

Teamwork: Building Bridges

Complex bridge project includes tight schedule and quality mandates.

By David Wilson

Working under tight contractual deadlines without sacrificing quality and facing site constraints that require carefully staged construction can be a daunting task for any bridge reconstruction effort. For the \$18.8-million Broadway Bridges reconstruction program in Ann Arbor, MI, the ultimate goal of the project team was to not only meet project challenges, but to exceed them.

The construction engineering and inspection consultants—the Broadway Bridges Team, comprised of Parsons Brinckerhoff (www.pbworld.com), PSI (www.psiusa.com), and Stantec (www.stantec.com)—worked daily with the Ann Arbor project manager and assistant project manager to bring the goal to fruition. Consultant personnel included a project manager, assistant project manager, full-time resident engineer, two bridge inspectors, a roadway and grading inspector, two utility

inspectors, on-site testing and density inspectors, off-site fabrication inspectors, and a full-time survey crew.

Included in the project's scope of work was the removal and replacement of two bridges—one an earthen-filled, two-span concrete-arched structure, the other a ten-span concrete encased steel I-beam structure. Both were replaced with new prestressed, precast concrete box beam bridges—one a three-span structure over the Huron River, the other a four-span structure spanning the Northfolk Southern Railroad and Depot Street in Ann Arbor.

Additional structural work on the project entailed construction of six retaining walls and six stairways. Roadwork involved reconstruction of city streets including Broadway, Summit Avenue, Beakes Street, North Division, and Detroit, High, Carey, Swift, and Depot streets. Pavement cross sections varied with some streets reconstructed

using reinforced concrete pavement with integral curb and gutter, some with brick pavers on concrete base course, and others with hot-mix asphalt pavement with concrete curb and gutter. Before reconstructing the city streets, new storm sewers and water mains were installed including 200 meters of directional drilled 400mm water main and 40 meters of 1,200mm storm sewer jacked and bored under the Norfolk Southern Rail Road.

Other project elements involved new decorative street lighting, ornamental steel railings, and architectural precast concrete columns on and adjacent to the bridges on Broadway. The program also called for the complete renovation of Broadway Park, including new contours, sidewalks, river walkways, lighting, and benches. A portion of Fuller Park was recontoured and a new soccer field constructed. Miscellaneous landscaping and plantings were also part of the project's scope.

Tight Schedules and Quality Materials

With such a large and varied program, the project team faced numerous challenges, one of the most critical being a tight schedule. The general contractor's contract featured incentive/disincentive provisions for the demolition and construction of the Broadway Bridges, amounting to \$6,000 in penalties for each day the project was behind schedule and \$6,000 per day as an incentive for each day the project was ahead of schedule up to a maximum of 30 days for each stage of the project.

In the end, the general contractor earned an incentive of \$360,000 for the



New prestressed, precast concrete box beam bridges replaced two bridges in Ann Arbor.

portion of the contract involving the two bridges. The contract also provided an incentive for the reconstruction of Depot Street, earning the general contractor an additional \$30,000 out of a maximum incentive of \$50,000 for completing the work early.

Quality materials and workmanship were a major priority. All materials had to meet or exceed standard specifications of the Michigan Department of Transportation (MDOT) and the City of Ann Arbor through specific contract provisions that dictated the level of workmanship and the quality of the materials used. For example, to ensure the quality of the ornamental steel railings, a fabricator with substantial experience in producing such railings was mandated in the contract. To assure that all quality standards met or exceeded contractual requirements, the contractor had to produce samples of the various aesthetic features on the job including ornamental railings, concrete pavers, and architectural columns for approval by the project engineer.

Careful Coordination

Careful coordination and constant communication among the various team members was instrumental in the success of the Broadway Bridges project. For instance, demolition and construction of the bridge over the railroad required that the work be performed over an active railroad and adjacent to an Amtrak station with daily commuter train traffic. To ensure minimal disruptions to ongoing rail operations, the general contractor implemented a fast-track schedule, carefully coordinating demolition and construction with the various train schedules.

Directional drilling for the replacement of two 400mm water mains that conflicted with the new roadway grades was challenging because the directional drills had to be placed with great precision to avoid existing underground utilities and the proposed work. Because the directional drilling was so important, full-time inspection, detailed staking including frequent checks on alignment and elevation, and coordination with the city departments was required.

Other concerns included vibration

monitoring of adjacent buildings during pile driving operations for the new bridges and retaining walls. Tight site constraints and the requirements to prohibit demolition debris from falling into the river necessitated that the general contractor design and build a debris containment system for demolition of the earthen-filled arch bridge.

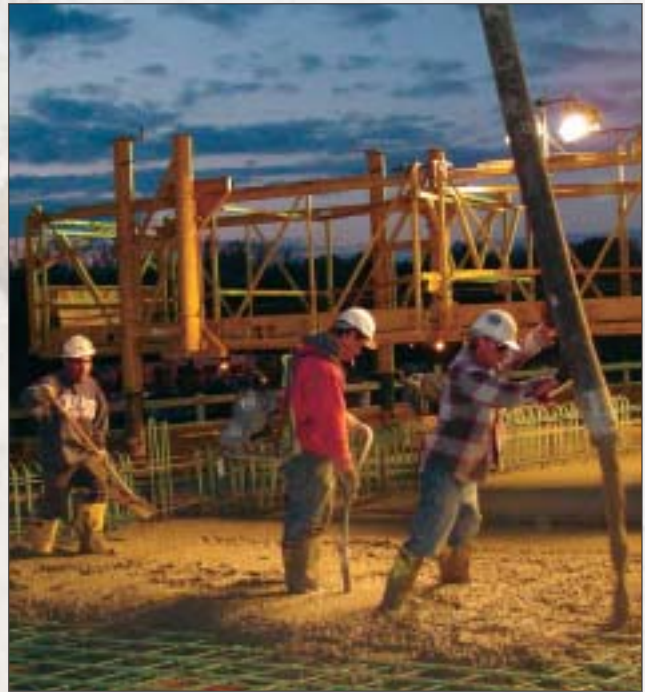
Addressing Environmental Concerns

Overseeing the contractors' compliance with environmental requirements was a critical concern. For example, on the Broadway Bridge over the Huron River, there were specific time constraints for working in the river, dictated by the Michigan Department of Environmental Quality to avoid fish spawning periods. Contractors had to pay close attention to soil erosion and sedimentation control to prevent siltation to the river. Solutions included coffer dams to aid in the construction of bridge footings in the river, and the use of turbidity curtains.

The project site had substantial amounts of non-hazardous contaminated soil. The contractor had to employ an environmental specialist to develop a health and safety plan for working in and around the soil. This included the excavation and removal of more than 26,000 cubic meters of non-hazardous contaminated soil and the containment, removal, and proper disposal of asbestos conduits that were on the old bridge structures.

Community Outreach

Given the prospect of the construction causing disruptions within the surrounding community, communicating with all



From pouring decks to renovating parks, the complexity of the Broadway Bridges project required careful execution and planning of the project, as well as a team philosophy.

the project stakeholders was an imperative. A comprehensive outreach program was initiated with public information meetings before the start of the project and one at the mid-point of the job.

In addition, a project-specific web site was created and updated monthly. It included answers to frequently asked questions, detour and pedestrian access maps, project photos, and links to city departments and the University of Michigan (with its campus and University Hospital in proximity to the project site). A project brochure was created and provided to area businesses and residents.

The reconstruction of the Broadway Bridges and surrounding area proved to be a highly complex undertaking. Meeting the project's extremely tight schedule and quality mandates was accomplished through careful planning, project execution, and above all, implementation of a team philosophy that ensured all the project participants were working in sync towards the same ultimate goal. **GE**

Mr. Wilson, P.E., is a Project Manager in the Southfield, Michigan office of Parsons Brinckerhoff. Parsons Brinckerhoff served as the prime construction engineering and inspection consultant on the Broadway Bridges project.