

Highlights

- Baulderstone Hornibrook Constructors add to their Sydney landmark structures.
- Australian Constructor employs a U.S. Engineering Consultant to build a bridge.
- E-mail technology facilitates U.S. transfer of technology, world-wide

Items

- The Anzac Bridge joins Sydney's Harbor Bridge and the Opera House by Baulderstone Hornibrook.
- Marketing effort yields two Bridge Construction Engineering contracts for the price of one.
- First impressions can be long-lasting.

SPANS



Public Works Department
Bridge Team

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BUSINESS DEVELOPMENT: 101

The Consulting Engineering profession's character has paralleled the evolution of Society since the time of Imhotep and his work on the Step Pyramid at Sakkara for King Zozer 4760 years ago. As recently as 200 years ago the North American and Continental University had no engineering schools. The educational path for the bridge engineer led through the foundries where iron, the new building material was shaped into the ever increasing spans demanded by society. The past 25 years has witnessed an explosion of litigation in the USA which has played a part in the trend of small Consultants being

assimilated by large, multi- disciplined firms.

Furthermore, this evolution has seen the recent advent of computers making it easier for American Engineers to project their diversified, practiced know-how into the less developed, global marketplace. A good example of this is the real case of a small consultant, with a Tampa office, doing a project in Melbourne, Australia. They were closing in on the due time for delivery of the 200 sheets of engineering drawings just completed. A call was made to their local, joint venture partner in

Melbourne to notify them that all of the drawings would be coming to them in a zip file. The file was e-mailed to them in a matter of minutes rather than the transmission of the cumbersome hard copy.

It is incumbent upon the Consultant, large or small, to generate billable work in order to sustain themselves. Herein lies the dilemma. Knowledgeable business development people have to "ride point" for their firms in order to discover business opportunities. The gestation period from the identification of a potential, major bridge project to it's' need for consultant



FIGURE 1: SYDNEY, AUSTRALIA'S ANZAC MEMORIAL BRIDGE SEEN LOOKING EAST FROM GLEBE ISLAND

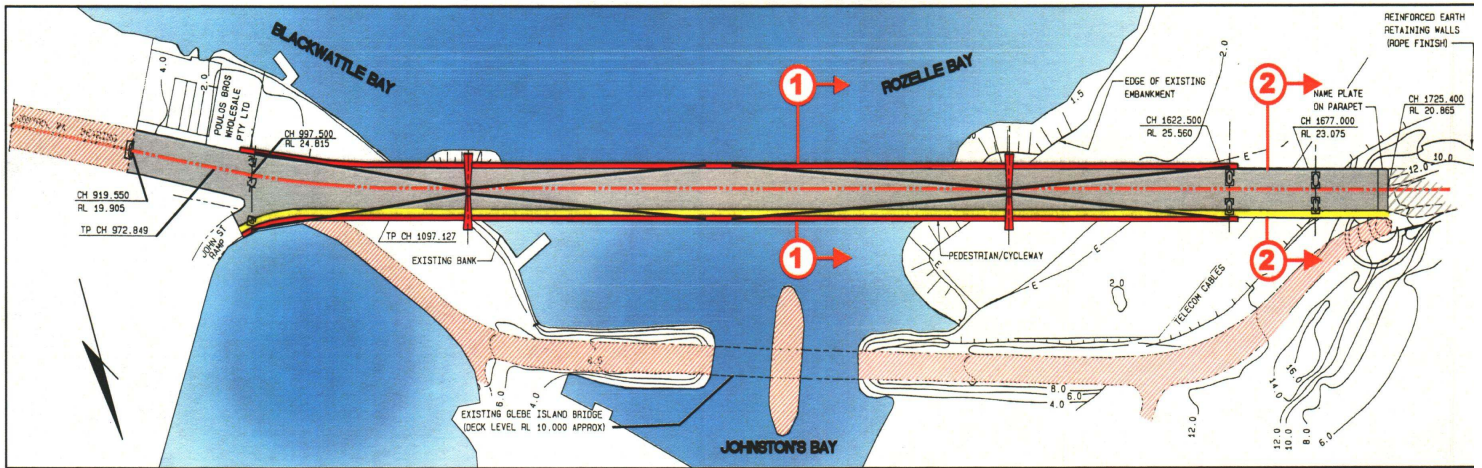


FIGURE 2: LOCATION PLAN AND SECTION MARKS FOR GLEBE ISLAND, ANZAC BRIDGE WEST OF SYDNEY BUSINESS DISTRICT.

services varies, typically, between one to ten years. However, if the Developer is dynamic and trustworthy, work will, on occasion, find him.

In 1989 a small Consulting Engineering firm's business developer in Tampa was invited to meet with a group of governmental officials from the Roads and Traffic Authority (RTA) of New South Wales (NSW) Australia by a very large, International Consulting firm. The RTA was the Owner and Design Engineer for the Glebe Island Arterial, Cable Stayed Bridge over Johnston's Bay, in Sydney (Figures: 1&2). The group from RTA consisted of two talented young engineers. This was a great responsibility for a landmark structure in one of the world's most famous cities, especially for these young engineers.

These two Australians were obviously very capable and had completed the design for the first structure of this type they had experienced and, presumably, they were seeking reassurance. They were asking questions about the management, documentation and administration of cable stayed bridge projects when an anomalous question arose as to what their experience had been with the L/R ratios for edge girders that were in compression from (the horizontal component) of the attached stay during construction before the deck girder and slab were cast (Figure: 4, Section: 1, Detail: A).

The answer that returned from the big consultant's home office was something just a fraction over 1 which apparently did not sit well with the two Australians. The Developer, a practiced engineer, knew this was not what they wanted to hear so he called his boss and introduced them on the speakerphone. The matter of fact response that tumbled back satisfied the two young men for it was 6.5 and within a few tenths of the figure they had estimated.

This information is not a consideration in the classroom, or for that matter, in the

Contract document for it would only be an issue during construction, as the deck comes together, sequentially. There are usually two engineers employed on a large bridge such as this and one does the Contract Design for the owner (RTA) and the other performs the design for the Contractor and this task is known as Construction Engineering.

The bridge, as it grows sequentially through its evolving configurations is being subjected to the greatest loads the structure will ever experience while at its weakest. One construction scenario for a suspended, cast in place deck on a cable stayed bridge is to cantilever the edge girder forms only, forward, off the previously placed segment and then attach

the stays to the free end of the cantilevered, edge girder forms using only a fraction of their stressing capacity.

Next, cast the edge girders complete then allow them to cure before adding stress to the stays anticipating the advancing deck and deck girder forms. Following this, the deck steel is positioned and the deck concrete is cast. Most of the western half of the cable stayed bridge (Figure: 3) was constructed by balancing stayed, segment construction about the tower. With this work completed the forms and equipment were transported and positioned for reuse in the construction of the east half of the bridge.

Within a month of the two RTA



FIGURE 3: WESTERN TOWER CONSTRUCTION SEEN FROM GLEBE ISLAND.

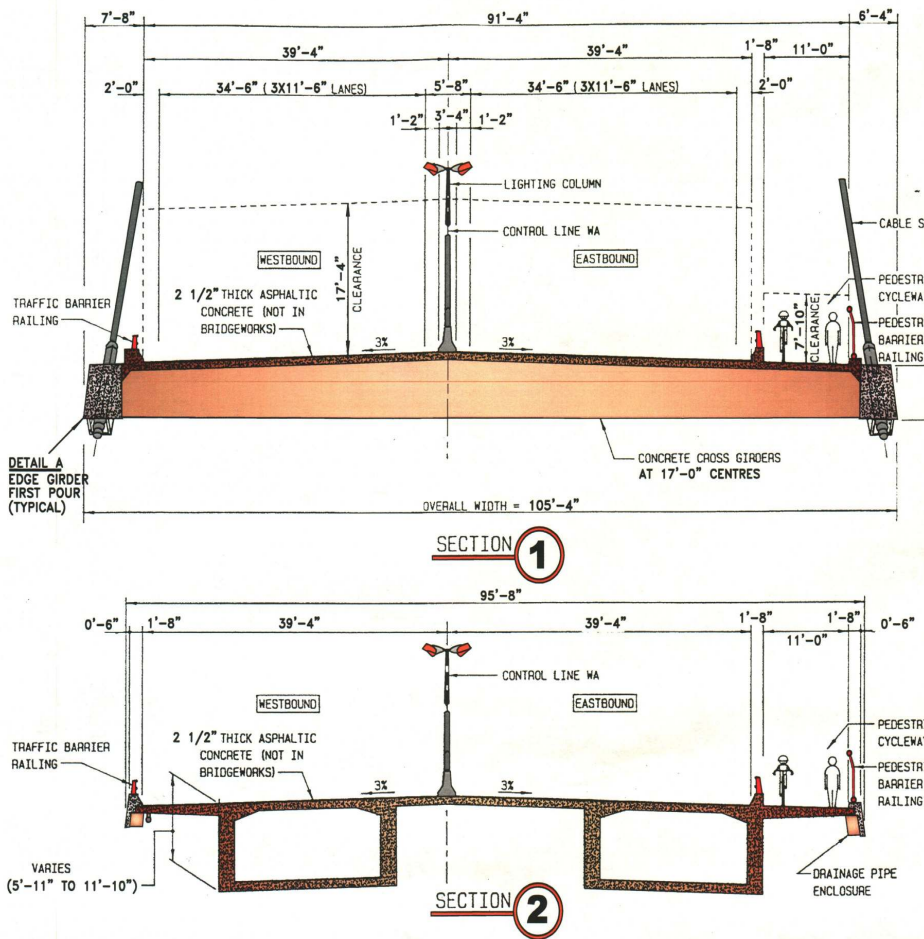


FIGURE 4: SECTIONS AT THE MAINSPAN & THE WESTERN APPROACH

Engineers returning to Australia, the Developer received a call from a contractor in Australia who was coming to the USA and wanted to meet. Mr. David Saxelby and Mr. John O' Leary, of the Contractor Baulderstone Hornibrook (BH) arrived and broached the issue of the small, US firm providing construction engineering to their Contracting Company on the Glebe Island Bridge. For nearly two years the Developer communicated with BH in preparing qualification documents for the on-again, off-again tendering process. Finally, notification was received that the award had been made to BH and arrangements began for engineering work to begin.

The plight of the Developer now that a project had been secured and a project number was assigned and the engineering staff could begin billing to this number is that the Developer continues his search for new work charging to the dreaded, home office overhead.

Construction began in March, 1992 on the USD 80 million bridge

consisting of 2,640 feet of structure. The 394 foot high, reinforced concrete western tower and the first three 32'-10" deck segments, which were cast on false work, were completed in mid, 1993. The two halves of the cable stayed bridge were joined in the early evening hours on July 24, 1995 in order to avoid the hot sun while the final pour was curing.

The three concrete box girder spans, one in the east and two in the west (Figure: 4, Section: 2) of the main span complete the bridge structure. The entire bridge has 15,000 cubic yards of substructure concrete and 22,000 cubic yards of superstructure concrete.

The three 105 feet wide cable stayed spans (Figure:4,Section:1) have a main channel span of 1132 feet and are bracketed by 460 feet of side spans. A maximum vertical channel clearance above MHWL of 98 feet was achieved, however, a minimum vertical clearance above MHWL of 88 feet was effected. The

10 foot envelope was for construction false work and is for operational clearance of the maintenance gantry. The stay cables are anchored 32'-10" on center longitudinally along each deck edge and they are stressed high above the decks at their tower anchors.

The bridge was dedicated Sunday, December 3, 1995 with four east bound and three west bound lanes of traffic and a 11 foot wide pedestrian and bicycle path on the north side all flooded with citizens, celebrating the occasion.

Meanwhile, the little company with a Tampa office was bought out by another Consultant. John O' Leary called the same Developer at his home requesting Construction Engineering services for another big Cable Stayed bridge, this time spanning the Mekong River in Vietnam, funded by AusAid. The Developer passed the project on to the same boss, now at the new company.

On the eightieth anniversary of Armistice Day, November 11, 1998 the Glebe Island Bridge over Johnston Bay was renamed The ANZAC Bridge, honoring the Australian and New Zealand Army Corp for their service in WWI (Figure:5) . The bridge roadway was reconfigured into eight lanes with an adjusted walkway in 2005.

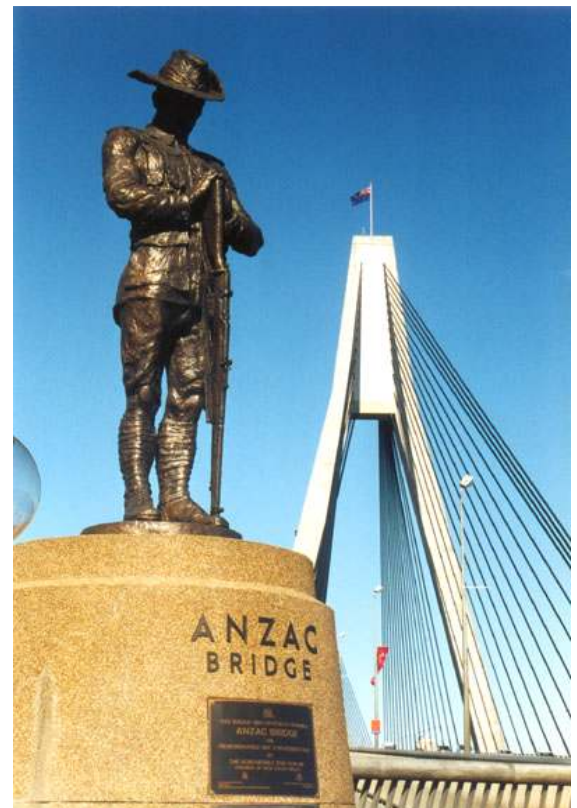


FIGURE 5: A TWELVE FEET TALL STATUE OF A WWI "DIGGER"

Guest Commentary

THANKS ENGINEERS!

By Mariana Llanso, J.D.

I am once again honored – actually, I asked but I am honored nonetheless – to be the Spans guest commentator. Three years ago I wrote about actual and symbolic bridges. Today, I want to focus on the designers and builders of the actual bridges and other transportation infrastructure. Why? Because I am in awe of what engineers build. I am in awe of the painstaking process whereby an engineering project is developed and built. Especially, I am in awe of the competence and dedication of the engineering profession.

Those of us who are not engineers, even if we appreciate the wonderful transportation infrastructure (which we rarely do), we tend to take the designers and builders for granted. Let's face it, as one stands on the Alexandre III Bridge in Paris, or drives on the Sunshine Skyway, or takes a perfect curve at a certain speed, or as one learns about balanced cantilevered construction, one really does not stop to say: Thanks, Engineers! As you can see, the reference made above is relevant to the aesthetic and perhaps functional qualities of said infrastructures.

Recently, however, a different element has been the focus of various publications. For example, not too long ago a bridge in Clearwater was shut down because it was determined dangerous for cars to traverse the span due to deterioration. This past week a barge hit Gandy Bridge causing thousands of dollars worth of damage to that important arterial corridor which joins Hillsborough and Pinellas counties. The national transportation infrastructure grade average is D! As you can surmise, safety trumps the aesthetic seduction of the beautiful bridges, roads, and infrastructure we encounter.

In addition to safety, there are other issues such as security, economic development and quality of life that are impacted by the condition of the infrastructure. It is important to note that a bill was recently introduced in the U.S. Senate to address the rapidly deteriorating public infrastructure. It is in everyone's best interest that this crucial piece of legislation, the National Infrastructure Improvement Act of 2006, be enacted.

When I asked to be the guest commentator, the editor of Spans asked me what I would write about. I said, "I will write about our outstanding engineers." I almost lost the assignment (!) because he (an engineer) said it sounded too self-serving. Ok, then I will write about how important it is for us to maintain the public infrastructure.

For government, it is crucial to the fiduciary duty we have to the citizens we serve. The safety of our citizens is one of the three top reasons for which government exists. For public works professionals, that means maintaining the integrity of the infrastructure. Ensuring that the transportation infrastructure is safe and sound is the number one priority of the Hillsborough County Public Works Department. Our County Commissioners recognize the responsibility, witness our capital budget allocation. We have over 30 licensed professional engineers in the department to lead this effort.

As a coworker, I see the competence, diligence and dedication that each engineer contributes daily; as a public servant, I am proud to be a part of this team of professionals; and, as a citizen I have to say: Thanks, Engineers!

Coming Issues:

- The nest of bridges in Jacksonville, Florida.
- The Acosta Bridge in Jacksonville, Florida.
- The Dame Point, N.B. Broward Bridge
- The Talmadge Bridge in Savannah, Georgia.

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