Outside the Box

Kannan Nagarajan

The rehabilitation of the historic Ford Street Bridge in Rochester, NY utilized modern technology and innovation to swiftly bring the past into the present.

Originally constructed in 1844, the Ford Street Bridge is a gateway to downtown Rochester, NY. To increase traffic capacity, the bridge underwent an $11-million rehabilitation project between May 2000 and December 2001. The rebuilt structure boasts two additional traffic lanes and turning ramps while maintaining the bridge's original appearance. Monumental piers were restored to both ends of the span. The bridge was open throughout the construction process and was completed on time despite difficult weather conditions.

HISTORIC EVALUATION

Bridge rehabilitation has become an important element of contemporary bridge engineering. Often, the exposed structural features of an historic bridge define the bridge's overall character. Sometimes hidden structural features—or even the entire structural system—are significant to the history of the bridge. The bridge's structural system should thus be evaluated early in the project-planning stage to determine both its physical condition and its importance to the bridge's historic character.

The Ford Street Bridge was a candidate both for expansion and for rehabilitation. During the initial stages of the

project, it was noted that any bridge expansion that affected the bridge's prominent trusses would change the historic appearance of the entire bridge. The historic rehabilitation guidelines for this project dictated that an exterior addition could be considered only after it was determined that the new use could not be met successfully by altering non-character-defining interior spaces. Since the new use could not be met that way, an acceptable alternative was an attached exterior addition. The new addition had to be designed and constructed so that the bridge's character-defining trusses were not radically changed, obscured, damaged or destroyed in the process of rehabilitation. The addition also had to be clearly differentiated so it would not appear to be part of the historic structure.

Contour Steel teamed up with Rochester-based The Pike Company for this project. The team initially considered removing old trusses from site and using a temporary, pre-fabricated bridge system. This approach was rejected because of the possibility of damaging the original trusses while removing them from the site. Contour's solution was to use a system of temporary trusses parallel to the roadway to support parts of the bridge (including the existing trusses) during construction. By supporting the existing trusses from below, the existing trusses could be "slid" apart to create a wider roadway between the trusses.

The final design for the bridge increased the number of traffic lanes from two lanes to four, and retained the existing trusses to support the sidewalks and to provide an aesthetically pleasing façade. The addition of period street lighting enhanced the character of the new bridge.

The temporary truss and support system consisted of two inter-connected temporary trusses more than 450' long, and 20'x40'x15' steel barges made by shop-welding high-strength steel. W-shapes form the main truss members, with channel sections acting as bracing. The members used to support the old trusses as they were moved were attached at hanging-point connections along the centers of the temporary trusses. Additional temporary stabilizing framework was used outside of the existing trusses after moving them to their new loca-

CIS/2 Aids Data Exchange

The 3-D CAD system helped designers simulate the construction process in stages, identify bottlenecks and plan to avoid them. CIS/2-based software systems helped generate output in a standard format. The use of these technologies resulted in the following improvements:

- The availability of an electronic data model allowed for automated quantity take-offs, which made bidding easier and faster than traditional paper-based methods.
- The shop-drawing creation and approval process was significantly reduced because detailing applications could check for accuracy with respect to the original design.
- Project team members were able to extract 2-D drawings from the 3-D shop model as needed.
- It was possible to accommodate design changes without causing delays in the project completion date.

Temporary beams, attached to the bottom chords of the temporary trusses, supported the existing trusses as they were disconnected from the bridge structure and slid outward.

The old deck and floor beam were dismantled and replaced. The existing trusses, moved outwards from their original locations, support the sidewalks for the reconfigured bridge.

tions on the expanded bridge deck. Temporary beams beneath the existing bridge deck supported it during the construction period.

THREE-DIMENSIONAL MODEL

After the design was completed, a three-dimensional CAD model was built for quick and early identification of the exact quantity of materials required to minimize lead times. Connection design and detailing proceeded as in-house detailers worked closely with the design department. Data from the computer model was used to generate fabrication data, and computer-based weight calculations saved shipping preparation time. Also, the 3-D model demonstrated the erection sequence so project managers were familiar with the process in advance.

INSTALLATION

Once trusses were fabricated and ready to be shipped, Contour's barge was unloaded in the water to facilitate the movement of the construction crew from one side of the bridge to the other. The foreman was provided with a motor boat equipped with a communication system and GPS locator to facilitate easy workflow at site. The boat also had water-level monitoring equipment.

The temporary trusses were placed in the middle of the bridge 5' apart, leaving a single lane of one-way traffic on the bridge. All cross bracings were connected and trusses were torque tested to AASHTO bridge specification requirements.

The temporary support beams for sliding the existing trusses into their new positions were lifted into position from below the bridge. The existing trusses were then cut free and jacked into their new locations, resulting in an increase of one lane width. Next, the old deck and floor beams were dismantled.

Strong water currents presented a challenge for the installation of the new bridge girders. Contour originally planned to load them on barges and float them into place. Instead the team erected a Gantry crane system on top of the roadway and used it to lower the girders into place. Traffic lanes remained open throughout the process. The construction continued on schedule and the project was completed on time. ★

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ARCHITECT/ENGINEER

Bergmann Associates, Rochester, NY

ENGINEER/DETAILER/ FABRICATOR/ERECTOR

Contour Steel, Eden, NY
(NEA member)

FABRICATOR (SUB-CONTRACTOR)

Buffalo Structural Steel, Inc.,
West Amherst, NY (AISC member)

GENERAL CONTRACTOR

The Pike Company, Rochester, NY

ENGINEERING SOFTWARE

RISA-3D

DETAILING SOFTWARE

AutoCAD, StruCAD