



1996 MERIT BRIDGE AWARD: SHORT SPAN RAINBOW ARCH BRIDGE



THE NEW REDFIELD RAINBOW ARCH BRIDGE in Redfield, SD, replaced a 1917 two-ribbed reinforced concrete through arch bridge that, while eligible for the National Register of Historic Places, was not economically feasible to rehabilitate.

The new bridge retains the arch form of the original, however it consists of a two-ribbed through arch with steel box sections for the arch ribs. Arch bracing members are steel tube sections and hangers are steel strand. Floor beams are steel rolled sections with full-length bottom flange cover plates made composite with the reinforced concrete deck. The thrust from the arch reactions is taken by battered steel piles.

Box sections were selected for the arch ribs due to their inherent strength and stability. However, the limited access on the inside of the arch ribs made it impractical to use conventional high-strength bolts. Therefore, for ease of construction, the arch rib splices and arch bracing connections are instead made with a high-strength lock pin and collar fastener system.

The floor beam hangers are composed of four individual steel cables to provide for redundancy. Full-length cover plates were used on the floor beams to minimize susceptible details. And to eliminate fracture critical considerations, the reinforced concrete deck slab was designed to span over a hanger-floor beam system. The bent system at the arch support locations was designed with columns having a rocker plate at the top of the column to allow rotation of the floor beam in the transverse direction, while elastomeric bearing pads at the top allow translation of the floor beam and deck system and a rocker plate at the bottom of the column eliminates moments from the bent system being induced into the supports.

ProjectData

Steel wt./sq. ft.
of deck: **20 lbs.**

Cost:
\$753,000

Steel Tonnage:
73

Project Team

Designer:
Clark Engineering
Corporation
Rapid City, SD

General Contractor &
Erector:
Swingen Construction
Co.
Grand Forks, ND

Fabricator:
Egger Steel Company
Sioux Falls, SD *

Owner:
City of Redfield, SD

Judges Comments:

*“A beautiful, light
arch design that
provides a very clear
roadway”*

**Please note
that red text
denotes an
AISC member*