SteelBridgeNEWS
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CORROSION PROTECTION

A New Era for Steel

Advancement in the use of steel in modern bridges and marine and other structures has been compromised by the imprinted idea that corrosion is an unsolvable and expensive problem. Concrete is often presented as the panacea for corrosion, and so many engineers lose track of the importance of steel.

PND Engineers, Inc. principals have observed, measured, and discussed steel corrosion in the Northwestern United States and Alaska for over 40 years. Most success has involved some form of galvanizing or metalizing.

For example, galvanized steel piles with an epoxy overcoat have shown little corrosion in salt water after 40+ years. Plain epoxy coatings, on the other hand, have failed after five years. Plain galvanizing has also shown success in Alaska for piles in salt water, with some galvanizing remaining in the submerged zone after 20 years and most remaining in the splash and atmospheric zones.

The Iditarod Trail Sled Dog Race crosses a steel orthotropic trail bridge in Anchorage. This bridge was the winner in the Special Purpose category of the 1996 NSBA/AISC Prize Bridge Awards and is annually shown on telecasts worldwide. More importantly, the steel surfaces are coated with metalizing with a paint overcoat. This system still looks like new after 10 years in service.

These examples, and many others, show the potential of steel coating systems in minimizing long-term maintenance and allaying the fears of engineers and owners alike.

—Dennis Nottingham, P.E., President of PND Engineers, Inc.
Anchorage, Alaska

A MESSAGE FROM THE

Executive Director

The Buy America legislation, which was written and passed to ensure an opportunity for the use of domestic steel in federally funded transportation projects, is in danger of being made irrelevant by the extended design and bid process for the San Francisco-Oakland Bay Bridge.

Congress enacted a provision to extend and strengthen the Buy America laws in 1982. This legislative action was initiated in direct response to a major bridge project in the heart of America's Iron Range being constructed with foreign steel. Despite that clear message from Congress, we are seeing a similar story unfold almost 25 years later.

The price of steel as a commodity varies little internationally. The market price difference comes from the cost of labor, which is significantly lower for many of our international competitors. In our bridge industry, which primarily serves state transportation departments funded by federal highway funds, the Buy America law has leveled the playing field, allowing us to remain competitive despite the obvious differences in labor rules from country to country.

The failure of the San Francisco-Oakland Bay Bridge project to include significant domestic steel in its construction, through a process that was condoned by the Federal Highway Administration, has exposed loopholes that we must work to close.

California has wavered on whether to use federal funds on the Bay Bridge project, which created an extraordinarily challenging business environment for domestic fabricators evaluating whether to make the investment to prepare a bid. What created great alarm in the bridge industry, however, was the insistence by Caltrans, with the concurrence of the FHWA, that they could essentially control how and when Buy America applied to the bridge project by segmenting the bridge while still receiving federal funds. According to FHWA and Caltrans, for the purposes of Buy America, a bridge project is not the entire span crossing the water, but rather the smaller component contracts of the bridge's planning and construction. Such an interpretation allows states, who choose to use federal highway funds, to game the system by narrowing the application of Buy America.

NSBA has responded by coordinating with the steel industry's Buy America Task Force to develop legislation that will close this loophole. We are launching a strong lobbying effort to persuade Congress to act and adopt our legislation. Expect a call from me asking if you can send a letter, make a phone call, or come to Washington to help Congress and the FHWA understand that the playing field is out of balance and a foul needs to be called.

Sincerely,
Conn Abnee
NSBA Executive Director

LONG-TERM MAINTENANCE-FREE SERVICE

California's Weathering Steel Antioch Bridge

Weathering steel has proved its mettle in California's Antioch Bridge, built in 1978 for about $30 million. At that time, the selection of weathering steel saved about $1.3 million for initial painting.

The 1.8 mile bridge is part of the state's Route 160. It crosses the San Joaquin River and its associated floodplain, linking the city of Antioch with Sacramento County.

With a vertical clearance of about 80' of 135', the bridge superstructure consists of weathering steel plate girders spanning the piers below and supporting a lightweight concrete slab above. Two ASTM 8588 weathering steel grade girders, ranging from 6.5' to 23.5' deep, support the concrete deck. Forty spans range in length from 135' to 460'. The bridge, about 43' wide, carries one lane of traffic in each direction and includes bicycle and pedestrian access.

Caltrans inspects the bridge every two years and has observed the formation of the expected protective surface patina characteristic of properly sited weathering steel. Rust flakes noticed early on some girders were attributed to ocean spray during shipment to the site from Japan.

Caltrans considers the Antioch Bridge a maintenance-free structure. It is also one of only two bridges in the state that Caltrans has determined not to need seismic retrofit work.

STANDING THE TEST OF TIME

Wheeling Suspension Bridge

Wheeling Suspension Bridge over the Ohio River in Wheeling, W.Va. is the world's oldest existing suspension bridge. The bridge has a span of 1,010' and was first opened to traffic in November 1849. It was designed by Charles Ellet, Jr. and built by the Wheeling and Belmont Bridge Company for between $200,000 and $250,000.

In 1854, a wind storm caused massive vertical oscillations of the bridge and hangers broke away. The entire structure, except for the towers and a few cables, collapsed into the river. The collapse of the bridge provided engineers with valuable lessons in how bridges react when subjected to high winds. Reconstruction of the bridge was completed in 1856 and much of the original material was salvaged and used.

Throughout the bridge's history, several minor repairs and many major maintenance programs—including the 1871 addition of auxiliary stay cables designed by Washington Roebling—have been completed to keep it in useable condition. As it is today, the Wheeling Suspension Bridge still has the general appearance of the original structure. Its towers, anchorage housings, and island approach are all the original stone masonry. The main cables are either original or additions that date back to the reconstruction. In 1982, the West Virginia Department of Highways spent $2.4 million to repair and protect the bridge.

The Wheeling Suspension Bridge is recognized as a landmark for its significance to engineering. It is among the most noteworthy antebellum structures engineered in North America and has played an important role in the development of Wheeling as a transportation and industrial center.

References

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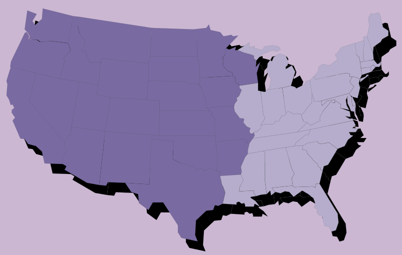
Regional Directors' Territories



Nostalgia Guides Design of New Viaduct

Oklahoma City planned to demolish a 70-year-old downtown viaduct, which included a pair of built-up, riveted steel bridges. The road was to be converted to an at-grade railroad crossing, but members of the community vigorously protested the plan.

Community pressure led the city to replace the viaduct with a $4.3 million look-alike, including two new steel bridges that mimic the originals. The new viaduct runs north-south and has a total length of 650'. A section of retaining walls leads to the first new bridge, which crosses the city's Main Street. Following another 60' of retaining walls, a road leads to the second, larger steel bridge that takes traffic over railroad tracks.

The three-span structure crossing Main Street consists of two simply supported rolled steel beam spans—plus one concrete beam span—that replicate the original structure. The bridge consists of approximately 16 tons of steel. Span lengths are 6.5', 29.3', and 6.5'. The first two spans are supported by Grade 50 W8 × 31 and W14 × 82 rolled steel beams, while the third span has concrete beams. The initial spans each have ten steel beams spaced at 3'-11" centers. Variable height haunches provide the grade, using level beam placement as in the original structure. The out-to-out width of the approach slabs and the bridge is 39'-11", providing 36' of clear roadway width throughout.

The longer bridge, which has a 16 degree skew over the railroad tracks, has five continuous steel beam spans, plus a sixth with shallower beams over the only active track. It contains 290 tons of Grade 50 steel. Span lengths are 33', 57', 66', 66', 66', and 59'. Spans one through five consist of six lines of W36 × 210 rolled steel beams made continuous by two bolted splices. Four interior beams are spaced at 12'-4", while the outside beams lie 7'-11" from the nearest interior beam. The sixth span is not continuous. It is a simple span supported on nine shallower W24 × 146 rolled steel beams to create the 23.5' clearance required over the active track. This bridge has an out-to-out width of 54'-1", which includes two 6' sidewalks that meet stairs from the south.

Eleven full-width steel blast plates were taken from original bridge sections and were reassembled on the new bridges. Prefabricated sections were made to match the original fascia sections of concrete. The fascia extends from the curb to the bottom steel flange and is as deep as the bridges' steel beams. Among the treatments on the new bridges that evoke the originals are old fashioned concrete rails and posts that support cast iron light poles.

—Michael Morrison, President, W2M Consulting, LLC

Owner
The City of Oklahoma City

General Consultant
Brawley Engineering Corp., Oklahoma City

Bridge and Structural Engineer
W2M Consulting, LLC, Oklahoma City

Fabricators
Capitol Steel and Iron Company, Oklahoma City, AISC member, NSBA member
AFCO Steel, Little Rock, Ark., AISC member, NSBA member

Contractor
Allen Contracting, Inc., Oklahoma City

The new roadway viaduct (above) over Main Street closely mimics the vintage appearance of the original viaduct (below).

The new viaduct (above) over the railroad tracks features full-width blast plates salvaged from the original bridge (below).