26,000 GALLONS OF COATINGS

PROTECTION FOR THE OHIO DOT'S LARGEST PROJECT

By Dee McNeill

Roughly 1.8 million square feet of steel comprise the finished westbound span of the Innerbelt Bridge over the Cuyahoga River, shown with finished coatings.

The Ohio Department of Transportation's (ODOT) Interstate 90 (I-90) Innerbelt Bridge replacement project in Cleveland, Ohio, is the largest project ever undertaken by the State. The old bridge over the Cuyahoga River had fallen subject to the effects of the city's harsh winters and hot, humid summers. After 55 years in service, ODOT needed to address corrosion issues by replacing the historic bridge – the main east-west artery into and through downtown Cleveland.

ODOT is currently in the midst of replacing the old Innerbelt Bridge with two new bridges, one to carry traffic in each direction. The pair of bridges has been named in honor of Ohio statesman George V. Voinovich. The decision to replace one bridge with two allows ODOT to maintain traffic during construction and increase capacity on I-90. The connection serves more than 140,000 vehicles per day.

The first of the pair is now open and temporarily carrying traffic in both directions while the second bridge is being constructed. The first new bridge, which will eventually carry westbound traffic, is 4,347 feet long and stands 120 feet over the Cuyahoga River Valley at its highest point.

To expedite work and minimize disruption to both local motorists and those traveling between Chicago and the Northeast, ODOT used a value-based design-build approach, versus a design-bid-build approach, for the first time.

Choosing the Right Contractor

Aesthetics played a vital role in choosing a general contractor for the westbound bridge project. The bridge's architecture has distinctive delta-shaped girders, made of A709 Grade HPS 70W steel, that complement the Cuyahoga Valley topography without dominating it. The design teams that competed for the work were evaluated on their ability to deliver not just on cost and an ambitious schedule, but also on preserving the aesthetics that define this part of Cleveland's landscape.

Inspections Lead to Action

In 2008, inspections conducted by ODOT concluded that the old Innerbelt Bridge was showing signs of aging sooner than expected. Harsh de-icing chemicals in the winter months, its location in a highly industrial area, roadway, waterway and vehicular traffic, and businesses located under the structure all presented corrosion threats to the bridge.

All structural steel corrodes or rusts when exposed to water and oxygen. The major ways to mitigate the corrosion of the structural steel are protective coatings applied to the steel and the closed drainage system.

Not all states require steel bridges to be coated, but ODOT stipulates protecting its bridges in a specific manner. Bridges in northeast Ohio must stand up to some of the most rigorous inspections there are, given the constant expansion and contraction caused by thermal cycling, and exposure to road salt and airborne contaminants from Lake Erie winds. To achieve all of its requirements, ODOT needed products with high gloss, a low film build of 2-4 mils with higher-build performance, superior weathering capabilities and that were easy to apply.

A painting contractor applies the intermediate coat to the steel girders under the Innerbelt Bridge. He uses a light mounted on his hard hat to improve visibility while stripe coating the bolts.

ODOT decided on a proven coating system in this part of the country for structural steel protection, specifying an inorganic zinc, epoxy and urethane coating system. Sherwin-Williams was chosen to supply coatings for the new span to provide a high-gloss finish and protect the structure from the harsh Cleveland elements.

Painting a Bridge is Like an Obstacle Course

One of the challenges was the bridge's proximity to high-trafficked areas in the Cleveland metropolitan area.

The biggest challenges for a painting contractor include rigging and containment, not only to provide safe surface access to painters, but also to contain overspray, from application practices, falling onto passing motorists.

Other challenges for the applicator include temperature and humidity. Dew point may affect the ability to apply coatings in general and to apply coatings within their stated recoat window. A contractor does not always have a realistic idea of the challenges an applicator may face during a project like this. In addition, ODOT painting

specifications require work to be completed within certain calendar dates to minimize disruption to the public.

Painters must schedule this work appropriately to complete all work within time and temperature parameters. Painters must also work in conjunction with the prime bridge contractor to avoid interfering with crucial operations.

With so many potential complications, it was important to establish how the coatings would be applied as early on as possible. A combination of spray guns, rollers and brushes are used. The entire area must be encapsulated with tarps. The tarps have to be secured and free of tears to prevent the paint and construction materials from escaping.

Why the Coating System Works

Zinc-rich primers have been proven through years of testing in various environments to provide the best corrosion protection for steel substrates in all types of environments, including salt, fresh and atmospheric water. The inorganic zinc prime coat is considered sacrificial once in direct contact with the structural steel – because zinc is weaker on the galvanic scale when exposed to oxygen and moisture, it sacrifices itself and corrodes instead of the steel.

The epoxy intermediate coating is a barrier coating. It prevents exposure to moisture and oxygen by adhering well to the inorganic zinc primer and protects the steel components from early corrosion. Epoxies break down when exposed to ultraviolet rays. This is where the urethane topcoat comes into play.

The gloss retention properties of a topcoat are crucial to determining its ability to resist the negative effects of UV exposure and protect the intermediate coating from degradation. In this instance, an off-white high-gloss polyurethane topcoat known to demonstrate gloss retention after 9,000 hours of exposure was used (5,000+ hours of UV exposure in QUV accelerated weathering testing is Ohio's standard). This doubles the maintenance-to-recoat cycle and provides unprecedented value for the taxpayers. In addition, the topcoat's good color retention would enhance the bridge's appearance and make it easier to keep clean throughout the years.

A final component was an organic epoxy, which was used by field painters to touch up shop-primed steel sections and splice plates that may have been damaged in the transportation and steel erection processes. In total, more than 26,000 gallons of coatings were used on the massive bridge project.▪

All photos courtesy of Ohio Department of Transportation.

The Cleveland Innerbelt Bridge project facing north. The original bridge, which opened in 1959, is the main east-west artery into and through the city's downtown.

CASE SUMMARY

Project
Construction of the westbound span of Cleveland's George V. Voinovich Bridge required protective coatings to prevent corrosion of the structural steel and provide a 30-year service life.

Coating System
Sherwin-Williams Macropoxy 646 intermediate and HP DOT Acrylic topcoat

Field Touch-up
Zinc Clad IV organic epoxy

Project Owner
Ohio Department of Transportation

Design-Build Team: Walsh Construction (Chicago, IL), HNTB Corporation (Columbus, OH), HDR (Omaha, NE)

Subcontractors: Atlantic Painting (Oak Lawn, IL), Corrosion Resistance LTD (Stow, OH), APBN Inc. (Campbell, OH)

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