NATIONAL STEEL BRIDGE ALLIANCE

2001 Prize Bridge Award

WINNER:

LONG SPAN

Paper Mill Road Bridge

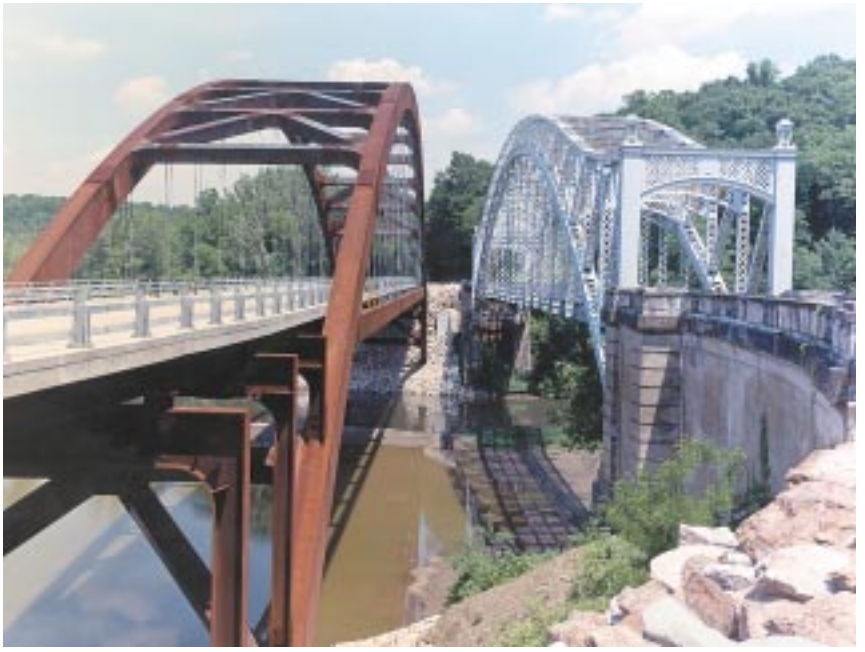
Baltimore County, MD

A new Paper Mill Road (MD Route 145) bridge crossing of Gunpowder Falls and Loch Raven Reservoir opened to traffic in December 2000. Travelers using the new bridge enjoy an improved alignment that eliminates the sharp curves of the earlier bridge approach roadways but maintains the serene nature of this area. This $12.1 million project, which complements the existing structure, relies on 3.9 million pounds of structural steel to cross a vital water supply for the Baltimore Metropolitan region with minimal permanent impacts to the watershed.

Design

As the bridge began to require increased maintenance, Baltimore City began to investigate replacing the bridge with a new structure. A new bridge would be able to carry the greater loads required by present day traffic conditions and also provide better-aligned approach roadways. The final recommendation was to replace the arch truss bridge with a new structure next the existing one, which was to remain intact as a river crossing for a future hiker-biker trail. An arch structure was chosen to accommodate the long center span necessary to avoid impacts to the waterway and to be aesthetically compatible with the historic bridge.

The structure consists of a steel box arch with a span of 495 feet that rises to a height of 99 feet above the Gunpowder Falls. The steel arch supports the center span above the reservoir, elimi-



nating piers. The parabolic arch is a 6′-8″ high by 3′-0″ wide steel box with smaller box sections with end flares providing lateral bracing between arches. The approaches include seven steel stringer spans supported on steel bents for an overall structure length of 670 feet. Two strands are used at each hanger location with each strand able to carry the full dead and live load. An innovative detail was developed at the upper end of the strands that equalizes the load between strands when both are in place but also allows the removal and replacement of one strand if necessary in the future. This rocker bearing type detail is located within the arch box to protect it from the elements.

The new bridge, approximately 25 feet north of the older structure, provides two 12-foot lanes with shoulders and provisions for a sidewalk on the north side. The structure will require minimal maintenance in the future due to the use of high-strength weathering steel and epoxy coated reinforcing steel in all concrete that would be exposed to water and/or salt.

Fabrication

One of the challenges of the project was the fabrication of the structural steel for the arch and the other bridge members. The size of the arches, 99 feet high and 495 feet long, made it impossible to completely erect the arches at the fabrication site prior to shipment to the job site. The fabricator decided to test-assemble the seven sections for each arch in sequence, with no more than three sections of each arch assembled together at one time until all the sections had been assembled together. At all times the fabricator kept strict control of the arch geometry to facilitate erection later at the site.

Construction

In order to construct the bridge quickly and, the contractor proposed an innovative method of construction. This method required the use of a causeway across the reservoir as a staging platform, but designed to protect any submerged Native American artifacts and paper mill ruins.

Each arch was consisted of seven sections. The three sections on each end of each arch were spliced together horizontally and supported from the causeway. One end was attached to the arch support using a pinned bearing, while the other end was raised by cranes and supported on temporary shoring towers. Each of these 275-ton lifts required two 300-ton cranes. After the four arch sections were set in place, the center sections were erected to complete the arches.

Prior to the erection of the arches, the entire deck system, including floor beams, stringers, edge girder, stay-in-place deck forms and reinforcing steel, was erected on the causeway directly under its final position.

When the arch was complete, the 388 foot long, 454-ton deck system was raised to its final position.. Twelve 100-ton hydraulic lifts raised the deck eight inches at a time, a task that required three days to complete. Once in place, the permanent strands were attached and the deck was poured.

Owner
City of Baltimore, Department of Public Works, Baltimore, MD

Structural Engineer
Johnson, Mirmiran & Thompson, Baltimore, MD

Steel Fabricator
Williams Bridge Company, Manassas, VA (AISC member)

Steel Detailer
Alabama Structural Detailers, Inc., Trussville, AL (NISD member)

Steel Erector
Kiewit Construction Company, Elkridge, MD (NEA member)

General Contractor
Kiewit Construction Company, Elkridge, MD

Software
STAADPro