Incrementally Launched Bridges
Bali - Hsintien Expressway, Contract C 805, Taiwan

Incrementally Launched Bridge

Client
The Hwang Chang Construction Company, Taiwan.

Project
Bali - Hsintien Expressway, Contract C 805; incrementally launched steel box girder bridge, Taiwan.

Services
Construction engineering design and support services for the incrementally launched steel box girder bridge.

Services period: 2006 - ongoing

Background
Expressway Contract C 805 includes a 900 m long steel box girder bridge, 22.8 m wide & 2.8 m deep. C 805 is being constructed by the incremental launching method in two directions 300 and 600 m long; in 45 m spans.

Services provided to Hwang Chang Construction include:
- computer simulation of the launching operation to check stresses during the launching and in the final state under service
- precamber calculations based on the final construction procedure
- design the fabrication platform and platform foundations
- shop drawings for the take over structure
- planning the incremental launching operations
- design and specifications for the launching system
- design of the temporary launching bearings
- design the bridge guidance system during launching
- design the earthquake restraining system for the superstructure during launching
- assist Hwang Chang prepare the incremental launching operation method statement
- strengthen the steel deck to be suitable for launching
- design the launching nose
- launching nose shop drawings
- hydraulic specifications for the launching nose
- site supervision during the first launching operation
- consulting services during the construction process
- provide value engineering services to optimize the construction costs
Taiwan High Speed Rail Project, Contract C 260,

Incremental Launching Method

Client
THSRC; the Taiwan High Speed Rail Corporation; the BOT concessionaire company responsible for the 345 km high speed rail project between Taipei and Kaohsiung.

Project
Design and Construct C 260; for the joint venture of Bilfinger Berger and Continental Engineering.

Services
- Launching equipment design and fabrication
- Formwork mould design
- Casting yard design
- Subcontractors consultant
- Specialist consulting services

Services period: 2001 – 2003

Background
The design and construct bridges in C 260 were located on the high speed railway alignment close to Taichung.

Services were provided to plan and design the casting yards for several incrementally launched prestressed concrete bridges on C 260.

Black Stone Construction was the specialist subcontractor appointed for the bridge construction works.

The prestressed concrete box girders were designed to be constructed by the incremental launching method.

Services were provided to design the casting yards; which included a highly automated formwork casting system.

Specialist consulting services were provided to Black Stone to support the incremental launching activities for Contract C 260.
Second Freeway, Contract C 345, Taiwan

Incrementally Launched Bridge

**Client**
Black Stone Construction, Taiwan.

**Project**
Second Freeway, Contract C 345, Taiwan.

**Services**
- Launching equipment design and fabrication
- Formwork mould designs
- Casting yard design
- Construction planning
- Construction consulting
- Construction supervision

**Services period**
1999 - 2001

**Background**
Services were provided to the Black Stone contractor for construction of two parallel, single cell prestressed box girders for the Second Freeway C 345 between Yun Lin and Chia Yi.

The Incrementally Launching Method (ILM) was used for the construction; the 13 span girder was 560 m long, 16.1 m wide and consisted of spans of 34 m + 11 x 44 m + 42 m.

The 30 m long steel nose beam was stressed to the front side of the box girder during construction.

The scope of work consisted of the construction stage and final stage analysis, prestressing instructions, temporary support design and the nose beam stressing.
Second Freeway, Contract C 323, Taiwan

Incrementally Launched Bridge

Client
Taiwan Area National Expressway Engineering Bureau, (TANEEB).

Project
Second Freeway, Contract C 323.

Services
- Special construction method
- Launching equipment design and fabrication
- Construction planning
- Consultant to TANEEB
- Construction supervision

Services period: 1997 – 2000

Background
Services were provided to TANEEB for the Second Freeway Contract C 323 constructed by the ILM; the Incrementally Launching Method.

Services were also provided for the:
- design and fabrication of the bridge launching equipment
- supervision during the bridge launching operations
Second Freeway, Contract C 360, Taiwan

Incrementally Launched Bridges

Client
Kung Hsin Contractors, Taiwan.

Project
Second Freeway, Contract C 360, Taiwan.

Services
- Launching equipment design and fabrication
- Formwork design
- Construction planning, consulting and supervision
- Construction stage calculations

Services period
1996 – 1999

Background
Incremental launching equipment was designed for the construction of two parallel; single cell prestressed concrete box girders for the Second Freeway Contract C 360.

The services included the:
- Formwork design
- Fabrication inspection

Equipment services comprised of:
- Design of casting yard formwork
- Design of launching equipment
- Specifications for the launching equipment
- Design of launching bearings
- Design of the steel nose beams

Services also included for the:
- Construction planning
- Construction consulting
- Construction supervision
2nd Freeway / Taoyuan International Airport Interchange
Incrementally Launched Bridge

Client
Taiwan Area National Expressway Engineering Bureau, (TANEEB).

Project
2nd Freeway / Taoyuan International Airport Interchange.

Services
- Design consultant to TANEEB
- Strengthening & stress analysis
- Technology transfer

Services period: 1996

Background
The original Airport Interchange had a trumpet type layout, however during the expansion of the 2nd Freeway, a new design was adopted. There are two loop ramps, one for south bound traffic and the other for north bound traffic onto the 2nd Freeway.

Detailed design consultant services were provided to TANEEB for the single cell prestressed box girder interchange; and the details were:
- 300 m long
- 8.6 m wide
- small radius of 500 m
- 8 spans
- 56 m maximum span

During the launch signs of distress were detected in the piercap of Pier No. 7 and construction was halted. This was resolved by replacing two bearings directly below the viaduct webs with one large bearing placed in the middle.

The diaphragm was then designed to adopt this change and the pier was reinforced with a steel jacket extending down to the foundation.
First System Interchange, Taiwan

Incrementally Launched Bridge

Client
Taiwan Area National Expressway Engineering Bureau, (TANEEB).

Project
First System Interchange, Taiwan.

Services
- Contractor consultant
- Construction stage calculations
- Casting yard designs
- Camber calculations and bearing presets
- Shop drawings

Services period
1991 – 1995

Background
Three structures were constructed for the First System Interchange using the (ILM); the Incrementally Launching Bridge Method which was designed with precast panel supported cantilevers.

The First System Interchange had an overall deck length of 915 m and width of 16.4 m.

Responsibilities also included the:
- basic design
- detailed design
- structural design
- construction engineering
- construction supervision.
Chang Shu Li Bridge, Second Freeway, Taiwan

Balanced Cantilever Bridges

Client
The Taiwan Area National Expressway Engineering Bureau, (TANEEB).

Project
Chang Shu Li Bridge on the Second Freeway, Taiwan.

Services
- Preliminary and detail design consultant to Sinotech
- Technology transfer

Services period
1991 - 1993

Background
The balanced cantilever method was selected for on the construction of the 372 m long Chang Shu Li Bridge.

The bridge being constructed in a segmental manner from fixed piers gradually advancing out, segment by segment until the completion of the whole bridge.

The project scope was for two balanced cantilever bridges 372 m long, 16.4 m wide, with a maximum span of 50 m.
Tou Chien Bridge, Second Freeway, Taiwan

Incrementally Launched Construction

Client
Taiwan Area National Expressway Engineering Bureau, (TANEEB).

Project
Construction support services and the design of the four sets of ILM equipment for the Second Freeway Tou Chien Bridge.

Services
- Consultant services
- Construction supervision
- Shop drawings
- Construction stage design
- Equipment design
- Casting yard design
- Bearing presets calculations

Services period
1990 – 1992

Background
The Tou Chien Bridge was the first freeway bridge in Taiwan that was constructed using the incremental launching method and the design of four sets of ILM equipment was part of the services.

Proceeding north on the Tou Chien Bridge, the road crosses the Tou Chien River, the Neiwan rail line, Highway No. 68 (Nanliao - Jhudong Expressway) to Jhulin Interchange; then climbing up with the terrain to enter the mountainous border area between Cyonglin and Guansi

The 793 m long bridge comprised of 2 parallel prestressed concrete box girders each 16.5 m wide.

The bridge had 18 spans, of which 15 were a standard span of 46.5 m which was constructed using four incrementally launching viaduct structures; each 400 m in length.

The feasibility study and the detail design was earlier undertaken for Tou Chien Bridge in 1986 to 1987.
Tou Chien Bridge, Second Freeway, Taiwan

Incrementally Launched Design

Client
Taiwan Area National Expressway Engineering Bureau, (TANEEB).

Project
The feasibility study and the detail design for the Tou Chien Bridge.

Services
- Feasibility study
- Detailed design

Services period: 1986 – 1987

Background
The 793 m long bridge comprised of 2 parallel prestressed concrete box girders each 16.5 m wide.

The bridge had 18 spans, of which 15 were a standard span of 46.5 m which was constructed using four incrementally launching viaduct structures; each 400 m in length.