

Newark Bay Bridge Rehabilitation

Woodbridge, NJ

Submitted by BASF Building Systems

The Newark Bay Bridge is a steel through-arch bridge that is continuous across three spans. The main span is 1270 ft (387 m) with a 135 ft (41 m) clearance over water to allow marine access to Port Newark. The structure was completed in April 1956 as a part of the New Jersey Turnpike's Newark Bay Extension. It crosses Newark Bay and connects the cities of Newark and Bayonne in New Jersey, carrying traffic along the New Jersey Turnpike to interchanges 14 through 14A. The Newark Bay Bridge is the major roadway connecting Newark Liberty International Airport from the New Jersey Turnpike's main roadway to the Holland Tunnel, which continues to Lower Manhattan in New York City.

Due to severely deteriorated concrete decking, in the spring of 2010 the New Jersey Turnpike put out a bid to rehabilitate the concrete deck on the Newark Bay Bridge. The prime objective of the project was to replace the existing concrete bridge deck with precast deck panels over 60,000 yd² (50,168 m²) of the structure. With an average size of 14 x 23 ft (4.3 x 7 m), nearly 1740 individually designed panels were placed.

CHALLENGES

With such a highly trafficked bridge, the owner compressed the schedule to reduce the construction impact on the traveling public. The plan called for a need to work in the Northeast climate for 12 continuous months during both the daytime and evening hours. The existing Newark Bay Bridge was composed of four active traffic lanes with two shoulders. The contractor was required to maintain the four active traffic lanes continuously during the construction process. Accordingly, the area available for the work zone consisted only of an area the width of two shoulders.

With work taking place continuously for such an extended period of time, the existing bridge could not be shut down to accommodate the work. The bridge experienced a significant deflection under live load conditions. In a normal application,

this deflection would cause the premature cracking of a standard cementitious grout.

SOLUTIONS

To comply with the New Jersey Turnpike's aggressive schedule and the need for an alternate product solution, the design engineer selected a methyl methacrylate (MMA) resin-based grout material to set and connect the panels. The grout had a fast setting time and superior bonding characteristics to reduce or eliminate the cracking of the material. Superior temperature placement ranges allowed work to take place year-round while still achieving rapid early strengths that were needed to facilitate the continuous demolition of existing deck and setting of new panels each day.

After completing preliminary operations, the repair contractor started the deck replacement work in the spring of 2011. The process included removal of the existing deck, rehabilitation of the existing structure, the installation of new shear studs, installation of the new precast planks, installation of the MMA-based grout into the haunch and slab joint areas, and micro-milling of the surface to achieve a new riding surface. Coordination by all team members was most crucial to constructing a high-quality project while simultaneously meeting the mandatory scheduled completion date in the summer of 2013.

REPAIR

To complete the repair, first a timber catch was built under the existing bridge deck to prevent debris from falling into Newark Bay. This catch system also served as a working platform for the steel workers. Simultaneously with this operation, a survey was done to determine the elevations of the existing structural steel members under the deck.

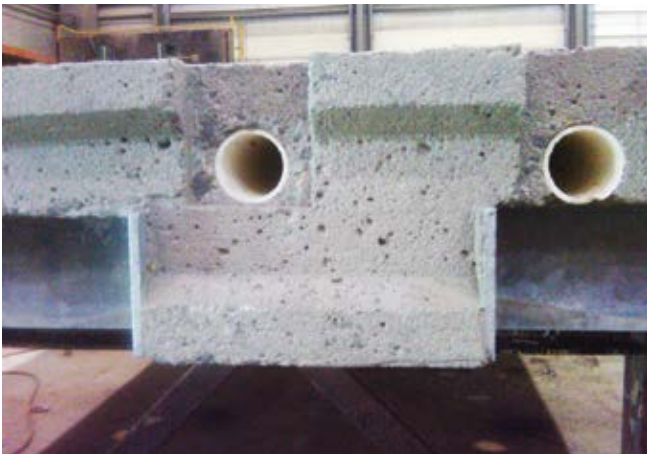
The existing concrete deck was then saw-cut and removed in 6 x 8 ft (1.8 x 2.4 m) sections, exposing the existing steel beams. Some repairs were necessary on the stringer beams and steel connections, after which the beams were grit-blasted and painted.



After deck shows catch system in place



Applying primer to precast panel in plant



Detail of haunch stud pockets and steel ducts



40,000 lb (18,144 kg) panel ready to ship 200 miles (322 km) from the plant to the job site

A second survey of the existing steel superstructure was then done to allow the contractor to account for structural steel rebound and calculate the new haunch heights. These calculations determined the size of the shear studs to be set at any given point along the bridge and also to determine the thickness of MMA grout that would be pumped under the new deck panels. The new shear studs would also have to be precisely spaced to match the haunch pockets cast into the bottom of each new deck panel. This was particularly challenging, as there were 116 different types of panels detailed for the project.

The precast deck panels were primed at the manufacturing plant and shipped to the site. All panels had to be grouted the same day they were placed for the process to be repeated the next day. Like a train, if one operation stopped, the entire train would come to a halt. A flatbed trailer was used to transport the grout, equipment, and all other materials. With this flatbed, it was easy to remove all materials from the site nightly.



Setting panels with gantry crane

After each phase, the surface of the new deck was micro-milled to provide superior rideability. Saw-cut grooving of the deck was the final operation performed prior to opening the completed section of bridge to traffic. Phase 3 is in progress at this writing and is scheduled for completion in June 2013.

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Setting panels with gantry crane



Deck surface after micro-milling



Grouting of transverse joint



Saw-cutting and grooving



Grout operation in progress

Newark Bay Bridge

OWNER
New Jersey Turnpike Authority
Woodbridge, NJ

PROJECT ENGINEER/DESIGNER
Ahmann and Whitney
New York, NY

REPAIR CONTRACTOR
**Ferreira Construction Co., Inc., and
Tutor Perini Corporation, a Joint Venture**
Jersey City, NJ

MATERIAL SUPPLIERS/MANUFACTURERS
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Shakopee, MN
Fort Miller
Greenwich, NY