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Editorial

MILESTONE PROJECTS COMPLETED & UNDERWAY

2006 was a banner year for completion or substantial completion of major segmental and cable-stayed bridge projects in the U.S. including:

- The Skyway portion of the San Francisco-Oakland East Bay Bridge, California (Newsletter, Volume 47)
- The Susquehanna River Bridge, Pennsylvania (see newsletter project report)
- The Otay River Bridge, California (see newsletter project report)
- The Penobscot Narrows Bridge and Observatory (see newsletter project report)
- The Lee Roy Selmon Expressway, Tampa, Florida
- The Veterans Glass City Skyway, Ohio (see newsletter project report)
- US-17 Wilmington Bypass, North Carolina (Newsletter, Volume 48)
- Benicia-Martinez Bridge, California (see newsletter project report)

Major Segmental projects underway in the U. S. include:

- Hoover Dam Bypass Bridge, Arizona-Nevada (Longest Concrete Arch Span in the U.S., Newsletter, Volume 48)
- Wakota Bridge, Minnesota (Newsletter, Volume 46)
- Seattle Sound Transit Light Rail Project, Washington (see newsletter project report)

- Allegheny River Bridge, Pennsylvania (see newsletter project report)

Taken together, the above projects illustrate major advantages of segmental and concrete cable-stayed bridges, including:

- Rapid, economical construction over water and in limited right-of-way
- Durability, with design life up to 150 years
- Design for extreme seismic events
- Protection of sensitive environment
- Long-span capability
- Integration of aesthetics

These advantages, and others, are considered to provide the basis for continued growth in the use of concrete segmental and cable-stayed bridges in the years ahead.



Editorial by Cliff Freyermuth
Manager, ASBI

New ASBI Organizational Members

We are very pleased to welcome McNary Bergeron & Associates, Inc. and PBS&J as new ASBI Organizational (Consultant) Members. The addresses and contact persons are as follows:

McNARY BERGERON & ASSOCIATES

220 Old Boston Post Road
Old Saybrook CT 06475
(860) 388-2267
Fax: 860-388-2268
Email: jim@mcnarybergeron.com
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PBS&J

5300 W. Cypress Street
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mgghali@pbsj.com

Amir Kangari, Morad Ghali

2006 ASBI Convention, La Jolla, California

The La Jolla Hyatt Regency at Aventine provided an outstanding venue for the 18th Annual ASBI Convention, November 5 – 7, 2006. Total attendance was 385, making this the second largest attendance at an ASBI Convention, second only to the attendance of 414 at the 2002 convention in San Francisco.

The convention program featured presentations on design and construction of significant segmental projects in the U.S., Canada, Mexico, Japan, China, Australia, India and Singapore. The international theme was continued in the Awards Luncheon presentation, "A World Perspective on Segmental Concrete Bridge Construction" by Hans-Rudolf Ganz, Chief Technical Officer, VSL



Figure 1 - Hans-Rudolf Ganz, Chief Technical Officer, VSL International.

International, **Fig. 1**. In-depth case studies were presented on the Veterans Glass City Skyway, Ohio, and the Otay River Bridge, California. The Tuesday afternoon tour was to the Otay River Bridge located southeast of San Diego.

Twenty-two companies participated in the Exhibitor Showcase in the Barcino Pavilion, an exceptionally attractive exhibit facility located on the hotel grounds (**Fig. 2**).

Exhibitors included:

BASF Building Systems
Bilfinger Berger Civil, Inc.
The D.S. Brown Company
DEAL/Rizzani de Eccher USA
Diebolt & Company
DSI
ENERPAC
F&M Mafco, Inc.
Freysinet, LLC
Fyfe Company, LLC
General Technologies, Inc.
Hilman Rollers
Howell Interqup Strukturas
LARSA, Inc.
MEXPRESA
R.J. Watson, Inc.
Sika Corporation
Sumiden Wire Products Corporation
Vector Corrosion Technologies
VSL
Watson Bowman Acme - A BASF Company
Williams Form Engineering



Figure 2 - Exhibitor Showcase, ASBI Convention.

Some photos (Figs. 3 - 8) taken during the convention are presented below.



Figure 3 - 2005 – 2006 ASBI President Paul Liles, Bridge Engineer, Georgia Department of Transportation presiding at the 2006 Convention Awards Luncheon



Figure 4 - Hans-Rudolf Ganz, Chief Technical Officer, VSL International during the Awards Luncheon presentation “A World Perspective on Segmental Concrete Bridge Construction”. Dr. Ganz was elected as fib President for 2007-2008 at the fib General Assembly convened in Naples on June 4, 2006.



Figure 5 - 2007-2008 ASBI President, Raymond McCabe, HNTB Corporation, during remarks at the 2006 Convention Awards Luncheon.



Figure 6 - ASBI Exhibit activity.



Figure 7 - ASBI President Paul Liles, Georgia DOT making Leadership Award presentation to Hala Elgaaly, FHWA-FLH Bridge Engineer.



Figure 8 - Caltrans Engineers Majid Madani, Ganapathy Muruges, and Gernot Komer, David Evans & Associates during a coffee break.

2006 ASBI Leadership Awards

The eight individuals selected for 2006 ASBI Leadership Awards presented at the 2006 Convention Awards Luncheon are shown in **Fig. 9**. The award recipients and the award citation are as follows:



Presented to JOHN D. ARMENI For Outstanding Contributions to the Segmental Concrete Bridge Industry as Chair of ASBI Committees on Membership, and Construction Practices.

Presented to HALA ELGAALY For Major Contributions to the Segmental Concrete Bridge Industry representing the FHWA on the ASBI Board of Directors, and as Chair, ASBI Bridge Award of Excellence Committee.

Presented to CLIFFORD L. FREYERMUTH For Outstanding Career Contributions to the Segmental Concrete Bridge Industry as ASBI Executive Vice President for 1989-2006.

Presented to PAUL V. LILES, JR For Outstanding Contributions to the Segmental Concrete Bridge Industry as ASBI President for 2005-2006.

Presented to ALAN J. MORETON For Outstanding Leadership In Advancement of Design and Construction Technology for Segmental Concrete Bridges.

Presented to W. DENNEY PATE For Outstanding Career Contributions in Design of Major Concrete Segmental and Cable-Stayed Bridges.

Presented to GUIDO SCHWAGER For Outstanding Career Contributions to Construction Technology for Segmental and Cable-Stayed Concrete Bridges.

Presented to STEVEN L. STROH For Outstanding Contributions to the Design and Use of Concrete Segmental and Extradosed Bridges.



ASBI Technical Advisory Committee

The ASBI Technical Advisory Committee was reorganized during the November 5, 2006 Board of Directors meeting at the Hyatt Regency La Jolla at Aventine. The stated purpose of the Technical Advisory Committee is to organize the wisdom and experience of ASBI Members to provide advisory services regarding the effective design and construction of concrete segmental bridges. The committee membership is as follows:

John A. Corven, Corven Engineering, Chair

Mike Bartholomew, CH2M Hill

W. Denney Pate, FIGG

Daniel Tassin, International Bridge Technologies, Inc.

Joseph K. Tse, Parsons Brinckerhoff

Steven L. Stroh, URS Corporation

Clifford L. Freyermuth, ASBI, ExOfficio

2007 -2008 ASBI Officers And Executive Committee Members Elected

ASBI Officers for 2007-2008 elected at the November 5 meeting of the Board of Directors are:

President **Raymond McCabe**, HNTB Corporation

Vice President **John D. Armeni**, Armeni Consulting Services, LLC

Secretary/Treasurer **John Crigler**, VSL

Three new members of the Executive Committee were also elected November 5:

Elie H. Homs, Flatiron Constructors, Inc.

Daniel Tassin, International Bridge Technologies, Inc.

Kevin Thompson, California Department of Transportation (Caltrans)

Figure 9 - ASBI award winners.

2007 ASBI Membership Directory

A copy of the 2007 Membership Directory is enclosed with the newsletter. Additional copies are available on request.

2007 ASBI Grouting Certification Training

The 2007 ASBI Grouting Certification Training will be held April 16 - 17 at the J.J. Pickle Research Campus at the University of Texas at Austin. The training is co-sponsored by the Texas DOT. A view of the large specimen grouting demonstrations is presented in **Fig. 10**.

A total of 971 engineers and construction personnel have participated in this training over the past 6 years.

ASBI will offer the grouting examination in both English and Spanish. Program highlights and registration information for the 2007 Grouting Certification Training are presented as an insert in this newsletter. A complete program brochure and registration form is posted on the ASBI website (www.asbi-assoc.org).

2007 ASBI Seminar on "Design & Construction of Segmental and Cable-Supported Concrete Bridges

May 14 -15
Red Lion Hotel -
Seattle International Airport
Seattle, WA

On May 14 & 15, the American Segmental Bridge Institute will sponsor a two-day seminar on design and construction practices of segmental concrete and cable-stay bridges to assist owners, contractors, engineers, consultants and suppliers on all aspects of segmental and cable-stay bridge design and construction. The seminar program and registration information will be posted to the ASBI website in February.



Figure 10 - Large Specimen Grouting Demonstration.

ASBI Construction Practices Seminar for the 2007 IBC Conference

ASBI has organized a seminar on "Construction Practices for concrete Segmental Bridges" for the 2007 IBC Conference scheduled July 4-6 in Pittsburgh to provide comprehensive background on construction technology for the more widely used types of segmental concrete bridges, including production of precast segments, and equipment used for erection of precast segmental bridges. The instructors will address constructability and lessons learned from past projects for avoiding problems, minimizing delays and reducing cost. The program is as follows:

ASBI Construction Practices Seminar for the 2007 IBC Conference June 4 – 6, 2007

Program

Overview of Segmental Construction

Cliff Freyermuth, American Segmental Bridge Institute

Construction of Precast Segmental Span-by-Span Bridges

David Jeakle, URS Corporation

Construction of Precast Balanced Cantilever Bridges

David Jeakle, URS Corporation

Construction of Cast-in-Place Balanced Cantilever Bridges

John Crigler, VSL

Production of Precast Segments with an Overview of Equipment for Handling, Transporting, and Erecting Precast Segmental Bridges

· Production of Precast Segments

· Overview of Equipment for Handling, Transporting, and Erecting Precast Segmental Bridges

Cliff Freyermuth, American Segmental Bridge Institute

2007 Meeting of the AASHTO Subcommittee on Bridges and Structures

Information on the 2007 meeting of the AASHTO Subcommittee on Bridges and Structures is as follows:
DELAWARE BRIDGE ENGINEER:
Jiten K. Soneji, P.E. (302) 760-2299
2007 DATES:

Sunday, July 8 - Thursday, July 12

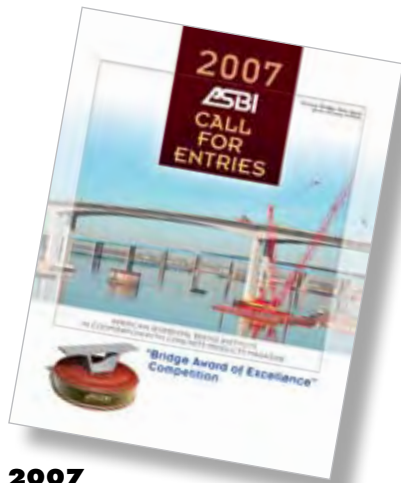
LOCATION:

Hotel DuPont, 11th and Market Street, Wilmington, Delaware 19801

HOTEL PHONE: (302) 594-3100

HOTEL WEBSITE: www.dupont.com/hotel/about_overview.htm

The ASBI Executive Committee and Board of Directors will meet on July 8 at 9:00 am and 11:30 am respectively, at the Hotel DuPont, and the ASBI-AASHTO Reception will be held July 9 from 5:30pm to 7:30pm.



2007 ASBI Bridge Award of Excellence Competition

The third biennial "Bridge Award of Excellence Competition" will be presented in 2007 sponsored cooperatively by ASBI and Concrete Products Magazine. The "Call for Entries," including all details for participating is now available on the ASBI website (www.asbi-assoc.org). The Bridge Owner or any ASBI Organizational Member may submit award entries. All entries must have the Owner's written endorsement.

Concrete segmental, or concrete cable-supported (cable-stayed or extradosed) bridges opened to the public or dedicated between January 1, 2005 and August 1, 2007 qualify for the competition. For complete details see the ASBI Bridge Award of Excellence Call for Entries on the ASBI website (www.asbi-assoc.org).

The ASBI office must receive all entries by August 1, 2007.



2007 ASBI Convention

The 2007 ASBI Convention will be held November 4-6 at The Orleans Hotel and Casino in Las Vegas, Nevada. The ASBI Executive Committee and Board of Directors meetings will be held on Wednesday, November 7. The 2007 convention bridge tour will be to the construction site of the Hoover Dam Bypass Bridge, with cast-in-place segmental arch spans of 1,060 ft. which will be the 4th longest in the world (and longest in North America) when complete.

Concrete Industry to Launch Bridge Magazine

Several Associations Join in Venture
Chicago, IL – The Precast/Prestressed Concrete Institute (PCI) is launching *ASPIRE*, a new, dedicated concrete bridge magazine in January 2007 targeting federal, state and local Departments of Transportation and consulting engineers. The quarterly



magazine's first issue will mail in January to a qualified circulation of 25,000.

John Dick, PCI's Director of Transportation, said, "This very important periodical will fill a bonafide need with our target audiences documenting concrete's distinct bridge advantages and applications. It responds to the market's continuing growth with concrete now accounting for 74.4 percent of the number of new bridge construction and replacement projects" (based on the latest FHWA figures released in August, 2006). "That breaks down to 35.7 percent for reinforced concrete and 38.7 percent for prestressed concrete. If you look at the size of bridges based on surface area, reinforced concrete accounts for 12.6 percent of bridges built and 59.9 percent for prestressed concrete," Dick notes. "Designers want to share what they're doing with creative designs and the need for technology transfer is tremendous."

Joining PCI in the *Aspire* venture are the **American Segmental Bridge Institute (ASBI)**, **Post-Tensioning Institute (PTI)**, **Portland Cement Association (PCA)**, **American Coal Ash Association (ACAA)**, **Expanded Shale, Clay & Slate Institute (ESCSI)**, the **National Ready Mixed Concrete Association (NRMCA)**, the **Silica Fume Association (SFA)** and the **Wire Reinforcement Institute**

(WRI). Other associations are expected to join, as well.

The magazine will cover all types of concrete designs including precast concrete, cast-in-place and segmental bridges. Each issue will feature a profile of a significant bridge consultant, as well as information on trends and case histories in a high-quality, four-color format. Departments will provide news from State DOTs, counties and cities that are designing significant concrete bridges.

The magazine will be produced by the same team that has published PCI's award-winning *Ascent* magazine for the past 14 years. Editorial services are provided by James O. Ahtes Inc. with *Ascent* Managing Editor Craig Shutt joined by Managing Technical Editor Dr. Henry Russell, (who also edits *HPC Bridge Views*). Other transportation and bridge experts have also been retained for article development and commentary.

Design, layout and production is handled by Leader Graphics Design (which also provides those services for *ASCENT*), and the handling of advertising sales through Jim Oestmann of Arlington Publishers Representatives.

FEG Technical Director Combault To Head IABSE

Jacques Combault, Technical Director at Finley Engineering Group (FEG) and one of the world's foremost bridge engineering and construction experts, was elected to head the International Association of Bridge and Structural Engineers (IABSE) at the group's annual symposium in Budapest, Hungary, in September.



Combault will serve as president of the group from November 2007 through October 2010. The IABSE is a scientific/technical association with 3,900 members in 100 countries, including 48 national groups worldwide. Founded in 1929, the IABSE is based in Zurich, Switzerland

"I am very proud for having been elected among four renowned and respected candidates by the 84 members of the Permanent Committee," says Combault. "My goal as president will be to make the IABSE even stronger and more useful to its members, the profession, and society as a whole."

IABSE is an international association serving professionals involved in all aspects of structural engineering,

including professors, researchers, designers, suppliers, and contractors. IABSE has the following objectives:

- promote a worldwide exchange of knowledge
- identify present and future needs of the society
- encourage innovations and progress in structural engineering
- promote major achievements in our global world

Bayshore Concrete Products Celebrates 45th Anniversary

Established in 1961 to produce the precast prestressed concrete components for the world famous 17 mile long Chesapeake Bay Bridge Tunnel, connecting Virginia Beach with the Eastern Shore of Virginia, Bayshore Concrete has continued as a premier supplier of a wide variety of precast prestressed concrete structural products.

Operated by a management and staff with world wide engineering and manufacturing experience, Bayshore has expanded its production capacity, and diversified its product line, while maintaining a strong emphasis on quality control. Bayshore personnel are proud of their reputation for outstanding product quality and customer service. Bayshore has produced precast segments for many notable segmental bridges in the Northeast.

Bayshore's main plant (**Fig. 11**) in Cape Charles, Virginia employs approximately 275 people and is centrally located for east coast shipment and readily accessible to ocean, coastal and inland waterways, as well as rail and highway networks.

In 1989 Bayshore Concrete opened a second plant in Chesapeake, Virginia to produce a variety of square piles and smaller structural members to better service the Tidewater/Hampton Roads area of Virginia. The Chesapeake facility employs approximately 85 people.



Figure 11 - Bayshore Concrete Products Cape Charles Facility.

Veterans' Glass City Skyway (I-280)

On December 20, 2006, the Ohio Department of Transportation marked a major milestone towards the completion of the \$220 million Veterans' Glass City Skyway cable-stayed bridge in Toledo, Ohio. On that day the final pair of precast segments for the project was erected at the main span cantilever (Figs. 12 and 13). During calendar year 2006, a significant amount of precast segmental erection work has been completed, with nearly 1300 of the 3050 total segments on the project erected span-by-span and in uni-directional cantilever. During the peak of the work in the summer of 2006, segments were being erected at six sites simultaneously, utilizing a variety of

equipment: two overhead gantries, one underslung launcher, falsework towers, ground-based crane erection and top-down erection of the main span cantilever.

Construction of the 612' main span cantilever and installation of the 20 stay cables has progressed very quickly, with stay cables stressed on average every eight calendar days. Each typical erection cycle included: aligning, applying epoxy and post-tensioning three pairs of superstructure segments; installation of a precast delta frame; casting of closure joints at the bottom corners of the delta frames, as well as a 15' wide median slab; and stressing of both top slab and bottom transverse tendons. Once this cycle was completed, the pre-welded full-length

stainless steel cable sheathing was lifted into position using an innovative highline system. The epoxy-coated strands of the stays were installed and stressed individually. The stays are the largest in the world for a cable-stayed bridge, with a maximum stay size of 156 seven-wire strands housed in a 20" diameter sheathing pipe.

The final main span closure pour is expected to be completed by the end of January 2007. Barrier rails, roadway lighting, expansion joints and the installation of the LED light fixtures and glass panels in the pylon will be completed this spring. Grand opening celebrations are scheduled for the end of May, 2007.



Figure 12 - Placement of final pair of segments Veterans' Glass City Skyway, Toledo, OH on December 20, 2006. (photo courtesy of FIGG).



*Figure 13 -
Placement of
final pair
of segments
Veteran's Glass
City Skyway,
Toledo, OH
on Dec. 20, 2006.
(photo courtesy
of FIGG).*

Figure 14 -
Otay River Bridge
(photo courtesy of
International Bridge
Technologies, Inc.).



Figure 15-
Otay River Bridge
(photo courtesy of
International Bridge
Technologies, Inc.).



SR125 Otay River Bridge

The graceful lines of the Otay River Bridge are emerging in San Diego, California, as construction of the bridge moves into its final phase. The bridge is a critical link in the South Bay Expressway, a new highway that is being built to connect the busy Otay Mesa border crossing with the southern California freeway network.

The Otay River Bridge is being built in the balanced cantilever method. Erection is proceeding on two parallel alignments simultaneously, employing an erection truss that can shift from one alignment to the other after each cycle. This allows post-tensioning operations to proceed on one alignment while segments are being positioned on the other. The bridge includes three mid-span closure joints, where continuity is achieved via internal steel beams.

All cast-in-place concrete substructure elements are now complete, and only two of the eleven piers remain for superstructure erection. Precasting operations are



Figure 16 -
Otay River Bridge
(photo courtesy of
International Bridge
Technologies, Inc.).

complete, though segments are still in storage at the precasting facility located in Perris, CA, roughly 80 miles north of the bridge site. Segments are hauled by trailer to the bridge site, where a limited number of segments are stored prior to erection.

Progress photos and a bridge webcam can be seen at www.southbayexpressway.com.

Participants:

Project Owner: California Transportation Ventures

Contractor: Otay River Constructors, a joint venture of Washington Group International and Fluor.

Gantry Supplier: **Rizzani de Eccher**

Designer: **International Bridge**

Technologies, Washington Infrastructure Services International

Penobscot Narrows Bridge & Observatory

More than 15,000 Maine residents and tourists enjoyed a walk on the new Penobscot Narrows Bridge on October 14, 2006. The Waldo Hancock Bridge may be seen in the background.

The Penobscot Narrows Bridge opened to traffic on December 30, 2006 with a group of stalwart Maine citizens who braved a snowstorm and limited visibility to celebrate the end of an era with a parade of antique cars across the Waldo Hancock Bridge (**Fig. 17**). Maine Department of Transportation employees repositioned barricades to shift U.S. Route 1 traffic onto the new Penobscot Narrows Bridge, which was opened with a ribbon cutting and parade of area fire trucks. Traffic flowed over

the new bridge just 40 months after the emergency replacement began in the summer of 2003. The 2,120' cast-in-place concrete bridge has a 1,171' cable stayed main span and features state-of-the-art technology to provide the strands with a protective environment (**Fig. 18**). **FIGG's** patented cradle system was used to carry the stays through the pylon in an alternating V pattern, originating at the center of the bridge. This opened the core of the pylon for use as an elevator shaft to carry sightseers to the top of the 420' pylon and the multi-level glass observatory. Finish work will be completed by the Cianbro/Reed + Reed IV on both the bridge and the observatory by spring, including the substitution of three traditional steel seven wire cable stay strands



Figure 17 - Penobscot Narrows Bridge & Observatory, linking Waldo and Hancock Counties, Maine (photo courtesy of FIGG).

Figure 18 - Penobscot Narrows Bridge (photo courtesy of FIGG).



with carbon fiber composite strands to evaluate this material under actual conditions. The cradle system provides the opportunity for selective removal, inspection and replacement of strands, while the bridge is under traffic. The observatory will open to the public in the spring, followed by the first annual Bridgefest in June of 2007.

Road 431: Advancing Segmental Bridge Technology in Israel

The Country of Israel clearly has an affinity for segmental bridges. Though it is only about the size of New Jersey, Israel has constructed more than 25 segmental bridge structures in the last 20 years.

Despite the country's considerable experience with segmental bridges, the Road 431 Project (Fig. 19) will be the first in Israeli bridge construction history to use external tendons. A Design-Build-Operate-Transfer venture, the Road 431 project consists of an interchange with six precast segmental bridges. These 12.5m wide bridges will have span lengths ranging from 30m to 66m and will consist of 501 precast segments with a total deck area of more than 18,000 square meters.

Finley Engineering Group, Inc. (FEG) is providing final design and construction engineering services for the segmental bridges in this interchange. The contractor, Danya-Cebus, Ltd., was challenged with a tight construction schedule to meet concession agreement requirements and project financing goals. As a result, FEG proposed the use of external tendons to allow for simplified precasting of the segments, reduction in segment cross-sectional area and foundation loads, fewer tendon stressing operations and a reduced design schedule. FEG worked with the contractor during a streamlined final

design process that began in February 2006 and resulted in the casting of the first segment in July.

The design process included a technical review by Israeli General Consultant engineers to confirm that the external tendon system adequately met the project requirements. To assist the Israeli engineers in evaluating external tendon post-tensioning systems, FEG produced a technical white paper that included details of previous projects, excerpts from technical articles, and a list of benefits that the external tendons bring to the project. It also included FEG's analysis of tendon loss scenarios to meet strict bridge security requirements and design methodology for service and ultimate limit state design with external tendons.

This project involves many challenges common in today's construction environment, including a rapid construction schedule and budgetary restrictions. Additionally, the contractor required details that enhanced the long-term durability of the structure; they must own and maintain these bridges in satisfactory condition for 30 years before transferring ownership to the

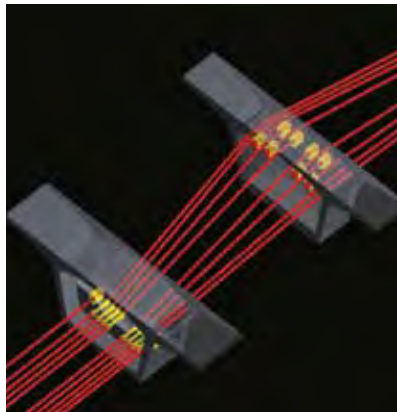


Figure 19 - Tendon layout Road 431 Bridge (photo courtesy of FEG).



Figure 20 - Pier Diaphragm Segment Road 431 Bridge (photo courtesy of FEG).

government. Due to the span lengths and size of the segments, FEG's technical director, Jacques Combault, proposed a combination of internal and external tendons to maximize the efficiency of these precast box girder bridges. Internal tendons are used in the top slab in support of the crane-based balanced cantilever construction, and external tendons are utilized for all continuity post-tensioning. This system was developed with the contractor for more consistent segment precasting configurations, rapid

installation of continuity tendons and fewer tendon stressing operations.

The use of external tendons also provided technical advantages in the bridge design, such as increased ductility for flexural moment resistance and a significant reduction in principle tensile stresses in the box girder webs. These benefits allowed for longer, constant-depth span lengths for the bridges while still meeting the interchange design requirements. The large anchorage zones required for external tendons presented a challenge in keeping the pier segment weight within the 65 ton lifting capacity of the contractor's equipment. FEG utilized a volume element finite element analysis to optimize the pier segment diaphragm design and keep the segment weight within the contractor's requirements. (Fig. 20) Along with the introduction of external tendons, FEG incorporated several other innovations on this project, including the use of diabolos in the pier segments

and deviators to simplify the external tendon details. These post-tensioning details allow for replacement of the external tendons should this be required in the future. FEG also specified the use of pre-packaged grouts, multiple levels of protection and enhanced duct systems to improve post-tensioning system performance. Erection photos for the Road 431 Bridges are shown in (Fig. 21a-d).

The use of external tendons on a segmental bridge project is not a revolutionary concept. But by assessing the contractor's needs and introducing proven segmental bridge technologies to the Israeli construction practice, this approach provided recognized benefits to the owner and contractor with simplified precasting details, rapid erection procedures and improved long-term durability. The Road 431 project offers another case study in the benefits of meeting challenges by seeking solutions that go beyond standard practice.



< Figure 21a



Figure 21b >



< Figure 21c



Figure 21d >

Figure 21 - Erection photos, Road 431 Bridges (photos courtesy of FEG).

Figure 22 - Benicia-Martinez Bridge Overview with Segments Complete (photo courtesy of Kiewit Pacific, Inc.).



Figure 23 - (inset) Benicia-Martinez Bridge Closure Segment Construction (photo courtesy of Kiewit Pacific, Inc.).

Benicia-Martinez Bridge Completes Last Closure Segment

On December 19, 2006 the last closure segment was cast for the Benicia-Martinez Bridge (Figs. 22 and 23). There was a total of 353 segments cast including typical, hinge, and closure segments. The cast-in-place balanced cantilever segmental bridge is located approximately 45 minutes northeast of San Francisco, California.

Participants:

Owner: Caltrans

General Contractor: Kiewit

Designer: T.Y. Lin International/CH2M Hill, a Joint Venture

Construction Engineer: Parsons

Post-Tensioning Supplier: Schwager Davis, Inc.

Form Traveler Supplier: VSL

Susquehanna River Bridge

Pennsylvania's first precast concrete segmental vehicular bridge is nearing completion (Fig. 24). The Susquehanna River Bridge, owned by the Pennsylvania Turnpike Commission, features twin 5,910 linear foot structures to carry I-76 over the Susquehanna River. Erection of the westbound structure was completed on November 7, 2006 and casting of the 1,040 precast segments was completed on December 29, 2006 (Fig. 25). Erection operations of the eastbound structure are on schedule for completion in late February, 2007. The bridge is scheduled to open to traffic by May 4, 2007 and plans are being made for a community bridge walk prior to the traffic opening.



Figure 24 - Susquehanna River Bridge (I-76), December 29, 2006 (photo courtesy of FIGG).



Figure 25 - Last segment for the Susquehanna River Bridge (photo courtesy of FIGG).



Figure 26 -
Rendering of the
Saadiyat Bridge
(rendering courtesy of
Parsons).

Update on Saadiyat Bridge Abu Dhabi Tourism Authority United Arab Emirates

The Saadiyat Bridge (Fig. 26) in Abu Dhabi will serve as the transportation link between the Mina Zayed district of Abu Dhabi and the new Saadiyat Island development. In addition to its role as transportation conduit, this \$125,000,000

Bridge project links the two urban fabrics and will set the stage for the visitors coming to Saadiyat Island.

The 1.5 km long bridge will have a main span of 200 m and is being designed by Parsons to accommodate a 5x5 lane configuration plus a passenger rail corridor. The main spans

will be constructed using the cast-in-place balanced cantilever segmental concrete construction method, while the approach spans which vary in length up to 55 m, will utilize the precast segmental span-by-span concrete construction method.

The design chosen for the substructure main span of the bridge is an asymmetrical “V” Pier. The boldness of the form combined with elegant sweeping curves creates a composition of strength that is appropriate for the bridge. Rustification on the faces of the piers and the superstructure reinforce the visual profile of the bridge and reduce the overall visual mass of the

structure. Likewise, the form of the superstructure has been sculpted to create a sleek and streamlined appearance that masks the massiveness of this structure.

The road lighting for the bridge will be used to reinforce the theme of the bridge and create a linear rhythm to the silhouette of the bridge. The static lighting will serve to feature the sculptural forms of the bridge. Uplights on the main span piers will create a beautiful composition, reflecting in the water. Dynamic lighting along the length of the bridge may be used to generate multiple lighting effects.

Services provided by Parsons include:

- Complete planning and design of the new bridge and adjoining 2 km roadway in the Mina Zayed area
- Support services during the bidding phase
- Construction supervision during the construction phase of the project

The design is complete and the project is out for tender.



Pennsylvania Turnpike Commission's proposed Allegheny River Bridge

The Allegheny River Bridge Replacement Project will be advertised for bid by the Pennsylvania Turnpike Commission on January 31, 2007. FIGG has completed the design and it consists of twin 2,350' cast-in-place segmental bridge structures with 532' main spans (Fig. 27). The project site is adjacent to the well-known Oakmont Country Club, which will host the U.S. Open Golf Championship in June, 2007. Additional information, a Contractor Information Guide and select drawings are available at www.paturnpike.com/Contractor/new_contracts.aspx.

Figure 27 -
Rendering of the
Pennsylvania
Turnpike
Commission's
proposed Allegheny
River Bridge
(1-76), near
Oakmont, PA.
(Rendering courtesy
of FIGG).

Figure 28 -
Duwamish River
Crossing - 350' Main
Span (photo courtesy
of International
Bridge Technologies,
Inc.).



Seattle Sound Transit Light Rail - Progress Report

The Seattle Sound Transit Light Rail Project, Tukwila Segment, consists of 5.2 miles of twin track light rail line, including of 4.6 miles of elevated precast segmental guideway. The contract was successfully bid upon by **PCL Civil Constructors, Inc.** in February 2005. Since that time, and additional extension has been added to the contract, bringing the total amount to approximately \$270 million. The first large scale precast segmental project for the state of Washington, the majority of the elevated line consists of simple spans with a typical length of 120' and will be erected using span-by-span construction with an overhead gantry. The 7' deep box-girder utilized a new cross-sectional shape with a minimized bottom slab and tendons that are both external and internal to the section.

The extension to the project, executed in September 2006, will include an additional 2447' of precast segmental superstructure. Typical spans are also 120' and simply supported. There are an additional two longspan, balanced cantilever structures. The longest is 679' between expansion joints, with a main span of 259'.

Another milestone for the project

was achieved with the midspan closure of the Duwamish River Crossing (**Fig. 28**), which at 350', has the longest span on the project. Activity has also begun at the longspan crossing over Interstate 5, which will achieve a main span of 268' when complete.

As of the end of 2006, approximately 50% of guideway erection has been completed, and 75% of the segments cast. Construction of the project is anticipated to conclude by the first quarter of 2008.

The construction for the project has been very high profile in the Seattle area, and has given local citizens a tangible indication that this long desired light rail project is progressing rapidly. The use of precast segmental construction is a significant reason for this impression.

Participants:

Owner: Sound Transit

Lead Design Consultant: Hatch Mott MacDonald

Sub-Consultant to HMM, Lead Segmental Design: **International Bridge Technologies, Inc.**

Construction Management: **Parsons Brinkerhoff**

Contractor: **PCL Civil Constructors**

Contractor Engineer: **T.Y. Lin Int'l.**

Truss Supplier: **Rizzani/DEAL**

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