## **OCEAN PARKWAY BELT BRIDGE**

## 2008 Nova Award Nomination 24

## Design-Build Reconstruction /Replacement of the Belt Parkway over Ocean Parkway Bridge and Interchange, Brooklyn, NY.

This project incorporated materials and techniques that when used in concert created an innovative project that superseded all owner and community expectations. The bridge carries the Belt Parkway, a regional corridor originally designed for 30,000 vehicles a day now traveled by 166,000 daily, over Ocean Parkway, a scenic landmark in southern Brooklyn. Illustrating the level of deterioration, temporary columns at its abutments supported the bridge and the Belt Parkway was plated over at the abutment locations. The adjoining four-loop ramps at the Belt/Ocean Parkway interchange were found to be geometrically substandard. The vertical clearance over Ocean Parkway had to be improved from existing 14.1 ft to 14.9 ft. The sight distance also had to be improved from existing 246 ft to 455.38 ft. This project included reconfiguring six exit and seven entrance ramps to the Belt Parkway within the 4547.23 ft project limits and replacement of the existing two-span bridge with a longer (213.25 ft), and wider (134.5 ft), continuous three-span bridge. The project included the rehabilitation of approximately 820.20 feet of Ocean Parkway, and the incorporation of new lighting, drainage, and various other safety improvements.

The NYCDOT wanted to minimize negative community impact from construction. GCN set an aggressive schedule to accomplish this. To meet the schedule, the team chose the extensive use of precast/prefabricated elements to expedite fieldwork. While taken individually, the components were routine construction elements but the use of the combination of them all proved to be the distinctive innovative edge on this project. The team also used a temporary by-pass bridge to maintain unimpeded traffic flow.

The precast/prefabricated elements incorporated into the project included:

- Taper Tube Piles filled with spiral reinforcing and concrete provide an economical pile design. Low headroom minipiles were used at locations under the existing bridge for the piers. This allowed GCN to progress most of the pier construction under the existing bridge in service.
- T-Wall for the abutments and wing walls –allowed installation of the north half of the abutment/wingwalls, including back fill in 14 days.
- Precast Concrete Pier Cap Beams due to interference with the existing bridge girders, the cap beams were
  prefabricated offsite and installed after the existing bridge was demolished. The pier foundations and columns were
  cast in place under the existing bridge, while the bridge was in service.
- Inverset Deck Units These elements enabled the erection of the north half of the bridge in just 10 consecutive calendar days (two night shifts and two day shifts).
- Roadway Barrier 6069.54 ft of 4.25 foot high barrier were fabricated -increasing motorist safety.

Some other unusual features of our design that provided a life expectancy of more than 50-years with low maintenance and allowed for speed in construction included:

- Use of Precast Inverset decking system with stainless steel reinforced deck utilizing alloy type, either UNS S31803, Grade 318, or UNS S31653, Grade 316L/N and high performance concrete containing micro silica, fly ash and DCI corrosion inhibitor. Although the design was based on 4,000 psi concrete, under controlled conditions in the shop, the achieved concrete strength was in excess of 7,000 psi.
- Jointless bridge, with semi-integral abutments with overhung backwalls behind the abutment cap beams (eliminating expansion joints from the entire bridge).
- Longitudinal closure pours to smooth out adjacent elevation differences for the wearing surface of this bridge deck, carrying limited access traffic at a design speed of 50 mph.
- Use of a T-wall retaining wall system independent from the abutment capbeam.

To achieve the 50-year useful life, the NYCDOT required the use of stainless steel reinforcement for the deck and galvanized reinforcement for the substructure elements. The GCN team enhanced this feature by eliminating deck joints and using precast elements that could be fabricated under controlled conditions resulting in high quality bridge components. The bridge, which alone cost \$17 million, has been built with such durability that it is expected to require no more than routine inspection during its lifetime. That prospect alone suggests huge, long term cost savings for bridge repairs, no longer necessary, as the structure endures extra heavy, continuous traffic load. High quality and fast construction were achieved by employing innovative precast concrete technology developed by The Fort Miller Co. This company, using its Inverset<sup>™</sup> bridge system, produced 51 precast, prestressed composite concrete and steel superstructure bridge units.

Agency expectations were exceeded on the construction schedule with the team beating the already ambitious schedule by more than four weeks.

