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Redecking Triborough's s u s p e n s i o n s p a n

Nearly 400 new orthotropic panels play a key part in rejuvenating the historic bridge

The Triborough Bridge is not simply a single span, but rather is a complex comprised of three long-span bridges, a number of smaller bridges and viaducts, 14 miles of approach highways and parkways, parks and recreational facilities, and administrative offices for the Triborough Bridge and Tunnel Authority.

Completed in 1936, the entire Triborough Bridge complex carries approximately 200,000 vehicles per day between Queens, Manhattan and the Bronx. The two Hell Gate and Bronx Kills spans carry eight lanes of traffic between the Bronx and Queens, while the Harlem River span spur carries six lanes of traffic to 125th Street in Manhattan via Randall's Island.

In 1997, MTA Bridges and Tunnels began a long-term, \$550-million program to rehabilitate the Triborough Bridge. The project, which is scheduled for completion in 2009, is divided into three phases.



Right: Deck replacement on New York City's Triborough Bridge main span.

Right: Applicators apply epoxy coating to deck panels prior to delivery.

The first phase involves replacing the roadway deck and barriers from the Randall's Island toll plaza to the Queens approach, and includes the Hell Gate suspension span, the Randall's Island-Ward's Island viaduct and the Queens viaduct. During this phase the suspender ropes on the main span will be replaced. The second phase involves replacing the roadway deck and barriers from the Randall's Island toll plaza to the Bronx approach, and includes the Bronx Kills truss span and connecting ramps in the Bronx. The final phase involves replacing the roadway deck and barriers from the Randall's Island toll plaza to the Manhattan approach, and includes the Harlem River lift span and connecting ramps in Manhattan.



When complete, more than 1.6 million square feet of deck will have been replaced. The most efficient alternative for replacing the decks, determined engineer Ammann and Whitney, was to utilize different designs for different deck sections. An orthotropic deck was chosen for the suspension span, a precast deck for the lift and truss spans, and precast concrete panels for viaduct and approach sections.

instead. Modern practice protects these constructions with a high-tech coating such as aggregate-filled epoxy.

Replacement systems were pre-formed in panels of approximately 10 feet 4 inches wide (the width of one road lane), so that replacement minimized traffic impact. The work sequence of each panel consisted of saw cutting existing deck, the lifting and removal of the existing deck, the cleaning and preparation of existing

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An orthotropic deck is a steel deck with the support structure already welded to it. Steel ribs are welded to the underside of the panel, followed by transverse sub-floor beams that attach the deck to the existing structure. The Triborough and many other NYC area bridges employ U-rib construction, although the GW Bridge has a longitudinal T-rib section

supports, and the placement, tie down and securing of the new panel.

Once all panels were installed and the edges connected by plates and grout, the deck planks were covered (paved) with a wearing surface of asphalt for the concrete panels and of epoxy for the steel panels.



A complete deck replacement on the suspended span of the main line of the bridge from Wards Island to Queens involves 250,000 square feet of new orthotropic deck with multicoat aggregate-filled polysulfide epoxy overlay—some 392 panels averaging 10 feet by 60 feet and weighing about 15 tons apiece. Anchorage and viaduct decking adds up to an additional 250,000 square feet of precast panels.

The general contractors for contract TB 64A redecking of the suspended span and Queens Viaduct portion is a joint venture

between American Bridge Corporation and Koch Skanska. The job was bid in November 2000. American Bridge/Koch Skanska won the bid with an original contract amount in the neighborhood of \$147 million, and received a notice to proceed in December 2000. Construction began in March 2001, with change-out of suspended cables and procurement of new deck materials.

Kwadwo Oseiakoto served as project manager for Koch Skanska, New York, N.Y. for this assignment. Robert Walent is project coordinator and a project manager for Koch Skanska.

All structural steel for the viaduct and the orthotropic steel plates came from Hyundai Corporation in Korea. The first shipment arrived at Port Newark in January 2002 and the fourth and final shipment arrived in October 2002. From Port Newark, the orthotropic deck panels were trucked to **Bridgewater Protective Coatings, Inc.**, Bridgewater, N.J.

Specifications required the orthotropic panels to be sandblasted and then protect-

ed with a multicoat aggregate-filled polysulfide epoxy overlay riding surface. The epoxy was supplied by Transpo Industries, New Rochelle, N.Y., and the aggregate by 3M.

Bridgewater Protective Coatings, Inc. was selected for the \$2.8-million contract for the 392 deck plates. With its blasting equipment, a 100,000-pound gantry crane for material handling in the yard and 40,000-pound indoor crane capacity, **BPC** was able to provide temporary storage for up to 200 panels as they came through from Korea, and to shop-apply the coating six panels at a time.

The contractor began removing and replacing the existing deck in May 2002. Where applicable, installation of precast deck speeds up construction. The bridge carries eight lanes of traffic, and only one lane can be closed at a time. Precast panels, with structural steel framing cast into the concrete riding surface, are relatively easy to put in place while maintaining seven lanes of traffic.



Gantry crane provides efficient system for removing existing deck panels

For improved drainage, the suspended span of the bridge is being elevated, using the new orthotropic deck. The new deck plate is 4 inches higher than the existing roadway at the curbline; at the center of the span it will be 8 inches higher than the existing deck.

Three overhead DeMag cranes are used for changing out the deck panels on the suspended span. The 30-ton capacity

cranes span the eight lanes - more than 95 feet - allowing flexibility in moving the deck panels and accessing the job. One is employed on each backspan and one on the main span of the bridge.

The replacement project is projected in eight stages starting from the Queensbound side of the bridge and working across to the Bronxbound side. The scheduled completion date of April

2004 may be accelerated by combining stages: the contractor has already been successful in combining stages 1 and 2 while keeping seven lanes open for traffic, and hopes to combine 3 and 4. Stages 1 and 2 were completed in January 2003, with all work accomplished during a daylight shift, 7 a.m. to 3:30 p.m.

The next part of the bridge reconstruction to come up for bid will be the Ward's/Randall's Island Viaduct. It is projected as a precast deck with structural steel supporting frame similar to the installation on the Queens Viaduct. Perini Corporation is working on the Bronx truss span, which connects Bronx and Randall's Island. This part of the bridge involves precast deck on one truss span and orthotropic on the other truss span. Yonkers Construction Company is working on the Harlem River liftspan, again a combination of orthotropic and precast deck. ■



Left: New orthotropic panel awaits placement over beams.



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