wyche consulting

COMPANY PROFILE

Aug 2011

THE FIRM

Wyche Consulting was founded in 2001 by Joe Wyche. From its inception, its philosophy has been to supplement other organizations in the specialized area of bridge and civil structural design, instead of competing with them. In its first several years of operation it has provided bridge and civil structural engineering services to a number of clients, and for the majority of these activities it has been integrated into design teams from other firms.

Wyche Consulting's client list includes several other firms which have considerable expertise on their own, but for whom Wyche Consulting can provide complementary or supplementary skills. These include GHD and KBR. In addition to this work, Wyche Consulting has carried out a number of direct design briefs for clients varying from government departments such as Main Roads, to builders such as Structural Systems, Leighton Contractors and Thiess.

THE PEOPLE

The structure of the firm naturally limits its people to a small number who develop a high level of skills and work as a closely integrated group. The skill and experience base is built around the firm's sole Director, Joe Wyche, who has thirty five years of experience in bridge and civil structural engineering for projects ranging from management of aging timber bridge infrastructure through to designing large bridges for D&C contracts. After working through a variety of positions to Senior Designer in Main Roads Bridge Branch between 1974 and 1990, Joe joined BG&E, through to 2001, where he was the Senior Associate responsible for bridges. Joe has a very strong technical background, having served on a number of Code committees, including current the Concrete Structures Standard committee.

Other team members.

Ros MacKinlay has been with the firm from its very early days, and is very experienced in civil structures, having completed numerous designs, verifications, load ratings, construction designs, and various other bridge consulting tasks to a high level of complexity. Her previous experience in the mining sector has often been useful, for example when verifying a pile arrangement for part of an ore processing plant, or for developing pipe bridges for sewerage works. Ros has a full range of skills, including report writing, computer analysis and design, and CAD drafting skills, which are constantly used in the design process, and when necessary, final drawings. All team members are encouraged and assisted in developing all of these skills, and we also regularly teach and coach engineers in firms we are working with to develop similar skills.

We have another younger colleague, Caroline Morrell who has been with the firm since early 2009, having worked for several years in the construction sector prior to that. Caroline works part time as her young family grows, and has steadily developed her design skills under our system of mentoring and coaching.

Wyche Consulting encourages extra curricular engineering development such as writing papers or developing software, and a proportion of revenue is set aside to pay each individual's time to develop his or her professional skills.

SOME WYCHE CONSULTING PROJECTS

Wyche Consulting has completed numerous design or consulting Briefs, either alone or more often in a leading role in another team. From these, the following examples have been selected to illustrate some typical problem solving skills:

1. Gauteng Freeway Improvement Project, Johannesburg 2009/11.

Wyche Consulting did all the temporary works design for three bridges on this project. The client was Structural Systems in an alliance with G5 in South Africa. Temporary works included cast beds, launch girders, side guides and various longitudinal restraint systems. The most spectacular bridge is a 400m long curved box girder, but the other two bridges which were a pair of straight 120m long box girders had to be launched down a 4.3% gradient, which required design of a special restraining system so they could be launched through a long jack which artificially "reversed" the gradient. Apart from the challenge of working from Perth within a group in a foreign country, the other new technical challenge for Wyche Consulting was designing a clamping system so the bridges could be "held" on the restraint pier in the middle of the bridge while the bearing changeovers were done. This was especially difficult for the bridges on the 4.3% slope as a supplementary restraint back to the cast bed had to be included, which allowed for thermal movements while parked and restrained.

Elands Overpass – GFIP project

2. New Perth Bunbury Highway, Perth 2006/9

Wyche Consulting had a major bridge and temporary works design role on the New Perth Bunbury Highway project, working in a design partnership with GHD, Leighton Contractors and WA Limestone in an Alliance with Main Roads WA – the Southern Gateway Alliance. Joe Wyche was the Technical Design Director. There are approximately 18 bridge sites most of which require duplicate bridges, costing in total over $100m. The largest and most complex site is a pair of 270m long incrementally launched bridges over the Murray River west of Mandurah, and there is another shorter launched bridge over the Serpentine River.

The other bridges are generally large precast T-roffs. These are about 3.5m to 4m wide, and span up to 35m, and can weigh in excess of 100 tonnes. They include road over water, and

road over road, and the longest is a 225m structure over South Yunderup Road and the Murray River flood relief plain. Foundation conditions along the alignment are often very soft and require piling, with the added complication of widespread acid sulfate conditions. Adjacent embankments and earth retaining structures have to be staged for as much preloading as can be fitted into the tight schedule, and then detailed for significant residual settlements, which are differential to the piled structures.

This was Wyche Consulting's first experience working in an Alliance, and one very rewarding aspect was the opportunity to work in partnership with Main Roads in the Technical Advisory Group (TAG) for this project. One of the briefs to the TAG from Main Roads is to provide a legacy of generic procedures and innovations for future Main Roads projects. Wyche Consulting has been instrumental in the development of several of these, including:

- Producing a revised set of architectural guidelines which will meet Main Roads expectations and standards, without being over-prescriptive and restrictive.
- Developing a revised set of rules for Shear and Torsion, which are unnecessarily conservative in the current Code, out of date for current bridge technology, and difficult to interpret consistently.

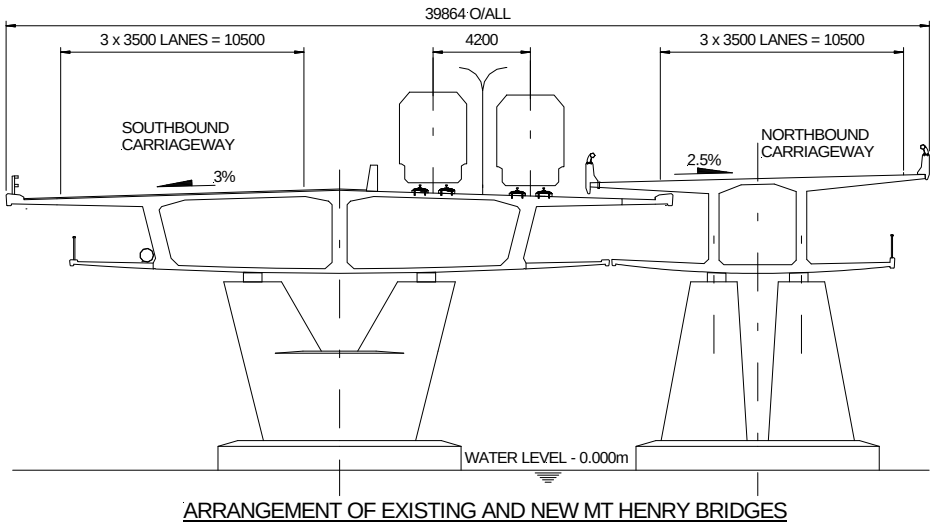
The project was opened in late 2009, several months ahead of schedule. The bridge structures were always critical to the overall program, and were completed without undue problems comfortably within schedule.

Launching the bridge across Murray River – New Perth Bunbury Highway

Craning in Super T girders at Nambeelup Brook – New Perth Bunbury Highway

3. Mt Henry Bridge in Package E, SW Metropolitan Rail Scheme, Perth 2004/5.

Wyche Consulting played a leading design role in the works for Package E of the South West Metropolitan Rail Scheme, working with partner GHD for Leighton Contractors. These involve a new 660 m long incrementally launched traffic bridge, a new 330 m long rail bridge, strengthening of an existing 660 m long bridge for rail loads, and numerous smaller structures, and temporary works. The arrangement for the new $40m traffic bridge developed during the Tender greatly assisted in providing the winning bid, and Joe Wyche was the Design Director.. A single incrementally launched bridge partially envelopes the existing bridge, where previously it had not been considered possible to fit a new single bridge into the available land on the approaches, and a much more expensive and time consuming widening on both sides was proposed. These works are now successfully completed.



ARRANGEMENT OF EXISTING AND NEW MT HENRY BRIDGES

Mt Henry Bridge. New launched bridge brackets existing to meet land constraints at abutments.

New Mt Henry Bridge being launched beside existing.

4. Liverpool Parramatta Transitway Barrier, Sydney 2002

For an RTA Design and Construct Contract won by Abigroup, Wyche Consulting designed several kilometers of bridge barriers for the bus transitway from Liverpool to Parramatta. Reinforced Earth walls are often a very competitive solution for earth retaining structures, but

when crash barriers have to be placed on top of them, it is difficult to carry the crash load forces back into the reinforced earth. The innovative solution developed used a series of discrete footings with the barrier spanning in flexure and torsion between them. This produced large savings in the footings and allowed the barriers to be slipformed. The solution incorporated special shrinkage/ thermal control joints which also ensure de-bonding between the top of the Reinforced Earth wall and the barrier, so that the lateral spanning mechanism operates truly.

Liverpool Parramatta Transitway Barrier being slip formed. Solution worked on Reinforced Earth walls up to 6 m high.

EARLIER LARGE PROJECTS BY JOE WYCHE

To demonstrate the background of experience which enables us to win and succeed at a large range of projects, the following four examples of successful completions are given, which involve larger and smaller bridges, often within large projects. These are selected from the career of Joe Wyche before he formed the firm Wyche Consulting.

1. Pacific Highway Upgrade Yelgun to Chinderah, NSW, 2001

This was a D&C for Abigroup. Joe was Lead Engineer and did the majority of the design work for BG&E. There were $15 m of overpass structures, including:

- A post-tensioned pre-stressed concrete cast in situ twin T beam, with spans of 50 and 45 metres on a 55 degree skew. The design was made more complex because it had to have a relatively shallow section and the deck twisted through a 10% superelevation change along the length of the structure.

- Two concrete arch bridges, with arches spanning over 50 metres, supporting plank bridge superstructures on precast portal frames. These two bridges were “signature” portals at each end of the 28 km project, and despite the fact that they are intended to be architecturally striking, they were also very economical.

- 7 Super T bridges with an architecturally integrated “family” of piers, of varying heights and width along the route. These conventional Super T cross-sections were stretched to the limit of 38 m spans, and had a variety of foundation conditions, including spread footings, bored and driven concrete piles, some in acid sulfate soils, and steel piles.

- Four precast concrete arch tunnel structures for fauna access. Two of these were for fauna passing under the road, and were conventional supplier designed precast arches. One was a 10 m span on rock, and the second was a 22 m span and had to be founded on timber piles. The other two were road tunnels, to allow fauna to pass over the road. Each of the latter locations comprised a pair of 15 m span precast arches, set on 2 to 3 m high wall foundations. The road tunnel arches were designed by Wyche Consulting.

Eviron Rd arch bridge and Road Tunnel Fauna Overpass, Yelgun to Chinderah Project, NSW.

2. Loftus Street Bridge, Perth, 1999.

This was a successful alternative design for Thiess, on a Main Roads WA project. Joe was Lead Engineer for BG&E, and he carried out most of the design himself. The bridge is 82 m long, significantly skewed, 6 lanes with 2 spans, 47 and 35 m. It comprises two new separately incrementally launched box girders, which had to be structurally joined longitudinally to an existing bridge and to each other. Architectural compatibility with the existing bridge is also required. This was a very complex design, and the most challenging aspect was to design the prestressing in the new structures so that the three structures were closely aligned in vertical profile prior to structural connection. The reinforcement in the severed footway of the old bridge also needed to align with the new bridge to fit joining reinforcement successfully, and the final prestressing operation had to apply loads to the old footway in such a way as to strengthen it for its new role as part of the trafficable deck. All this was achieved successfully.

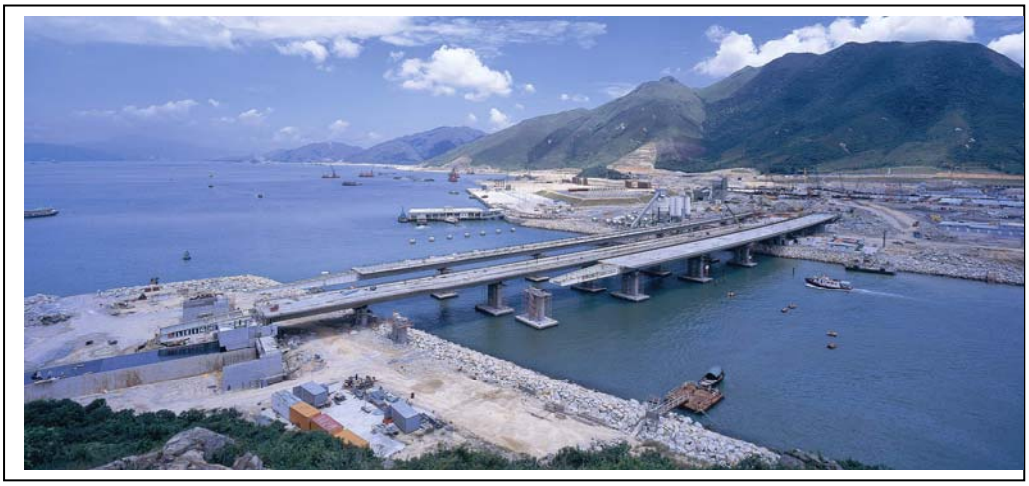
Construction access was very tight, and the bridge crosses Mitchell Freeway and several Electrified Rail lines, all of which had to be kept fully operational during construction. To achieve this safely, a special underslung cantilever extension to the joining slab was cast, so all operations over the freeway and railways were over solid concrete. Design work included construction engineering, including casting bed, modification of existing launching equipment and design of the launch girder connection. The value of the bridge was about $4.5m.

Broken out edge of old Loftus St Bridge with underslung cantilever from new bridge, Perth.

Completed Loftus St Bridge, Perth.

3. Tung Chung First and Second Sea Channel Crossing (Hong Kong), 1994-1995.

For both the First Sea Channel Crossing (Leighton Asia), and the Second (Structural Systems), Joe was the Lead Engineer for BG&E, and carried out most of the design work himself. The First Crossing project had fallen well behind schedule because another contractor was installing foundations, but Leighton Asia accelerated the program five months by successfully launching three bridges simultaneously.



Launching three bridges simultaneously,
Tung Chung First Sea Channel Crossing, Hong Kong.

In all there are five road bridges and a rail bridge, each about 300 m long. Each is a prestressed concrete box girder on concrete piles, piers and abutments. Apart from redesign of the launching prestress, construction engineering design included casting beds, launch girders, temporary bearings, side guides and one temporary pier.

4. Port Bouvard Bridge, Mandurah, WA, 1993.

This was a D&C for Thiess, for which Joe did most of the design as BG&E Lead Engineer, working with Director, Ernie Evans. The bridge is 360 m long with eight spans, carrying four lanes with lower level footways and internally is a services bridge. The value of the bridge is approximately $15m.

The superstructure is twin three metre high prestressed concrete I beams. These unusual large I beams enabled incremental launching with minimal handling of forms, assisting in meeting the strict one week cycle. Piers are 19 m high tapered columns with an inverted truncated cone capital, set on a pile cap with ends pointed to deflect impacting vessels. There are large bored pile foundations in the channel. The columns, pile caps and slender superstructure make a graceful architectural whole well suited to this prime location.

Port Bouvard Bridge,
Mandurah WA.