2011

Bridge Awards of

In recognition of the owners of bridges which exemplify concrete

In the fifth biennial American Segmental Bridge Institute (ASBI) Bridge Award of Excellence competition, nine projects were selected as outstanding examples of segmental concrete bridge construction. Judging for the 2011 program took place at the Florida Department of Transportation office in Tallahassee, Florida, hosted by Robert Robertson, Jr., State Structures Design Engineer, Florida Department of Transportation—Structures Design Office.

Excellence

segmental bridge design and construction excellence.

All concrete segmental or cable-supported bridges located within the 50 United States and completed between January 1, 2009 and August 1, 2011 were eligible for the 2011 awards competition. The jury also considered international projects involving ASBI members. Entrants in the competition were judged on the basis of the following criteria:

- **Innovation of Design and/or Construction**
- **Rapid Construction**
- **Aesthetics and/or Harmony with Environment**
- **Cost Competitiveness**
- **Minimization of Construction Impact on the Traveling Public (When Applicable)**

DCR Access Road Bridge Over Route 24

The DCR Access Road Bridge is a functionally unique bridge in that it links the popular "Blue Hills Reservation" recreation area with the nearby city of Randolph. While the bridge was built to provide critical access across State Route 24, it also serves as an important link to miles of hiking and equestrian trails. An existing steel bridge provided access over a busy highway and had served in that capacity since 1958. However, the bridge was both functionally obsolete due to inadequate clearance, and increasingly difficult to maintain.

The owner wished to increase the available clearance and reduce maintenance costs, but was faced with geometric constraints. Due to the scenic nature of the parkland on either side, as well as the usage by pedestrians and equestrians, increasing the approach grades was not a viable option.

The solution was the use of an innovative precast channel bridge. A channel bridge is a type of precast segmental deck with the primary support girders integrated with the parapets. With this section, the designers were able to increase the clearance by 2'-2" and eliminate two of the three existing piers, all while maintaining the existing approach grades and minimizing highway lane closures.

Innovation of Design and/or Construction

The project was largely driven by one overarching challenge—how to increase the clearance by two feet without changing the approach grades. The secondary considerations were to reduce maintenance costs and reduce the impact of construction.

The bridge is 248 feet long, comprising two 124 foot spans with a width of 29.7 feet. The substructure consists of two new, reinforced concrete subtype abutments supported on steel piles and a new center pier consisting of two 59-in. diameter, reinforced concrete columns supported on a common concrete spread footing. Utilizing only a center pier, the DCR Bridge eliminates the need for side piers at each outside roadway edge. This adds safety for highway users, and also reduces material cost and construction time.

Rapid Construction

The final concept was developed to directly address the project goals with the creative use of precast segments. The channel bridge design addresses the clearance, while also bringing to the table the inherent advantages of precast concrete. As a fully post-tensioned design, the deck is highly durable and requires little maintenance. Because the deck is part of the precast section, the entire superstructure was erected in only two weeks. A total of 31 precast concrete channel segments were match-cast for the project with concrete having a specified compressive strength of 6,500 psi. Typical segments were 8.2 feet long, with the two abutment segments being 5.1 feet long.

To avoid deflection issues resulting from unequal weight distribution, all of the segments were placed onto the erection beams prior to their actual assembly. Segment placement took only four days. Then, groups

Photo Courtesy of MassDOT
(Massachusetts Department of Transportation)

Jury Comments

The "recycling" of the existing bridge to erect the structure was innovative and enabled construction to be completed in two weeks, minimizing traffic disruption, reducing cost, and improving safety. This project showcases the advantages of segmental construction to address the goals of accelerated bridge construction.

of two to four segments were assembled incrementally using epoxy joints and post-tensioning bars, starting from the center of the bridge and moving towards the abutments in a balanced sequence. Each group of segments was assembled in a one day shift resulting in a total time of 10 days. Once all of the segments were assembled, the permanent post-tensioning was stressed in the edge beams and deck slab, and the temporary steel erection beams were removed.

When the erection of the superstructure segments was completed, contractors finished casting the abutments and wingwalls and added the riding surface. The bridge's channel shape provides a 4-foot high concrete parapet railing along both sides of the bridge, to which a Type II Modified Protective Screen was mounted on each of the parapets.

Aesthetics and/or Harmony with Environment

The Owner has a Green DOT policy encouraging sustainable design. Sustainability is often thought of in terms of what can be done to improve the final product. In this project, however, the sustainability focus was on things that were not done. The impact of the project was reduced by diminishing the scope—without sacrificing the performance.

This focus began with the alignment of the bridge. While it was imperative to increase the clearance below, all participants were keenly aware of the importance of the scenic character or the open space on either side. The design was specifically developed to eliminate the conflict between the two, and provide highway safety with no changes to the parkland. This spirit was continued in the design of the substructure. A spread footing was used for the central pier, located in the same place as the existing foundation. Instead of excavating and replacing the previous foundation, it was incorporated into the design of the new foundation, reducing the disruption to the area. During construction, the existing bridge was "recycled" twice. After the deck was removed, the steel girders were welded together to form box beams with adequate capacity to support the segments during erection. The old bridge enjoyed a second life as falsework before ultimately being recycled. At all levels of design and construction, the goal of minimizing the impact on parkland guided key decisions.

The channel design results in a sleek low-profile appearance that provides functional clearance benefits while keeping it unobtrusive in scenic areas. Best of all, it minimizes long-term maintenance needs that will improve safety of workers and users while reducing costs over its service life.

(Photo Courtesy of Unistress Corporation)

CREDITS

Owner:
Massachusetts Highway Department (MassHighway)

Owner's Engineers: Thomas Donald

Designer:
Purcell Associates / **International Bridge Technologies, Inc.**

Contractor: R. Zoppo Corp.

Construction Engineering Services:
Finley Engineering Group, Inc.

Constructability Review/ Estimating Services: R. Zoppo Corp.

Construction Engineering Inspection:
Massachusetts Highway Department (MassHighway)

Precast Producer: **Unistress Corp.**

Formwork for Precast Segments:
EFCO Corp.

Post-Tensioning Materials: **VSL**

Epoxy Supplier: **Sika Corporation**

Prepackaged Grout: **Sika Corporation**