National Steel Bridge Alliance 2012 Prize Bridge Awards

2012 PRIZE BRIDGE AWARD WINNERS

Prize Bridge Awards

- Major Span: Main Street Bridge, Columbus, Ohio
- Long Span: Nooksack River Bridge, Whatcom County, Wash.
- Short Span: South Layton Interchange SPUI at I-15 and Layton Parkway, Layton, Utah
- Movable Span: BSNF Railway Burlington Bridge, Burlington, Iowa
- Reconstructed: I-93 FAST 14 – Salem Street Interchange, Medford, Mass.
- Special Purpose: Tempe Town Lake Pedestrian Bridge, Tempe, Ariz.

Merit Awards

- Major Span: kcICON Project – Christopher S. Bond Bridge, Kansas City, Mo.
- Major Span: John James Audubon Bridge, St. Francisville, La.
- Long Span: Estero Parkway, Estero, Fla.
- Medium Span: S.R. 0113, Section 08B, Gay Street Bridge Replacement Project, Phoenixville, Pa.
- Short Span: Lynch Village Bridge, Lynch Village, Pa.
- Reconstructed: Bridge of Lions Historic Rehabilitation, St. Augustine, Fla.
- Special Purpose: Hillhouse Pedestrian Bridges, New Haven, Conn.
- Special Purpose: Pedestrian Bridge at the Yards Waterfront Park, Washington, D.C.

Accelerated Bridge Construction Commendations

- San Francisco – Oakland Bay Bridge – East Tie-In Structure, San Francisco
- Sam White Bridge, American Fork, Utah
- I-93 FAST 14 – Salem Street Interchange, Medford, Mass.

Sustainability Commendation

- Silverdale Bridge, Stillwater, Minn.

EIGHTEEN STEEL BRIDGES have earned national recognition in the 2012 Prize Bridge Awards Competition. Conducted by the National Steel Bridge Alliance (NSBA), the program honors outstanding and innovative steel bridges constructed in the U.S.

The awards are presented in several categories: major span, long span, medium span, short span, movable span, reconstructed, special purpose, accelerated bridge construction and sustainability. This year's winners range from a pair of charming New England pedestrian bridges to the longest cable-stayed bridge in the U.S.

Winning bridge projects were selected based on innovation, aesthetics and design and engineering solutions, by a jury of six bridge professionals:

- Benjamin Beerman, P.E., senior structural engineer, FHWA Resource Center, Atlanta
- Robert Healy, P.E., director of structures, RK&K, Baltimore
- David Hohmann, P.E., senior project manager, HDR Engineering, Austin
- Ray McCabe, P.E., senior vice president, HNTB Corporation, New York
- Hormoz Seradj, P.E., steel bridge standards engineer, Oregon Department of Transportation, Salem, Ore.
- Doug Waltemath, project manager, Harrington & Cortelyou, A Burns & McDonnell Co., Kansas City

This year's competition attracted nearly 70 entries and included a variety of bridge structure types and construction methods. All structures were required to have opened to traffic between May 1, 2009 and September 30, 2011.

The competition started in 1928, with the Sixth Street Bridge in Pittsburgh taking first place, and over the years more than 300 bridges have won in a variety of categories. Between 1928 and 1977, the Prize Bridge Competition was held annually, and since then has been held every other year, with the winners being announced at NSBA's World Steel Bridge Symposium.

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Prize Bridge Award—Major Span

MAIN STREET BRIDGE, COLUMBUS, OHIO

Columbus, Ohio's original Main Street Bridge, a concrete open spandrel barrel arch that was built over the Scioto River in 1937, was deemed significant enough to make the National Historic Register. By 2002, however, the city found it to be in very poor condition and thus closed it, eliminating the primary connection between the Franklinton neighborhood and downtown. The city knew a new bridge would encourage and facilitate much needed redevelopment for Franklinton, as well as reconnect it to the central business district in time for Columbus' 2012 Bicentennial Celebration.

The replacement span, a steel-framed 663-ft-long structure (including approaches) that opened in 2010, pays homage to the original structure. It also reinforces Columbus' reputation as the "city of arches," employing an inclined arch with clean, classical lines that compliments the city's neighboring art deco buildings and is compatible with other bridges on the waterfront.

The original design of the new bridge was a slender, single-ribbed inclined concrete arch bridge that met all of the city's requirements—with the exception of the budget. This prompted a redesign, in steel, that would retain the key design elements of a sloping, single-ribbed arch, the L-strut braces and separate pedestrian and vehicular decks. The result is the United States' first inclined steel arch bridge tied with cables and struts, that has separate pedestrian and vehicular decks. Inclined at a 10° angle from vertical, the arch emerges through the bridge deck, and steel hangers descend from the arch to support members below the deck. Unlike traditional tied-arch bridges, stay cables are used for the tie. The structure uses nearly 3,000 tons of Grade 50 steel and was designed to last more than a century as the iconic gateway to the heart of Ohio's Capital City.

The bridge features three vehicle lanes for traffic (two eastbound and one westbound), a 5-ft-wide sidewalk on the south side, a steel box girder roadway, piers that complement the superstructure design and a concrete pedestrian deck that sweeps horizontally and vertically away from the roadway to provide an unobstructed view of the city's downtown skyline. Everything in the bridge design is asymmetrical. The inclusion of a separate deck for pedestrians and cyclists emphasizes their importance and provides them with a link to the recently completed Scioto Mile green space project.

More than just a river crossing, this project connects communities with the downtown core, links new parkway developments on both riverbanks, serves as an iconic destination for residents and visitors and provides significant aesthetic value to the city's infrastructure.

Owner
City of Columbus

Designer
HNTB Corporation, Kansas City, Mo.

General Contractor
Kokosing Construction, Columbus

Consulting Firm
DLZ Ohio, Inc., Columbus

Steel Team
Steel Detailer

Tensor Engineering, Indian Harbour Beach, Fla. (AISC Member/NSBA Member)

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Cathy Morrison, MoDOT

Tom Skinner, MoDOT

P-Tri.com

Merit Award—Major Span

kcICON PROJECT—CHRISTOPHER S. BOND BRIDGE, KANSAS CITY, MO.

A lot can happen in four miles. Just ask the Missouri Department of Transportation (MoDOT), whose kcICON project involved an overhaul of more than four miles of Interstate 29/35 in Kansas City and North Kansas City, Mo. The $232 million project included the reconstruction of a four-lane section of I-29/I-35, reconfiguring existing lanes and five interchanges, reconstructing 12 bridges and designing and building a landmark bridge over the Missouri River.

This latter component is the 1,700-ft-long Christopher S. Bond Bridge, a two-span, cable-stayed structure that enhances the skyline with its diamond-shaped pylon and semi-fan stay arrangement that rises 300 ft off the water and creates a striking gateway experience for motorists. The superstructure is supported by 40 stays that radiate in a semi-fan arrangement from a single diamond-shaped pylon of reinforced concrete. The suspended portion of the bridge consists of an asymmetrical composite steel and concrete system with a main span of 550 ft and a side span of 451.5 ft. The cross section of the bridge deck includes three 12-ft traffic lanes in each direction along with a 12-ft northbound auxiliary lane. The bridge features a kinetic lighting system with diode panels mounted to the edge girders to allow an infinite number of lighting shows across the length of the bridge, from simple one-color panels to complex color-changing events.

The steel framing system comprises two continuous longitudinal edge girders supported by two planes of cable stays. The transverse floor beams are spaced 16 ft, 8 in. apart. At the deck level, the cable stays are anchored by anchor pipes, and the gusset plates are welded directly to the top flanges of the edge girders along the line of the girder webs. This simple concept for connecting the cable gussets to the top flanges of the girders has been successfully implemented on many cable-stayed bridges, but this detail was subject to stringent quality criteria on the Christopher S. Bond Bridge, ensuring trouble-free, long-term durability. These criteria included the following:

- The use of high-quality Z-steel, which is steel with a low sulfur content and a tested level of ductility through the z-axis of the plate to provide for superior strength, ductility and toughness, particularly against high loads acting in a direction perpendicular to the plate surface.
- The successful completion of the wholly nondestructive testing of all welds connecting top flanges to cable gussets.
- The use of a high-quality replaceable sealant where the cable gusset meets the deck to preclude the possibility of crevice corrosion after the infill concrete shrinks.
- The use of a high-performance paint system involving three coats.

The cable stays are anchored, in their semifan arrangement, as closely together as possible at the top of the pylon. This arrangement minimizes the amount of bending applied to the pylon by the stays. It also maximizes the cables' vertical angles, allowing for efficient stay sizes and minimizing the axial loads applied to the deck. The cable stays are protected from corrosion in three ways. Each stay is a bundle of seven wire strands, and each strand has wedge anchorages and is sheathed in polyethylene, providing one layer of protection. The interstices within each sheathed strand are filled with a corrosion-inhibiting compound, forming a second barrier. For the third barrier, the entire bundle of strands is enclosed in a high-density polyethylene pipe, forming a corrosion and mechanical protection system.

Owner
Missouri Dept. of Transportation

Designer
Parsons Corporation, Chicago

Architect
Touchstone Architecture & Consulting, P.A., Tallahassee, Fla.

General Contractor
Paseo Corridor Constructors, Kansas City, Mo.

Steel Team

Steel Fabricator
W&W/AFCO Steel, Little Rock, Ark. (AISC Member/NSBA Member/AISC Certified Fabricator)

Steel Detailer
Tensor Engineering, Indian Harbour Beach, Fla. (AISC Member/NSBA Member)

Merit Award—Major Span

JOHN JAMES AUDUBON BRIDGE, ST. FRANCISVILLE, LA.

Sometimes, records are broken not because they are set to be broken but rather due to circumstances. The John James Audubon Bridge, part of Louisiana's Transportation Infrastructure Model for Economic Development (TIMED) program, spans the Mississippi River near St. Francisville, La. and enhances the economy of the region by providing a means to transport goods across the river in an area where crossings are sparse. The bridge's cable-stayed unit was required to be designed for a minimum span of 1,400 ft across the Mississippi. Due to the shallower depth of water on the east side of the east pier, however, this span was increased to 1,583 ft, making it the longest cable-stayed span in the U.S. This increase facilitated the construction of the east pier in the swift-moving water of the river, while maintaining the overall economy of the proposed solution. The foundations of the towers are supported on 21 drilled shafts, each 8 ft in diameter. This innovation was proposed in lieu of the sunken caisson approach, which is more common for bridges across the lower Mississippi. The drilled shafts reduced the risks associated with delivering, placing and lowering a caisson.

While the 6,505 tons of structural steel used in the project was intended primarily to support vehicular traffic, it also provides a safe river crossing for another community: Louisiana black bears. The project included a total of 10 bear crossings, which double as drainage structures at high-water levels. Fencing is used to provide open areas for the bears to cross, and tunnels were constructed under the roadway for the bears to travel through and to provide a continuous cross-river habitat.

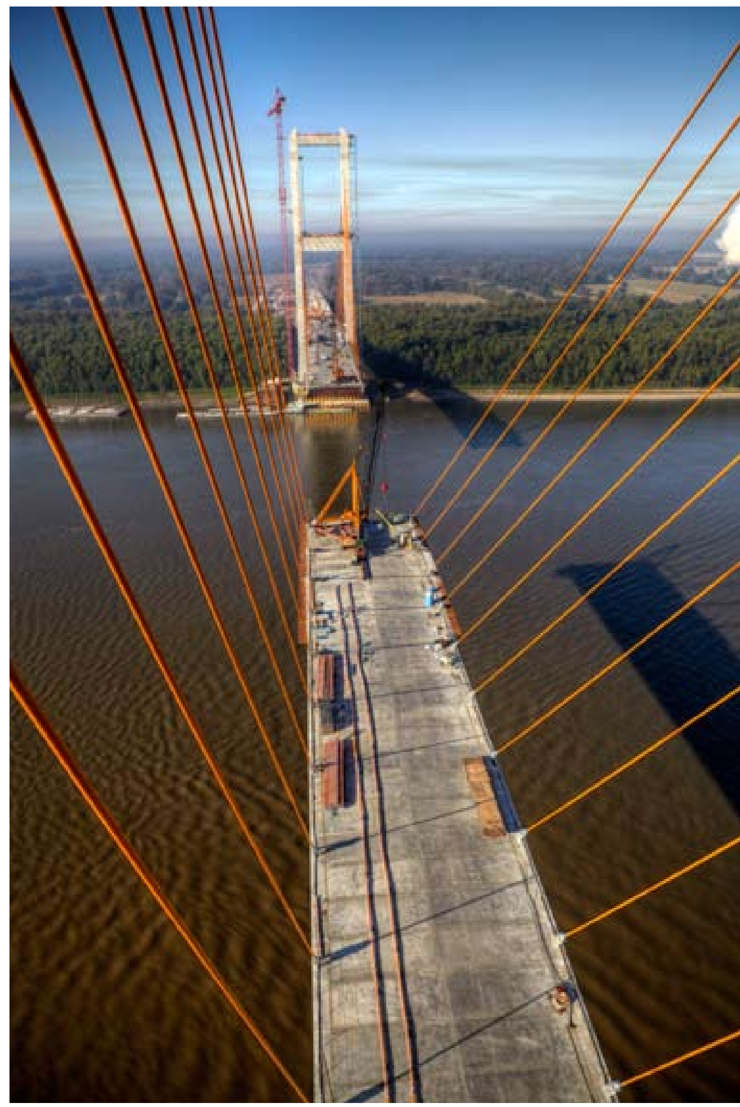
Owner

Louisiana Dept. of Transportation and Development

Designers

Parsons Corporation, Baltimore, Md. (Lead Designer)
Buckland & Taylor Ltd. (Designer of Cable-Stayed Main Bridge), North Vancouver, British Columbia

All photos in this spread courtesy of Parsons



General Contractor
Audubon Bridge Constructors (a joint venture of Flatiron Constructors, Granite Construction and Parsons Transportation Group), Benicia, Calif.

Consulting Firm
Louisiana Timed Managers, Baton Rouge, La.

Architect
Touchstone Architecture & Consulting, P.A., Tallahassee, Fla.

Wind Consultant
RWDI, Guelph, Ontario

Steel Team

Steel Fabricator (levee spans)
Stupp Bridge Company, St. Louis (AISC Member/NSBA Member/AISC Certified Fabricator)

Prize Bridge Award—Long Span

NOOKSACK RIVER BRIDGE, WHATCOM COUNTY, WASH.

Photos this page courtesy of Washington State DOT

While the construction method was left to the contractor's discretion, the single-span truss design used for the Nooksack River Bridge was pre-engineered for cantilevered construction. This approach kept all bridge construction activities outside of the ordinary high-water mark, which not only protected the aquatic ecosystem but also shaved months off the schedule that would have otherwise been incurred to acquire the environmental permits needed for in-water work. In addition, this time-savings allowed for the Washington Department of Transportation (WSDOT) to keep its commitment to the public and have the corridor open in time for the 2010 Winter Olympics in nearby Vancouver.

"Out of the water and way ahead of schedule" is an apt descriptor for the Nooksack River Bridge. Located near Lynden, Wash., approximately six miles south of the border crossing to Canada, the 590-ft-long bridge (total steel tonnage was 700) was part of a widening project—from one lane each way to a four-lane divided highway—for Washington State Route 539.

The cantilevered construction method required two halves of the main span to be temporarily anchored to the precast-prestressed girder approach spans as they were erected piece-by-piece. The anchorage included cable stays supporting a temporary tower frame, which was bolted to the portal panel. Mobile cranes operated on temporary access decking to erect the members. Once the trusses were joined, the access decking was removed and the permanent floor system was installed. (For more on the Nooksack River Bridge, see "The Cantilever Truss Shortcut" in the December 2009 issue of *MSC*.)

Owner/Designer
Washington State Dept. of Transportation

General Contractor
Max. J. Kuney Construction, Spokane, Wash.

Steel Team

Steel Fabricator
Rainier Welding, Redmond, Wash. (AISC Member/NSBA Member/AISC Certified Fabricator)

Steel Detailer
Pro Draft Inc., Surrey, British Columbia (AISC Member/NSBA Member)

Merit Award—Long Span

ESTERO PARKWAY, ESTERO, FLA.

The Estero Parkway project in Estero, Fla. came out on top in a couple of ways—and not just because it's a highway overpass. The 559-ft-long flyover employs the largest tub girders (16 of them) ever erected in the state of Florida. In addition, the average site delivery weighed more than 300 tons and was 380 ft long, making these shipments some of the heaviest hauls to ever travel on Florida roads.

Built to alleviate traffic in the growing Ft. Meyers area and provide a new passage over Interstate 75, the overpass uses a total of 2,278 tons of structural steel and is more than 116 ft wide. Transportation of the girders, which are 15 ft tall and 10 ft wide at the bottom, from Tampa to Ft. Meyers could only be done during four-hour windows, between midnight and 4 a.m. For more on the Estero Parkway project, see "On Opposite Coasts" in the June 2008 issue of *MSC*.)

Owner
Lee County Dept. of Transportation, Ft. Meyers, Fla.

Designer
Finley Engineering Group, Tallahassee, Fla.

General Contractor
Zep Construction, Inc., Ft. Myers, Fla.

Consultant
JCA Engineering LLC, Pembroke Pines, Fla.

Steel Team

Steel Fabricator
Tampa Steel Erecting Company, Tampa, Fla. (AISC Member/NSBA Member/AISC Certified Fabricator)

Steel Detailer
Tensor Engineering, Indian Harbour Beach, Fla. (AISC Member/NSBA Member)

Steel Erector
V & M Erectors, Inc., Pembroke Pines, Fla. (AISC Member/NSBA Member/AISC Advanced Certified Erector)

Photos this page courtesy of V & M Erectors, Inc.

Merit Award—Medium Span

GAY STREET BRIDGE REPLACEMENT PROJECT, PHOENIXVILLE, PA.

The purpose of the Gay Street Bridge Replacement Project? Simple. Replace an existing 12-span, 936-ft-long concrete arch structure (built in 1924 but that had since deteriorated into poor condition) with a structurally sound bridge with an increased load carrying capacity that would maintain safe and adequate pedestrian, vehicular and emergency services movement over French Creek, Taylor Alley, Mill Street, the Norfolk Southern Railway, the proposed French Creek Parkway and the former site of the Phoenix Iron Works—a brownfield site with proposed future development—between the downtown area of Phoenixville, Pa. and the north side of the community. Oh, and also pay respect to not only the existing structure but also a structure, in the same spot, that predated it.

The new Gay Street Bridge consists of three sections. The first section is the south approach, a three-span continuous composite curved steel plate girder bridge with spans of 61 ft, 61 ft and 75 ft; the south approach and part of the first arch span are located on a horizontal curve. The second section is the north approach, which is a two-span continuous composite steel plate girder bridge with spans of 123 ft, 3 in. and 100 ft. The third (main) section is a four-span arch that uses a two-hinged steel open-spandrel deck arch with a floor system that consists of rolled beam stringers and floor beams; the arch rib is a constant-depth steel plate girder. The span lengths of the arch spans are 116 ft, 162 ft, 162 ft and 112 ft, 3 in. The structure's overall length is 972 ft, 6 in. and its out-to-out width is 50 ft, 2 in., with two sidewalks and bump-outs for lighting and scenic overlooks at each pier. The overlooks provide room for viewing the bridge-mounted historic markers and the site below without interfering with pedestrian movement.

The project was completed approximately three months ahead of schedule (total construction duration was 23 months) and opened to traffic in October of 2009. The arch erection required the use of three cranes to erect each arch rib before the top deck could be put into place. A template plate was used to hold the anchor bolts in place when the piers were poured, simplifying the erection of the arches over the anchor bolts. Deck construction was relatively straightforward, with the exception of the fascia overhangs; the fascia stringers in the arch spans required both tension and compression struts to resist the torsion loads placed on them by the bridge overhang formwork.

The project faced an interesting challenge due to the fact that the existing structure was a contributing element to the extensive Phoenixville Historic District. This bridge was a very prominent fixture in Phoenixville, known locally as the "High Bridge," and many members of the community were passionate about it. Therefore, it was imperative for the design team to work with the community and the Pennsylvania Historic and Museum Commission (PHMC) to provide a context-sensitive design and to define parameters that would be acceptable for the proposed solution. This project also spanned over the former site of the Phoenix Iron Works, which started as a nail factory and then went on to manufacture such items as the Griffen cannon, iron and steel beams and even the patented Phoenix column truss bridges. Now a brownfield site, this property was under land development at the commencement of the replacement project. The only remaining building from the Iron Works facility was the Foundry Building, which was also undergoing a historic renovation during the project.

The design team researched the history of the site to help define the appearance of the new structure, as well as what the material should be. While the existing structure was a massive concrete arch, the previous structure at this location was, in fact, a steel bridge—and since this structure spanned over a site that previously housed a steel fabricator, there was equal support for either a concrete or steel structure. JMT prepared a study that evaluated numerous replacement alternatives that would satisfy the mitigation requirements. Photographic renderings of the replacement alternatives were prepared, a visual preference survey was conducted at a public meeting and a consensus was formed to sustain the history of the


Mark Richard of JMT


Paul S. Bartholomew Photography

site—and to pursue a steel-arch structure. The bridge typical section is highly visible from underneath the new structure. Therefore, the view from underneath was considered as aesthetically important as the elevation view, an issue that played heavily in the decision to provide a true arch span as opposed to a standard beam bridge with arched fascia panels.

Owner
Pennsylvania Dept. of Transportation District 6-0, King of Prussia

Designer
Johnson, Mirmiran & Thompson, Inc. (JMT), York, Pa.

General Contractor
Nyleve Bridge Corporation, Emmaus, Pa.

Steel Team

Steel Fabricator
High Steel Structures, Inc. Lancaster, Pa. (AISC Member/NSBA Member/AISC Certified Fabricator/AISC Advanced Certified Erector)

Steel Detailer
abs Structural Corp., Mellbourne, Fla. (AISC Member)

Photos this page courtesy of Michael Baker Jr., Inc.

Prize Bridge Award—Short Span

SOUTH LAYTON INTERCHANGE, LAYTON, UTAH

The Single Point Urban Interchange (SPUI) was designed as part of the $97M South Layton Interchange project for the Utah Department of Transportation (UDOT). The interchange, over Interstate 15, is an hourglass-shaped 218-ft-long two-span bridge with out-to-out deck widths of 220 ft at abutments and 135 ft at the center bent. It has two 12-ft-wide traffic lanes and a 15-ft-wide turn lane in each direction, an 8-ft-wide sidewalk and 17-ft-wide shoulder on one side, and a 9-ft-wide bike lane and 13-ft, 9-in.-wide shoulder on the other side. The cross-section consists of 12 steel plate girders at 11 ft, 8 in. spacing and six flared girders per span with a 9-in.-thick cast-in-place lightweight concrete deck. The hourglass design reduced material costs substantially as well as satisfied the seismic requirements.

As with many interchange projects, time was of the essence. With only a short six-hour closure window, the team would need to use temporary fill to make up the required grade changes for using self-propelled modular transporters (SPMTs) and then remove the fill to resume interstate traffic. Therefore, a launch technique was designed such that the bridge could still be constructed off-site (allowing the bridge and the new fill to be constructed and placed at the same time) and then moved into place with minimal impacts to traffic. The team accomplished this by launching two sections of the bridge from both sides onto temporary slide support members; once launched, the sections came together in the middle to form the complete bridge structure. This project represents the first ABC multi-span bridge launch in Utah.

In order to accelerate the settlement of the new, tall approach embankments of the bridge, the embankments were temporarily surcharged with 12 ft of soil above the proposed finished grade. Approximately 13 ft of settlement occurred, which was anticipated. During the four months of surcharge settlement time, the team constructed the bridge superstructure on temporary steel supports above the temporary soil surcharges.

The temporary steel supports were constructed by extending the permanent abutment piles at the front end and providing temporary piles at the back end. The slide support members for the launch were two rows of temporary support beams on piles constructed on either side of the three lanes of traffic in each span. After soil settlement was obtained the surcharge was removed from underneath, and after the team raised the superstructure (using 12 lowering jack towers for each span) the temporary structure was removed. The bridge was lowered to approximately 18 ft in about 16 hours and was set on elastomeric pads with Teflon sliding surfaces placed over inverted slide shoes at the forward end, and skid beams at the rear end.

In preparation for the bridge launch, a 3D model was created and a finite-element analysis was performed to calculate the exact deflection of the bridge as it was cantilevered across the interstate. To perform the launch, 22-ft-long launch noses were attached to six of the twelve girders, and the bridge was pushed using hydraulic jacks across Teflon-coated bearing pads located at abutments and intermediate temporary supports. The bridge was then launched into place using hydraulic jacks to push the bridge. The sliding surfaces consisted of Elastomer pads with Teflon surfaces, mounted on inverted stainless steel shoes at abutments, and intermediate temporary supports. These temporary supports were approximately 45 ft apart. The bridge was moved into place using only five hours of the allotted six-hour full lane closures of I-15 in each direction. Each span weighed approximately 1,150 tons (structure, deck, etc.); the steel for the project totalled 410 tons.

Owner
Utah Dept. of Transportation, Salt Lake City

Designer
Michael Baker Jr., Inc., Midvale, Utah

Consultant
Nordholm Rentals (Norsar, LLC), Everett, Wash.

Aesthetics Designer and General Contractor
Ralph L. Wadsworth Construction Company, Inc., Draper, Utah

Steel Team

Steel Fabricator
Utah Pacific Bridge & Steel, Lindon, Utah (AISC Member/NSBA Member/AISC Certified Fabricator)

Merit Award—Short Span

LYNCH VILLAGE BRIDGE, LYNCH VILLAGE, PA.

Lynch Village, Pa. (about 10 miles north of Marienville, Pa.) isn't a large town but it can boast an engineering first. Located on the edge of the Allegheny National Forest in western Pennsylvania, the town is home to a first-of-its-kind, two-span demonstration bridge that carries S.R. 1003 over Tionesta Creek. The bridge uses concrete-filled tubular flange girders (CFTFGs) and its design and construction was the culmination of research and development sponsored by the Federal Highway Administration (FHWA), Pennsylvania Department of Transportation (PennDOT) and the Pennsylvania Infrastructure Technology Alliance (PITA).

A CFTFG is an I-shaped girder that uses a concrete-filled hollow structural section as the top flange. The resulting I-girder section has torsional stiffness and lateral torsional buckling strength that is much larger than that of a conventional steel I-girder with similar depth, width and steel weight. The increased stability and strength allows the lateral bracing of CFTFGs to be minimized, compared to conventional steel I-girders.

This demonstration bridge combined the use of CFTFGs with span-by-span construction to further increase the speed of the steel erection. The girders were designed to be simply supported on temporary erection bearings during deck placement and then made continuous for superimposed dead load and live load. A bolted mechanical field splice is placed at the interior support to make the spans continuous.

The demonstration bridge consists of two 100-ft spans and the overall length is 200 ft from the centerline of the abutment, bearing-to-bearing on a tangent alignment and straight grade. It consists of two 11-ft-wide lanes and two 3-ft-wide shoulders, and uses standard PennDOT barriers (1 ft, 8 in. wide and 2 ft, 8 in. high along each overhang) for an overall structure width of 31 ft, 4 in. and a curb-to-curb width of 28 ft. The bridge cross section has four CFTFGs spaced at 8 ft, 5.5-in centers, with 3-ft deck overhangs.

CFTFGs bring several advantages, including the ability to minimize the required under-clearance, simplify erection and eliminate cross frames or diaphragms. The hollow structural section (HSS) flange is filled with unreinforced concrete in the fabrication shop after girder fabrication, and the concrete strengthens the compression flange of the girder. The torsional stiffness and strength of the girder is significantly increased by the tube, thus increasing the lateral-torsional buckling resistance of the girder. The concrete-filled tube also has the effect of reducing the depth of web in compression, thus decreasing the girder's web slenderness.

This increased stability and strength of a CFTFG allows the lateral bracing to be reduced, compared to that of conventional plate girders, and to span greater distances with the same structure depth. The increase in torsional stiffness and strength also eliminates the need for fabricating exterior girders with intermediate constructability stiffeners, as is needed on normal plate girders to resist overhang forces. Diaphragms or cross-frame and stiffeners are among the most labor-intensive and expensive components per pound of steel to fabricate and erect; therefore, using fewer diaphragms and stiffeners reduces cost and increases speed of construction. A few transverse stiffeners along the girder length are necessary to control cross-section distortion, allowing the girder to fully realize its lateral torsional buckling strength.

On the flip side, this demonstration project revealed that considerable difficulty can arise when attempting to make the tubular flange girders continuous by splicing at the piers. Future designs should consider elimination of the shear connectors within the splice region and incorporate methods that may eliminate the need for the tedious procedures required to set temporary bearings utilizing brackets, as was done on this project. Nevertheless, the project paved the way for future development of steel bridge systems and provides an additional option to engineer.

Owner
Pennsylvania Dept. of Transportation

Designer
Michael Baker Jr., Inc., Moon Township, Pa.

Other
Lehigh University Department of Civil and Environmental Engineering, Bethlehem, Pa.

General Contractor
Francis J. Palo, Inc., Clarion, Pa.

Steel Team
Steel Fabricator
High Steel Structures, Inc., Lancaster, Pa. (AISC Member/NSBA Member/AISC Certified Fabricator/AISC Advanced Certified Erector)

Photos this page courtesy of Michael Baker Jr., Inc.

Prize Bridge Award – Movable Span

BSNF RAILWAY BURLINGTON BRIDGE, BURLINGTON, IOWA

The reconstruction of the century-old BNSF Burlington Bridge over the Mississippi River at Burlington, Iowa began in 1991 when the United States Coast Guard issued an Order to Alter under the Truman Hobbs Act for replacement of the swing span. The bridge was a hazard to river traffic due to the narrow navigable width of approximately 160 ft on either side of the center pivot pier. The replacement structure needed to provide a minimum 300 ft of horizontal channel clearance and 60 ft of vertical clearance above the normal pool elevation.

This directive to replace the existing swing span led designer HNTB Corporation to study various alternate designs and alignments, thus leading to the selection of a vertical lift span to replace the swing span on the existing alignment. Nearly two decades after the Order was issued—and following preliminary studies and design and final design of project—replacement of the swing span commenced in 2009, with a portion of the federal funding provided through the American Recovery and Reinvestment Act of 2009.

During construction of the replacement span, not one, not two but nine flood events occurred. In fact, out of the 680 days from notice to proceed to substantial completion, 143 days were at or above the flood stage and a total of 192 days were lost due to unseasonably high river elevations. While other items, such as the lift span erection on barges, could continue during flood events, critical path substructure was delayed.

HNTB's railroad experts were on call throughout the project, and participated in design review meetings on site, allowing for construction issues to be addressed ahead of time to keep the project moving forward. In an effort to reduce construction cost, BNSF researched their inventory for secondhand deck plate girder spans that could fill the gap left following removal of Span 6. Six individual spans were needed, four at 80 ft in length and two at 93 ft, each span supporting one track. BNSF was able to locate four 80-ft, two-girder spans that could be reused with minimal rehabilitative work (in an effort to minimize the environmental footprint, HNTB reused as much of the existing structure as possible, including the existing bridge

HNTB

HNTB

Matt McDonald, Photographer

Pat Seiple, Photographer

piers). The spans were shipped to the BRT Staging Yard as individual girders and a new cross frame system was installed on-site. The 93-ft deck plate girder spans were designed by HNTB and were constructed of new material. The spans consisted of four deck plate girders with internal cross framing. These spans were also erected on site and stored until needed.

Owner
BNSF Railway Company

Designer
HNTB Corporation, Kansas City, Mo.

General Contractor
Ames Construction, Burnsville, Minn.

Photos in this spread courtesy of CME Associates, Inc.

Prize Bridge Award—Reconstructed
Accelerated Bridge Construction Commendation

I-93 FAST 14—SALEM STREET INTERCHANGE, MEDFORD, MASS.

The Salem Street bridge carries Interstate 93 over Salem Street westbound in Medford, Mass. and is part of a rotary interchange that contains two similar bridges: I-93 over Salem Street WB and I-93 over Salem Street EB. All of these bridges were part of the "93 Fast 14" project, which replaced 14 I-93 bridges in 10 weekends last year.

I-93 is an eight-lane elevated expressway that carries approximately 200,000 vehicles per day. The 14 bridges in the 93 Fast 14 project all carry I-93 over local features such as city streets, state highways and the Mystic River. All of the bridges are steel stringer spans with concrete decks. Thirteen of the fourteen bridges are multiple span structures. The entire superstructures would be replaced due to deterioration of the concrete decks and the beam ends (brought on by years of leaking deck joints).

During the summer of 2010, MassDOT was exploring the feasibility of replacing bridge superstructures on I-93 in Medford using accelerated bridge construction (ABC) techniques. In August, while the feasibility study was underway, a failure of one of the bridge decks occurred during an ongoing resurfacing project. A large "punch-through" developed on the bridge that carries I-93 over Route 28. The ensuing repair required the removal of hundreds of square feet of deteriorated concrete. The severe traffic impacts that occurred as a result of the deck failure affected the entire Metro Boston area and drove home the point that ABC methods would be needed to maintain mobility during bridge construction activities. It also underscored the need to begin and complete the deck replacement project before more potholes developed. Spurred by the punch-through, MassDOT accelerated the project so that construction would be complete in 2011, with all the superstructure replacements occurring between June 1 and September 4, 2011.

Central to the ABC process were the prefabricated modular beam units used on the project. Each unit is made of two grade 50 weathering steel girders pre-topped with a composite deck. By using modular units for the superstructure, the construction team was able to demolish and replace the Salem Street Bridge in less than 55 hours. The 55-hour window occurred during a weekend so that rush hour traffic was not impacted by construction—a very important aspect of this project, since it is located on a major artery just outside of Boston. The units were shipped to the project site and placed side-by-side to form the new bridge superstructure and were connected using a simple cast-in-place concrete closure pour. The spans were designed and detailed as simple spans. However, using link slab technology, the completed decks are jointless. In addition, no special equipment was needed for construction; each unit

was erected using standard high-capacity hydraulic cranes. The closure pours between the units allowed for significant adjustment in the field in order to accommodate the variations in the 50-year-old substructures. In addition to the accelerated construction techniques, the fabrication and delivery of steel was also expedited. The first set of bridge units was delivered in only four months (including deck casting). All 252 units (504 girders) for all bridges in the 93 Fast 14 project were fabricated in fewer than six months.

Owner
Massachusetts Dept. of Transportation

Designer
Gill Engineering Associates, Needham, Mass.

General Contractor
White-Kiewit J.V., Framingham, Mass.

Steel Team

Steel Fabricator/Detailer
Structal Bridges, A division of Canam Steel Corporation, Point of Rocks, Md. (AISC Member/NSBA Member/ AISC Certified Fabricator)

Sub-consultant
CME Associates, Inc. (concept development/ owners rep.), East Hartford, Conn.
Dewberry, Boston, Mass.
Lin Associates, Inc., Brighton, Mass.
Tensor Engineering (sub-consultant detailer), Indian Harbour Beach, Fla. (AISC Member/ NSBA Member)

Merit Award—Reconstructed

BRIDGE OF LIONS HISTORIC REHABILITATION, ST. AUGUSTINE, FLA.

The historic Bridge of Lions has long been one of the most recognizable structures in St. Augustine, Fla. Originally built in 1927 and listed in the National Register of Historic Places, the bridge serves as a critical link between Anastasia Island and St. Augustine's historic downtown area. Over the years, however, the bridge showed signs of significant deterioration and was in need of safety improvements, leading the Florida Department of Transportation (FDOT) to rehabilitate the historic structure.

Following *The Secretary of Interior's Standards for Rehabilitation*, the reconstruction project's design team sought to preserve as much of the original bridge as possible, while also improving safety and transportation connectivity. Maintaining the steel arched girders of the approach spans (as well as the bascule piers and towers, built in the Mediterranean-Revival style architecture of many of the historic buildings in downtown St. Augustine) was crucial. However, the bridge did not meet modern load carrying capacity (the original 15-ton posted limit was less than the weight of the city's largest fire truck). Preserving these elements required a key innovation: a one-of-a-kind interior steel framework and a new foundation system.

In order to increase load carrying capacity, the team designed a new interior steel framing system that would be hidden from view and essentially constitute a new bridge within the existing 1927 structure. The original framing system consisted of two non-redundant, parallel plate girders spaced 22 ft. apart transversely. These riveted, built-up girders were typically continuous over two piers with a shear splice at mid-span in the first and third spans of each unit. Transverse steel floor beams were spaced 7 ft, 5 in. apart perpendicular to and framed between the two main girders. These floor beams transferred dead and live loads from the bridge deck to discrete points along the length of the two girders; thus the two girders ultimately carried the entire load of the bridge.


Root Photography


Root Photography

The new interior framing system replaced the existing transverse floor beams with a longitudinal stringer system parallel to the main girders. The stringers then shifted the main loads of the bridge to transverse crossbeams at each pier support, allowing the original girders to be removed, repaired and returned to the bridge without having to carry the entire load as they had done for nearly 80 years. The new interior framing system also allows higher fatigue ranges, but more importantly eliminates the longitudinal fracture-critical non-redundant two-girder system.

Construction began in 2005 and lasted six years, as the Bridge of Lions was completely dismantled only to be rebuilt again, this time stronger, while also preserving as many of the original elements as possible. To maintain traffic during the rehabilitation, the team also designed and constructed a 1,600-ft temporary bridge, which included a vertical lift-span designed to 80-ft vertical clearance. (This bridge was removed once the original bridge reopened.)

Owner
Florida Dept. of Transportation

Designer
Reynolds, Smith and Hills, Inc. (RS&H), South Jacksonville, Fla.

Architect
Kenneth Smith Architects, Inc., Jacksonville, Fla.

General Contractor
Skanska USA Civil, Virginia Beach, Va.

Steel Team

Steel Fabricator
Florida Structural Steel, Tampa, Fla. (AISC Member/NSBA Member/AISC Certified Fabricator)

Steel Detailer
Tensor Engineering, Indian Harbour Beach, Fla. (AISC Member/NSBA Member)

Other
TranSystems, Ft. Lauderdale, Fla.
Taylor Engineering, Inc., Jacksonville, Fla.
MACTEC, Jacksonville, Fla.
Halback Design Group, Inc., St. Augustine, Fla.


FDOT

Prize Bridge Award – Special Purpose

TEMPE TOWN LAKE PEDESTRIAN BRIDGE, TEMPE, ARIZ.

The Tempe Town Lake Pedestrian Bridge was designed to provide both function and aesthetics to the Tempe Town Lake area. It connects existing bike and pedestrian paths from the north and south sides of the lake, allowing runners, walkers and bikers to cross the lake without having to compete with vehicular traffic at major intersections.

The inspiration for the design came from the natural and built environments of Tempe Town Lake and Rio Salado area. The graceful curves of the arches recall the undulating Salt River and the crossing of the arches and suspension cables create geometric shapes echoing the architectural patterns found in the Tempe Center for the Arts. Crossing of the arches creates a distinctive shadow on the bridge deck that is commemorated in a paving band, which marks the shadow on the summer solstice. The shade structures between each arch evoke the wings of a crane in flight and subtle lighting enhances the romantic nighttime atmosphere of Tempe Town Lake.

The total structure length is 912 ft from abutment to abutment and consists of four simple-span tied arches that are each 225 ft, 8 in. Each span is integrated with the existing Tempe Town Lake Dam's concrete piers and abutments for its foundation. The bottom chords and arches are fabricated from 16-in.-diameter HSS. The tubular steel pipe varies in thickness from 0.375 in. to 0.844 in. The bottom chords are spaced at 20 ft on center and serve as the anchor point for the 34-ft-high arches, which slope at 21.4°, leaning and crossing each other near the quarter points, giving the bridge its distinctive shape. Structural steel hangers (1⅜-in.-diameter galvanized cables) are positioned at the 10th points of the bottom chord and attached to offsetting points at the top chord, causing the cables to cross one another both within the plane of each arch and in the locations where the arches have crossed. The floor system is supported by W12×53 floor beams and W12×40 stringers.

Photos this page courtesy of T.Y. Lin International

Transporting the completed HSS frame of the bridge in one piece was not feasible, so sections were delivered to a fit-up area immediately west of the Tempe Dam and assembled. The bottom chords of each span were shipped in thirds already framed with the associated floor beams and stringers, then set on 12 equally spaced pre-leveled field stands. Each arch was delivered in five pieces. Two falsework towers were built and set at the quarter point locations, and saddles were used to prop all legs in place while a crane positioned the remaining top arch section in-place. Precise fit-up of the whole arch was crucial, as any offset of a connection would have an impact on the integrity of the structure. Once the steel frame was completed, the steel hangers were placed and tensioned according to the detailed sequencing and specifications to provide rigidity to the structure.

Owner
City of Tempe

Designer
T.Y. Lin International, Tempe, Ariz.

Architect
Otak, Tempe, Ariz.

General Contractor
PCL Constructors, Tempe, Ariz.

Project Artist
Willco Art and Design, Tempe, Ariz.

Merit Award—Special Purpose

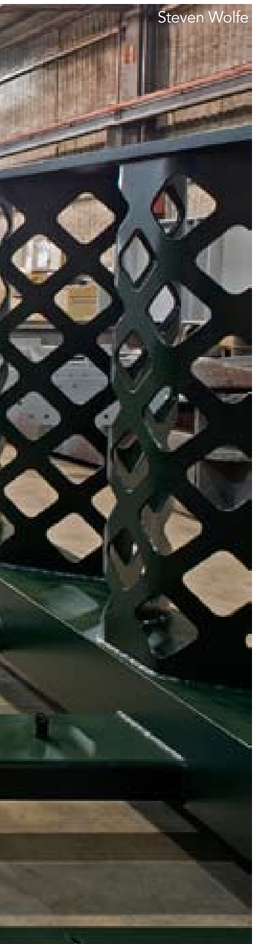
HILLHOUSE PEDESTRIAN BRIDGES

The Hillhouse Avenue area, listed on the National Register of Historic Places and part of Yale's University's New Haven, Conn. campus, has been called a walkable museum, due to its 19th century mansions and streetscape. Mark Twain and Charles Dickens both called Hillhouse Avenue "the most beautiful street in America." Seen from a distance, the two new Hillhouse Avenue pedestrian bridges that span the Farmington Canal trail resemble a 19th century-style lattice truss bridge. It is a modern twist on a truss bridge design, patented in 1820 by New Haven architect Ithiel Town, who resided on Hillhouse Avenue.

The current Hillhouse Avenue improvement plan was to construct two pedestrian bridges, in addition to replacing the motor vehicle bridge. When the vehicular bridge was reconstructed, the pedestrian passageways were separated as two independent footbridges to align with the existing axes of the sidewalks along the avenue. The two bridges are identical apart from their widths; the east bridge has a clear width of 10 ft while the west bridge has a clear width of 8 ft. The bridges span 62 ft clear and are made from a high-performance, high-strength steel (HPS70W). Each one consists of two 46-in. deep steel plate girders that comprise the primary structure, as well as the handrails.

Matthew Butts


MC Ironworks


Steven Wolfe

While unimaginable when Ithiel Town designed his truss, the team used a series of 3D computer analyses to design and verify the capacity of its most prominent feature: the undulating wave pattern of the railings. In addition to establishing the prominent aesthetic feature of the bridges, the railings function as the principal load-carrying members in the half-through girder bridge. While girders with constant web corrugation have been developed and used in highway bridges for more than a decade, the design team varied the amplitudes of the waves to accommodate the changing structural demands of each bridge across its span. The girder web sections with the greatest corrugation amplitudes are located at the bridge ends, where the corrugation enhances the shear capacity of the ¼-in.-thick web, and at midspan, where the corrugated web laterally braces the top compression flange of the girder.

In between, where deep corrugation is not required, the amplitude of the wave is reduced. This direct relationship between the form of the bridge and its structural function results in a more efficient design, including reduced web plate thickness and elimination of web stiffeners. The plate girders have ¼-in.-thick corrugated, perforated webs and are, in fact, the first of their kind. (Although corrugated webs have been used previously on highway bridges, the new bridges at Yale are believed to be the first in the world to combine a corrugated design with perforations.) Because the use of corrugation to stiffen the webs was a relatively new concept, the team also had to validate the approach, including evaluating and confirming research conducted at Lehigh University on corrugated web girders. The research indicated that the welded connections between the bottom flanges were of paramount importance because of the complex stresses that could develop in those locations as a result of the shear loading on the corrugated geometry of the welds.

Each bridge was installed on-site in a single lift. The four bearings on each bridge, located below each girder end, allow for both longitudinal and transverse expansion and contraction due to the extreme temperature changes in the area.

Owner
Yale University & City of New Haven

Designer
Guy Nordenson and Associates, New York

Architect
Pelli Clarke Pelli, New Haven, Conn.

Steel Team

Steel Fabricator
Michelman-Cancelliere IronWorks, Inc., Lehigh Valley, Pa. (AISC Member/NSBA Member/AISC Certified Fabricator)
Sure Iron Works, Brooklyn, N.Y. (AISC Member)

Merit Award—Special Purpose

PEDESTRIAN BRIDGE AT THE YARDS WATERFRONT PARK, WASHINGTON, D.C.

Robert Silman Associates

Robert Silman Associates

This 200-foot pedestrian bridge is a striking centerpiece in the new Yards Park on the Anacostia riverfront in Washington, D.C. This park is at the center of the ongoing redevelopment and restoration of a long-abandoned portion of the historic Navy Yard, and links Nationals Park (home of MLB's Washington Nationals) with the remaining Anacostia waterfront restoration project.

The bridge has a dramatic curved, sweeping geometry that creates a feeling of compression and release as one walks through its circular rings from one side to the other. The tied-arch structure features built-up steel box elements with an arch depth of 8 ft. The tension tie element is a 14-in.-deep member, with the slab and beam deck cast between to maintain the thin profile. The arches sweep inward so that the bridge deck compresses from 18 ft wide at the abutments to about ten ft wide at the center. The arches also cant inward, and are braced by rings of varying radii, giving the bridge an hourglass form. These rings are rolled 8-in.-diameter HSS members; below the top chord, they are reinforced by a series of built-up plates, with fixity to the transverse deck girders to provide moment continuity around the completed rings. It is this continuity between the rings and the deck that provides bracing for the arch compression members. The desired aesthetic is a feeling of lightness of the ribs as they extended above the top chord.

However, the behavior of the structure's form works against this. The canted orientation of the top chord means that the rings attract a significant amount of the out-of-plane load for bracing the compression arch. This was solved through staging of the steel erection. By leaving out the top section of the ribs until after the arches were erected and the concrete deck was placed, the lateral forces from the top chord, due dead load, were carried by the continuity of the rings to the deck girders. For analysis of this intermediate stage, the bridge assumed a half-through truss (or "pony truss") configuration, wherein the compression chords were elastically braced by the lower portion of the ribs and the transverse framing in the bridge deck. With most of the permanent load locked into the lower structure and the stability of the compression chords provided for by the bottom of the rings, the remaining top segment of the ribs could be installed, only to see forces imposed by live loads.

The greatest design challenge for this bridge was balancing the flow of forces through the structure while satisfying the aesthetically driven form. While the primary structural elements


MPFP llc / M. Paul Friedberg & Partners


MPFP llc / M. Paul Friedberg & Partners

of this bridge are the pair of tied arches, the ribs exhibit significant vierendeel behavior, forming a hybrid structure similar to many covered timber bridges. As the ribs were stiffened to resist forces transverse to the arches and to ensure the top chord's stability, the ribs attracted more moment in the plane of the arch. This required a carefully coordinated effort to satisfy the desired aesthetic of each built-up rib section, while maintaining stresses within the strength and fatigue limits.

Owner
Forest City Washington, Washington, D.C.

Designer
Robert Silman Associates, Washington, D.C.

Architect
MPFP LLC/M. Paul Friedberg & Partners, New York

General Contractor
Smoot Construction/P. J. Dick Incorporated Joint Venture, Washington, D.C.

Steel Team

Steel Fabricators
Banker Steel Company, Lynchburg, Va. (AISC Member/NSBA Member/AISC Certified Fabricator)

Steel Detailer
WSP Mountain Enterprises, Sharpsburg, Md. (AISC Member)

Steel Erector
Williams Steel Erection Co., Inc., Manassas, Va. (AISC Member/NSBA Member/AISC Advanced Certified Erector)

Photos this page courtesy of Barrie Rokeach for T.Y. Lin International

Accelerated Bridge Construction Commendation

SAN FRANCISCO-OAKLAND BAY BRIDGE—EAST TIE-IN STRUCTURE

The average person might not realize that the San Francisco-Oakland Bay Bridge is really one giant bridge made up of several smaller sections. One such section is the East Tie-In (ETI) structure, a double decked, steel truss bridge. Over Labor Day weekend in 2009, the Bay Bridge was closed so that a section of the existing bridge could be removed and a new section, which acts as a detour for traffic connecting Yerba Buena Island (YBI) to the existing eastern span of the Bay Bridge, could be brought in—a method of construction called roll-out/roll-in (RORI).

The RORI operation is very rarely executed because of the challenges involved, but the rewards can be equally significant; the project has expedited the completion of the East Span Replacement by as much as two years, providing a significant cost savings to the region and the State. Additionally, the project dramatically improves the seismic safety of the current structure by replacing structures that currently do not meet today's seismic standards. In addition, a lengthy bridge closure was avoided and the impact of construction to the public was reduced to a mere four days.

The main challenge was to connect the detour structure with the existing east spans with minimum interruption to traffic. The closure to traffic was limited to a four-day weekend, during which crews removed an existing 288-ft-long span by rolling it sideways to the north, and rolled in a new truss, thus redirecting the traffic from the existing bridge spans to the detour structure. The existing truss was 70 years old and weighed approximately 3,300 tons, and what complicated the operation was that the structure sat 150 ft above ground level. The truss was originally designed to sit on its bearings and not for jacking-up at the intermediate nodes.

The available capacity needed for the modified load path was investigated and the truss was then strengthened where required. The new truss was positioned south of the existing alignment, ready to be rolled in; this meant erecting the new truss on temporary supports 150 ft in the air! The rolling system had to be robust and reliable; it had to be able to withstand the vagaries of Bay Area's weather. Given the tight schedule, CalTrans and the design team opted to use a bridge information modeling (BrIM) approach to render the new ETI structures during the design phase. The models were used to perform a virtual simulation of the construction sequence and to evaluate the procedures and systems employed for the RORI operation to identify and eliminate all possible geometry and space requirement issues.

The most challenging aspect of the entire operation was the removal of the old truss because of the uncertainty involved with the forces locked in during the original erection of the truss (decades ago) as well as the instability of the remaining trusses once the roll-out truss was disconnected from the bridge and rolled out. There are a total of four trusses, each 288 ft long, on YBI leading to the island's tunnel. The two trusses next to the main cantilever truss over the old navigation channel are tied into a massive concrete pier designated E1, which also serves as a tension tie-down for the cantilever truss. The other two trusses are also tied into concrete pier located towards the entrance to the tunnel portal. Once the roll-out truss was removed, there was the risk that the adjacent truss might become unstable. However, this was addressed by designing tension ties to the remaining trusses on the tunnel side.

Owner

California Dept. of Transportation

Designer

T.Y. Lin International/Moffatt & Nichol Joint Venture, San Francisco

General Contractor

C. C. Myers, Inc., Rancho Cordova, Calif.

Steel Team

Steel Fabricator

Thompson Metal Fab, Inc., Vancouver, Wash. (AISC Member/NSBA Member/AISC Certified Fabricator)

Steel Detailer

Norcal Structural, Berkeley, Calif. (AISC Member/NSBA Member)

Other

Mammoet (Jacking/Moving)

Accelerated Bridge Construction Commendation

SAM WHITE BRIDGE, AMERICAN FORK, UTAH


Photos this page courtesy of Provo River Constructors

In March of 2011, bridge history was made in American Fork, Utah, when the Sam White Bridge over Interstate 15 was moved in one night. It is the longest two-span bridge ever moved by SPMTs in the Western Hemisphere. Crews set the bridge into place at approximately 4 a.m. on a Sunday and reopened the freeway at 7 a.m., three hours ahead of schedule (the entire move took 6½ hours). Two sets of SPMTs—hydraulic jacks on wheels, controlled by a single joystick—were used to lift the 354-ft-long, 3.8 million-lb structure 21 ft in the air. The bridge was then moved from the "bridge farm," where it was constructed on the east side of I-15, across eight freeway lanes (approximately 500 ft) and lowered into place.

The bridge itself is a two-span steel-plate girder structure and is 76 ft, 10 in. long. The superstructure uses six girders at 13 ft, 6 in. spacing with a 4 ft, 8-in. overhang. The girders use 70-ksi steel in the flanges over the bent and 50-ksi steel everywhere else. The framing plan uses staggered perpendicular cross frames up to near the bent. Near the bent the cross frames go to a continuous line across the bent, with each line intersecting the girder at the column. The bent does not have a cap; each girder sits directly on a 4-ft-sq. column.

Constructing the bridge using SPMTs helps meet the project's aggressive three-year timeline. The bridge is one of 59 bridges that are expected to be new, rebuilt or modified on UDOT's I-15 CORE project by December 2012.

The Sam White Bridge is UDOT's 23rd ABC bridge move—nearly double the number moved by all other states combined. The FHWA designated UDOT's move as a "showcase" event for leaders to learn more about ABC technology and how it can be applied to other transportation systems in the country.

Owner
Utah Dept. of Transportation

Designer
Michael Baker Jr., Midvale, Utah

General Contractor
Provo River Constructors, Lehi, Utah

Other
The Sarens Group, Rigging International, Missoula, Mont.

Steel Team

Steel Fabricator
Utah Pacific Bridge & Steel, Pleasant Grove, Utah (AISC Member/NSBA Member/AISC Certified Fabricator)

Olson & Nesvold Engineers

Olson & Nesvold Engineers

Tim Davis/HNTB

Tim Davis/HNTB

Sustainability Commendation

SILVERDALE BRIDGE, STILLWATER, MINN.

Sometime in the 1870s, the Silverdale Bridge started life as an equestrian and footbridge over a river in Sauk Centre, Minn. In 1937, it was disassembled and moved near Silverdale, Minn. to serve as a vehicular bridge over the Little Fork River. And in 2009, it was dismantled for refurbishment, moved near Stillwater, Minn. and since late last year is back its original duties as an equestrian bridge, as it carries horses and riders on the Gateway Trail over a roadway.

Aligned on a north-south axis, the crossing consists of a 162-ft, wrought-iron eight-panel pin-connected Parker through truss with three steel-beam approach spans on the north and three on the south. The superstructure rests on H-piling abutments and timber piers and bents. In the main span, the two truss webs are identically detailed. Paired channel sections with V-lacing form the upper chord, while paired punched eyebars comprise the lower chord. All vertical members are double paired angle sections with V-lacing.

When it came to rehabilitating the bridge, given that the original plans weren't available, 3D laser-scanning technology was used to evaluate the structure. This created a "point cloud" of the bridge, consisting of 13 million points, each with x, y and z coordinates. The point cloud, a geometrically correct digital representation of a structure that can be viewed from any angle, assisted greatly in the fabrication of replacement members. Only two of the nine floor beams required replacement, though a new floor system was installed, due to corrosion of the vintage steel stringers (caused by drainage through the timber deck, which was replaced with a lightweight concrete deck).

Who knows what's in store for the bridge in its fourth life, but thanks to this most recent rehab, that shouldn't be a concern for quite some time.

For more on the Silverdale Bridge, see "Back on the Job" in the January 2012 issue of *MSC*. **MSC**

Co-Owners
Minnesota Dept. of Transportation
Minnesota Dept. of Natural Resources, St. Paul, Minn.

Designer
HNTB Corporation, Bloomington, Minn.

General Contractor
Minnowa Construction, Harmony, Minn.

Consulting Firm
Olson & Nesvold Engineers, P.S.C., Bloomington, Minn.

Cost Consultant
A.A. Sehlin Consultants, Naples, Fla.

Coatings Consultant
KTA-Tator, Inc., Pittsburgh, Pa.

Steel Team

Steel Fabricator/Detailer
White Oak Metals, Inc., Dalton, Minn. (AISC Member/NSBA Member/AISC Certified Fabricator)