

Launched Steel Girder Bridge Erection U.S. 20 Iowa River Bridge

Sometimes the simplest bridge designs come in the most complex and innovative engineering and construction packages. Such is definitely the case with the new U.S. 20 Iowa River Bridge in Steamboat Rock, Iowa. The 1,630-foot bridge was successfully erected during the past year thanks to the design and construction team's commitment to applying incrementally launched erection in an innovative and previously untested way.

Sited on 10 acres in the Iowa River Greenbelt, the bridge was to be constructed in the heart of an area of historic, ecological and archaeological significance. The project team embraced the challenge of building a new structure that would facilitate vehicular movement but not negatively impact the surrounding natural environment, which is a favored locale for roosting bald eagles, endangered species of freshwater mussels and outdoor enthusiasts.

Environmental sensitivity and economics were the overriding design directives provided by the client, the Iowa Department of Transportation. The project was integral to the state's effort to expand the U.S. 20 to four lanes, but access to the valley was highly restricted. Construction equipment was prohibited from crossing or entering the river. The construction season initially was limited to an April-to-November timeframe to avoid disturbing the eagles' roosting behavior. Existing trees set the limits for allowable construction areas. With these stringent requirements established and understood, the project team quickly rules out conventional erection methods for the Iowa River Bridge.

It should be noted that the Iowa River Bridge's splendor, low-profile steel I-girder design is typical for long-span structures that cross narrower rivers worldwide. What sets this bridge apart is not the structure itself but rather the launched-girder erection technique, which eliminates the need for the temporary erection towers and piece-by-piece "in place" erection of structural steel required by conventional methods.

While it defies all typical erection logic, the innovative construction technique of incrementally launched erection was the only viable answer to the project's numerous challenges. No one had ever before attempted to build a structure of this type and magnitude on the side of a valley and then literally push it 1,500 feet across the same environmentally protected valley. However, the team knew that conventional erection techniques would have required tremendous temporary modifications to the environmentally sensitive construction site.

The incremental launching technique has been successfully applied for years for erection of more torsionally stable concrete box structures in Europe. It also has been used for a smaller steel box girder railroad bridge in the United States. But it had never before been employed for the launching of a long span I-girder bridge made up of nearly 10 million pounds of structural steel. The project innovation comes in taking a sound concept, adapting it for the new conditions and applying it in a previously unproven way.

Steel assembly for the \$21 million bridge began in June 2001. The launch of each of the bridge's ten 302-foot spans began after the contractor completed steel erection in a specially excavated 15-foot-deep, 600-foot-long launching pit behind the bridge's east abutment. A temporary launching nose, weighing more than 150,000 pounds, was attached to the front of the first span, and large hydraulic rams pushed the structural steel into place on a system of guided roller bearings. The entire steel bridge deck system, including all diaphragms, lateral bracing and drain pipes, was launched downhill along a .64-percent grade at a pace of approximately one foot per minute. The bridge's deck concrete was completed in the spring of 2002.

The client and the community have recognized the project as a tremendous success. The client and project team's insight, commitment and willingness to take a risk have provided central Iowa commuters with a more direct route, with little to no impact on the natural resources they enjoy. And the bridge's innovative, but now proven, erection techniques are blazing paths for new projects that have followed. Currently a steel I-girder bridge in West Virginia is approaching readiness for its first launch, while another in Ohio is under design and scheduled for launching in 2005.

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Sections of the bridge superstructure were assembled in a 15-foot-deep 600-foot-long launching pit outside the river valley and pushed incrementally across the bridge piers.



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In a carefully orchestrated sequence, the new U.S. 20 Iowa River Bridge was launched into place one span at a time. In total, nearly 10 million pounds of structural steel were pushed by customized equipment.



“From an engineering standpoint, this project was not just a structural challenge, it required innovative aesthetic, geotechnical, hydraulic and environmental solutions as well.”

– Dave Rogowski
HNTB Project Manager and Project Engineer

“This bridge is certainly not business as usual.”

– Bob Younie
IaDOT District 1 Construction Engineer

Temporary roller bearings were positioned atop the bridge piers to help move the 10 302-foot spans into place.



A temporary “launching nose” guided span placement and reduced deflection of the 302-foot cantilever.



“With the Iowa River Bridge, we pushed the limits of conventional construction techniques. We also provided the client and community with a bridge that was aesthetically pleasing, cost-effective and could be constructed without compromising the surrounding environment.”

– Mike LaViolette
HNTB Resident Construction Engineer