NATIONAL STEEL BRIDGE ALLIANCE

2001 Prize Bridge Award

WINNER:

SPECIAL PROJECT

I-15 Design/Build Reconstruction Project

Salt Lake City, Utah

The success of the I-15 project mandated that all construction disciplines act as a team. Utah Pacific Bridge and Steel led the team effort by creating a joint venture of four fabricators, an erector and a detailer, called I-15 Steel Structures. The I-15 Design/Build Project involved the design and construction of over 125 bridges in approximately four years to have this major roadway open in time for the 2002 Winter Olympics in Salt Lake City.

The girders for the project were all I-girders, but their similarities ended there: they were haunched, straight, curved, simple and multiple span, medium and long span, tapered, skewed, splayed, Y shaped and located over rail yards, roads, interstate highway and a river. They varied from 2.5′ deep to 14′ deep. For the steel bridges, all the designers agreed to limit the use of transverse stiffeners, to avoid the use of longitudinal stiffeners and to limit the use of haunched girders

The decision was made early in the project that all work on the design would be completed in Salt Lake City. All companies working on the project would have staff located in one design office near the SLC airport. Over 400 engineers, architects, contractors and

UDOT staff moved into the facility, and at the peak of the project over 140 bridge engineers were in Salt Lake City. The use of one office made it very easy to make quick and effective decisions

Throughout the process, the bridge designers, detailers, fabricators and construction personnel worked closely together to provide a design that is the most cost-effective for everyone in the process. After about six months of design, the designers, detailer, and fabricators met to review the designs to date and readjust the design criteria to the demands of design in a high seismic region.

For each submission in the process, plans were shared with the contractor, fabricator, UDOT, and other design disciplines for a constructibility review. This allowed all others in the process to tender comments to improve constructibility, reduce cost, coordinate disciplines and standardize presentation throughout the project.

Input from the detailer, fabricator and erector was received by the designer on every bridge. Fabricators have long known that simply reducing steel weight will not necessarily result in less overall cost. If an engineer replaces a thicker, unstiffened web with a thin web stiffened by numerous intermediate stiffeners, he will reduce weight but actually increase cost because of the high cost of labor. The design for I-15 included many cost saving measures as follows

- Thicker webs resulting in elimination of intermediate stiffeners. Only two intermediate web stiffeners were allowed adjacent to the pier bearing stiffeners.
- Consistent flange thickness from girder line to girder line reduced waste from plate nesting and purchasing from the steel mill.
- Greater cross-frame spacing resulting in fewer cross-frames to fabricate.
- The use of 1″ diameter bolts at the field bolted splices verses $^{7}/_{8}$″ diameter bolts resulted in fewer bolts and fewer holes.
- The elimination of stiffener tab plates that attach to the flanges resulting in a $30.00 savings at every stiffener location.
- A standardized "K"- type cross-frame was used for intermediate

bracing resulting in more economical fabrication and material purchase. A welded full depth plate type diaphragm was used at the pier and abutments.

- Wider girder spacing averaging 14′-0″ resulting in less girder lines to fabricate, ship and erect. The heavier, stiffer girders were more cost effective to fabricate, holding their curve and camber well, and having minimal weld distortions.

Detailing

The I-15 Design Build project in Salt Lake City presented the steel detailer with a completely new set of challenges. Detailing challenges included the following:

- Establishing a common detailing system that would work for four different fabricators each with its own standards and detailing systems.
- Establishing a common design presentation and typical details that would be used on all of the bridges.
- Establishing the method to transfer all of the design data and drawing files electronically to and from the design engineers and fabricators.

This project is a great example of what can be accomplished when the detailer is engaged prior to the award of a contract and works closely with the designer and fabricator during the preparation of the design plans.

Owner

Utah Department of Transportation,
Salt Lake City, UT

Structural Engineers

Sargent Engineers Inc., Logan, UT

H.W.Lochner Inc., Murray, UT

T.Y. Lin International, San Francisco, CA

Washington Infrastructure Services Inc.,
Salt Lake City, UT

URS Greiner Inc., Tampa, FL

Parsons Transportation Group, Littleton, CO

Sverdrup Civil, Inc., Bellevue, WA

Steel Fabricators

Roscoe Steel & Culvert Co., Billings, MT
(AISC member)

Fought & Company, Tigard, OR
(AISC member)

Universal Structural, Inc., Vancouver, WA
(AISC member)

Utah Pacific Bridge & Steel,
Pleasant Grove, UT (AISC member)

Steel Detailer

Tensor Engineering Co., Indian Harbor Beach,
FL (AISC & NISD members)

Steel Erector

OLSENBEAL, Lindon, UT (NEA member)

Design Build Contractor

Wasatch Construtors, Salt Lake City, UT

Software

DESCUS, Merlin DASH