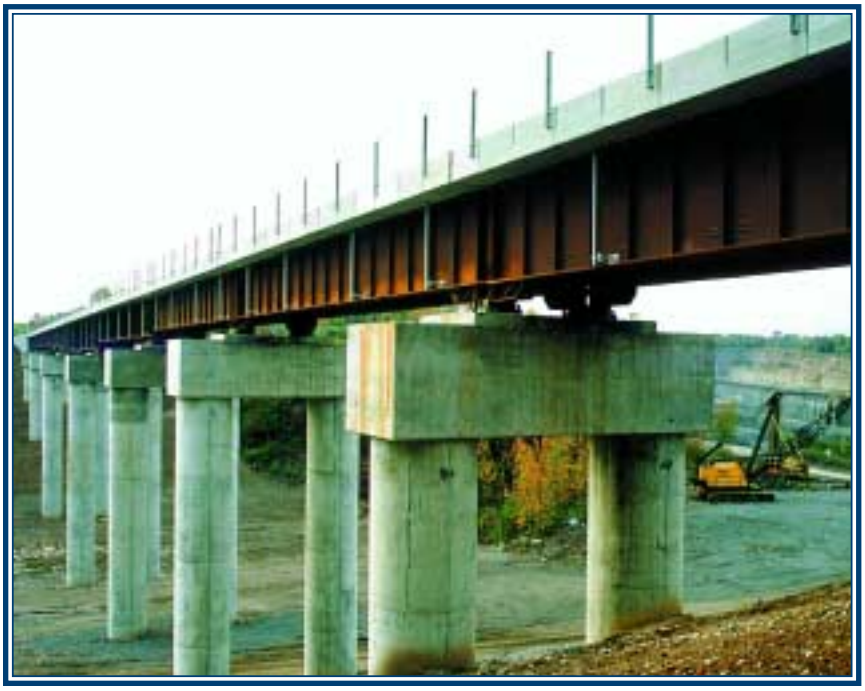
1996 Merit Bridge Award: Railroad
Union Pacific Railroad Joppa Bridges



Judges Comments:

"An excellent job given the difficult construction constraints"

"An innovative design and construction project"

Project Data

Steel wt./sq. ft. of deck: 95 lbs.

Cost: $10 million

Steel Tonnage: 1,200

Time wouldn't seem to be of the essence in replacing two 1899 vintage steel frame trestle bridges near Marion, IL, but it proved to be a crucial consideration after the Union Pacific Railroad's coal marketing department negotiated a contract requiring heavier train service than those bridges would allow on the Joppa Branch Subdivision.

HNTB received notice to proceed on the job in mid-March 1993, and successfully completed the design, preparation of 122 plan drawings and specifications in 93 calendar days. This permitted a structural steel fabrication contract to be awarded by mid-July, construction to begin by September 1, and completion in less than 21 months—a speed that was partially accomplished by temporarily reusing parts of the existing bridges truss during the construction phase of the new bridges.

The new Little Saline Creek Bridge is 878'-11" long and is composed of 10 simple span, ballasted deck, deck-plate girder spans ranging in length from 51' to 121'-9". The girder web depth varies from 84" to 120". The precast, concrete ballast deck pans are 16'-6" out-to-out and 4'-6" long. The nine substructure piers are composed of twin 8'-diameter concrete columns that are, in turn, founded on 8'-diameter drilled shafts socketed 20' into bedrock. Capbeams are 8' deep and 9' wide. The new bridge over Grasshopper Creek is similarly designed, though only 693'-5" long and with eight simple span, ballasted deck, deck plate girder spans ranging in length from 72'-6" to 121'-9". Both bridges have an E-80 live load capacity with diesel impact.

Despite the time constraints, it was still necessary to maintain rail traffic on both existing structures throughout the construction of the new bridges. This was accomplished by strategically placing the new piers under one of the panel points of the existing drop-in truss spans, which permitted the contractor

to work around and completely remove the taller towers during the span change-out sequence. Strategic pier placement also provided a unique and convenient method to salvage and reuse a portion of the existing drop-in truss spans, eliminating the need for expensive and time consuming temporary jump spans to maintain rail traffic.

During the span change-out, the contractor supported the old truss on the new pier with temporary bearings. He then cut the old truss into two pieces, discarded the unnecessary portion of the truss and salvaged the remainder of the truss, a process repeated 14 times.

The span change-out was achieved by erecting the new spans on temporary cantilever brackets and jacking frames supported at the top of the new piers. By utilizing re-usable falsework and jacking frames attached to the top of each pier, a cost savings and schedule compression were realized over the use of ground-supported falsework.

Another innovation was erecting the girders in Teflon-coated saddles that rested on a stainless steel sliding plate. The two sliding surfaces were lubricated using common dish washing liquid, which provided such a low coefficient of friction that it took less than one minute to slide the 150-ton spans into position.

The existing fragile and vulnerable shallow spread footings created an extraordinary problem because they could not be inadvertently undermined or disturbed during construction, which could have effected train traffic. To avoid disturbing the footings, 8'-diameter shafts were utilized for the new bridge foundations using a temporary 9'-diameter steel casing to stabilize the surrounding geologic formations. The shaft was then lined with a permanent 8'-diameter steel casing to permanently maintain the geologic integrity of soils supporting th existing footing.

A unique design feature of the project was the use of a flange-to-web weld for the plate girders. The American Railway Engineering Association specifications indicate full penetration groove welds should be used for deck plate girder flange-to-web connections. By designing the flange-to-web welds as fillet welds and considering both the horizontal and vertical shear forces, a $125,000 savings on fabrication costs was realized.

Project Team

Designer:
HNTB Corporation
Kansas City, MO

General Contractor:
Walsh Construction Co.
Chicago

Fabricator:
Stupp Bros. Bridge & Iron, Co.
St. Louis, MO*

Erector:
Rednour Steel Erectors, Inc.
Cutler, IL

Owner:
Union Pacific Railroad

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