

harsh Minnesota winter months, with the resulting structure being ahead of schedule in the spring of 2016.

CM/GC Advantages

The four work packages for the new bridge and associated roadway work cost \$77 million, which is around \$2.5 million below the letting amounts. In addition, the project team documented over \$10 million in cost savings directly attributed to the use of the CM/GC procurement methodology and the partnership efforts of the entire team.

MnDOT used a CM/GC collaborative process with a first-time construction engineering innovation that included the engineer of record (EOR), peer reviewer, CM/GC, and the post-tensioning subcontractor. Models developed by the EOR for the design and peer review were updated with information provided by the contractor's suppliers, leading to a seamless effort to produce integrated segmental girder shop drawings by the EOR. Collaboration before letting allowed for early production of complex pier table segments, and other segments that were on the critical path, rather than the contractor beginning development of shop drawings after



Form travelers with suspended heated enclosures enabled concrete for the segments to be placed throughout the winter. Photo: FIGG.

letting. This process also allowed for early collaboration with the form traveler supplier to review form traveler details and make adjustments. This took an entire year off the construction schedule. ▲

Keith Molnau is the bridge design project manager with the Minnesota Department of Transportation in Oakdale, Minn., and Terry Ward is the Winona project manager with the Minnesota Department of Transportation in Rochester, Minn.



Main river piers are 3 ft by 9 ft 6 in. and extend 45 ft above the top of the ice breaker to the pier table. Photo: FIGG.

AESTHETICS COMMENTARY

by Frederick Gottemoeller



Building a new bridge parallel to an existing bridge is always a difficult aesthetic problem, especially where, as in this case, the old bridge is recognized for its historic nature and aesthetic quality. One can always just duplicate the old bridge, unless its materials and technology are so outdated as to make that strategy hopelessly expensive. That was the case in Winona. So, that establishes the aesthetic challenge: to create some visual relationship with the old bridge while using completely different materials and construction methods, and to do it in such a way as to not create an adverse effect on the old bridge or compromise its continued eligibility for the National Register of Historic Places.

The designers decided to base the visual relationship on the graceful downward curve of the top chord of the cantilever truss. They answered that with an equally graceful upward curve of the soffit of the haunched girder. The result is almost a mirror image, a yin-yang relationship that turns the two bridges into an ensemble, in spite of the fact that they are completely different materials, technologies, and colors. The most powerful visual aspect of any bridge is its overall shape, and here the designers have made that shape work for them very well.

Frederick Gottemoeller is an engineer and architect, who specializes in the aesthetic aspects of bridges and highways.