Bay. Elevation of the graceful structure varies from about 6 feet above high water to 530 feet above high water on top of the huge suspension towers. An average of four million vehicles ply back and forth across its steel reaches each month.

In spite of apparent dangers, the bridge has become one of the nation's outstanding examples of safety for painters doing industrial maintenance painting at high altitudes.

Hoist (behind railing) raises and lowers suspender rope cage as much as 250 feet. Canvas curtains form safety fence and protect passing vehicular traffic from paint splatters.



Reprinted from the July 1965 American Painting Contractor

Bridge's main cable scaffold runs on grooved wheels on handrail ropes. Deck is adjustable to keep it level. Wind curtains are rolled up, exposing the two levels where painters work.

Its 146,000 tons of steel must constantly be painted for protection against the onslaughts of nature. Painting involves 370 acres of painted surface, 105,000 gallons of paint were required for the original paint job—three coats of red lead and a finish coat of aluminum.

Currently, more than 15,000 gallons of paint are used each year in the maintenance painting program supervised by D. Ewing Marsh.

Original specifications called for the steel to be sandblasted after it arrived in the San Francisco Bay area. It also was to be painted with two coats of red lead prior to erection.

"After the steel was put in place," Marsh related, "a third coat of red lead and a spot coat of lead paint were applied on the rivet heads, seams and edges. This was followed by the finish coat."

All of the sandblasting and priming was done at three locations. About 50 per cent of the steel was sandblasted at Alameda, using sand or steel grit. The suspension bridge trusses were sandblasted and painted in San Francisco.

The first coat of paint put on, said Marsh, was a 28-pound-per-gallon red lead with raw linseed oil.

"This was very slow in drying," Marsh said, "and to improve the drying time the formula was changed by the addition of mineral spirits. This reduced the weight of the paint to 27.9 pounds."

The second coat was a similar red lead modified by the addition of lamp black for coloring. The original second coat weighed 24.7 pounds to the gallon. When modified to improve drying time,



the weight dropped to 24.5 pounds per gallon.

The third coat also was a red lead, raw linseed oil type which, with the addition of carbon black, weighed 22 pounds per gallon. Before the finish coat was applied, changes were made from the black, because of civic pressure, and aluminum was used for the finish coat.

The aluminum originally used was a long oil varnish with tung oil. The formula included 21.4 pounds of aluminum paste per gallon of varnish.

The careers of the bridge painters began before the bridge actually opened for traffic when it became necessary to paint a portion of the upper deck floor system from a contractor's traveling gantry. Permanent

acid deposits and some aluminum hydroxide.

"The older surfaces painted with aluminum, when dirty, tend to retain moisture," Marsh explains. "In shady or poorly ventilated locations, the surface remains tacky or sticky to the touch until nearly noon."

"This condition is eliminated on steam cleaned surfaces and these areas are dry enough for painting by the regular morning starting time."

The make-up of the permanent painting crews has varied somewhat through the years, starting with the original 10 men. The crew was gradually increased to 40 men by December, 1941, when World War II began.

During the war, the crew dwindled from 40 down to 14 men. Later it was built back up to 50 men. At the time of the Korean War, the crew diminished again to 35. Currently, however, the Bay Bridge paint crew has two foremen, six lead men, 60 painters, two laborers and four truck drivers. The budget provides for 66 painters.

Initially, crews painted with wire rope catenary or springboard rigging beneath the lower deck. By 1959, however, three large suspended scaffolds, 6 x 85 feet, had been constructed to provide the necessary accessibility for painters.

Bridge officials learned early that conventional methods of rigging required too much of a painter's time and frequently resulted in as much as a 30 per cent time loss.

"We attempt constantly to have as large as possible scaffold units operating on wheels or on a track and with power drive, wherever possible, to save painter time," says Marsh.

The painting crews also have learned that three-inch wheel brushes and up to 3 1/2-inch diameter cup brushes can be operated on straight buffers or

grinders at free speeds of 7,000 rpm for cutting rust.

Marsh explains that considerable trial and error went into learning which commercial brushes could stand the constant abuse. On broad flat surfaces, his crews now use a six-inch wire cup brush on a tool which operates at 2,400 rpm.

The painters call these 'salt brushes' and use them to remove the general accumulation of dirt from the faces of the floor beams and larger steel members. Bottle or tube brushes are used to paint the long slots which were left in the steel for erection clearances.

There are some 2,400 floor beam connections to the trusses. These floor beams are from six to seven feet deep, with an open slot 1/2-inch to 3/4-inch at each end between the connection angles. These must be painted with the long handled bottle brushes. Some, however, are plugged at the bottom and paint is simply poured in. Others are swabbed first and then are plugged at both ends.

Anchor bolt holes are cleaned and filled with mastic. Some of these are set in pipes 10 to 15 feet deep in concrete piers. These must be cleaned out with air jets and they are then swabbed with red lead and filled with mastic or red lead paint.

Marsh's crews also have developed a "crack brush" or grainer which is used for painting the narrow slots and cracks. These are pure bristle brushes three inches wide by two inches in length.

"Actually," Marsh says, "there are more than 10,000 linear feet of just one of these slots a quarter-inch wide x 3/4-inch deep."

Other painting tools used include four-inch stucco brushes and two-inch oval brushes as well as 7 and 9-inch paint rollers with extension handles from 18 inches to four feet long.

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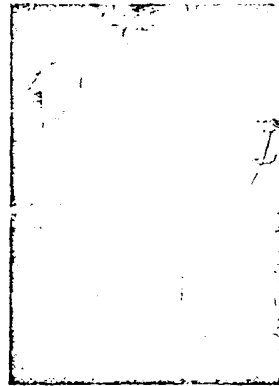


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The careers of the bridge painters began before the bridge actually opened for traffic when it became necessary to paint a portion of the upper deck floor system from a contractor's traveling gantry. Permanent



Steam cleaning as a method of surface preparation has been in effect since 1937. It eliminates inter-coat contamination and minimizes the need for sandblasting, bridge painters say.

crews in larger numbers, however, were not established until October, 1937, about a year after the bridge had opened to traffic.

A small crew of 10 painters and a foreman was put to work at the lower end of the East Bay portion of the bridge and about this time the late Carl S. Hamilton established a program of steam cleaning, which still is in operation to eliminate inter-coat contamination and to minimize the need for sandblasting.

Rust was removed at first with hand methods—wire brushes and scrapers. Some experiments were performed with motor-driven wire cup brushes. But these did not prove successful.

"Maintenance painting in those early days," Marsh recalls, "consisted of the application of two lead spot coats and a spot coat of aluminum. This was not

practical, however, and the system was changed to a new process involving first a spot coat of lead, a second spot coat of lead, and a solid coat of aluminum.

"Even this method didn't work out too well because within a few weeks of completion the finish began to develop a mottled appearance," he said. "Then we figured out another approach, making the first coat of lead a spot coat and the second a solid coat, with a final finish coat of aluminum."

This provided the appearance everyone seemed to want and the use of a solid coat of lead immediately before application of the finish coat of aluminum has been the practice since late in 1939.

The present routine is to steam clean all surfaces that can be reached in areas where the process does not interfere with traffic. Rust is removed by spot sandblasting, power brush buffing, hand cleaning and phosphoric acid crack treatment and caulking.

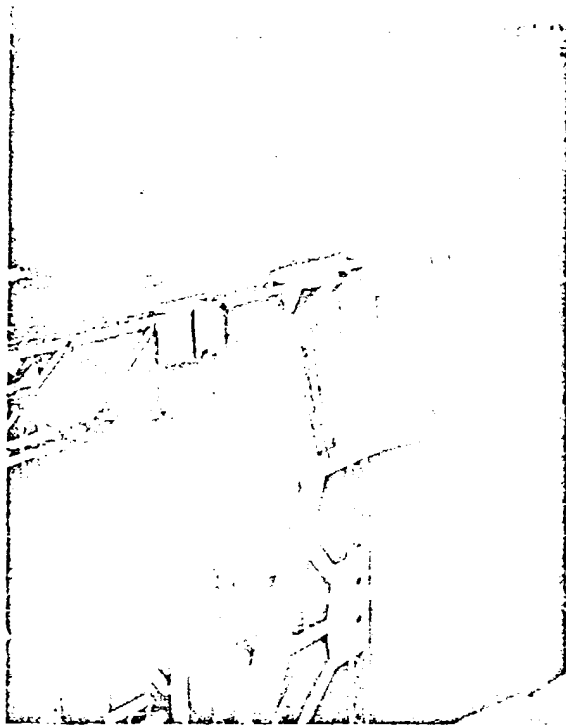
A first spot coat of red lead is applied on all seams, edges, rivet heads and sandblasted areas, followed by another coat of red lead, a solid coat and a finish coat of aluminum.

Marsh contends that this process provides protection which, in the opinion of the bridge authorities, is fully equal to the original paint job on all of the raw steel surfaces.

Sea salt, incidentally, is found on the bridge surface as high as 400 feet above the water level.

The upper deck floor system (which is the bottom side of the upper deck, about 20 feet directly above the lower deck) also suffers from heavy deposits of motor vehicle exhaust, soot, sulphur-

No place for a painter with vertigo is the top of the lateral bracing in the bridge's cantilever structure tonight. Painters shown here are applying a coat of aluminum. Once black was used but "public pressure" brought about a change.



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The painters call these 'soft brushes' and use them to remove the general accumulation of dirt from the faces of the floor beams and larger steel members. Bottle or tube brushes are used to paint the long slots which were left in the steel for erection clenchers.

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Other painting tools used include four-inch stucco brushes and two-inch oval brushes as well as 7 and 6-inch paint rollers with extension handles from 18 inches to four feet long.

Caulking guns are frequently employed, but only those which have a catch level mechanism for forcing the piston.

In some areas, following the original paint job, parts of the bridge attained an age of 25 years before the crews were able to get around to repainting them.

Many of these areas were found to have accumulated not more than five per cent rust.

There are a few areas of the bridge where the steel structural members are comparatively light in weight. The surface temperatures of these areas change more rapidly than at other locations, causing an accelerated breakdown of the paint film. In these areas crews begin repainting at intervals of 3 1/2 to four years.

The paint force now uses a semi-quick-drying red lead paint which weighs 21.7 pounds per gallon. This paint dries for re-coating in 16 hours. The formula for the aluminum vehicle also has been changed from a long tung oil varnish to a phenol formaldehyde type.

Quicker drying paints are used in those areas of the bridge where the painters can get at the surface rapidly, thus reducing surface contamination between coats during the repainting.

Lead metallic lead paste also is added to the lead coats to reduce or to speed drying and to provide a better bond between coats. Approximately 1 1/2 pounds are added per gallon in the mixing tubs.

Coal tar coatings also have been used occasionally, in small quantities and in some areas only. Marsh declares the results have been excellent.

Currently, the painters use eight scaffolds, covering an entire truss panel,

for painting the truss web system. These scaffolds were built in the bridge maintenance shops.

Five "travelets" run beneath the upper deck. These 15 x 60 foot platforms are suspended from overhead rails and cover half a floor system panel.

Another scaffold suspended beneath the lower deck is used to paint some 3,000 feet of bridge on the east end and three similar 15 x 75-foot scaffolds are used to paint other areas.

Special scaffolds running on the main cable hand ropes are adjustable and may be kept level as the cable changes slope. Special elevator type platforms are used for painting the suspender ropes.

An articulated scaffold which completely encircles a tower, is used to get to the towers for painting. For vertical transportation, a variety of air powered scaffold machines are used.

A four-inch air line runs the entire length of the bridge to provide the compressed air necessary at working locations.

The west bay suspension bridge towers have been painted twice, at intervals of 12 years. This also is true of the main cables and the suspender ropes. The suspension bridge trusses have been painted twice.

The upper and lower deck floor system painting, however, is "a lifetime process" which never stops. It is carried on from the center of the suspension bridge toward the ends, or downhill from the center. The floor system has been painted at an average of eight-year intervals.

Marsh is assisted by Clair Gibson and Roy H. Proffer, structural steel painter foremen, both of whom have been with the bridge since 1937. ■

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By Kenneth and Katherine MacDonald

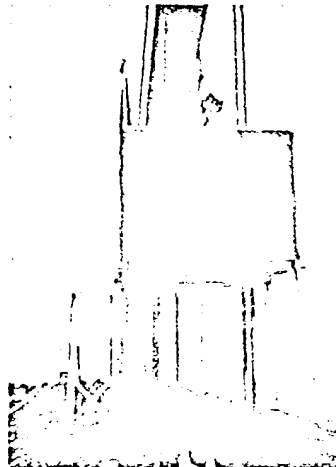
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