Inspection and Rehabilitation of a 4950'-0" long Segmental Concrete Bridge

By

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Abstract
The Jamestown-Verrazzano Bridge over Narragansett Bay, Rhode Island, features a 4,950-foot-long prestressed segmental box girder main bridge with 23 spans varying in length from 109 to 712 feet, and a 2,402-foot-long trestle structure. The 636-foot long main span provides a maximum vertical clearance of 135 feet from MHW and a horizontal clearance of 500 feet.

Typical main bridge superstructure element is a 186-foot-long two-cell precast, prestressed and post-tensioned concrete box girder with each cell supporting a 13-foot overhang. The deck slab is 74 feet wide and varies in thickness from 16 inches at the edges to 1 foot at the center. The Epoxy coated reinforcing steel is used in the deck and concrete barriers.

The initial baseline inspection was conducted in 1999. Cracks were recorded on AutoCAD-based crack maps that have been updated each inspection cycle. The inspection included analysis and load rating as well as comparison of creep deflections based upon as-built shop drawings, and casting and stressing schedules versus field-surveyed conditions.

Subsequent biennial inspections included use of nondestructive and destructive methods to investigate the post-tensioning ducts for the presence of voids. At the time of the bridge’s construction, grouting methods were not always fully effective and voids in post-tensioned ducts are now an issue for a number of bridge owners. The paper will discuss in some detail the findings and repairs that are underway.

Other discussed repairs include the use of a carbon-fiber reinforced polymer reinforcement system for the cracked webs of the segmental box girder pier tables.

Bio
Steve specializes in bridge analysis and design, and inspection and rehabilitation of long-span and complex bridges at PB Americas, Inc. in New York City, an international engineering consulting firm specializing in the design and construction of transportation-related structures and systems. He has served in many roles, including as a manager and field leader of bridge inspection and rehabilitation projects, as a client representative, and has participated in on-site emergency inspections and construction operations. He has worked in these capacities on a variety of complex bridges that include suspension, cable-stay, segmental concrete box girder, long-span truss and movable structures.

Prior to working at PB, Steve was employed from 1994 to 1998 as a senior project engineer for a bridge engineering consulting firm specializing in the design of concrete segmental and cable stay bridge structures, and in the construction engineering of these structures. From 1987 to 1994, Steven was employed as a project engineer for a firm specializing but not limited to the design, inspection, and rehabilitation of long span bridge structures. His project work is highlighted below:

Other experience has included the design and inspection of vehicular and rail tunnels, and marine structures.