



Innovative QuikShield™ Access System Used On Restoration of Boston's Longfellow Bridge

The Mesopotamians developed the arch. The Romans became famous for the arch. And now J.F. White Contracting Company has applied an innovative solution for safer, more efficient access to an arch. The arches in this instance are the 11 open-spandrel steel arches of the 2,135' Longfellow Bridge, one of the most architecturally distinguished bridges in Boston, which was in need of a structural update and cosmetic repair. The solution involved the first application of QuikShield™, a new suspended access system from Safway Group, which can closely follow the geometry of any arch to provide a consistent, more stable access solution for painters, carpenters and ironworkers.

Rehabilitating an Icon

The Longfellow Bridge spans the Charles River to connect Boston with Cambridge. Each day it carries about 90,000 transit users on the Massachusetts Bay Transportation Authority (MBTA) Red Line, 28,000 motor vehicles and large numbers of pedestrians and bicyclists.

The bridge was completed in 1908 and consists of the 11 steel-arch spans

supported on ten masonry piers and two abutments. The two large central piers feature four ornamental stone towers, carved with images of Viking ships, which provide stairway access to pedestrian passageways beneath the bridge. These neoclassic granite towers give the bridge its popular nickname, the Salt and Pepper Bridge.

The bridge last underwent rehabilitation in 1959, and recently showed structural deficiencies. The MassDOT (Massachusetts Department of Transportation) engaged one of the leading heavy civil construction companies in New England, J.F. White (Framingham, Mass.), to undertake this rehabilitation project. J.F. White worked in partnership with world leader, Skanska USA (New York, N.Y.), and masonry restoration expert, Consigli Construction Co., Inc. (Milford, Mass.).

According to J.F. White's website, "The primary objective of the Longfellow Bridge Rehabilitation Project is to upgrade the structural and seismic capacity of the bridge. The rehabilitation work includes in-place structural repairs to the steel arches, as well as the

refurbishment and/or replacement of the existing spandrel columns. The steel stringers, floor beams and concrete roadway deck of the superstructure will be completely removed and replaced in sequential stages.

"The restoration and rehabilitation of the bridge will be in accordance with the Secretary of Interior's Standards for the Treatment of Historic Properties, which includes the restoration of the cast iron fascia elements previously removed and the restoration of the existing cast iron pedestrian railings. The four granite salt and pepper towers will also be removed, cleaned, repaired and reinstalled as a part of the historic restoration process."

Complementary Access Solutions

The curve of the bridge's 11 arches — which vary in length from 101'-6" at the abutments to 188"-6" at the center — presented the biggest access challenge on the project.



The traditional solution to bridge access involves corrugated steel decking or chain link fence supported on cables suspended from structural members. However, steel decking can become slippery when wet. It also flexes, and blasting media can be difficult to remove from the valleys. Chain link fence often induces a sense of vertigo, and the platform is not particularly stable. Neither provides a good option for material movement.

In 2004, seeking to provide more stable, safer access solutions, Safway introduced QuikDeck®, a patented system that uses 4" and 8" joists to support plywood decking panels. To form a rectangle or square, joists connect to a node at each corner. Chain slots on each node provide locations to secure 3/8" grade 100 suspension chain. Suspended every 16', QuikDeck has a rating of 25 psf; suspended every 8', it has a 50 psf rating. The Longfellow Bridge project used a combination of configurations "QuikDeck is top notch. It's the best platform out there because you have rigid plywood deck," says Michael Kelleher, J.F. White's superintendent for the project. "It's a very stable area to stage materials and work from."

On the Longfellow Bridge project, J.F. White located a 30' x 80' barge underneath the middle of each span. They connected 30 QuikDeck sections to create a 26' x 67' "starter platform" and used manual hoists to lift it into place. Workers then raised additional sections as needed. Most spans use about 70 sections, combining 8' x 8' and 4' x 8' sections to achieve the desired size. A single 8' x 8' cantilevered section on each platform enables convenient ladder access from the bridge deck.

However, while a flat platform makes sense directly underneath an arch, using tiered platforms to access the entire span doesn't make sense. First, access height would vary as the arch dipped to the water, which would add a burden to the trades. Second, it would necessitate more ladders and timbers. Third, QuikDeck has a relatively expensive cost per square foot.

Fortunately, Safway engineers had been working on a new solution, QuikShield, which J.F. White agreed to pioneer on the Longfellow Bridge project.

Engineering a New Solution
Seeking to provide a cost-effective, complementary suspended access solution to QuikDeck, while avoiding the disadvantages of corrugated decking or wire mesh, Safway designed the new QuikShield system with the following features:

- Easy and safe to erect with minimal training and no specialized labor
- Fast installation rates of 600 square feet, per person, per day (about twice that of QuikDeck)
- Solid, non-slip working surface
- Superior, safe access
- Live-load capacities from 25 to 100 psf
- Integration with other access systems
- Lower total installed cost, with competitive rental rates

QuikShield consists of plywood decking riveted to a galvanized steel frame. It is available in standard sizes of 2' x 8', 1' x 8', 2' x 4' and 1' x 4'. Compared to corrugated metal decking, plywood provides more secure footing (especially when wet), permits easier

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clean-up of blasting media and construction debris, and costs about the same per square foot. Most importantly, it creates a much more stable platform.

“The wooden deck provides much more traction, plus it gives us a more secure feeling,” says Kelleher. “Stability-wise and strength-wise, there’s no comparison to the other systems I’ve worked on. I think that’s a plus factor.”

Russell Hansen, the Safway project engineer who worked closely with Kelleher, notes, “As configured on this project, QuikShield has a maximum deflection (sag) of 11” when fully loaded. Most of time, they’re not even approaching that amount of deflection. This flexible system makes moving workers and materials more efficient and safer than ever before.”

Patrick Blais, J.F. White’s lead engineer, steel and coatings, for the Longfellow Bridge project adds that, “It’s a stable platform for a system suspended on a sloped tendon cable. I think our workers were happy



with the system. They appreciated the ability to put up ladders to reach higher areas under the arch.”

Hansen also notes that QuikShield provides an easy platform on which to erect containment systems, as well as act as a debris shield.

Easy, Safe, Fast

QuikShield panels latch onto dual wire rope tendons at each end. The $\frac{7}{16}$ " diameter tendons terminate in swage sockets, spelter sockets, wire rope clips or turnback eyes (the choice on the Longfellow Bridge project, where U-bolts connect them to QuikDeck nodes).

As for suspension, QuikShield’s unique suspension bracket serves two functions. First, they grip the wire tendons after workers use an impact wrench to tighten two bolts; a visual indicator ensures proper installation. The suspension bracket also features a chain slot connection, with a chain retainer used to secure the chain to the bracket. This design, the same one used on QuikDeck, eliminates fist grips, a major source of platform failure.

On the Longfellow Bridge project, workers strung the tendons between the middle QuikDeck platform and four-foot-wide “anchor” QuikDeck platforms at the ends of each span (e.g., abutting the piers). Sections of QuikShield were staged on the top QuikDeck platform. Workers set a panel on the tendons and then used a rope to lower the QuikShield panel to a waiting team member, who would set it in place. QuikShield’s carrying handles then serve a dual purpose. Offset on each side, the handles cup the frame of the next panel, automatically adding stability as the workers build the platform.

In addition, using concrete anchor brackets to secure scaffolding to the bridge piers simply wasn’t an option on this historic bridge. As a result, Safway custom



designed suspension brackets that accommodated Safway's QuikShield as well as QuikDeck. These brackets prevented the beam clamp assembly from slipping down the arch, which would have occurred with a standard clamp.

During the project's initial phases, "We used a composite crew from Safway and our 12-person team. We learned the best way to erect it together," says Kelleher. He notes that the erection time has been cut in half since the first section.

"The beginning was a little slow, but once we had a good handle on all the parts and how they fit together, it was very easy," comments Jaime Melendez of Carpenter's Local 33.

Peter Bidgood of Carpenters Local 40 says that the QuikShield system is, "very universal. There are a thousand and one

applications for us. It's easy to work with, and safe. With some of the other systems I've seen, the materials are too heavy. You always have to muscle them. You really don't have to muscle these panels."

Peter Ruffin of Local 33 adds that although the arches of the Longfellow Bridge create a steep work angle, "You don't feel like you're going to fall through it. In general, you feel safe as you connect the panels together. I think that on a straightaway, QuikShield would be beautiful."

"We chose to work with Safway because of cost, the stability of their access solutions and response by their team during the design period," said Blais.

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