2009
Bridge Awards of Excellence

ASBI

AMERICAN SEGMENTAL BRIDGE INSTITUTE

2009 Bridge Awards of

In recognition of the Owners of bridges which exemplify concrete

In the fourth biennial American Segmental Bridge Institute (ASBI) Bridge Award of Excellence Competition, five projects were selected as outstanding examples of segmental concrete bridge construction. Judging for the 2009 program took place at the Minnesota Department of Transportation Office in Oakdale, Minesota, hosted by Dan Dorgan, Chair, ASBI Awards Committee, Minnesota Department of Transportation – Bridge Office.

Excellence

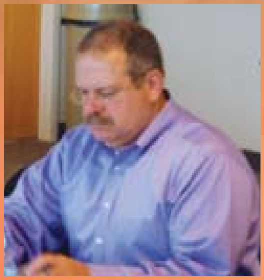
segmental bridge design and construction excellence.

All concrete segmental or cable-supported bridges located within the 50 United States and completed between January 1, 2007 and August 1, 2009 were eligible for the 2009 awards competition. The jury also considered international projects involving ASBI members. Entrants in the competition were judged on the basis of the following criteria:

- Innovation of Design and/or Construction
- Rapid Construction
- Aesthetics and/or Harmony with Environment
- Cost Competitiveness
- Minimization of Construction Impact on the Traveling Public (when applicable)

Bridge Awards Jury

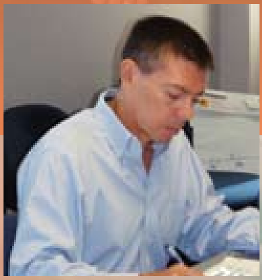
Ralph Salamie
Kiewit Pacific



Steve Pabst
Watson Bowman Acme Corporation – A BASF Company

Dan Dorgan
Minnesota Department of Transportation

M. Myint Lwin
Office of Bridge Technology, Federal Highway Administration



Doug Geiger
Reynolds, Smith & Hills Construction Services

BRIDGE AWARD OF EXCELLENCE WINNERS:

Confusion Hill-South Fork Eel River, CA

The New IH35W Bridge, MN

I-280 Veterans' Glass City Skyway, OH

Maroon Creek Bridge, CO

Sound Transit Central Link Light Rail, Tukwila Segment, WA

Awards will be presented to bridge owners' representatives during the 2009 ASBI Convention Awards Luncheon, Monday, October 26 at The Hilton Minneapolis in Minneapolis, Minnesota. Following are jury comments, project details, and participant credits for the winning entries (ASBI Members are noted in bold).

MINNEAPOLIS, MINNESOTA

I-35W Bridge

The new I-35W Bridge, an emergency replacement for the steel girder bridge that collapsed on August 1, 2007, consists of twin bridges 1,223' long with a 504' precast segmental main span across the Mississippi River in Minneapolis, Minnesota. This segmental concrete "smart bridge" features a progressive design of new technology and achieves the owner's vision for quality, safety and innovation. Close coordination of the design/build team allowed for the successful completion of the new I-35W Bridge within the accelerated schedule and set a new standard for speed and innovation in design/build projects. Designed to carry 10 lanes of interstate traffic, the new I-35W Bridge is also transit and suspended pedestrian bridge ready to meet Minneapolis's changing transportation needs.

Innovation of Design and/or Construction

Innovative concrete set the stage for a segmental bridge design with an over 100-year life. High-strength, high-performance concrete was used to cast the new bridge structure. Most concrete was placed during a harsh Minnesota winter, with -40 degree wind chills, requiring special mix designs to maintain proper temperatures.

Over the service life of the bridge, information collected from 323 sensors embedded in the concrete throughout the bridge will assist in managing operations by enhancing bridge inspections with structure performance data; maintaining efficient and safe traffic flow; and providing infrastructure security. The sensors measure the bridge's response to loads in real-time to alert officials when there is the potential for a problem before it occurs. When temperature, humidity and wind speeds reach specified levels, the sensors on the main span trigger the bridge's automated anti-icing system. The information gathered from the sensors will provide valuable feedback about bridge traffic patterns, infrastructure maintenance and design sustainability for future bridges.

Low energy, low maintenance Light Emitting Diode (LED) lights were used throughout the project. The nighttime signature for the bridge is achieved through LED lights, allowing for reduced costs, maintenance and an array of color choices. LED highway lighting, its first use in the United States, was also implemented on the new bridge. The energy savings and effects of this new lighting method are being studied in conjunction with the Department of Energy to explore ways to reduce energy consumption in outdoor lighting applications across America.

In the future, lane configurations may be adjusted to add vehicular, HOV, bus or light rail lanes. Provisions for a future pedestrian bridge were also included in the plans for the new interstate bridge.

Rapid Construction

The new I-35W Bridge was opened to traffic on September 18, 2008 – more than three months early. The entire emergency replacement structure was designed and built in 11 months to restore a vital transportation link in the heart of downtown Minneapolis.

One of the biggest time savers was combining construction methods. It is unusual to use both cast-in-place and precast construction on the same job, but doing so allowed for spans over land on both sides of the river to be constructed on temporary steel falsework while the box girder segments for the main span over the river were precast in the casting yard. Eight casting beds were built to allow for casting of all 120 segments in as little time as possible. Proceeding out from both sides of the river toward the center, cantilever construction of the 504' main span over the Mississippi River began on May 25, 2008 and was completed just 47 days later.

Jury Comments

This project incorporates innovations in design and construction in meeting the desires of the community, enhancing the environment, assuring sustainability, quality, and economy. The high level of cooperation between the owner, builder and contractor resulted in this significant construction achievement. This project exceeded expectations under very demanding requirements.

From notice-to-proceed to completion of the main span of this 10 lane interstate bridge over the Mississippi River was only 9 months.

Aesthetics and/or Harmony with the Environment

The theme of "Arches-Water-Reflection" inspired the lines, proportions and aesthetic features of the new I-35W Bridge. The modern curves are a salute to the historic arch bridges along the corridor. Water, the centerpiece of the project, is framed to pay homage to the power and importance of the great Mississippi River. Reflection refers to both literal reflection, as is often captured in the river, and the spiritual reflection of the site.

At night, lighting accentuates the reflective curves of the 70' tall piers as they rise to meet the sweeping parabolic arch of the superstructure. Rip rap and native landscaping surround trails below the bridge and are juxtaposed with accents of stainless steel to blend the modern, white bridge with its river environment. These trails tie into existing trails around the city and lead to plazas at the waters' edge that offer unique views of the river. Conceived as a functional sculpture within the existing landscape, the bridge celebrates and preserves its site while incorporating great redundant strength and new technology.

Cost Competitiveness

The contract for the new I-35W Bridge was designed as a "Best Value" design/build project, combining both the final bid price, technical merit, and schedule into the final score. The owner's experience with design/build projects allowed them to facilitate award of this contract quickly. Through creative planning, the design/build team was able to accomplish the bridge under budget for a cost of $234 Million, while also completing the innovative bridge ahead of schedule and with a remarkable safety record.

Minimization of Construction Impact on the Traveling Public

At a cost to the local economy of nearly $400,000 per day, quick restoration of the I-35W crossing was crucial to minimize impacts on the community. The design/build team worked quickly to restore the crossing, finishing more than three months early, allowing the community to return to normal routines.

Because of the circumstances leading to the construction of the new I-35W Bridge, working with the community to help restore confidence in the structure was also important. The design/build team and owner worked together throughout the project to keep the community informed about progress, answer questions about construction and the new bridge, and to gain their acceptance of the new structure.

CREDITS

Owner:
Minnesota Department of Transportation

Designer: **FIGG**

Contractor:
FLATIRON-Manson Joint Venture

Construction Engineer: **FIGG**

Construction Engineering Inspection: **FIGG**

Formwork for Precast Segments: EFCO

Post-Tensioning Materials:
Dywidag Systems International, USA, Inc. (DSI)

Bearings and Expansion Joints:
Bearings: R.J. Watson
Joints: **The D.S. Brown Company**, Large Movement Modular Joints
Watson Bowman Acme – A BASF Company, Small Movement Strip Seals

Prepackaged Grout: **Sika Corporation**

Epoxy: Pilgrim

Maroon Creek Bridge

Colorado State Highway 82 provides the primary access into the world class ski resort of Aspen and prior to its replacement crossed the wide and deep Maroon Creek basin on the oldest bridge in service on the Colorado state highway system. Originally constructed as a railroad trestle bridge in 1888, the Colorado Midland Railroad Bridge became the property of what was then called the Colorado Department of Highways in 1927. Due to its historical significance, this original bridge is listed on the National Register of Historic Places.

In 1990, CDOT recognized the need to replace the existing bridge; however, public concerns regarding the number of lanes, alignment, and impact the construction and resulting traffic would have on the environment, resulted in the start of the 8 year long Environmental Impact Study. Various structure alternatives were studied and after careful evaluation, a cast-in-place concrete segmental bridge, to be built using the balanced cantilever method of construction, was approved.

The 620 ft. long replacement structure, 100 ft. above the Maroon Creek basin, features a 270 ft. long main span flanked by equal 170 ft. long side spans, supported by 'A' shaped piers developed to complement the design of the existing historic bridge and its characteristic steel trestle supports. The single cell box girder is 73 ft. wide, including a 12 ft. wide pedestrian and bike path, and is a constant 13 ft. 6 in. deep.

Innovation of Design and/or Construction

The concrete box girder was constructed from above in balanced cantilever, using form travelers to protect the environmentally sensitive and difficult access area below the bridge and to minimize construction impacts.

The design and construction of the abutments presented unique challenges because of the difficult site conditions. The steep sides of the Maroon Creek ravine consist of large boulders, cobbles and smaller granular material. The adjacent historical structure abutments are founded on stacked stone footings on the slope surface, making the vibration from driving steel piles too risky for fear of damaging the supports. The large boulders in the slopes also made driving steel piling and drilling large diameter drilled shafts nearly impossible. Therefore, the foundation type selected was small diameter micropiles, consisting of 8" diameter drilled holes approximately 80 feet deep, a single 1" diameter steel bar in the center, and pressure grouted. The piles were spaced at about 5 ft. centers each way and supported a reinforced concrete footing. The grouted columns and the spread of grout around the piles also increased the slope stability be cementing the granular materials so that the area acts as an integral mass. Another unique aspect of the abutment design is the cellular configuration. The front, back, and side walls support a structural deck slab with no fill between to create a structure that is much lighter than a conventionally backfilled system, thus reducing the amount of weight that the slopes need to support.

Rapid Construction

Awarded for construction in June 2005, the bridge was completed in early spring of 2008, and opened to traffic in July of 2008 after completion of the roadway approaches in a subsequent project. Although the site is located at an elevation of 7,900 ft., the contractor controlled temperature

Jury Comments

The bridge owner is satisfied with the innovative use of CIP balanced cantilever construction method in meeting design and construction challenges, minimizing environmental impact and accelerating construction, protecting water quality and wildlife. The pier shapes are unique and attractive, matching as best possible the existing bridge's trestle substructure. This project illustrates the competitiveness of segmental construction for short bridges with specific site constraints.

in the segments throughout the winter by insulating the forms and running heated glycol through pipes on the exterior surface of the forms, saving substantial time in the construction schedule.

Aesthetics and/or Harmony with the Environment

The architectural design of the new Maroon Creek Bridge is influenced by the pristine natural beauty of the Maroon Creek gorge and the form of the existing historic trestle bridge. The Record of Decision for this project provided guidance to the Project Team regarding architectural requirements. It states, "The new bridge shall be designed with particular attention to providing a substructure which is complementary to the existing railroad bridge and which facilitates safe pedestrian/bicycle movements." Because of the historical significance of the original bridge, it is required to remain in place adjacent to the new bridge to honor its historic designation.

Several pier shapes were developed during the initial pier evaluation. The selected A-frame shape pier column shape, an innovative and unique feature of the new bridge, was developed to complement and harmonize with the historic railroad trestle bridge.

The new Maroon Creek Bridge has been a successful project for many reasons, but none more important than its utilization of a 'from the top' construction method. The wetlands in the Maroon Creek basin have been subjected to serious environmental impacts since the area was first settled in the 1800s. Therefore, one of the major goals of the project was to design an economical bridge that could be constructed with minimal impact to the basin.

Cost Competitiveness

Although the bridge square footage is on the low end of that historically required for segmental bridges to be competitive, the difficult access to the site allowed the segmental alternative to be economical. The awarded cost of $13.97 M ($313 per sq. ft.) was just below the Engineer's Estimate.

Minimization of Construction Impact on the Traveling Public

By using cast-in-place segmental construction, closure of the only access into the City of Aspen was minimized. Materials required for the segmental structure were easily transported to the site and lifted into position with a crane.

CREDITS

Owner:
Colorado Department of Transportation

Designer: **Parsons**

Contractor:
BTE/**Atkinson Construction**
Joint Venture

On-Site Inspections: Carter-Burgess

Construction Engineering Services:
McNary Bergeron & Associates

Sound Transit Central Link Light Rail, Tukwila Segment

The 4.9-mile-long Sound Transit Tukwila Segment is a light rail project that extends from the Boeing airfield at the southern limit of the City of Seattle to the Sea-Tac airport. It provides the final link in a 20-mile-long mass transit system known as the Sound Transit Central Link Light Rail.

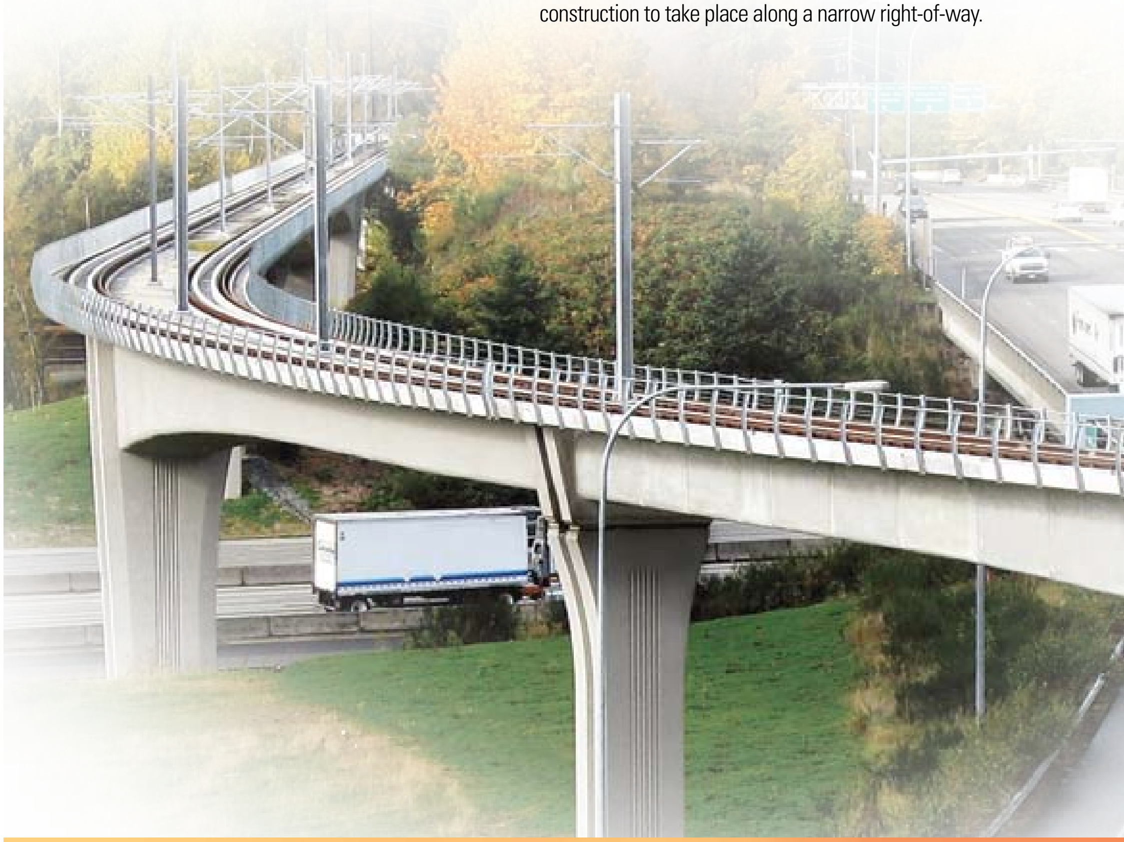
The project includes 4.2 miles of elevated guideway carrying twin tracks with a station and commuter park-and-ride located near the airport. The guideway spans several major obstacles including a freeway, a railroad, and a river. Typical spans up to 132 ft were built span-by-span and long span structures up to 350 ft were built in balanced cantilever.

Innovation of Design and/or Construction

A unique 7-ft-deep triangular cross-section for the typical span was developed to optimize superstructure quantities. To assist the stability of the streamlined structure, external diaphragms at the ends of the span provide a wider bearing spacing. The diaphragm components were integrated with the pier shapes that flare at the top and narrow down to a standard prismatic section. The result was a sleek, narrow guideway structure that significantly reduced material quantities compared to traditional box girder designs. The reduced mass of the superstructure also greatly reduced seismic demands allowing for slender column design with reduced substructure and foundation cost. Also, the inclined webs of the V-shaped box girder give a less intrusive appearance to the guideway by reducing its visual mass.

The guideway is post-tensioned with hybrid external and internal tendons. At intermediate points along the span the post-tensioning transitions from external at the anchorages to internal in the bottom slab near midspan. This design feature enhanced seismic performance, reduced the depth of the structure, and decreased the post-tensioning quantities.

The variable soils and close proximity to surrounding structures made foundation design a critical part of the overall project. A wide range of foundation types were used, including traditional spread footings, CIDH piles, driven piles and large diameter drilled shafts. Also included were spread footings with tie-downs, which were the key to employing spread footings in locations where adjacent structures did not allow a large footprint. Similarly, the use of 10-ft-diameter drilled shafts in many areas allowed construction to take place along a narrow right-of-way.



Jury Comments

This project overcame many design and construction challenges through value engineering and the adoption of the study recommendations: standardization to the greatest extent feasible, optimized use of construction materials and integrating superstructure with the pier columns to enhance aesthetics. The project demonstrated solid performance in all categories; innovative design, aesthetically pleasing, ahead of schedule, and below budget.

Rapid Construction

A recent goal in U.S. bridge construction has been to "Get In, Get Out, and Stay Out." This project exemplifies this idea on a grand scale. Squeezed in between an urban and sub-urban setting, major travel corridors, and sensitive environmental habitats, the light rail alignment faced significant challenges for completion. For this design, structural optimization was coupled with a full concept integrated with efficient and rapid construction techniques.

Aesthetics and/or Harmony with the Environment

Aesthetics were not sacrificed to achieve reduced costs; efficiencies in the structural design were blended with aesthetic qualities of the structure. As noted by the prominent author and expert on bridge aesthetics, Fredrick Gottemoeller:

"…The preliminary design for the rail link was quite a different structure. With a single segmental box section and without the miles of hammerheads, it is much sleeker, less massive, and more transparent. The designers did an excellent job of marrying the piers and the girders in an attractive and structurally honest way. Finally, the piers have vertical insets that create shadow lines that minimize their apparent width…"

Cost Competitiveness

The precast segmental V-box girder was adopted as part of a value engineering proposal that created a savings of approximately $20 million (15% of the original construction cost estimated for the Owner's preliminary design). In addition, the segmental concept accelerated the original construction schedule by 6 months.

The cost savings for the project did not end with the initial value engineering exercise. The constructability aspects of the design were validated at tender, with the successful contractor bidding 10% below the engineer's estimate.

Minimization of Construction Impact on the Traveling Public

By erecting from the top, the technique eliminated many of the access issues associated with ground-based cranes or falsework. It also minimized impact to traffic and environmentally-sensitive sections of the project, helping maintain good community relations throughout construction.

CREDITS

Owner:
Seattle Sound Transit

Design Engineer:
Hatch Mott MacDonald Group

Group Contractor:
PCL Construction Services, Inc.

Bridge Designer:
International Bridge Technologies

Construction Manager:
Parsons Brinckerhoff Construction Services

Construction Engineer:
T.Y. Lin International

Construction Engineering Inspection:
T.Y. Lin International

Precaster:
Bethlehem Construction (PCI Certified Plant)

Post-Tensioning Materials/Stay Cables:
Schwager Davis, Inc.

Erection Equipment:
Rizzani/DEAL

Epoxy Supplier and Prepackaged Grout:
Sika Corporation

Formwork for Precast Segments:
EFCO Corp.

Bearings and Expansion Joints:
The DS Brown Company (Expansion Joints), R.J. Watson, Inc. (Bearings)

TOLEDO, OHIO

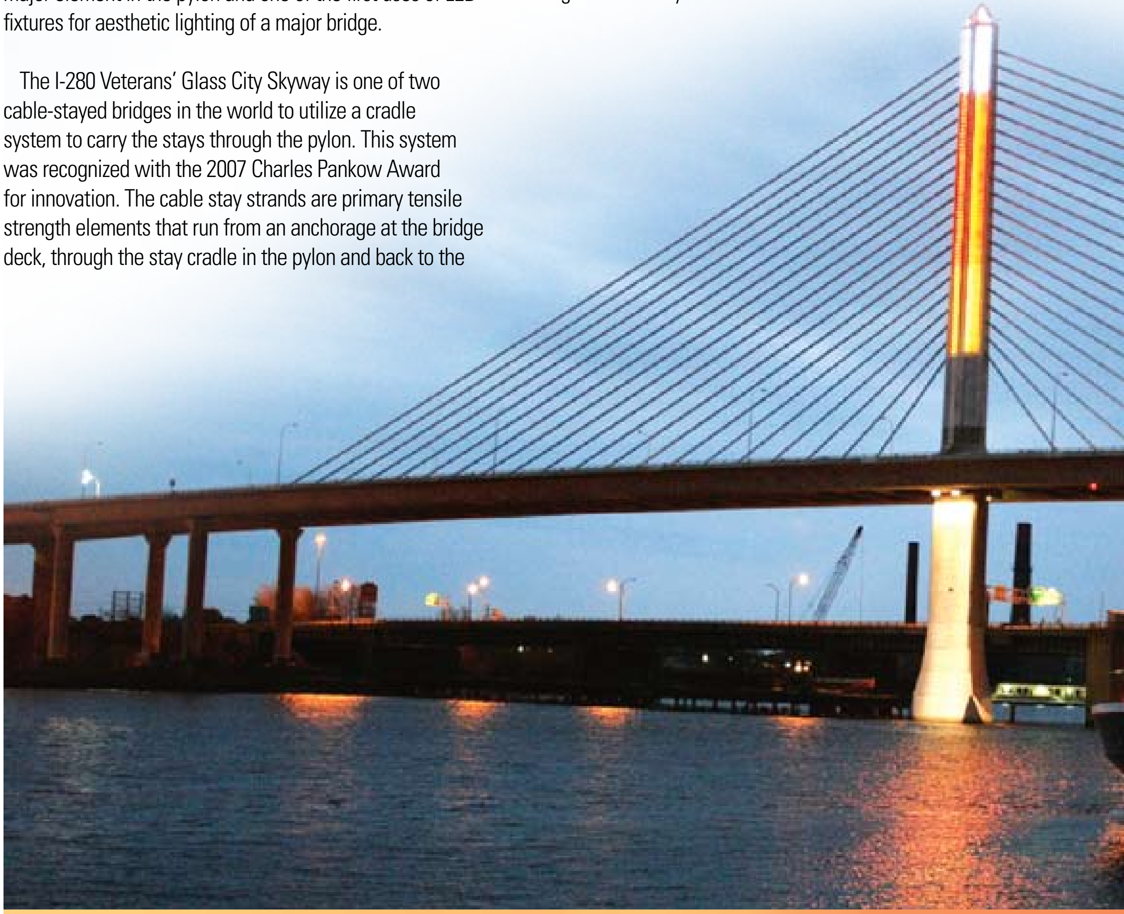
Toledo's new bridge landmark, the I-280 Veterans' Glass City Skyway, replaces one of the last bascule spans on the Interstate system and provides for uninterrupted traffic flow along I-280 in the heart of Toledo, while freight is moved easily in and out of the Port of Toledo on the Maumee River. The 8,800' long new bridge includes a 1,525' cable-stayed main span unit with aesthetics centered around a theme of glass to honor the city's industrial heritage. This segmental concrete bridge features many firsts and new innovations in the segmental bridge industry.

I-280 Veterans' Glass City Skyway

Innovation of Design and/or Construction

The bridge features a 440' tall single pylon, with the upper 196' faced in glass on all four sides. This achieved a community goal of incorporating glass in a highly visual way in the new bridge. Industries in the City of Toledo are recognized as world leaders in the manufacturing and development of specialty glass, thus the community wished to showcase this material. Behind the glass are 384 LED fixtures programmed to provide shows throughout the year. Each fixture is capable of 16.7 million colors, translating to an infinite array. The I-280 Veterans' Glass City Skyway is the first cable stayed bridge in the world to utilize glass as a major element in the pylon and one of the first uses of LED fixtures for aesthetic lighting of a major bridge.

The I-280 Veterans' Glass City Skyway is one of two cable-stayed bridges in the world to utilize a cradle system to carry the stays through the pylon. This system was recognized with the 2007 Charles Pankow Award for innovation. The cable stay strands are primary tensile strength elements that run from an anchorage at the bridge deck, through the stay cradle in the pylon and back to the bridge deck, transferring naturally compressive forces to the pylon through the curved portion of the cradle. Epoxy coated steel stay cable strands are housed in individual steel tubes in the curved portion of the cradle. During fabrication, grout is injected into the spaces between the tubes, allowing the individual epoxy-coated strands to remain ungrouted and act independently, simplifying maintenance and inspection and improving long term durability. Each stay incorporates two reference strands that may be removed, inspected and replaced with the same, or potentially newer materials, at any point in the future. Since each strand is independent from the others, this allows for an increase in the number of strands in a stay. Four stays use 156 strands, becoming the largest cable stays in the world..



Jury Comments

The cradle system developed for the project is an advancement and innovation in cable stayed design. The use of stainless steel sheathing, epoxy coated strand, and reference cables to monitor performance provides the owner a durable and maintainable bridge for future generations. The pylon accented with glass backlit panels is an artistic way to recognize the history of Toledo's glass industry. Community involvement was key to the success of this outstanding project.

The stay sheathing and cradles are stainless steel, another first use in the world. The reflectivity of stainless steel achieved aesthetic goals, along with providing the most economical life cycle costs. The cable-stayed main spans utilize precast delta frames to transfer forces from adjacent box girders to the cable stays. This patented innovation has been used on just three other American cable-stayed bridges and results in a single plane of stays.

Aesthetics and/or Harmony with the Environment

The bridge aesthetics were developed around the community-selected theme of glass, with the majority of the elements selected during design workshops or charettes with the community. During these public workshops, aesthetic options were presented, discussed and then voted on, building consensus along the way.

Perhaps the most unique element of the new bridge is the pylon at night. The glass panels are backlit by 384 LED fixtures, each capable of producing 16.7 million colors, resulting in a nearly infinite number of displays. Numerous 'shows' have been pre-programmed to run through the year during specific holidays, seasons and sporting events.

The single pylon provides Toledo with the greatest opportunity for a bridge landmark reflective of their history in the glass industry. The location of the shipping channel on the north side of the river accommodates the pylon near the middle of the river, without impacting river traffic.

The community voted for a single plane of stays, supporting the desire for visual impact, elegant appearance and undisturbed views for drivers, along with a clear separation of northbound and southbound traffic. Voting resulted in a fan arrangement for the stays drawing viewers' eyes up in concert with the project slogan - "Look up Toledo!"

Cost Competitiveness

2.75 miles of ramps, roadway and cable-stayed main span (1.2 million square feet of bridge deck) were completed for $237 million, while providing hundreds of local jobs during construction. Economy was achieved through repetition in the design of the structural system. Use of the cradle system generated approximately $3 million in material savings. High-performance concrete was utilized throughout the structure, resulting in a durable, low-maintenance bridge with a service life of at least 100 years. A life cycle cost/benefit analysis was completed to evaluate the use of stainless steel cable stay sheathing and given the minimal maintenance that will be necessary, this choice was found to be financially attractive.

CREDITS

Owner: Ohio Department of Transportation

Designer: **FIGG**

Contractor: Fru-Con Construction, a member of Bilfinger Berger AG

Construction Engineer: **International Bridge Technologies, Inc.**

Construction Engineering Inspection: **FIGG**

Formwork for Precast Segments: EFCO

Erection Equipment: **Strukturas**, Paolo di Nicola

Underslung: Design by Somerset, Fabricated by Trinity Industries, Dallas, TX

Post-Tensioning Materials/Stay Cables: **Dywidag Systems International, USA, Inc. (DSI).**

Bearings and Expansion Joints: **The D.S. Brown Company**

Epoxy Supplier and Prepackaged Grout:
Grout – **BASF Building Systems**, **DSI**
Epoxy – **Sika Corporation**

NORTHERN MENDOCINO COUNTY, CALIFORNIA

Confusion Hill – South Fork Eel River Bridge

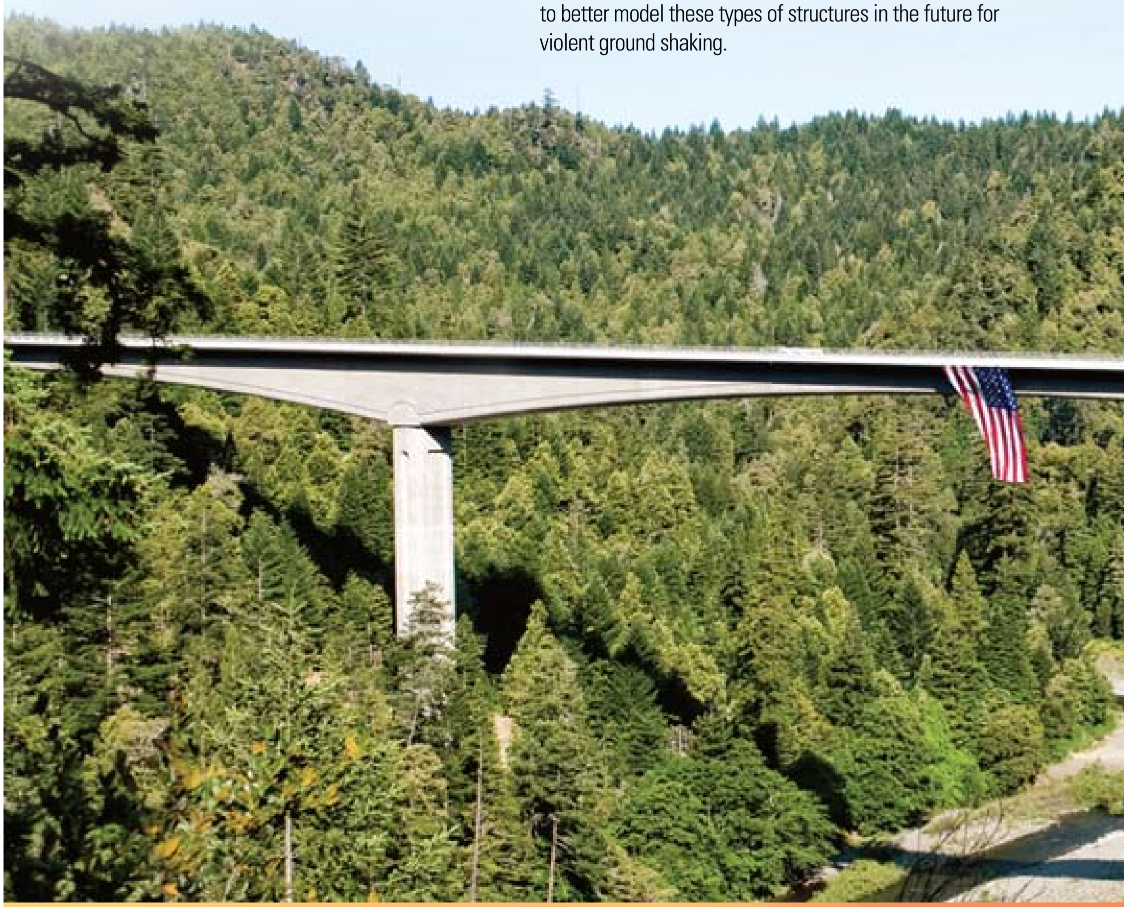
The Confusion Hill bridge project relocates approximately 1.5 miles of Route 101, to the west via two bridges that span the South Fork Eel River, in order to alleviate a recurring problem of landslides and slipouts around Confusion Hill on Route 101. A large, ancient rock slide complex extends from the South Fork Eel River to more than 1,000 feet above, enveloping the current highway located 140 feet above the river. This slide activity has caused numerous road closures and delays associated with one-way traffic control situations. Geotechnical studies of the site concluded that the ancient slide is progressively losing strength with a high probability that the slides within the complex will continue to move in the future. The current road had to endure numerous closures during the winter of 2005 and 2006 because of continued slide activity.

The new south bridge is a variable-depth, cast-in-place segmental box girder structure with spans of 106 m, 174 m, and 133 m and a deck width of 13 m. The superstructure was built using balanced cantilever construction from the two interior piers and construction on falsework at the abutments.

Innovation of Design and/or Construction

The single pier-column utilizes multiple, confined concrete cores provide the necessary resistance for both cantilever segmental construction as well as the seismic design forces. An integral superstructure connection completes the seismic resistance system. The superstructure design combines a traditional internal post-tensioning system with additional mild steel reinforcement used to provide additional strength and ductility during a seismic event. An integral superstructure connection completes the seismic resistance system.

The bridge has a seismic monitoring system consisting of strong motion sensors placed at strategic locations along the interior of the box girder as well as at all supports and a free field site to capture real time displacements and mode shapes of the structure during a seismic event. The sensor layout provides 24 channels of data and is all recorded on the same clock to capture pertinent mode shapes. Information from the data recorders is transmitted immediately to DOT personnel by phone line. The sensors will provide relative footing/superstructure movements that can be used to immediately determine if the bridge is safe for the traveling public. Comparing recorded mode shapes along with the amplitudes of motions will help further the knowledge of how structures react to earthquakes and how to better model these types of structures in the future for violent ground shaking.



Jury Comments

The selection of the balanced cantilever segmental bridge for this rugged and challenging location resulted in a construction method that minimized impacts to the environmentally sensitive scenic river gorge. The innovative design provides for a safe, durable structure in a seismically active area.

Rapid Construction

The total construction time of this bridge was 30 months and was completed nearly three months ahead of schedule. The successful completion of this challenging project was the result of well planned, coordinated efforts within the construction team as well as the open, working relationship between the designer, construction engineer and contractor.

Aesthetics and/or Harmony with the Environment

The South Fork Eel River Bridge project presented many challenges in balancing aesthetics, constructability, environmental issues and design efficiency. The cast-in-place segmental concrete bridge provides an efficient, cost effective long span structure that meets the critical environmental issues of minimizing the impact to the river basin below.

To enhance the bridge's visual impact, several aesthetic reveals and a rounded web to bottom soffit interface were incorporated. A concrete see-through barrier with tubular steel bicycle railing provides travelers with a view of the scenic river valley. These features combine a well proportioned box girder with subtle detailing that highlights the geometry of the structure and provides an impressive visual impact.

CREDITS

Owner: **California Department of Transportation (Caltrans)**

Designer: **California Department of Transportation (Caltrans)**

Contractor: MCM Construction Inc.

Contractor's Segmental Construction Engineer: **Finley Engineering Group, Inc.**

Construction Management & Engineering Inspection: **California Department of Transportation (Caltrans)**

Form Travelers for Cast-in-Place Segments: **AVAR Construction Systems, Inc.**

Post-Tensioning Materials/Stay Cables: **Schwager Davis, Inc.**

Bearings and Expansion Joints: **The D.S. Brown Company**

Prepackaged Grout: **Sika Corporation**

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