STEEL BRIDGES '86

Engineering News-Record • Special Advertising Section • November 20, 1986

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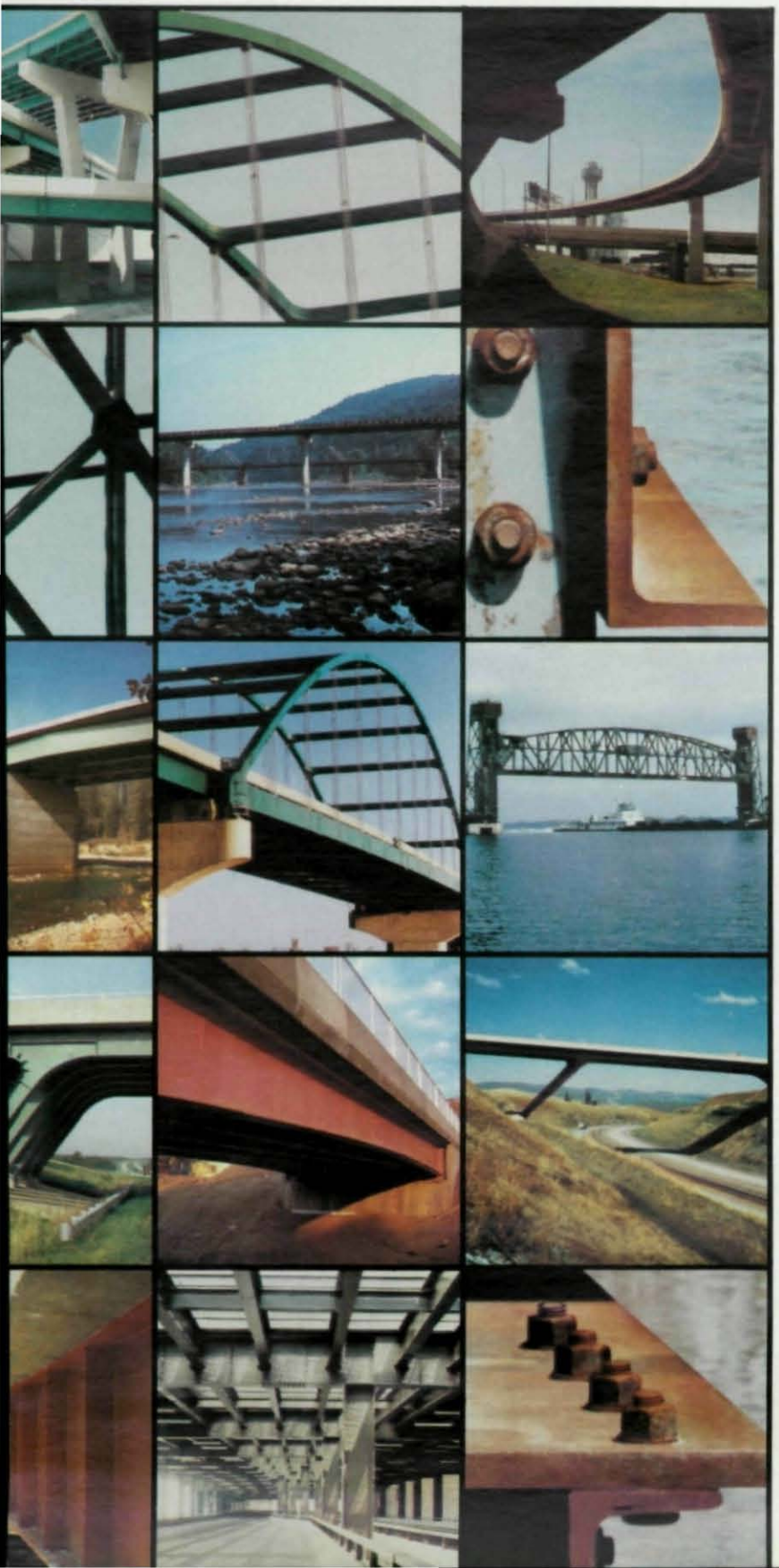

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Sixteen Winners Selected in the 1986 Steel Bridge Competition

Simple or complex, long or short, high or low, fixed or movable—steel bridges have established their benefits historically from the standpoint of cost, time, consistent quality control, utility and beauty.

Winners in the 1986 Prize Bridge Competition sponsored by the American Institute of Steel Construction confirm that established reputation.

Category: Long Span

For the second consecutive year, a tied arch design was the winner in the Long Span Category. The I-255 Bridge over the Mississippi River received a Prize Bridge Award as a "graceful tied arch representing an approximately 1,000-ft. span of clean design with a good approach superstructure." The jury noted that the substructure for a twin span will be built at a later date. They liked the Vierendeel bracing of the arch, and commented, "It's open and free and clean and very elegant."

There were no Award of Merit Winners in the Long Span category.

Category: Medium Span, High Clearance

A welded plate girder bridge with a Delta frame arrangement of the superstructure was the Medium Span, High Clearance Prize Bridge Winner. The McCallum Street Bridge over Cresheim Creek in Philadelphia was chosen for its unique solutions to both fabrication and erection problems. The jury liked the way the bridge blends into the existing territory. "It's not an intruder," they noted. McCallum Street was one of two winners located in Philadelphia. (The B & Somerset Streets Bridge over Conrail was an Award of Merit winner in the Short Span category.)

Category: Medium Span, Low Clearance

The jury's selection for Prize Bridge in this category was a pair of bridges (Becton Dickinson Franklin Lakes Bridges) which provide access to a company property from the eastbound roadway of Route 208 in New Jersey. The jury indicated that its choice was dictated primarily because of the bridges' clean lines "and the treatment of the roadway, providing an unobstructed view of the structures . . . it lets everyone know, immediately, that there's a structural steel bridge across the highway."

The jury made an award of Award of Merit to the Falls Road Bridge, which crosses the Milwaukee River in Grafton, Wisconsin. They found the structure very similar to other bridges in the same category but singled it out for honors because of "the beauty of the bridge," finding the stark white parapet and the abutment over dark steel girders particularly attractive.

The Bonners Ferry Bridge, also designated for an Award of Merit, was chosen for design innovation. "The thing that impressed the panel to a considerable extent was the use of prestressing as a means of reducing steel requirements," they reported. The Bonners Ferry Bridge received considerable publicity in 1982 when the Idaho Department of Transportation's studies found that prestressing steel girders with steel cables, together with other innovative concepts, would make a steel bridge competitive with a concrete alternative. Although the DOT had first chosen a prestressed concrete bridge design for this replacement bridge to carry traffic on U.S. 95 across the Kootenai River, they permitted both concrete and steel to be bid. Eight contestants chose to bid the steel alternate. Steel was the winner . . . and won again in the 1986 Prize Bridge competition.

Category: Short Span

Although there were several entries in the short span category, the jury chose none for a Prize Bridge Award. They did, however, make two Awards of Merit for short span bridges: the B & Somerset Streets Bridge over Conrail in Philadelphia, a tied arch structure that presented a shallow depth and accommodated clearance requirements, and the Pacific Street Bridge, in Appleton, Wisconsin, where the focal point was weathering steel haunched girders and "a beautiful treatment of the piers."

Category: Grade Separation

The Melrose Interchange, six structures composed of horizontally curved, constant depth, steel plate box girders, was selected as Prize Bridge in the Grade Separation category. Designed by the Division of Structures of the Tennessee Department of Transportation (winner in the same category in 1984 for the Granby Road over State Route 137 grade separation), the jury found

Twin steel plate box girders enabled the designer to weave a complex but compact web of lanes in this 1986 Prize Bridge: the Melrose Interchange, Nashville, TN.

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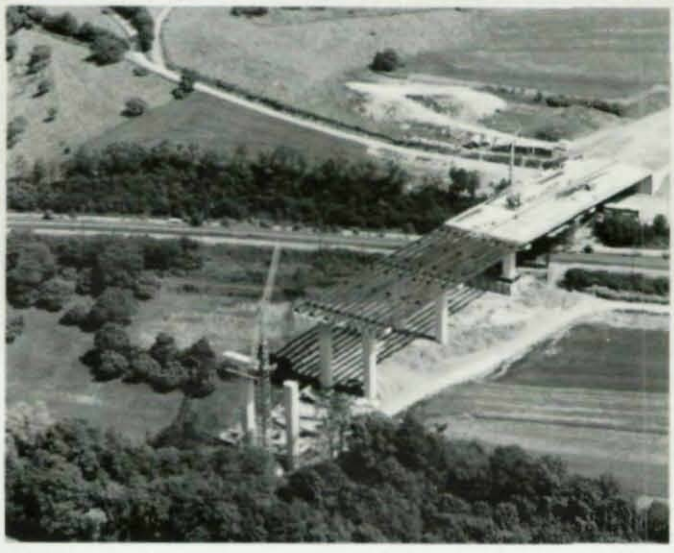

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the geometry of this four-level interchange particularly attractive. They especially noted the framed-in cross girder support system and the concrete-filled steel piers.

No Award of Merit designations were made in this category.

Category: Elevated Highway/Viaduct

"Number one winner" in the elevated highway or viaduct class was the Sixth Street Bridge over Jefferson Avenue, Detroit, Michigan. The jury called attention to the considerable use of innovative computer design in the structure, but also found the appearance worthy of note. "The blue painted structure blends well with the sky and water; the substructure, although it had cantilevered arms on the piers, didn't present a massive appearance."

The panel also specified the Merritt Parkway E-S & W-N Roadways (Fairfield County, Connecticut) for an Award of Merit. "This is an attractive structure with its curved constant depth box girders and a particularly noteworthy framing system between the longitudinal girders. They described the underside of the design as "especially attractive."

Category: Movable Span

Movable bridges, by virtue of both weight and mechanical requirements, are invariably designed in steel. This year's Prize Bridge in the category was the Wells Street vertical lift bridge in Milwaukee, Wisconsin. The jury was impressed with the arrangement of the lifting mechanism and the fact that, as a vertical lift bridge, it was without the usual extended towers. "It is retractable into the substructure, and from outward appearances looks like an ordinary bridge," they noted. The tower house blends in with the decor of the street system and buildings in the area. The panel was particularly impressed by the use of brick on the control tower, which further enhanced its compatability with other nearby structures, and the mechanics of the bridge's control devices. They made no Awards of Merit in this category.

Category: Special Purpose

While there were no Prize Bridges chosen in the Special Purpose category, the jury did select two structures for Awards of Merit. They found the Skyride at Miami International Airport "resembles an aircraft fuselage." With its very smooth and tubular face, "it looks like an airport-relevant structure." The jury also called attention to the unique use of tubular members in a double-intersecting arrangement or truss.

The Sixth Street Marketplace pedestrian bridge, with a unique architectural style, was selected because "it differs from the traditional pedestrian-type overpass." The jury also referred to the fact that, in addition to the walkways, there is an area where pedestrians can stop and look up and down the median of the roadway underneath. Massive heavy architectural exposed structural shapes combine with a light truss system on the exposed roof. "It demonstrates the flexibility of fabricated structural steel, because it represents a lot of Victorian-appearing elements, yet it's modern. You've got both beauty and function."

Steel goes into place for the 6th Street Marketplace pedestrian bridge, Richmond, VA. (1986 Award of Merit, Special Purpose)

Category: Railroad Structure

The Vista Avenue Bridge, Boise, Idaho, presented a very unique treatment of box girders in a thru-girder arrangement. The exterior webs are sloped, with a smaller bottom flange than top flange, and the surface of the top flange serves as a walkway for railroad personnel. The jury decided that simple span arrangement and graceful treatment of the abutments, along with the framing, developed a very pleasing structure for a railroad type bridge. They selected it as a Prize Bridge in this category. They did not select any bridge for an Award of Merit in this group.

Category: Reconstruction

The jury added its accolades to the considerable fanfare which has surrounded the deck replacement on the Golden Gate Bridge. "The development of this orthotropic replacement deck on a bridge of this magnitude deserves a First Prize," the jury said. They complimented the engineers on the analysis and design which led to the orthotropic deck system, the fabricators for "a remarkable piece of fabrication," and especially lauded the handling of traffic problems during construction because, "any time you disrupt traffic on this particular structure, you're playing with the economy of a very dynamic and overcrowded area."

An Award of Merit was made for restoration of the Mary Hunnewell Fyffe Footbridge. Actually a duplication of the original Cordingly Footbridge, the first all-steel pedestrian bridge built in the United States, the new structure resuses the substructure of the old, modifying one abutment for use of a pier. It incorporates a four span superstructure with double trusses, assembled with shop riveted steel angles, recreating the appearance of the orginal. All structural steel was galvanized and then coated with a matte black finish to match the lamp black and oil paint of the original.

Steel's Role in Historic Preservation

This year's jury added a footnote to the competition, and particularly the Reconstruction category, on the use of steel to shore up the many wooden bridges that are being restored throughout the U.S. "While steel may not play a major role in these restorations, because the bridge is essentially wooden, it's still going to stay there because of structural steel."

Weathering Steel

While it is extremely difficult to draw any definite conclusions from the jury's selections in the bi-annual bridge competition, use of A588 weathering steel was noted in two Prize Bridges and three Award of Merit winners.

Partially opened lift span shows the double diagonal equalizer system in the Wells Street vertical lift bridge, Milwaukee, WI. (1986 Prize Bridge, Movable Span)

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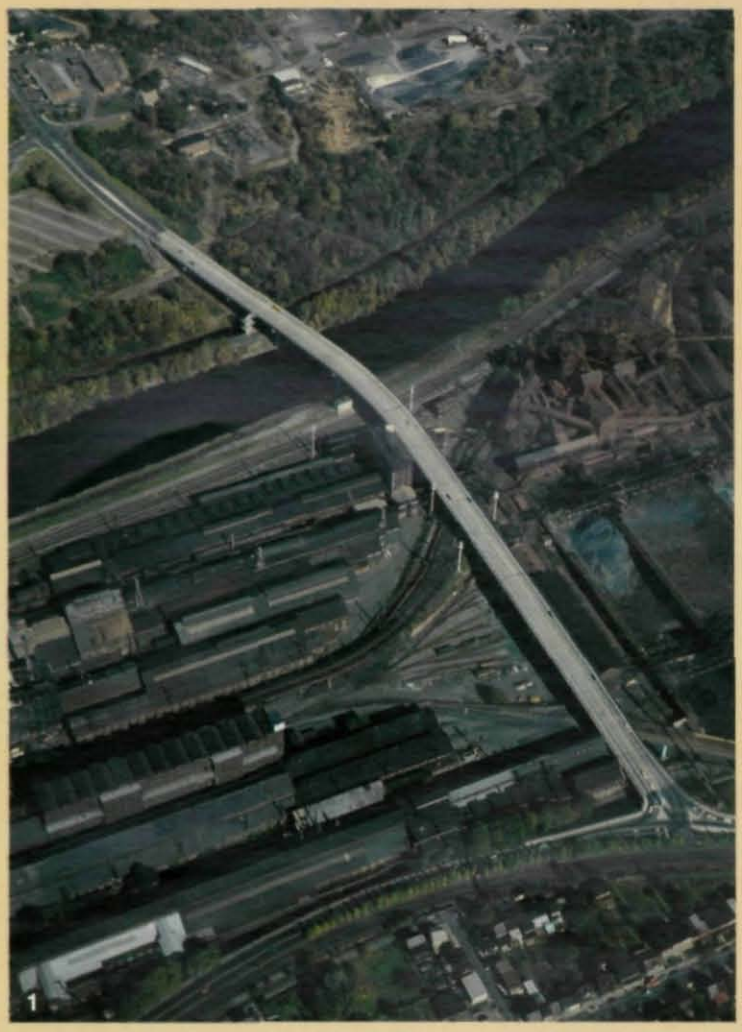

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3. **The I-279 Fort Duquesne Bridge Approach Pittsburgh, Pa.**
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Box Girders Reduce Costs, Speed Erection for Three Winners

The Merritt Parkway elevated highway in Fairfield County, Connecticut (1986 Award of Merit)

Three of the winners in the 1986 Prize Bridge competition featured box girder designs that provided an economical and logical solution to design problems.

Merritt Parkway designers, Seelye Stevenson Value & Knecht, Stratford, Ct, (Award of Merit—Elevated Highway/ Viaduct) noted that aesthetics was also a major consideration in the selection of box girders as support elements for these two high level, turning roadway bridges. Since the bridge structures would be visible from a great distance, a further requirement imposed by the Connecticut Department of Transportation was that the box girder supports (pier caps) be placed within the depth of construction for the box design. Only a single concrete shaft was used to support the superstructure at pier locations, thereby making the lines of the superstructure in elevation continuous and uninterupted between abutment supports.

The hidden pier caps had to meet two different design criteria: one type had to serve as both deck box girder support at pier locations while also serving as an integral part of these longitudinal deck units in the negative moment area. The second type had to support the discontinuous end of adjacent two-span continuous box girder units within a design depth no greater than the box girder units they were supporting. The total weight of the pier cap also had to be within legal limits for highway loading and designed to permit the completed unit to be transported over state highways within one standard lane width. A closed box section was selected as the ideal structural shape for the pier cap units. At expansion bearing locations, pier caps were at the same level as deck girders. Structural outriggers were built into the pier caps to provide a bearing seat to support the deck box girders.

The six structures in the four-level Melrose Interchange (Prize Bridge—Grade Separation) are composed of horizontally curved, constant depth, steel plate box girders with composite concrete decks. The twin boxes, varying in length from 462 to 705 feet, are connected at bents to integral steel box caps. The caps are supported on reinforced concrete-filled steel shell columns varying in height up to 75 feet.

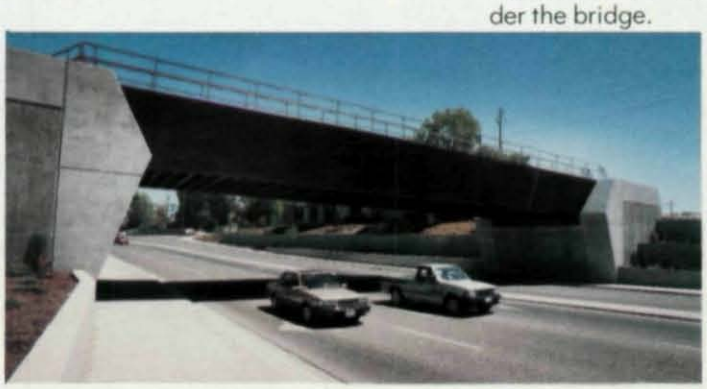
Each set of twin girders for the bridges was erected expeditiously, according to the Tennessee Department of Transportation designers, primarily due to the design features of the bent cap-to-column connections. The columns were erected and filled with concrete to a level just below the embedded length of the steel pin plates. The caps were then erected with pin bearing assemblies attached and temporarily supported on tower bents braced against the columns. The girders were then spliced to the caps while the latter were free to be rotated to meet fit-up conditions. After all girders were erected, the remaining concrete to fill the steel shell columns—and anchor the pin plates—was poured. Utilization of the shell columns allowed the designer to reduce diameters to 8 feet for heights up to 75 feet, significantly reducing the complex geometry and tight clearance restrictions to manageable proportions.

Another unique feature incorporated into the design of the integral bent caps was the elimination of biaxial bending in the top flange of the cap at the juncture of the top flanges of the girders. In lieu of expensive flange transition widths and critical welding to fracture critical material, the top flanges of the girder were terminated at the edges of the cap beam flange and connected via single shear splice plates placed over the top cap beam flange. Elastomeric pads were used as filler plates, sandwiched between the top flange of the cap beam and the girder top flange splice plates.

CH2M Hill of Boise, Idaho, designers for the Vista Avenue Railroad Bridge in Boise (Prize Bridge—Railroad) selected A588 steel for this 104-foot-long trapezoidal steel box girder bridge, which helped to reduce costs by allowing higher stresses and thus requiring less steel.

Use of steel box girders also sped erection of the structure. The girders were placed in just one day, minimizing traffic disruption. The brown tones of the weathering steel and the sloping sides of the trapezoidal box helped to make the structure appear more natural in the pastoral setting of a city proud of its trees and natural beauty.

This particular structure forms an entry for motorists approaching the city and the clean, uncluttered lines of the box girder create a gateway without detracting from the primary visual objectives. While aesthetics were considered important in this project, the box girders also had a practical aspect. Achieving vertical clearance between the roadway and the bottom of the bridge was difficult, as the adjacent railroad depot restricted vertical changes in the railroad alignment. Supporting the railroad track from the bottom of the box girders decreased the effective depth of the structure and maximized the vertical clearance under the bridge.



The Vista Avenue Railroad Bridge in Boise, Idaho (a 1986 Prize Bridge) utilizes weathering steel in a trapezodial steel box girder. Railroad tracks are supported from bottom of box girder.

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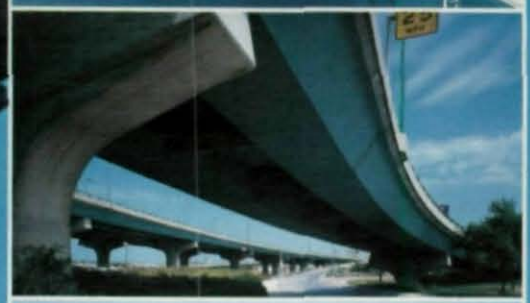

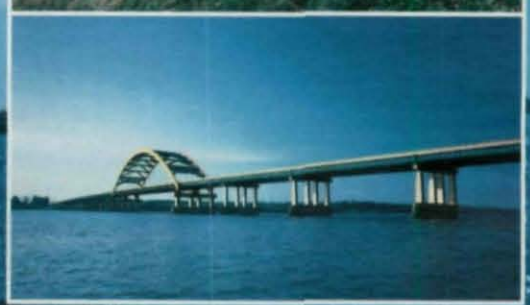

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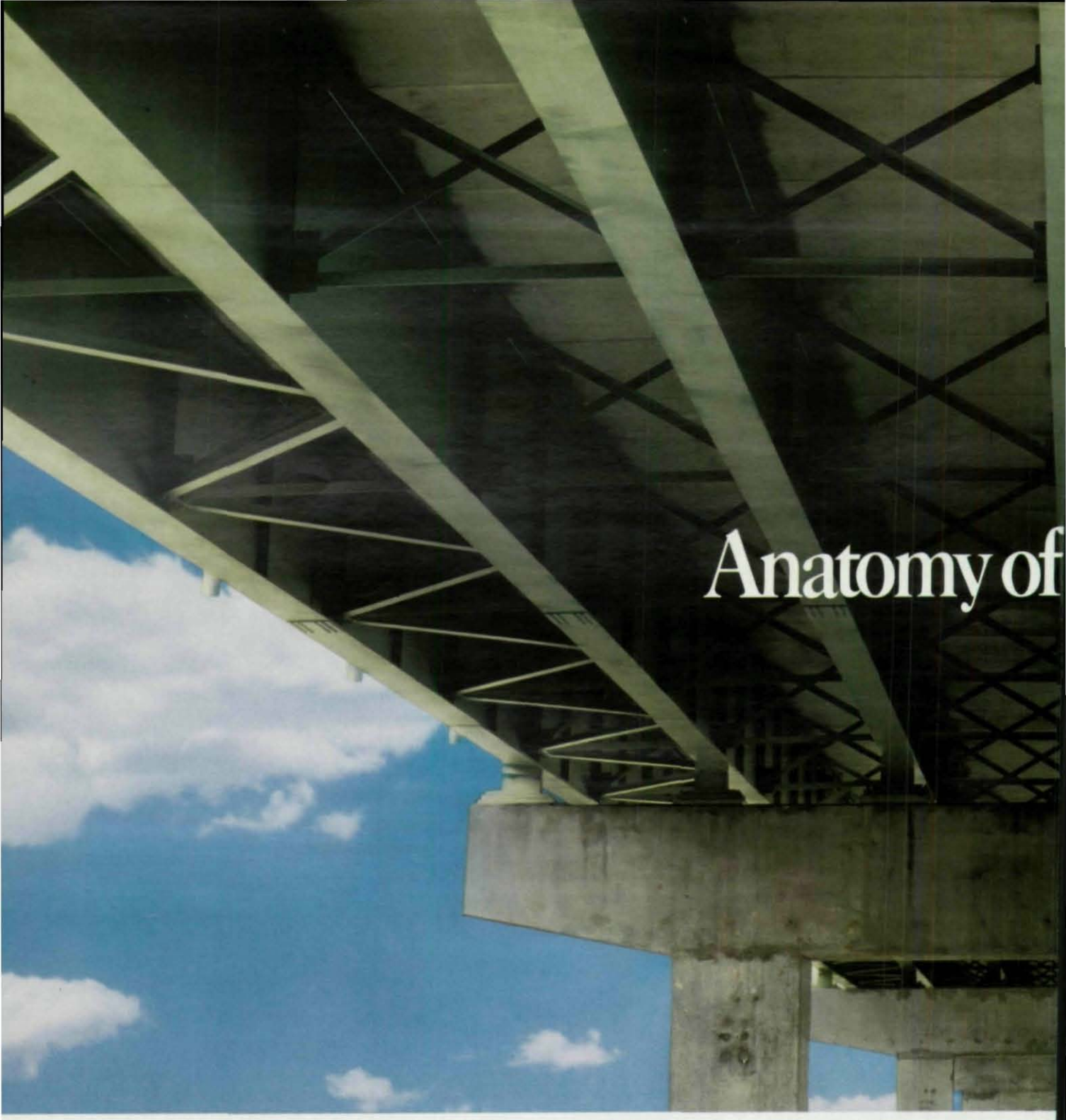

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Structural Engineer: South Carolina DOT, Columbia, S.C.
Fabricator: Owen Steel Company, Inc., Columbia, S.C.

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Four Plate Girder Bridges are Winners

Plate girder bridges made an outstanding impact on the 1986 Prize Bridge competition. Winning plate girder projects were:

McCallum Street over Cresheim Creek (Philadelphia, PA)–Prize Bridge, Category: Medium Span, High Clearance;

Becton Dickinson Franklin Lakes Access Bridges (Franklin Lakes, NJ)–Prize Bridge, Category: Medium Span, Low Clearance;

Sixth Street Bridge over Jefferson Avenue (Detroit, MI)–Prize Bridge, Elevated Highway/Viaduct; and

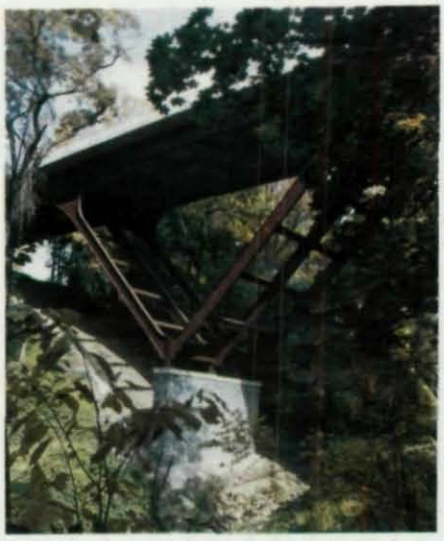
Falls Road Bridge (Grafton, WI)–Award of Merit, Category: Short Span.

The twin single-span bridges crossing Route 208 in New Jersey were designed by Zaldastani Associates, Inc. and Kallmann, McKinnell & Wood, both of Boston, MA, to provide the least interruption to the visual continuity of the roadway. The plate girders were erected rapidly, with little interruption to through traffic. The transverse floor beams could be erected by only closing individual lanes of the roadway. The girders were treated with a zinc rich primer and epoxy coated in the shop. The color is recessive and sensitive to the adjacent rural environment.

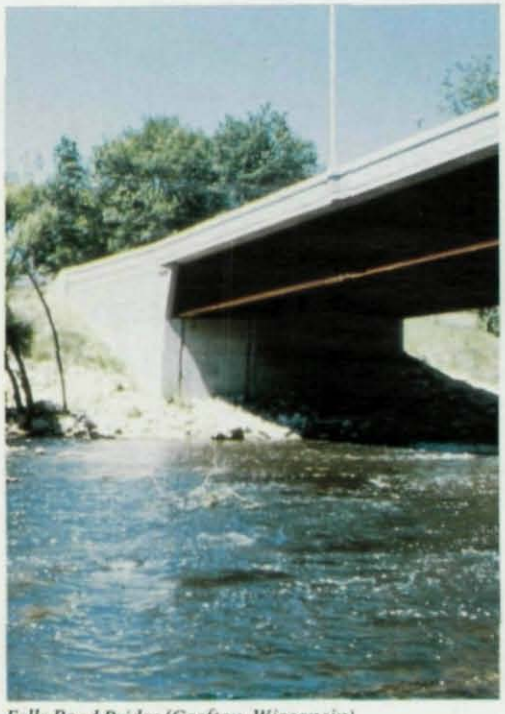
The McCallum Street Bridge in the Cresheim Valley in the Chestnut Hill section of Philadelphia (see cover) utilized longer span lengths to eliminate high level substructure work. The designers used a Delta leg configuration to cause the upper portion of the frame to behave as a five-span continuous girder. Columns comprising the legs of the Delta frame are also welded plate girders. Designers of this winning structure, the Bridge Section of the Philadelphia Street Department, also designed the B & Somerset Streets bridge, an Award of Merit winner in this year's competition.

The Falls Road Bridge (Grafton, Wisconsin) utilizes a single span plate girder of A588 steel to cross the Milwaukee River with a minimum of fuss. The four parallel flange plate girders are spaced at 10' and have web depth of 96' and a web thickness of 7/16". Diagonal cross bracing is provided at approximately 25' spacing across the entire span. Bolted field splice connections were detailed at the outer quarter points of the span to facilitate shipping and hauling requirements. High strength structural steel conforming to A588 requirements was specified and left unpainted to provide a rustic appearance. Donahue & Associates, Inc. of Madison, Wisconsin, designed the winning structure.

Three spans of the Sixth Street Bridge over Jefferson Avenue in Detroit are carried on rolled beams at 6' 11" on centers with a 9" thick concrete deck. Three more 60" spans, curved to connect Jefferson Avenue, could not be carried on heat-curved wide-flange beams. It was necessary to flame cut the flanges and weld them to a web of ½" x 32" plate. These three spans are continuous welded plate girders with a composite concrete deck; curve cut flanges are 2" thick and vary in width from 18" to 16" and continue to the south abutment. Girders at a spacing of about 8' 6" continue from the abutment to terminate on independent fixed bearings. This Prize Bridge (Category: Elevated Highway/Viaduct) was designed by Madison, Madison International of Michigan, Detroit.



McCallum Street Bridge over Cresheim Creek (Philadelphia, Pennsylvania)



Falls Road Bridge (Grafton, Wisconsin)

Becton Dickinson Franklin Lakes Access Bridge (Franklin Lakes, NJ)

Sixth Street Bridge over Jefferson Avenue (Detroit, Michigan)

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Thanks to Lincoln subarc, traffic is flowing as smoothly over the Throgs Neck Bridge as the water under it.

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The Long and The Short of Two Tied Arch Prize Bridges

I-255 over the Mississippi River (St. Louis, Missouri)

Steel tied arches were used in the design of two winners in this year's AISC Prize Bridge Competition.

The main span of Interstate 255 bridge over the Mississippi River at Jefferson Barracks, a Prize Bridge in the long span category, is a tied arch. The span between tie points (909 ft.)is believed to be the longest in the United States.

The first tied arch bridge ever built in Philadelphia is an Award of Merit Winner in the short span category.

In the I-255 bridge, the tie, the main stiffening element of the structure, is an I-shape instead of a box. As a result, it used less material and was, according to the designers, easier to fabricate.

The lateral bracing between the arch ribs is a Vierendeel system, which coincides with the hangar spacing. The arch rib and tie were "prestressed" so that there are no flexural stresses in either member due to dead load shortening of the rib and elongation.

The designer Alfred Benesch & Company, Chicago, believes that the I-shaped girder is at least as effective as a box section of equal weight in providing the required torsional stiffness, and point out that use of the I-shape also greatly simplified connection details and fabrication, as well as reducing the potential for harmful secondary stresses.

Design of the tied arch structure was based upon rigorous "large deflection" nonlinear analysis. A computer program was developed to optimize the parameters of the arch (rise and hangar spacing) to further improve the efficiency of the design. Illinois approach spans were designed as three and four-span continous steel stringer units, with spans of 200 feet to 250 feet. A comprehensive computer synthesis developed the span arrangement, length and superstructure type.

Another innovative design procedure utilized in the I-255 crossing provided for "prestressing" of the arch rib and tie so that there were no flexural stresses in either member—no shortening of the arch rib or elongation of the tie under dead loads. A savings of approximately 150 tons of structural steel was realized.

A tied arch bridge was also the long span winner in the 1984 Prize Bridge competition, the I-470 bridge over the Ohio River in Ohio County, West Virginia.

Philadelphia's B & Somerset Streets bridge, designed by the Bridge Section of the city's Street Department, replaces a Thru-Pratt Truss constructed in 1887. The new bridge was required by site and terrain to have approximately the same configuration as the old; aesthetic considerations in this densely populated neighborhood also mandated a "clean" structure.

The choice was narrow: a truss similar to the old bridge, or an arch. Although the span length needed (approximately 105 ft.) does not normally indicate a truss or an arch as viable alternates economically, the severe vertical clearance limitations precluded any other choice. Both alternates, due to framing requirements, depth of structure limitation and strength of material needed, made steel the choice for framing material.

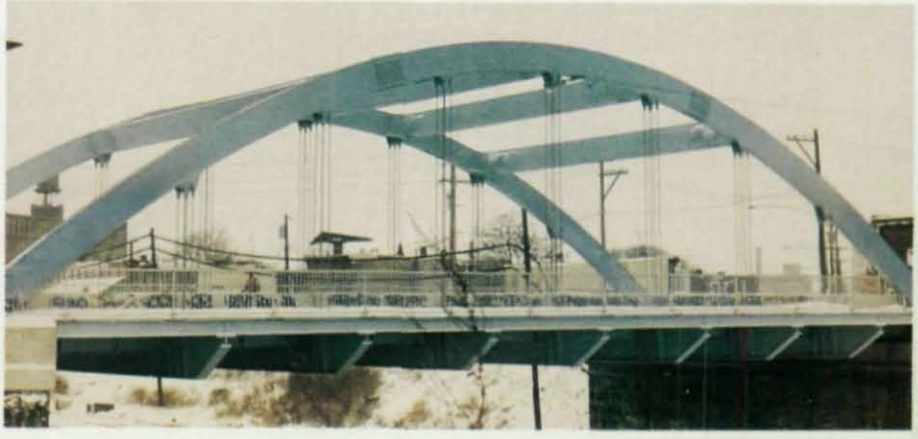
The tied arch was chosen by virtue of appearance, speed of erection and a cost approximately the same as that for a truss. A depth to span ratio of 1:4.5 produced an attractive and economically functional structure.

In final design, the bridge has the configuration of the arch tie and rib located behind the curb barrier with the floorbeams cantilevering beyond in order to support the sidewalk framing system.

Design of the arch rib and tie was performed utilizing a STRESS computer program for the various group loadings. Box sections for the arch rib and arch rib bracing members utilized fillet welds for corner junctures. The designers believe that fillet welds offered both greater speed of erection, economy and elimination of "box racking."

Arch hangers are 1⅛" diameter strand with Class A zinc coating. Ends of floor beams were tapered, and stringers were formed into the floorbeams at a variable height differential to provide the cross slope for the roadway. The crossing serves four streets simultaneously.

B and Somerset Streets over Conrail (Philadelphia, Pennsylvania)



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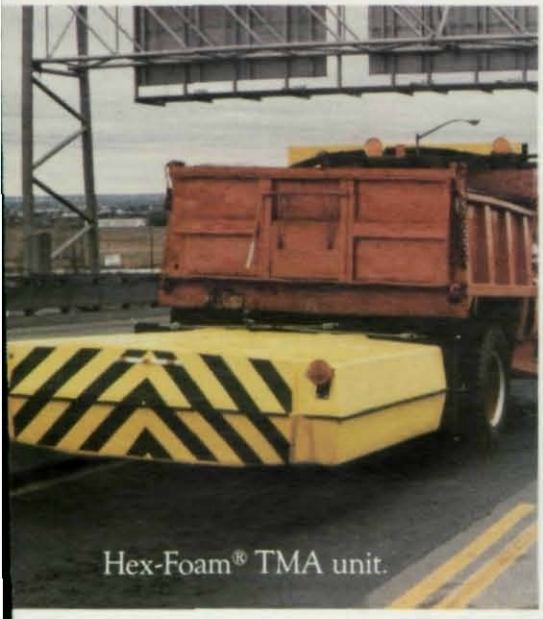
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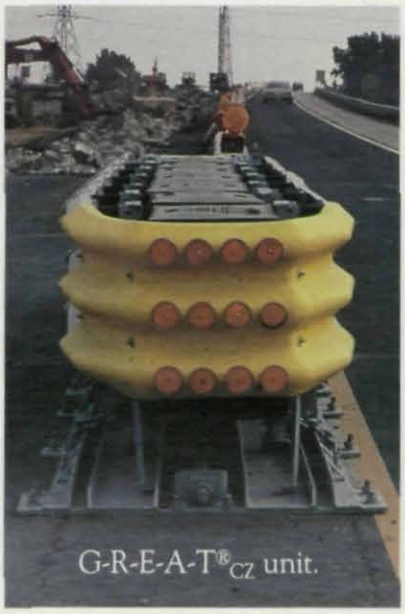
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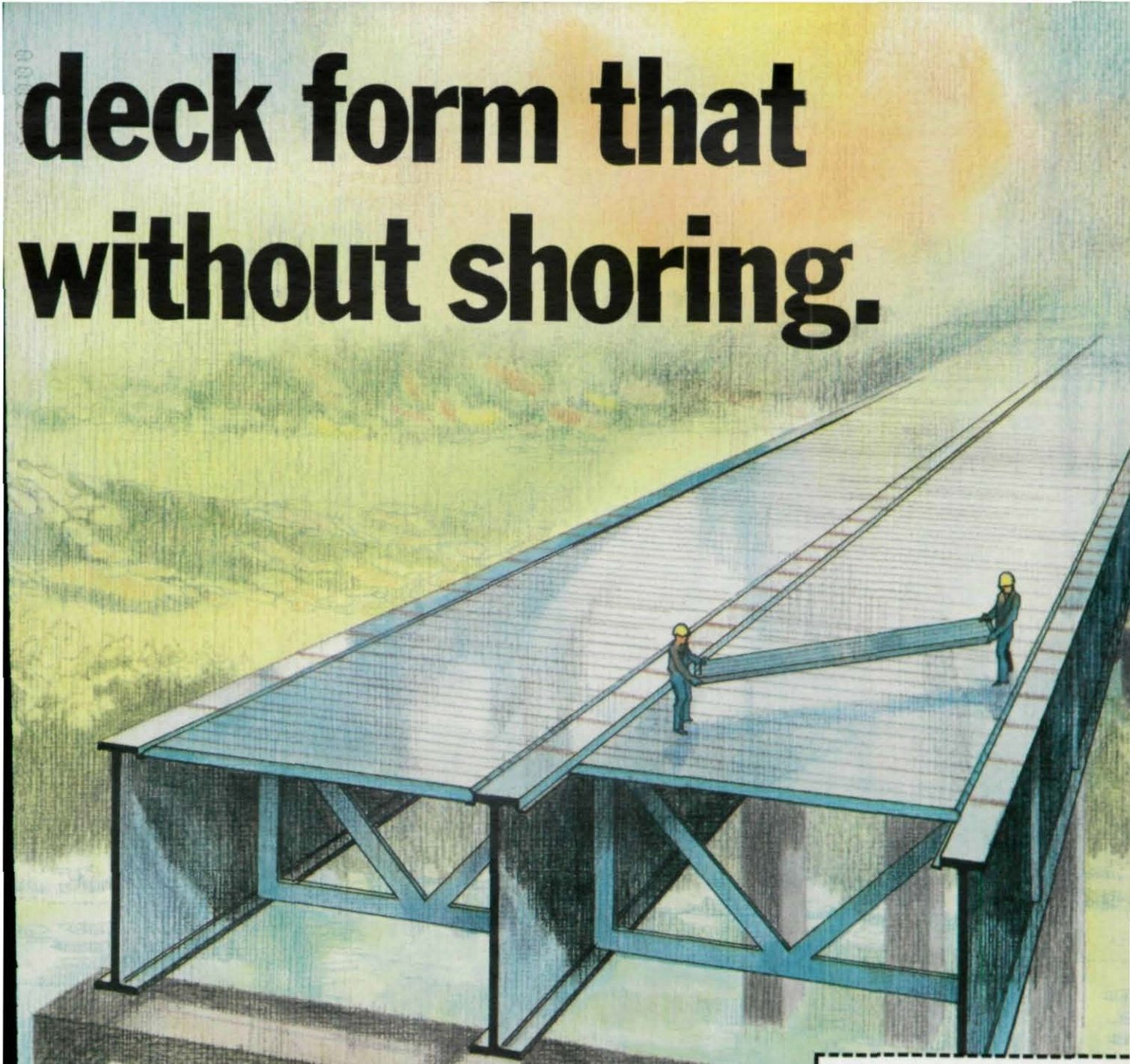

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Prize Bridges/ 1986

Steel bridges selected in the national competition conducted by the American Institute of Steel Construction recognize bridges that have utilized structural steel aesthetically, imaginatively and economically. All winning bridges were opened to traffic during the period June 1984 through June 1986.

Award Categories

Long Span
One or more spans over 400 ft. in length.

Medium Span, High Clearance
Vertical clearance of 35 ft. or more, with longest span between 125 and 400 ft.

Medium Span, Low Clearance
Vertical clearance less than 35 ft. with longest span between 125 and 400 ft.

Short Span
No single span greater than 125 ft. in length.

Grade Separation
Basic purpose is grade separation.

Elevated Highway or Viaduct
Five or more spans, crossing one or more traffic lanes.

Movable Span
Having a movable span.

Railroad
Principal purpose of carrying a railroad, may be combination, but non-movable.

Special Purpose
Bridge not identifiable in one of the above categories, includes pedestrian, pipeline and airplane.

Reconstructed
Having undergone major rebuilding.

The Jury of Awards for the 1986 competition included (from left to right):

Robert D. Bay, *Engineering Manager, Black & Veatch, Kansas City, Missouri, and current President, American Society of Civil Engineers;*

Frank D. Sears, *Chief, Review and Analysis Branch, Federal Highway Administration, Washington, D.C.;*

Louis A. Garrido, *Bridge Design Engineer, Louisiana Department of Transportation, Baton Rouge, Louisiana*

James E. Sawyer, *Chief Operating Officer, Greiner Engineering, Inc., Tampa, Florida.*

Stanley A. Tigerman, *FAIA, President, Tigerman Fugman & McCurry, Chicago (and Director of the School of Architecture of the University of Illinois at Chicago) was not present when the photo was taken.*

The American Institute of Steel Construction, Inc. is the voluntary trade association representing and serving the fabricated structural steel industry in the United States. Its purpose is to improve and advance the use of fabricated structural steel and, through research and engineering studies, to develop the most efficient and economical design of fabricated steel structures.

The Institute provides a wide variety of services to the design profession, the construction industry and the steel fabricating companies that support its activities. Programs include development of specifications, technical publications, regional engineering services, research, technical and management seminars, engineering fellowships, programs for quality control, productivity and safety. Among the leading programs, for its effectiveness and lasting impact, is the AISC Prize Bridge Program.

Since 1929, this national competition has recognized the creative, functional and esthetic excellence of modern steel bridges, paying eloquent tribute to the vision and skill of those who plan, design and build them. Noted professionals select those steel bridges judged the most handsome and functional of those recently opened to traffic.

The Bridge Awards and resulting national acclaim continue to inspire designers and builders toward greater creativity and innovation. Contemporary steel bridges combine beauty, economy and reliability, founded on century of experience. This year winners reflect that past, and anticipate the future: bridges displaying a creative integration of structure, function and form—skillfully executed in steel.

SINCO Nets protect traffic from debris during rehabilitation of Queensboro Bridge, New York City.*

SINCO Nets protect ironworkers during steel erection on Rte 9W Bridge, Albany, NY.

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*Note: These nets are installed to catch debris only, and as such are correctly installed. This could not serve as a personnel installation since it lays directly on steel beams.

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I-255 OVER THE MISSISSIPPI RIVER

(Jefferson Barracks), St. Louis, Missouri

1986 Prize Bridge
Category: Long Span

Designer: Alfred Benesch & Company, Chicago, IL
Steel Erector & Fabricator: American Bridge Div., U.S. Corp., Pittsburgh, PA
Owners: Illinois Department of Transportation, Springfield, IL and Missouri Highway and Transportation Department, Jefferson City, MO

The arch tie girder of this tied arch main span is an I-shaped section rather than the conventional box section, greatly simplifying connection details and fabrication and greatly reducing the potential for harmful secondary stresses, according to the designers. "Large deflection" nonlinear analysis reduced the amount of steel in the main span superstructure and resulted in significant cost savings. Another innovative design procedure provided for "prestressing" of the arch rib and tie, saving approximately 150 tons of steel. The span between tie points, 909 ft., is believed to be the longest in the U.S.

McCALLUM STREET OVER CRESHEIM CREEK

Philadelphia, PA

1986 Prize Bridge
Category: Medium Span, High Clearance

Designer: Phildelphia Streets Department, Bridge Section, Philadephia, PA
General Contractor: The Nyleve Company, Emmaus, PA
Steel Erector: Lindstrom & Companies, Inc., Cinnaminson, NJ
Steel Fabricator: High Steel Structures, Inc., Lancaster, PA
Owner: City of Philadephia, Department of Streets, Philadephia, PA

Longer span lengths were used in order to eliminate costly high-level substructure work for this three-span composite rigid frame bridge over Cresheim Creek in Philadelphia's Chestnut Hill section. A Delta leg configuration, utilizing 45 degree angles for the triangular delta of weathering steel, fits in well with the terrain. Use of the Delta leg also caused the upper portion of the frame to behave as a five-span continuous girder, resulting in economic member sizes while only requiring construction of two members. The three frames are spaced 6'-6" on centers with W21 x 62 rolled sections spanning between them. The columns comprising the legs of the delta frame are also welded plate girders. Rolled sections were chosen for the struts, a welded box section for the bottom strut of the bearings.

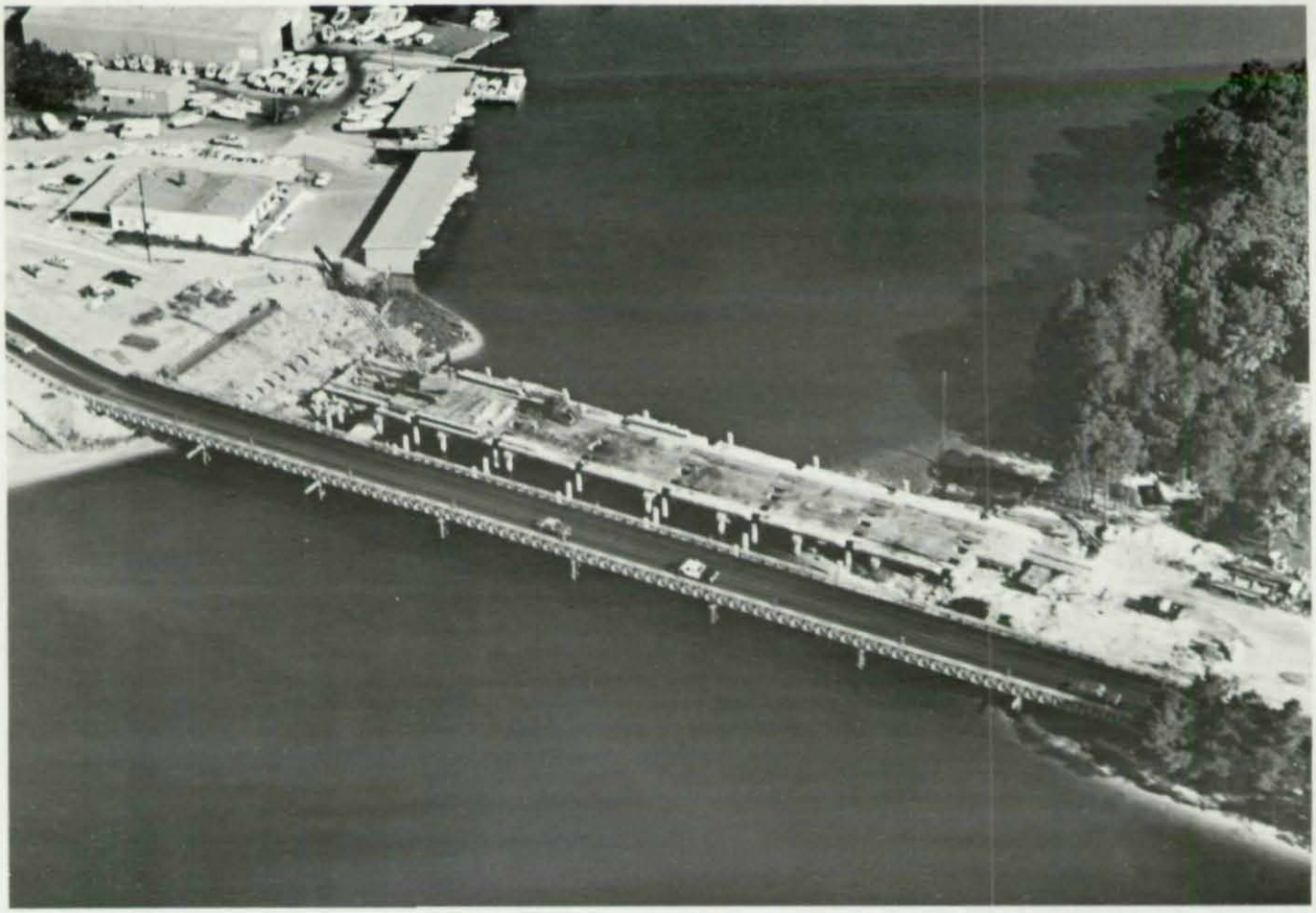
BECTON DICKINSON FRANKLIN LAKES ACCESS BRIDGES

Franklin Lakes (Bergen County), New Jersey

1986 Prize Bridge
Category: Medium Span, Low Clearance

Designers: Zaldastani Associates, Inc., Boston; Kallman, McKinnell & Wood, Boston, MA
Construction Manager: Gilbane Building Co., Princeton, NJ
General Contractor/Steel Erector: R.A. Hamilton Corporation
Steel Fabricator: Lehigh Structural Steel Company, Allentown, PA
Owner: Becton Dickinson Real Estate Company, Inc., Franklin Lakes, NJ

Two pairs of plate girders equal "twin" bridges, simple and slender structures placed between natural embankments which are well covered with trees and other vegetation. The single span solution provides the least interruption to the visual continuity of the roadway, erected rapidly with little interruption to through traffic. Transverse floor beams could be erected by only closing individual lanes of the roadway. The plate girders were treated with a zinc-rich primer and epoxy coated in the shop.



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This Acrow Panel Bridge was erected as a bypass bridge to allow traffic to continue uninterrupted during the replacement of the bridge on Business Highway US 98 in Panama City, Florida.

This temporary bridge is only one of many erected by Fairchild-Florida Construction Company in their work on US and State highways in Florida. The unique modular construction feature of the Acrow Panel permits this bridge to be disassembled after the new bridge is built and all the components are reusable on other bridge replacement projects.

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Circle Number 1 on Reader Service Card

MELROSE INTERCHANGE BRIDGE

Nashville, Tennessee

1986 Prize Bridge
Category: Grade Separation

Designer: Division of Structures, Tennessee Department of Transportation, Nashville, TN
General Contractor: The E. Randle Company, Frankfort, KY
Steel Erector & Fabricator: Bristol Steel & Iron Works, Inc., Bristol, VA
Owner: Tennessee Department of Transportation, Nashville, TN

The structural efficiency of steel enabled the designer to weave a compact web of lanes within the least space possible, with minimal traffic disruption. The six structures in this four-level interchange present the clean lines of horizontally curved, constant depth, steel plate box girders. Fully continuous from abutment to abutment, each structure has twin boxes, varying in length from 462 to 705 feet, connected at bents to integral steel box caps. Caps are supported on reinforced concrete-filled steel shell columns varying in height up to 75 feet. Maximum span length is 281 feet. Total tonnage: 4,418.7.

SIXTH STREET BRIDGE OVER JEFFERSON AVENUE

Detroit, Michigan

1986 Prize Bridge
Category: Elevated Highway/Viaduct

Designer: Madison, Madison International of Michigan, Detroit, MI
Consulting Firm: Sidney E. Shorter & Associates, Detroit, MI
General Contractor/Steel Erector: Barton-Malow, Detroit, MI
Steel Fabricator: Phoenix Steel, Inc., Eau Claire, WI
Owner: City of Detroit, Detroit, MI

The sharply curved configurations of this complex structure in downtown Detroit, combined with soft clay strata on the Detroit riverbank, were problems solved by curved welded plate girder spans, rather than the concrete or steel box girders customarily used to provide the resistance to torsion and transverse warping stresses generated by live and impact loads. One steel box girder ramp, built to a 30' inside radius, only carries a single lane. The three curved welded plate girder spans were designed by DISCUS, a computer program developed by Dr. David Scheling, University of Maryland. A system of W 27 x 84 rolled beam diaphragms forced the girders to act as a two-dimensional grid.

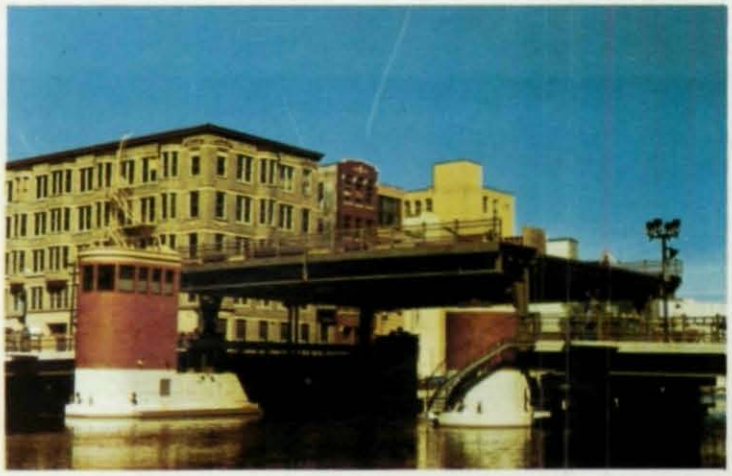
WELLS STREET VERTICAL LIFT BRIDGE

Milwaukee, Wisconsin

1986 Prize Bridge
Category: Movable Span

Designer: Department of Public Works, Bureau of Bridges & Public Buildings, Milwaukee, Wi
General Contractor/Steel Erector: Edward Kraemer and Sons, Plain, WI
Steel Fabricator: Theodore Kupfer Iron Works, Inc., Madison, Wi
Owner: City of Milwaukee, Department of Public Works, Milwaukee, WI

This new vertical lift bridge carries four lanes of one-way traffic over the Milwaukee River at a strategic location in downtown Milwaukee. It replaces a one-leaf bascule bridge built in 1911. The complexity of the structure and the necessity of maintaining navigation during construction required that the main members of the movable girder be completely fitted and then disassembled in the fabricator's yard before shipping to the site. Combined weight of the massive lift span and counterweights is in excess of 400 tons. It takes one minute to raise the bridge in high speed.



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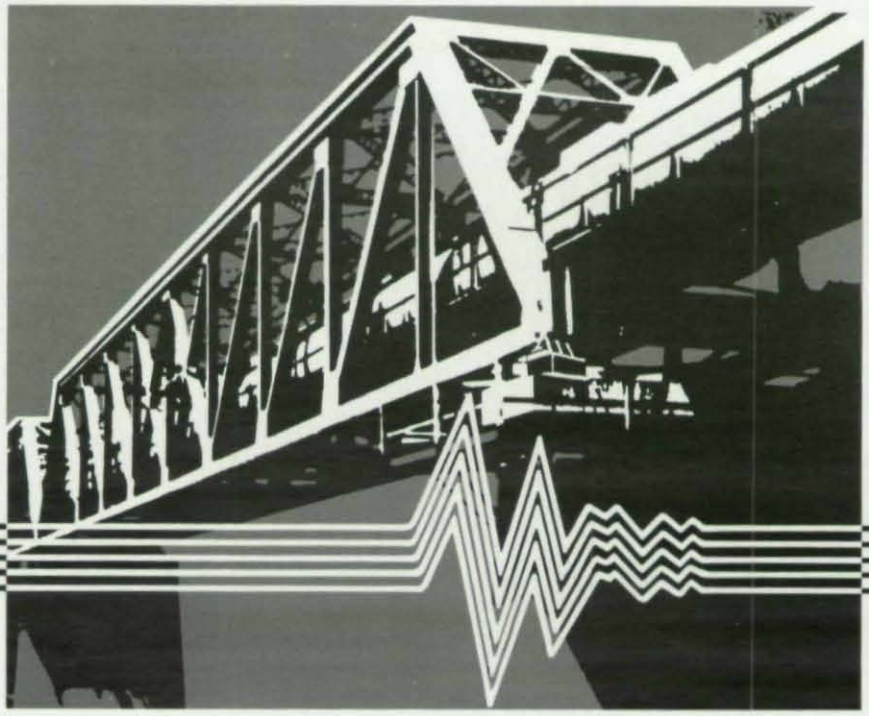

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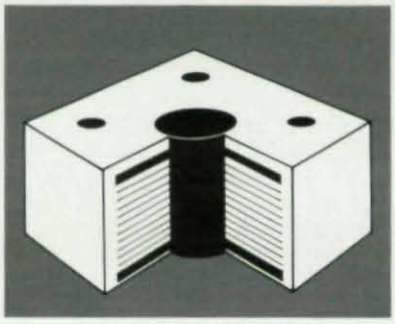
Growing Technology

- Currently there are over 50 seismically isolated bridges worldwide.
- America's first seismically isolated bridge was the Highway 101 Sierra Point bridge for the California Department of Transportation (CALTRANS). Designed to meet CALTRANS stringent criteria of 0.6g, this retrofit was achieved at 7% of the cost of a replacement bridge—the only other way to meet the seismic criteria—without traffic disruption.
- DIS bearings were also the centerpiece of the recent seismic upgrade of a Santa Ana River bridge carrying a 120" water pipeline for the Metropolitan Water District of Southern California (MWDSC).
- And more projects are now on the DIS drawing board for new and existing bridges, as well as buildings and special equipment support.



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VISTA AVENUE RAILROAD BRIDGE

Boise (Ada County), Idaho

1986 Prize Bridge
Category: Railroad

Designer: CHZM, Hill, Boise, ID
General Contractor: Harcon Incorporated, Pocatello, ID
Steel Erector: Sorensen Steel, Inc., Idaho Falls, ID
Steel Fabricator: Morrison-Knudsen Company, Inc., Boise, ID
Owner: Ada County Highway District, Boise, ID

A-588 steel was selected for this 104-ft. trapezoidal steel box girder bridge, a design that helped reduce costs by allowing higher stresses, requiring less steel. Girders were placed in just one day, minimizing traffic disruptions in this busy area. An adjacent railroad depot restricted vertical changes in railroad alignment, but by supporting the railroad track from the bottom of the box girders, effective depth of the structure was decreased and vertical clearance under the bridge maximized. The use of a box girder with clean, uncluttered lines, creates a natural portal for motorists entering the city.

GOLDEN GATE BRIDGE (Deck Replacement)

San Francisco, California

1986 Prize Bridge
Category: Reconstructed

Designer: Ammann & Whitney, New York, NY
General Contractor/Steel Erector: Dillingham/Tokola, Pleasanton, CA
Steel Fabricator: Chicago Bridge & Iron Company, Salt Lake City, UT
Owner: Golden Gate Bridge, Highway and Transportation District, San Francisco, CA

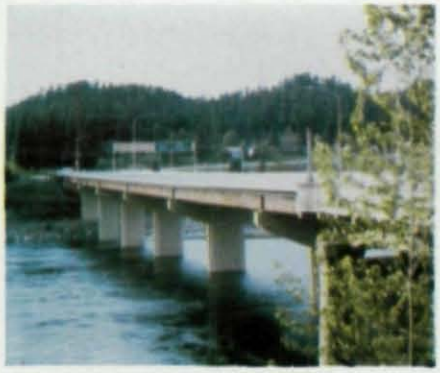
New orthotropic design technology permitted replacement—without ever stopping traffic—of the entire 60-foot wide reinforced concrete roadway and its supporting structural steel members. In addition to widening the roadway by two feet, the project also included rehabilitating approximately 15,400 ft. of structural steel sidewalk framing, fabricating about 3,000 ft. of new structural steel sidewalk framing, and fitting the entire length of the Bridge with new sidewalks. The new structural section is sturdier, yet lighter, than the original roadway by approximately 30%, reducing the deadload by approximately 19,000 KIPS.

1986 Award of Merit
Category: Medium Span, Low Clearance

BONNERS FERRY BRIDGE

Bonners Ferry (Bonner County), Idaho

Designer:
T.Y. Lin International, San Francisco, CA
General Contractor and Steel Erector:
Kiewit Pacific Company, Vancouver, WA
Steel Fabricator:
Robberson Steel & Bridge Company, Oklahoma City, OK
Owner:
Idaho Transportation Department, Boise, ID

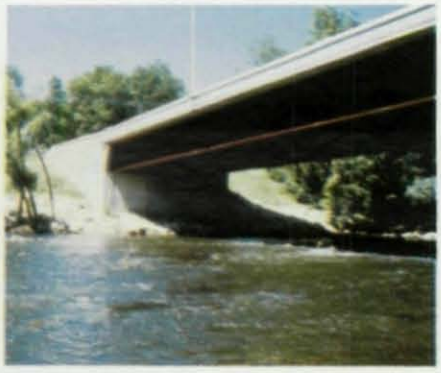


1986 Award of Merit
Category: Medium Span, Low Clearance

FALLS ROAD BRIDGE

Grafton, Wisconsin

Designer/Consulting Firm:
Donohue & Associates, Inc., Madison, WI
General Contractor:
Lunda Construction Company, Black River Falls, WI
Steel Erector:
Hi-Boom Erecting, Inc., Black River Falls, WI
Steel Fabricator:
Phoenix Steel, Inc., Eau Claire, WI
Owner:
Village of Grafton, WI



1986 Award of Merit
Category: Short Span

B & SOMERSET STS OVER CONRAIL

Philadelphia, Pennsylvania

Designer:
Philadelphia Streets Department, Bridge Section, Philadelphia, PA
General Contractor:
Belbold Contracting Corporation, Bristol, PA
Steel Erector:
Coastal Steel Construction Company, Inc., Glenside, PA
Steel Fabricator:
Delsea Parker Corporation, Millville, NJ
Owner:
City of Philadelphia, Department of Streets, Philadelphia, PA

1986 Award of Merit
Category: Elevated Highway, Viaduct

MERRITT PARKWAY E-S & W-N ROADWAYS
Fairfield County, Connecticut

Designer:
Seelye Stevenson Value & Knecht, Stratford, CT
General Contractor:
Arute Brothers, New Britain, CT
Steel Fabricator & Erector:
The Standard Structural Steel Company, Newington, CT
Owner:
State of Connecticut, Department of Transportation, Wethersfield, CT

1986 Award of Merit
Category: Reconstructed

MARY HUNNEWELL FYFFE FOOTBRIDGE
Newton-Wellesley, Middlesex, Massachusetts

Designer:
Barnes and Jarnis, Inc., Boston, MA
Steel Fabricator, Erector & General Contractor:
Engineering Construction Inc., Ipswich, MA
Owner:
Metropolitan District Commission, Boston, MA

1986 Award of Merit
Category: Short Span

PACIFIC STREET BRIDGE
Appleton, Wisconsin

Designer:
Ayres Associates, Eau Claire, WI
General Contractor:
Lunda Construction Company, Black River Falls, WI
Steel Erector:
Hi-Boom Erecting, Inc.
Steel Fabricator:
Hartwig Manufacturing Corporation, Wausau, WI
Owner:
City of Appleton, WI

1986 Award of Merit
Category: Special Purpose

6TH STREET MARKETPLACE
Richmond, Virginia

Designers:
Marcellus Wright, Cox & Smith, Richmond, VA and
Design Architects:
Wallace, Roberts & Todd Architects, Philadelphia, PA
Consulting Firm:
Harris, Norman & Giles Consulting Engineers, Richmond, VA
General Contractor:
The Whiting-Turner Contracting Company, Richmond, VA
Steel Erector:
Wall's Welding Service, Glen Allen, VA
Steel Fabricator:
Liphart Steel Company, Richmond, VA
Owner:
Richmond Festival Marketplace Partnership, Richmond, VA

1986 Award of Merit
Category: Special Purpose

SKYRIDE AT MIAMI INTERNATIONAL AIRPORT
Dade County, Florida

Designer:
Bliss & Nyitray, Inc., Miami, FL
Consulting Firm:
M.C. Harry & Assoc. Inc., Miami, FL
General Contractor:
Darin & Armstrong, Inc., Miami, FL
Steel Erector:
Tampa Steel Erecting Company, Tampa, FL
Steel Fabricator:
Dixie Metal Products, Inc., Fort Lauderdale, FL
Owner:
Metropolitan Dade County-Aviation Department, Miami, FL

New Company Will Provide Steel Design, Cost Analysis Service

A new company, AISC Marketing, Inc., has been formed to increase structural steel's share of the building and bridge market. The new company has been organized by the American Institute of Steel Construction, U.S. Steel Corporation and Bethlehem Steel Corporation, and is headquartered in Chicago.

AISC Marketing, Inc. is represented by 14 field sales engineers strategically located throughout the United States. They will work with owners, developers, engineers, architects and construction managers on design and cost studies of steel framing systems to show their effectiveness over other framing materials or systems. The field organization will be supported by a staff of engineering specialists in design and cost analysis.

Neil W. Zundel, president of the American Institute of Steel Construction, will also serve as president of the new company. AISC is the trade organization representing the fabricated structural steel industry.

Ronald W. Flucker has been selected as Vice President and General Manager of AISC Marketing, Inc. He has been Manager, Construction Services, with U.S. Steel.

Applications Invited for AISC Fellowships, Higgins Award

The application period for the 1987 AISC Fellowship and T. R. Higgins Award programs has officially started.

The annual Fellowships provide $5,000 grants to a maximum of eight university civil or architectural engineering students who plan to undertake a graduate project on some aspect of steel design or construction. Announcements and application forms are being distributed to all the U.S. schools. The Fellowship application deadline is March 1, 1987.

The T. R. Higgins Lectureship Award recognizes yearly the author of a significant technical article (or articles) that is considered an outstanding contribution to engineering literature on fabricated structural steel. A nomination deadline of Nov. 14, 1987 has been set for the 1987 award.

Additional information and forms for these two prestigious award programs may be obtained from the AISC Education Department, 400 N. Michigan Ave., Chicago, IL (phone 312-670-2400).

AISC Plans Combined NEC/COP in New Orleans

In 1987, the National Engineering Conference and Conference of Operating Personnel—both sponsored by the American Institute of Steel Construction—will be held simultaneously at the Rivergate Convention Center in New Orleans. Dates for the combined meetings are April 29-May 2.

The NEC is the traditional meeting place for engineering professionals interested in the latest information on steel design, code changes, technological advances and recent research. The COP has been devoted to the nuts-and-bolts details of fabricating and erecting structural steel: project management, shop and field inspection, safety, quality certification, welding, bolting, cleaning, painting.

Because there are so many topics common to both interest groups—foreign competition, documenting change orders, responsibility for connection design, performance of structures, codes and standards—the AISC is giving attendees an opportunity to experience both meetings for the price of one.

The East Hall of the Rivergate will be devoted to exhibits by the people and firms who provide products and services to the steel construction industry. More than 1,500 attendees and exhibitors are expected to be in New Orleans for this "all-steel" show and conference.

For information on exhibit space or the combined NEC/COP technical sessions, write AISC, 1987 NEC/COP, P.O. Box 804556, Chicago, IL 60680-4107, or call 312-670-5432.

Steel Bridge Conference Set For Fall of '87

A conference on Steel Bridge Construction has been scheduled by the American Institute of Steel Construction for September 14-15, 1987 at the Shoreham Hotel, Washington, D.C. The purpose of the meeting is to create a dialogue between owners, designers and builders to enhance the quality and reliability of steel bridges.

Subjects to be considered for the two-day session will include such topics as standardized details, fracture critical plans, material usage, quality control, weathering steel, shop testing, inspection, value engineering and ground rules for alternate bridge designs. Both the American Association of State Highway and Transportation Officials (AASHTO) and the Federal Highway Administration (FHWA) are expected to participate.

Pedestrian Bridge Winners

Two parallel trusses, located 26 feet apart, center-to-center, and connected by structural steel floor trusses and roof purlins form the structural system for the two major Skyrides (pedestrian bridges) at Miami International Airport. The Skyrides are Award of Merit winners in the 1986 competition.

Top and bottom chords of the main trusses are structural "WT" sections, joined by 8-inch diameter steel pipe diagonals placed in an "X" pattern. The Skybridges are supported at terminal ends on existing columns, strengthened by adding steel plate to carry the increased load. Intermediate supports are pairs of reinforced concrete columns. Support at either end is provided by a "Tripod" of three 5-foot diameter reinforced concrete columns. Bridges and connectors are covered by a skin of insulated aluminum, which gives them the streamlined appearance of a jetliner fusilage.

Another unique pedestrian bridge, linking the 6th Street Marketplace in downtown Richmond, Virginia, is also an Award of Merit Winner. Massive heavy architectural exposed structural shapes combined with the light truss system on the exposed roof give the market an attractive effect.

The Miami Skyride was designed by Bliss & Nyitray, Inc., Miami. The 6th Street Marketplace overpass was designed Marcellus Wright, Cox & Smith, Richmond. Design architect was Wallace, Roberts & Todd Architects, Philadelphia. Consultants were Harris, Norman & Giles Consulting Engineers, and Jackson & Tull, both of Richmond.

Awards Banquet Will Honor Winners

Members of the nation's construction industry will gather at the Westin Hotel in Chicago Dec. 2 to honor winners in the 1986 Prize Bridge Competition at the Annual Awards Banquet, sponsored by the American Institute of Steel Construction.

In announcing this year's banquet, Neil W. Zundel, AISC president, noted, "AISC is honored to host this prestigious event. Those attending the reception and banquet represent the country's premier structural design firms and engineers, developers, financial executives, contractors, steel fabricators, as well as others associated with the steel construction process.

Among those guests will be the jury for the 1986 Prize Bridge Competition.

Winners of the biennial competition receive plaques adapted from the single-edition bronze sculpture, "The Long Reach" by sculptor Joe Kinkel. This sculpture, commissioned by AISC in 1981, symbolizes the significance of steel in construction.

For further information, and reservations, contact AISC Public Affairs Department, 400 N. Michigan Ave., Chicago, IL (phone 312-670-2400).

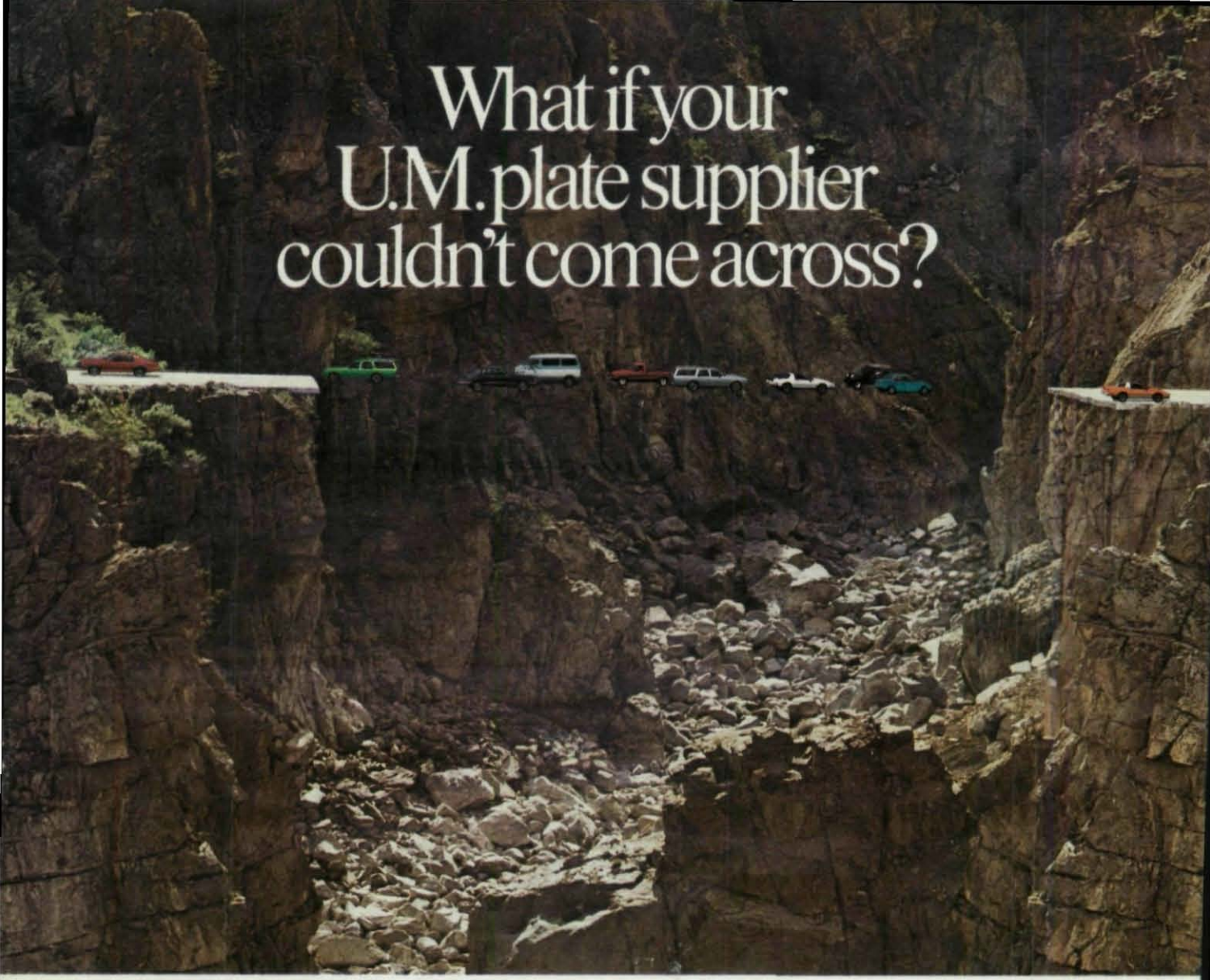
AISC Introduces LRFD Manual

The Load and Resistance Factor Design (LRFD) Manual of Steel Construction, 1st Edition, published by the American Institute of Steel Construction, is now available. The 1,109-page Manual is based on the Load and Resistance Factor Design Specification for Structural Steel Buildings, approved September 1, 1986. The new steel design Specification is based on limit state philosophy. The design procedure relies on the actual strength of a member or component, rather than on an arbitrary calculated stress. Both working loads and resistance are multiplied by factors, and design performed by comparing the results.

The concept is intended to help engineers design steel-framed buildings of more uniform reliability, with more efficient use of structural steel. The LRFD Manual, which contains the entire Specification and Commentary, also includes the newest design aids for plate grider, composite beam and composite column design, the new requirements for edge distance and spacing of bolts, as well as block shear, tear-out and bearing, plus new charts for eccentrically loaded bolts and weld groups.

The LRFD Manual contains six major parts: (1) Dimensions and Properties, (2) Columns, (3) Beams and Girders, (4) Composite Members, (5) Connections and (6) Specifications, Codes and Commentary. The format and style of the book are similar to previous AISC manuals.

AISC will also begin a five-lecture program for engineers in December. The program is presently scheduled for 63 cities, and will extend through 1988. The LRFD Specification (S328) is available for $10 and the LRFD Manual (MO15) for $42 (members) and $56 (non-members). Order from AISC Publications Department, P.O. Box 4588, Chicago, IL 60680-4588. Call AISC (312-670-2400) for details on the lecture program.



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