

AMERICAN BRIDGE

Connections

SUMMER '09

Temporary Works

"...would by far constitute the largest project executed by American Bridge in recent history."

MICHAEL FLOWERS
ABFJV PROJECT DIRECTOR

ALL PHOTOS BY TOM PAIVA

In this newsletter and throughout the civil engineering industry, the superlatives of the San Francisco/Oakland Bay Bridge's East Span replacement project and especially the signature Self Anchored Suspension (SAS) bridge mainspan currently under construction by the American Bridge Fluor Joint Venture (ABFJV) have been well documented. However, we have seen little of the massive temporary works that are enabling this project. These works, now well underway, are the subject of this article.

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If the temporary works were a stand alone project, it would be a large one. The ABFJV is the design builder for this 'project within a project', which includes the design and construction of twin 607.5m eight-span truss bridges and a 160m erection tower. The temporary bridges will be used to receive, launch, align, and support the permanent twin orthotropic box girder (OBG) superstructure so that the main bridge cable can be anchored in its deck. Once the main and suspender cables are completed, ABFJV will transfer the load of the permanent superstructure from the temporary bridge to the new bridge's cable suspension system. The 160m erection tower will be used as a gantry to lift the permanent steel tower segments weighing up to 1,100mt, then translate them to their final position. All told, these temporary works have a value of about \$325 million (including



"E" line temporary bridge with original bridge on right



Temporary bridge towers fabricated by AB manufacturing

removal) and utilize some 25,000mt of fabricated structural steel. ABFJV Project Director Michael Flowers, P.E., the Executive VP of American Bridge Company, says "As a stand alone project, the temporary works would by far constitute the largest project executed by American Bridge in recent history.

Underlining that sense

of achievement is the fact that the work is being completed on a Design-Build basis".

The designs for the temporary structures for the project are under the overall direction of Ron Crockett, P.E., a Vice President of American Bridge and ABFJV's Technical Director. Ron's charge has also included overseeing the design, construction, shipping and mobilization of the 1700mt *Left Coast Lifter* shearleg crane which will be used to lift many of the heavy bridge and temporary works components. He is ably

assisted by a team of 13 ABF design engineers at the site and 13 engineering consulting firms spread out from Europe to British Columbia and the US. Ron states: "We had a full plate to prepare the means and methods of erection in time for shipments when they start arriving. This included not only the temporary structures but also all specialized rigging, lifting, marine plant and floating equipment. To get it done in time, we organized

four teams that focused on the Temporary Bridge, Box Girder Erection, Tower Erection and Cable Erection. Each team coordinates several consultants as well as self-performs the DE sheets (AB parlance for Details of Erection) for its portion of the work. I focused on the *Left Coast Lifter* while the teams carried on with everything else."

Everything else includes the erection system and equipment design for the 28 permanent OBG segments with individual weights up to 1,500mt, the erection system and equipment design for the 160m erection tower that will be used to lift the permanent bridge tower (some sections weigh as much as 1,100mt, the erection system and equipment design for the installation of the 1,400m long main cable and 200 suspender ropes, and the system to transfer the load of the OBG from the falsework towers to the main cable.

Scott Tudor, P.E., Senior Design Engineer for ABFJV, led the design effort for and is currently leading the erection engineering for the Temporary Bridge team. The twin 607m temporary bridges begin at the SAS's west end, utilizing the permanent W2 Piers as abutments. The W2 Piers are located at the western end of the bridge on Yerba Buena Island in the middle of San Francisco Bay. They are designated W2W and W2E for the westbound (W-Line) and eastbound (E-Line) permanent bridges, respectively. Each of the piers has four, six sided architectural concrete columns. Working with Vancouver based Klohn Crippen Berger Ltd. (KCBL) as its main design engineering subcontractor for temporary works, ABFJV utilizes one of these four columns on each of the W2W and W2E Piers as the abutment by building a structural steel collar

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AB GREEN

Green-Collar Future by Kadi Camardese

It is our future effort at American Bridge to encompass a profound interest for world concerns. Currently one of the ways AB demonstrates attentiveness to global affairs is through a responsible recycling program at its headquarters near Pittsburgh, PA. These efforts to improve the environmental quality of its operations began in 2007, and demonstrate that AB employees are committed to the continual implementation of sustainable principles in the company's daily operations.

Among many environmentally purposed efforts to come, the company has implemented a "Buy Fresh, Buy Local" program at the Pittsburgh office. Employees order produce, meats, seafood and organic goods through the Good Apple Markets website and fresh products are delivered from Pittsburgh's Strip District directly to the office weekly. This provides a convenient way to shop and encourages local farmers simultaneously.

At AB we will continue to develop a company-wide strategy for an environmentally sustainable future. While we develop the important but smaller scale initiatives described above, we are also measuring our company carbon footprint, and will develop long term goals and a strategy to reduce it.

Check out these sites:

<http://constructionjunction.org/>
http://www.fossilfreefuel.com/fossilfreefuel_nonflash.html
<https://www.goodapples.org/index.html>
<http://usmayors.org/recycle/>

"I hoped that starting the (recycling) program in the corporate office would not only set an example to the rest of our company, but also to the many people that AB employees interact with everyday."

BEN REEVE
AB Field Engineer and recycling coordinator



Next Issue Look For: *AB's Carbon Footprint*

OFFICE GREEN:
Keep a ceramic mug from home at your desk instead of drinking your coffee from styrofoam.

DID YOU KNOW?
It takes styrofoam over 400 years to START decomposing.

American Bridge Active

in ARTBA's

Bridge Policy & Promotion Council

American Bridge has leadership roles in ARTBA's (American Road & Transportation Builders Association) Bridge Policy and Promotion Council (BPPC), the nation's only association dedicated exclusively to growing the bridge market in the United States. Bob Luffy, CEO of American Bridge, is the charter Chairman of the Council. Charter members (in no particular order) include construction companies Walsh, Corman, Granite, Skanska, Flatiron, Zachry, Swank, Lane, PKF Mark III, Balfour Beatty, Osmos, and Vecillio Group in addition to American Bridge. Charter engineering companies include HNTB, Figg, Parsons Brinckerhoff, AECOM, Amman & Whitney, HDR, Modjeski & Masters, Gannett Fleming, Hatch Mott McDonald, Transystems, and CH2M-Hill. Other charter members include suppliers High Steel Structures and Emseal; The University of Washington and Florida State University; and the National Steel Bridge Alliance.

The Council is focused on a six part agenda:

1. growing the funding available to reduce the deficient bridge count in the USA,
2. shaping federal and state bridge inspection programs and project delivery methods,
3. creating a strong private sector voice in the development of bridge project financing,
4. streamlining acceptance of new technologies and products in the bridge market,
5. building bridges faster and safer,
6. ensuring that federal and state regulations that impact the bridge market are fair and reasonable.

"We envision BPPC as the go-to source for lawmakers and policy developers about bridge issues, especially focusing on the funding, inspection and delivery system aspects of bridge projects."

ROBERT LUFFY

CEO of American Bridge

BPPC is utilizing the strong governmental relations of ARTBA to stand as a unified voice for the bridge industry to communicate with the federal and state governments that are the primary sponsors of bridge projects in the USA. "What's needed is a communications link with the government to advocate specifically for bridges" says Luffy. "We envision BPPC as the go-to source for lawmakers and policy developers about bridge issues, especially focusing on the funding, inspection and delivery system aspects of bridge projects." The group has already met with House Transportation and Infrastructure Committee Chairman Jim Oberstar (D-Minn) and his top staff, and is assisting in the overhaul of the bridge inspection system in the USA. BPPC is also serving as a conduit for bridge issues in the developing debate over the Highway Re-authorization bill. The current one expires October 1, 2009.

In addition to Bob Luffy, AB's Michael Cegelis is chairing the BPPC Project Delivery Committee. Other committees and chairs include Market Promotion (Linda Figg, Figg Engineering), Inspection Issues (Ray McCabe, HNTB), New Technology (Vijay Chandra Parsons Brinckerhoff), and Financing Issues (Sonny Brown, Zachry American Infrastructure). Membership in BPPC is open to all ARTBA Members. Membership in both ARTBA and BPPC can be arranged through Executive Director Allison Wenograd at awenograd@artba.org, phone 202/289-4434. ^{AB}

TRAINING

by Bob Chance
All photos by Bob Chance

FIELD ENGINEERS

Fourteen new field engineers came to Pittsburgh in June to begin their formal training as "Class of 2009." "I am very impressed with this group," said Bob Chance. "They are bright and eager to get out into their projects and make a positive impact." The engineers will be put through 10 one-week courses over a span of several years to develop them as American Bridge engineers. They will also be included in the formal rotation program. The engineers in class of 2009 were hired from various universities around the country including: University of Pittsburgh, Penn State University, University of Buffalo, Virginia Tech and Cal Berkeley. This is the third group to enter into the Field Engineer training program which now totals 42 engineers.

CONSTRUCTION SUPERVISORS

The American Bridge Construction Supervisor Training, designed for Construction Superintendents and Foreman is also off to a great start. The first weekend training was held in Mobile, AL with 7 Tampa District Superintendents attending from Mobile, Jacksonville, Tampa and Bahamas. A second weekend training was recently completed in the Virginia district with 26 participants. "It was a great success," said Bob. "The district leadership really stepped up and added to the positive impact of the weekend training." Training for New York and Pittsburgh districts are scheduled to be completed before the end of 2009.

GENERAL ADMINISTRATION

Corporate and Pittsburgh Manufacturing Administrative employees were recently asked to participate in an assessment regarding their skills in Microsoft Office Products. Based on the outcome of analysis, it was determined that we needed targeted training to increase skill levels. ContactPoint was contracted to conduct the training in Word, Excel and Outlook. Six one-day sessions were conducted over a three week period with a total of 48 employees participating in portions of the training. ^{AB}

TRAINING PERMEATES MANY FACETS OF AMERICAN BRIDGE



Left to right:
Kara Mullin, Michael Comstock, Benjamin Berardino, Paul Fikse, Chris Deklewa, Benjamin Crowder, Daniel Sheehan, Eric Blue, Zachary Lauria, Zachariah Osei, Troy Bodenschatz, Joseph Stilson, Scott Swamback, (Matthew Boos not pictured.)

The Project Team

Allen Dronko, Project Manager
Tom Fritz and Marc Wooten, Superintendents
Paul Vitucci, P.E., Quality Control Manager
Dan Byrne and Jim Hall, Safety Managers
Chris Bergquist, Sr. Project Engineer
Brian Binder, Field Engineer
Catherine Swain, Project Administrator

Soil Anchor Technology Eases Wharf Reconstruction

Work to be completed by February 2011

The Tampa District of American Bridge is underway with a \$19.3M design build contract to reconstruct Wharf Delta at the US Navy's Mayport Base near Jacksonville, Florida. The contract calls for the replacement of 2,100 LF of wharf. The difficulty in the project is the maintenance of a myriad of existing shore-to-ship utility services located just behind the existing bulkhead, that must remain in service throughout construction. This requirement would have made excavation for the installation of a conventional tie-back system for the new wall difficult and expensive. Therefore AB and its design partner Halcrow decided to utilize soil anchor technology for the tieback system. These tiebacks are drilled in place below the existing utilities, avoiding the necessity of disturbing the ground surface.

The procedure is as follows: AB crews engineer and construct all access systems for the wharf. Drilling subcontractor Commercial Construction Group (DBE) drills access ports through the existing concrete bulkhead, located 5.5' on center. Using AB supplied barges and cranes, specialty subcontractor Hayward Baker drills a 7" casing to a depth of 60', at a 75° angle to vertical. The drilling is assisted by water jetting, which also removes all material from inside the casing. The high strength anchor rod, fitted with spacers to keep it centered, is then inserted inside the casing to its full 60' depth. Grout is injected and pressurized while simultaneously extracting the casing by reverse rotation. The pressurized grout expands to fill spaces between soil particles and any voids, creating a bond between the soil and the anchor rod that enables the anchor to resist forces of at least 170 Kips.

Following immediately behind the soil anchor installation, AB piledriving crews drive a continuous HZ combiwall to a depth of -50'. A horizontal waler is installed between the H-Piles, and the high strength soil anchor rods are connected to it. The soil anchors are then tensioned securing the new HZ wall. The old concrete bulkhead cap is partially removed, and AB carpenter crews then form, reinforce, and place a 15' high concrete encapsulation of the HZ wall. This forms a high quality seawall to service the Navy's mission. ^{AB}



by Kadi Camardese
Special 'Thanks' to Ellen

MS Miles of Smiles

Something fun,
something healthy and something for a
good cause –

that's why dedicated AB employees (along with their family
and friends) volunteered their time off one Sunday morning this May.

And their efforts paid off in the end.

May 27th, 2009 was the 2nd annual Multiple Sclerosis Miles of Smiles race held at
North Park, PA boathouse. Of the 7 participating teams, AB placed *first* with
27 members raising \$540. (Congratulations!)

Ellen Stewart, race coordinator, is passionate about this event as she explains, "With the help of
supporters such as you, we can continue to make an impact in the life of Denise (Stewart's friend)
and others who are afflicted with this neurological, debilitating disease." Since 2008, this event has
collectively raised over \$37,000 for the National Multiple Sclerosis Society research efforts.

It seems the 380 participants and over 200 volunteers affiliated with Miles of Smiles share the same goal
– to help others in need. "Your support has helped us continue to raise public awareness about MS and
helped improve the quality of life of those whose daily reality is Multiple Sclerosis" says Stewart.
Stewart forecasts an upwards of 500 runners at the 3rd annual Miles of Smiles race to be held on
May 16th, 2010. Mark your calendars. The pre-registered cost is only \$20 per person - and dogs?
Well, this is how Stewart put it, "There is no cost for dogs. We just enjoyed seeing them out there
walking!!! This year, we had a last minute donation of dog treats, so every dog received a prize."

Bring your families, your friends and your dogs to be part of AB's Miles of Smiles 2010
winning team. **AB**



Top Row: Eamonn Clements, Anthony Deramo (AB), Trevor Kennedy, Andy Graff (AB), Carson Carney (AB), Liam Carney, Henry Mykich (AB)
Middle Row: Amanda McCrum, Eric Lansberry (AB), Shawn Roman, Karen Roman (AB), Erin Mitchell (AB), Jennifer Pelligrene (AB), Kelly
Carney, Janet Cordero (AB), Dickie Foster (AB), Saunie Kosar, Dave Kosar (AB)
Bottom Row: Bryn Carney, Eva Carney, Andrea Ward, Denise Mykich
Not Pictured: Bob Chance (AB), Amr El Nokali (AB), Nermeen El Nokali, Tony Noxon, Debbie Schoenbeck
The Dogs: Sophie Clements (left), Keesha Mykich (right)

Human Resources



by Erin Mitchell

Blues on Call is provided by our medical provider, Highmark Blue Cross Blue Shield. It is a comprehensive health information and support program. This program offers a variety of up to date and easy to understand health care resources. Contacting Blues on Call connects you to a Health Coach, who is a specially trained medical nurse. Your personal health coach is available to discuss questions about any health topic that concerns you – from a rash to a recent diagnosis.

You do not have to be ill to contact a Health Coach. You can learn about valuable programs and resources that address stress management, personal nutrition and more. Once you have established a relationship with your Health Coach, he or she is then familiar with your concerns or conditions, and will be your personal health coach.

Health Coaches are available 24 hours a day and you can call as often as you want. With Blues on Call, you speak directly to a live person – *not an automated system*. A nurse can be reached at 1-888-BLUE-428. ^{AB}



**"If you'd like to press 1, press 3.
If you'd like to press 3, press 8.
If you'd like to press 8, press 5..."**

AB
WELLNESS PROGRAM
American Bridge is committed to employee wellness and would like to begin implementing wellness programs throughout the company. You will soon be receiving a survey regarding wellness incentives and ideas. This survey is anonymous and it is your opportunity to express your suggestions on the wellness program. ^{AB}

LIFE SOLUTIONS EAP PROGRAM

Frequently Asked Questions

1. Who can use *LifeSolutions* services?

Employees and their household members. Household means family members living with the employees, children in school, children away from home and unrelated people living in the home.

2. Why would a person use *LifeSolutions*?

People use *LifeSolutions* for many reasons. Many of our callers contact us to obtain professional help for stressful or challenging situations. Other employees contact us seeking personalized work/life consultations and referrals from our *WorkLife* services for matters such as legal or financial issues. Others are looking for information on how to choose a god child care service. Please check with our call center to obtain American Bridge's level of legal and financial referral services.

3. Will my supervisor know I came to *LifeSolutions*?

LifeSolutions services are completely confidential. The only way that any information is released is:

If you have signed a release for your *LifeSolutions* counselor to talk with your employer based on a mandatory referral. Under legal requirements as stated by the law (such as a person being dangerous to himself or herself and/or others). Your *LifeSolutions* counselor will review confidentiality with you and will clarify any questions you have at that time.

4. Is there a co-pay for *LifeSolutions* services?

No, *LifeSolutions* is a workplace benefit – independent from your health insurance. In fact, many employees use *LifeSolutions* services in place of their behavioral health insurance to avoid having a co-pay. A visit to one of our *LifeSolutions* counselors does not cost you anything nor is it reflected on your health record. American Bridge has purchased this confidential service for all of its employees and has chosen to offer an excellent benefit which enhances both your own and your family's well being.

5. Do you offer marital counseling?

Yes. Marital and family issues are one of the major reasons employees use *LifeSolutions*' services. Our providers are highly skilled in working with couples and families.

6. What are *WorkLife* services?

WorkLife services provide employees with personalized consultation, research, and referrals to help them address a wide range of everyday challenges. *WorkLife* services include resources for:

- Child care
- Elder care
- Legal referrals
- Financial information and debt management

Daily living needs such as home repair, consumer information, health and wellness services, and transportation information. Our members use *LifeSolutions* *WorkLife* services for information on these and many other services. *LifeSolutions* can help make members' lives a bit easier by doing the initial work for them.

7. How do the legal referral services work?

When one of our members calls *LifeSolutions* with a legal question, our legal specialist reviews the request with the caller and then provides the name of a local attorney near their home or work who can provide a 30 minute in-person or by-phone consultation regarding that specific issue. If you need additional services, the attorney can provide consultation for most services at a 25% discount. Please check with our call center to obtain American Bridge's level of legal referral services. Please note that we do not handle any legal issues related to your employment or employer.

8. Can *LifeSolutions* help find housing options for an employee's aging loved one?

Yes. *LifeSolutions* elder care experts can help you identify the kinds of resources your family needs. We can help you research housing options and alternatives for you and your family to consider.

9. Is my friend who lives with me eligible for *LifeSolutions* services?

Yes. Anyone who lives with you is eligible for *LifeSolutions* services.

10. Will my *LifeSolutions* records be part of my HR file?

No. *LifeSolutions* records are only accessible by our staff.

11. Can I talk with a *LifeSolutions* counselor over the phone?

Yes. If you prefer telephone counseling, an appointment will be scheduled with a *LifeSolutions* counselor if appropriate. There are some concerns that are more appropriate for an in-person appointment.

12. My child is having problems at school. Can I use my *LifeSolutions* benefit for him?

Yes. The *LifeSolutions* benefit is for you and anyone who lives in your household. Your *LifeSolutions* counselor will meet with the child and a parent to discuss the issues and to make recommendations, which may include referrals to local resources. ^{AB}



“People will often ask, ‘Where are the magnets in your shoes?’ They think nothing is real anymore, that everything is modern technology, so they don’t believe that people really risk their lives for entertainment.”

NIK WALLEDA
HIGH WIRE PROFESSIONAL

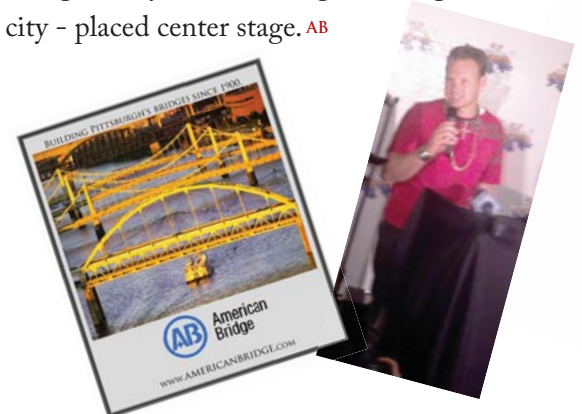
Pittsburgh Regatta

by Kadi Camardese
All photos and ads by Kadi Camardese



Regatta, in a traditional sense, is a boat race or a series of boat races ... Pittsburgh’s was a party. The entire weekend of July 3-5 activities for all ages were scheduled in a section of the Tribune Review newspaper in which American Bridge advertised (left bottom). As a sponsor of this event, AB enjoyed the VIP party at PNC Park Home Run Club where guests had a perfect view of the tightrope act positioned adjacent to the AB built Roberto Clemente Bridge (left). Afterwards the high wire record holder, Nik Wallenda, was interviewed as he told about his third-generation risky entertainment career (bottom right).

Just a short walk away is Pittsburgh’s North Shore where a stage is built each year atop a barge in the water. The AB Marketing Department designed a banner that focused on the company’s long history of connecting Pittsburghers to their city - placed center stage. **AB**



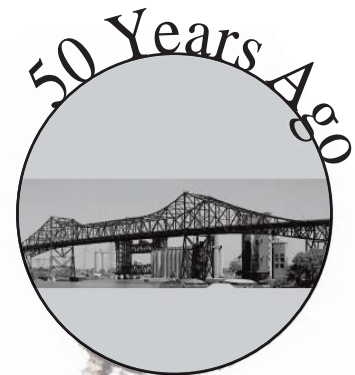
FLASHBACKS

In 1908, American Bridge completed the Hakonstadir 90' pony truss bridge in Eastern Iceland for the Icelandic Roads Commission. The bridge was completely (and beautifully) restored by the Government of Iceland in 2008, and it still serves drivers crossing over the Jökulsá River. The picture was provided to AB courtesy of the Government of Iceland. AB Order Number - C-1151.



The 10th Street Bridge has been connecting Pittsburgh natives and visitors to its historical South Side and students to Duquesne University for over 75 years. Erected by prime contractor American Bridge in 1932, this yellow suspension bridge crosses 1,275ft over the Monongahela River. The bridge has a stiffening girder and possesses parallel wire strands for the main cables. AB Order # G-4180-99.

American Bridge was the prime contractor for fabrication and erection of this nine-span bridge on the Chicago Skyway over the Calumet River. The bridge includes 3 x 208' deck truss spans for the north approach, 3 x 178' deck truss spans for the south approach, and a 3 span 1,300' cantilevered truss with a 650' main span and 325' anchor arms. The bridge was erected using an American Bridge S-2 traveler derrick as well as falsework bents to construct the anchor arms and cantilevering the main span from two fronts. It took a total of 8,777 tons of fabricated steel to complete what is known in Chicago as the "High Bridge." AB Order # Q-9334-40.



If you had a deserted island it would cost about 35 million dollars to turn it into a fairy tale adventure, at least that's what the price tag read ten years ago. In 1998 American Bridge transformed an uninhabited island in Abaco, Bahamas where no services or docking facilities had previously existed into Castaway Cay Out an out island Adventure. - and it has been 'making dreams come true' ever since.

This \$34,671,000 contract included, a 1.3 Mw power plant (three 455kva units with load sharing) and electrical distribution system, RO water treatment plants (two 20,000 GPD/ each) and water distribution system, wastewater treatment plant and gray water distribution system, incinerator, 550,000 CY of dredging to 35 ft., 1,200 LF of pipe Z piling ship berth with cast-in-place concrete cap, RO-RO berth, small craft marina, beach construction, 2,500' of chip seal roadway, 1,500' of stamped concrete roadway, construction of 25 themed buildings for food and beverage, retail, aquatics, post office, massage huts, cast housing, etc., landscaping, graphics and signage. AB Order #450910.

Post-contracts specific to Castaway Cay:

1999 - Hurricane Floyd Emergency Repairs - AB Order #400310.

2000 - Hurricane Floyd Repairs - AB Order #491410.

2003 - Miscellaneous Rehab - AB Order #430810.

2005 - Hurricane Francis Restoration - AB Order #445810.

2010 - Expected Completion of Enhancement Project - AB Order #486710.^{AB}



around the column at about elevation +45m. According to Bruce Hamersley, P.Eng., Senior Project Engineer at KCBL: “The Owner’s proposed temporary tower configuration in the tender documents included individual towers with bracing in both transverse and longitudinal directions. During the development of the design we determined it would be much better from an access and operations standpoint to provide continuous trusses and walkways for the entire bridge length. The continuous truss could then be connected at each end to the suspension bridge end piers using collars to provide longitudinal stability for the trusses. The longitudinal bracing between the temporary towers could then be eliminated.”



Mating of the OBG in fabricators yard

Foundations

The temporary bridges use a variety of foundation systems. Their seven bents are labeled A through H (there is no “E” in order to avoid confusion with the E-line) starting on Yerba Buena and progressing eastward toward Oakland. Towers A, B, & C each have four columns; two for the east bent and two for the west. The foundations for Towers A and B on the W-Line (westbound bridge) sit in a sharply sloping terrain of weathered sedimentary rock. Since access for normal pile foundations was impossible, micro piles were utilized at three of the four tower legs. These piles utilize a 194mm steel casing that also serves as a rotating bit, and they are installed in short sections by small machines. The casings are rotated to the rock layer, and then excavated with sockets up to 10m deep. A total of 28 micro piles were installed, including six on an 80° batter. The fourth (south) tower leg of AW and all four legs of Towers AE and BE were more easily accessible by traditional drilling equipment, and are founded on single 1574mm diameter drilled shafts reaching depths of about 10m including a 6m rock socket.

The four legs of the two C towers (W-Line & E-Line) are also founded on concrete pilecaps on 1574mm diameter drilled shafts, two per tower leg. One of these legs is in water and the other three are located on land.

Towers D, F, & G are complex deep open water foundations with pile depths to -65m. Tower D is located at the main suspension bridge tower location, adjacent to the navigational channel. All water foundations consist of a steel frame with pipe sleeves that double as a pile driving template and a steel

cap for supporting the towers. They were each designed to resist 7,600kN of vessel impact. The pile sleeves enable the efficient and accurate positioning of the piles, over 75% of which are battered. In addition to serving as a piledriving template, the driving frame contains structural steel framing that evenly distributes the temporary tower loads. Each driving frame for the F & G towers has a weight of about 3,100mt, including the piles. The piles are 1067-1220mm, with 32mm wall thickness. In all, Towers D, F, & G have a structural steel weight of 7,750mt, including piles. Tower H is located at (permanent) Pier E2, which was constructed in another contract. No temporary pilings are necessary at this location, since the permanent pilecap provides sufficient working surface to erect temporary columns to support the temporary trusses.

Truss Superstructure

The temporary bridge superstructure consists of twin seven-span, 607.5m trusses, with the easterly span cantilevered. The trusses are each ten meters wide, and range from 6.5 to 12.5m deep. They are being erected in 35 stages by a variety of methods. The over-land trusses were assembled in planes, and erected with crawler cranes in single pieces ranging from 13-35m, and weighing up to 65mt. While both the E and W Line erection began simultaneously, the east generally proceeded ahead after the first couple panels. Scott Tudor noted that “the progression of the temporary tower and truss erection was based on several limiting factors. One factor was the steep slope on the north side of YBI that limited the reach of land-based cranes in the level area between the E-Line and W-Line. Another factor was the shallow bay water and the environmentally sensitive area (ESA) adjacent to the W-Line truss between Towers BW and CW that limited reach and access for water-based cranes. Additionally, progressing on the E-Line towers and truss allowed time for fabrication to complete on the W-Line and for engineering to develop a plan to erect the 128m long, 700mt large span truss lift between Towers BW and DW.”

As a result, E-Line erection proceeded into the over-water spans well ahead of the W-Line. The truss plane erection method continued nearly through Tower D on the E-Line. One 40m segment over Tower D was erected in a double crane pick, with a weight about 240mt. By contrast, the

W-Line trusses and the E-Line trusses east of Tower D were fully assembled in the Zhenhua Port Machinery Company (ZPMC) fabrication shops, and were erected by the 1700mt capacity *Left Coast Lifter* that the ABFJV designed and built specifically for the needs of this project. These lifts ranged to 125m segments weighing 1,000mt. “The temporary work field work has been a success due to the leadership of general superintendent Jerry Kent, ironworker superintendent Danny Dunn, and field engineer Katherine Quillin in addition to the ironworkers working out of Local 377 and Local 378,” said John Callaghan, Project Manager-Temporary Works, for the ABFJV. “Without these individuals the dreams of engineers would never get built.”

The trusses have a depth of 6.5m from Pier W2 through Tower D, then increase to 8m through the vicinity of Tower H. At temporary tower H (located at permanent Pier E2) the truss must pass under the E2 transverse concrete cap beam. This requires complex truss geometry. Says KCBL’s Hamersley: “The Owners proposed temporary tower configuration in the tender documents included additional temporary towers on both the west and east sides of pier E2. By founding the tower on the piercap and cantilevering the truss to the east to support Lifts 13 and 14, these additional marine foundations could be eliminated, achieving significant savings. The truss geometry is very complex as the top chord has to drop under the pier cap beam, and the truss must be deepened to handle the enormous forces from the cantilever.

How the Temporary Bridge Will Be Used

Kevin Smith, P.E., Deputy Technical Director for the ABFJV, leads Team Box Girder Erection. In this role he is concerned with the means and methods of erection, including the special rigging and transport systems required for the large orthotropic box girders. The OBG segments are 5 meters high, 27 meters wide and range from 25 meters to 70 meters in length and 520 to 1,500mt in weight. The box girders are erected upon cradles to distribute their massive weight into several support points. Each cradle is designed with a pair of rocker beams to equalize the loads imparted into the box girder floorbeams.

To fulfill its ultimate purpose, the temporary trusses are

designed to support the vertical loads from the box girders as well as lateral loads from wind and seismic. “As part of the design build process for the temporary trusses, ABFJV’s Box Girder Erection Team provided input to KCBL to incorporate features into the temporary trusses that will simplify erection and final positioning of the box girders”,

says Kevin. “One of the key features is the sliding pedestals which are built into the truss at several panel points. At key locations these pedestals are designed to accommodate a vertical

jacking system. The jacking pedestals are capable of adjusting the elevation of the box girders between 250mm and 475mm. All pedestals are topped with Teflon lined bearing pads which interface with stainless steel cover plates on the underside of the cradles to reduce friction during sliding operations.”

The location of some of the box girders over Yerba Buena Island are such that they can not be reached with the *Left Coast Lifter*. These lifts will be placed on the temporary trusses over the water and slid to the west, up to 200m, to their final locations. A custom built pushing frame, designed by Allnorth Consultants, Ltd. of Vancouver, Canada, will be used to



New bridge tower section

slide the OBG lifts on the truss. This pushing frame is equipped with a pair of 150mt capacity jacks with a stroke of 3.2m each. With the pushing frame secured to the truss, the jacks will be extended thereby moving the box girder forward. At the end of the jack stroke the

pushing frame restraints are disconnected from the truss and the jacks are retracted, pulling the pushing frame forward. This process is repeated until the box girder has been slid to its final location.

Other devices used to manipulate the OBG lifts into their final locations are the vertical and lateral jacking systems. Eight 350mt capacity jacks will be located under each OBG lift to adjust its position and align the box girder splice for bolting and welding. Likewise, eight 50mt jacks will be used per lift to make lateral adjustments.

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T1 Temporary Erection Tower

Nick Greco, P.E., Design Engineer for ABFJV, leads the means and methods portion of Team Tower. In his role, Nick leads the design effort for the T1 Temporary Erection Tower design, and the means and methods for building both the T1 Temporary Erection Tower and the Permanent Bridge Tower. Team Tower worked closely with KCBL to design the 160m tall T1 Temporary Erection Tower and it's 1,455mt capacity gantry system, which will be used to hoist the Permanent Tower shaft lifts into place. The T1 Erection Tower will also provide the workers access to the Permanent Tower.

The T1 Erection Tower is four sided with a base footprint of 20 x 16m. It tapers to 14 x 16m at elevation 47m in order to pass between the north and south box girder sections. Temporary Tower D Driving frame will provide the erection tower its base foundation and surrounds the Permanent Tower footprint on Pier T1. The erection tower consists of box shaped members using a chevron brace configuration. The east face is opened by eliminating the chevron braces and using two pairs of latticed columns, which allows the gantry system to lift the permanent tower segments from a barge and translate them into place.

The erection tower will be erected to elevation 70m from the water using one of two of the project's pontoon mounted 4100W Ringer cranes. Once the T1 Erection Tower is erected to 70m, the 4100W Ringer will erect a self climbing, 65mt capacity Favco tower crane on the North side of the erection tower. The base of the tower crane will be supported from a platform at 59m, which will cantilever above OBG Lift 6W. This crane will be used to erect the remainder of the T1 Erection Tower, the personnel hoist and stairs located on the South face of the erection tower, miscellaneous components of the Permanent Tower (i.e. shear links, shear link facades, etc), and be used as a general support crane for the work. The Favco tower crane will reach a height of 100m from its platform and will be braced into the T1 Erection Tower in 4 locations along its height. The T1 Erection Tower will be erected in 4 major stages corresponding to the 4 stages of the Permanent Tower, always built higher in order to hoist the Tower lifts into place with the gantry system. Four major work platforms will be

located at the 4 field splices of the Tower shafts and accessed via the South face stairs and personnel hoist.

In order to achieve significant material savings (roughly 50%), KCBL used the Permanent Tower as the primary means of lateral load resistance for the T1 Erection Tower against lateral loads induced by lifting operations, wind, and most notably, seismic events. Elastomeric bracing pads were incorporated into the design of each of the 4 main work platforms, which created a direct lateral load path from



Diaphragm at fuse location

the T1 Erection Tower to the platform framing and eventually to the robust Permanent Tower. The Favco bracing locations were also strategically placed to coincide with the work platform bracing so as to direct the tower crane's lateral loads into the Permanent Tower as well.

“The Permanent Tower might be the biggest cantilever beam you'll ever see so why not take advantage of it. We cut down a considerable amount of material in the erection tower by bracing off of the Permanent Tower with our bearing pads and letting it do the majority of the work. This took a lot of time and expense up front with the analysis and design but the fabrication cost savings proved to be worthwhile,” says Greco.

“We cut down a considerable amount of material in the erection tower by bracing off of the Permanent Tower with our bearing pads and letting it do the majority of the work.”

NICK GRECO, P.E.,
AMERICAN BRIDGE
DESIGN ENGINEER

How the T1 Temporary Erection Tower will be Used

The main function of the Temporary Erection Tower T1 is to support the gantry that will lift the permanent tower sections into place. The gantry consists of two main runway girders and a three tiered gantry system. This system allows translation in both east-west and north-south directions via “gripper” jacks connected to Hilman rollers. The jacks grip the top flange of the beams using a fulcrum-jack mechanism and a separate push-pull jack connected to the Hilman rollers to push and pull the gantry. The Hilman rollers range from 400 to 800mt capacity. The two main runway girders cap the erection tower and are 2.5m deep, 33m long, sit on 3 pot-bearings, and are

supported on a propped cantilevered platform east of the main erection tower columns. Two 660mt strand jacks will sit on the top tier of the gantry and will be used to lift the Permanent Tower sections.

The gantry will hoist into place a total of 18 major lifts ranging from 450-1,100mt. The 18 major lifts include 16 permanent tower shaft lifts, 1 permanent tower saddle grillage, and 1 tower saddle. The tower saddle caps the permanent tower and will be hoisted by the gantry system a total height of approximately 156m. The tower saddle lifting operation is projected to last approximately 10 hours.

Temporary Works Fabrication

The temporary work has been manufactured by fabricators in the US and elsewhere. The pipe piles were fabricated by Twin Brothers Marine of Port St. Mary, Louisiana, and the 9200mt of pile were delivered by barges to the site. The temporary towers AE, AW, BE, BW, CE, and CW and the truss superstructure through Tower C were fabricated by American Bridge Manufacturing in its Reedsport, OR, and Coraopolis, PA shops. This work totaled 1,727mt and was delivered to the job by truck. Walkways for ABM's trusses were supplied by GO Supply of Vallejo, California. The D driving frame was fabricated by Jesse Engineering of Tacoma, Washington. This work totaled 941mt and was delivered by barge. Jesse also fabricated the erection tower gantry, which totals 183mt. The transfer girders which attach the D driving frame to the T1 foundation were fabricated by Lortz Manufacturing of Bakersfield, California. These four 98mt weldments were delivered by multi-axle heavy haul trailers. The F and G driving frames were fabricated by XKT Engineering of Vallejo, California. This fabrication totaled 2,130mt and was delivered by barge.



ZPMC crane operators

In order to accelerate the temporary works fabrication, ABFJV also purchased welded box sections from Tung Kang Steel Structures of Taiwan. These sections were assigned to various fabricators for their use. The remainder of the temporary works, including Towers D, F, G, & H, the



ABFJV's 150 person fabrication management & inspection staff

truss superstructure from Towers C through H, and the T1 Temporary Erection Tower are being fabricated by Shanghai Zhenhua Heavy Industries (ZPMC) of Shanghai, China. These items total in excess of 8500mt. The towers and truss delivery is by three dedicated ships with some cradles and parts of the T1 erection tower to be shipped with permanent work shipments.

"We split up the fabrication in order to optimize delivery time and price. Twin Brothers is a first class operation, both ABM and ZPMC have done an excellent job with the trusses and towers, Jesse and XKT have done a great job with the driving frames, and Tung Kang was extremely helpful with the welded box sections", says Callaghan. "American Bridge Manufacturing had a particularly difficult contract to fulfill with only a short time to fabricate and deliver to the hook due to lack of storage space at the jobsite. In spite of that, ABM's material fit up great and the iron was delivered

when we needed it. In my book, that's a successful job".



Skilled workers from ZPMC's fabrication shop

Which part of this large-scale temporary works project is most vital?

Perhaps it is the 1,700mt Left Coast Lifter, which was designed and constructed for this project alone. Perhaps it was the 25,000mt temporary bridge and tower that was designed, fabricated and constructed to support the permanent construction. Or maybe it's the 1,455mt gantry that will lift permanent tower sections to their 150m height, or the ingeniousness of the launching system mounted on the temporary truss. Each of these as well as a variety of temporary foundations used during the project are cardinal in enabling the construction of the seismically competent signature span of the new San Francisco Oakland Bay Bridge Eastern crossing.

And the temporary works would not be possible without the experience, hard work and expertise of the design and engineering teams. This is truly a 'project within a project.' As John Callaghan put it – "without these individuals the dreams of engineers would never get built."^{AB}

WE WOULD LOVE TO HEAR FROM YOU.

If you would like to contribute:

Feedback
Suggestions
Events
Comments

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CURRENT CONTRACTS BY DISTRICT

New York

Marine Parkway Rehabilitation, NYC
Throgs Neck Bridge Strengthening, NYC
Bronx Whitestone Bridge Strengthening, NYC
South Grand Inland Bridge Redecking, Niagara River, NY
RFK (Triborough) Bridge Strengthening, NYC

Richmond

Pier 31 Groton, CT
Vehicular Bridge Replacement, Kittery, ME
Repair Dry Dock, Berth 11, Kittery, ME
M-140 #2 Complex, Kittery, ME
Pier R3-Repairs Yorktown, VA
Chesapeake Bay Bridge Redecking, Annapolis, MD
Chincoteague Bridge, VA
Radio Island Pier, Morehead City, NC

Tampa

Marine Improvements (Bakers Bay), Abaco Bahamas
Ritz Carlton Rose Island, Nassau, Bahamas
Pinto Island Terminal, Mobile, AL
Mayport Warf Delta, Jacksonville, FL
Albany House Marina, Nassau, Bahamas
Castaway Cay Enhancements, Abaco, Bahamas
Roatan Cruise Terminal, Honduras

Pittsburgh

Kentucky Lakes Bridges, Paducah, KY
Point Marion Bridge, PA
Williams Gas Pipeline Bridges
Recabling, Houston, TX

Western

AB/Fluor-Oakland Bay Bridge

American Bridge Manufacturing

145th Street Swingspan Truss Fab, NYC
Wm Preston Lane Mem. Bridge (Re-Decking & Rehab) Fab, MD
Huey P. Long Bridge (Widening) Fab, New Orleans, LA
Point Marion Bridge (Truss), PA
CSX Ohio River Bridge (Rehab) Fab, PA
Harold Structures Fab, Queens NYC
Bronx Whitestone Bridge (Strengthening) Fab, NYC
East River Park, NYC
NSRR Conway Yard Bridge Fab, PA
RFK Bridge (Strengthening), PA
Irvin Mills Road Bridge (Plate Girders) Fab, NY
Hoover Dam Bridge (Box Girder) Fab, AZ-NV
MDOT CPR Overpass Fab, MI
SAS Temporary Works (Truss) Fab, CA

company news

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