

SUSTAINABLE DEVELOPMENT

“What Do Clients Want from Engineering Consultants”

An Infrastructure Investor’s Perspective

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Cheung Kong Infrastructure Holdings Limited

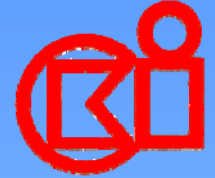
Cheung Kong Infrastructure Holdings Limited

- Largest Infrastructure Company listed in the Hong Kong Stock Exchange
- Scope of Business: Infrastructure investments in Energy, Transportation, Infrastructure related business
 - **Energy** – Power plants, power distribution network, gas distribution network
 - **Transportation** – toll roads, bridges and tunnels
 - **Infrastructure related business** – cement, asphalt, ready-mix concrete



Key Issues of Sustainable Development

- Meeting the Objectives of the Project/Development
- Complying with relevant statutory requirements, environmental standards
- Complying with technical and operational standards specified in the Concession Agreement
- Providing benefits to the community at large
- Meeting budgets and schedules, and providing appropriate level of investment returns to the investors



Market for Engineering Services for Sustainable Development

- Transportation Infrastructures are important for developed as well as developing countries. They are traditionally government sponsored
- Because of the large capital investments involved, new business models are being adopted for delivering these projects
- “Private-Partnership-Participation” (PPP) programs are being implemented in some countries
- These programs offer opportunities for private investments in transportation infrastructures

Market for Engineering Services for Sustainable Development

Delivering New Projects

The following business models are commonly adopted:

- “Design-Build-Finance-Operate” (DBFO) model – commonly adopted in U.K., Canada, and Europe
- “Build-Operate-Transfer” (BOT) model – commonly adopted in China and Australia

These two models are similar in principle but differ slightly in detail when applied in different countries.



Market for Engineering Services for Sustainable Development

Acquisition of Existing projects

- Investment opportunities are available through privatization schemes adopted by governments in various countries.

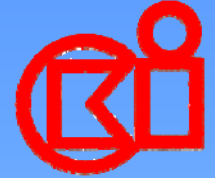
The above activities have created a lot of opportunities for the providers of engineering services in various sectors.

Role of Engineering Consultants in Transportation Infrastructure Projects

Delivering New Projects

Scope for Engineering Consultants

- Become a member of the Consortium led by the Concessionaire to bid Design-Build-Finance-Operate (DBFO) or Build-Operate-Transfer (BOT) projects.
- Working with the Contractor (also a member of the Consortium) and Concessionaire, to produce engineering designs to meet the requirements for a sustainable development under the DBFO or BOT Agreement



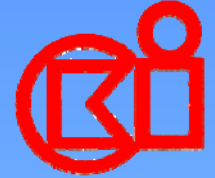
Role of Engineering Consultants in Transportation Infrastructure Projects

Scope for Engineering Consultants

- Significant scope for design innovations, value engineering, life cycle analysis and construction scheduling to optimize design and project financing.

Risk Sharing

- Share financial risks during the bidding stage (lower fees at the bidding stage with success fees upon winning the project).
- Participate as a minor equity partner of the Consortium.



Role of Engineering Consultants in Transportation Infrastructure Projects

Other Opportunities

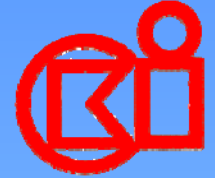
- Alternatively, Engineering Consultants could act as an independent consultant for banks and financial institutions that offer financing to the project
- There are also opportunities for specialist consultants to provide specialized services

Role of Engineering Consultants in Transportation Infrastructure Projects

Acquisition of Existing projects

Scope for Engineering Consultants

- Carry out due diligence engineering evaluation to assess project viability for investment purposes
- Provide recommendations for improvement in engineering and operational issues – to enhance project valuation and investment return for investors



Role of Engineering Consultants in Transportation Infrastructure Projects in China

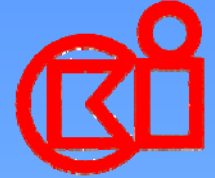
Build-Operate-Transfer (BOT) Projects in China

- There are no statutory regulations established for the BOT model for the delivery of transportation infrastructure projects in China.
- Potential foreign or domestic investors are invited to participate in major transportation infrastructure projects (mainly toll road projects) that have been approved by the Provincial or Central government.

Role of Engineering Consultants in Transportation Infrastructure Projects in China

Build-Operate-Transfer (BOT) Projects in China

- The investors set up a Co-operative Joint-Venture Entity to deliver and operate the project within the Concession period.
- The Chinese Joint Venture Partners are normally enterprises established under the jurisdiction of the local Transportation Bureau.



Role of Engineering Consultants in Transportation Infrastructure Projects in China

Scope for Engineering Consultants

- Engineering Consultants are members of a Design Institute normally established as a subsidiary of a government organization or University
- Engineering Consultants normally work as a member of the Design-Build team selected by the Joint-Venture Company
- Normally less integration between the Engineering Consultants and Contractor and less scope for innovation and value engineering as compared with other overseas projects. There are however some successful exceptions

Role of Engineering Consultants in Transportation Infrastructure Projects in China

Risk Sharing

- Normally Engineering Consultants provide services for fees, no risk sharing mechanism
- Normally Engineering Consultants do not participate in project equity



“What Do Clients Want from Engineering Consultants?” An Infrastructure Investor’s Perspective

- A fully integrated team of engineering expertise with adequate resources to cover all aspects of the project
- Clear understanding of project requirements, critical engineering issues and project risks
- Competent project management to co-ordinate and integrate design activities from different disciplines and geographical areas
- Ability to integrate with Construction Contractor to develop innovative, practical and workable designs within budgetary constraints.
- Cognizant of project financing requirements and the need to develop a bankable project



“What Do Clients Want from Engineering Consultants?” An Infrastructure Investor’s Perspective ~ Some Examples ~

- 1. *Cross City Motorway – Sydney, Australia***
2-km (tolled) tunnel – (CKI has 50% shareholding)
- 2. *Sea-to-Sky Highway Improvement Project – British Columbia, Canada***
100-km existing highway (shadow toll) - (CKI was an equity partner of a Consortium that submitted a bid for this project)
- 3. *Guangzhou East-South-West Ring Road – Guangzhou, China***
45-km Ring Road (toll road) bounding the east, south and west sides of Guangzhou – (CKI has 45% shareholding)



Cross City Motorway – Sydney, Australia

Project Highlights

- Dual two-lane tunnel under the City of Sydney to avoid 18 sets of traffic lights; a saving of 20 minutes of travel time
- Total investment: approximately A\$ 1 billion
- BOT project with 33 years concession period

Engineering Innovations

- Tunnel excavation was successfully completed using roadheaders to minimize disturbance to adjacent structures
- Competent rock condition was utilized to optimize design of tunnel support system
- Fully electronic tolling system was used to avoid delays in toll payment



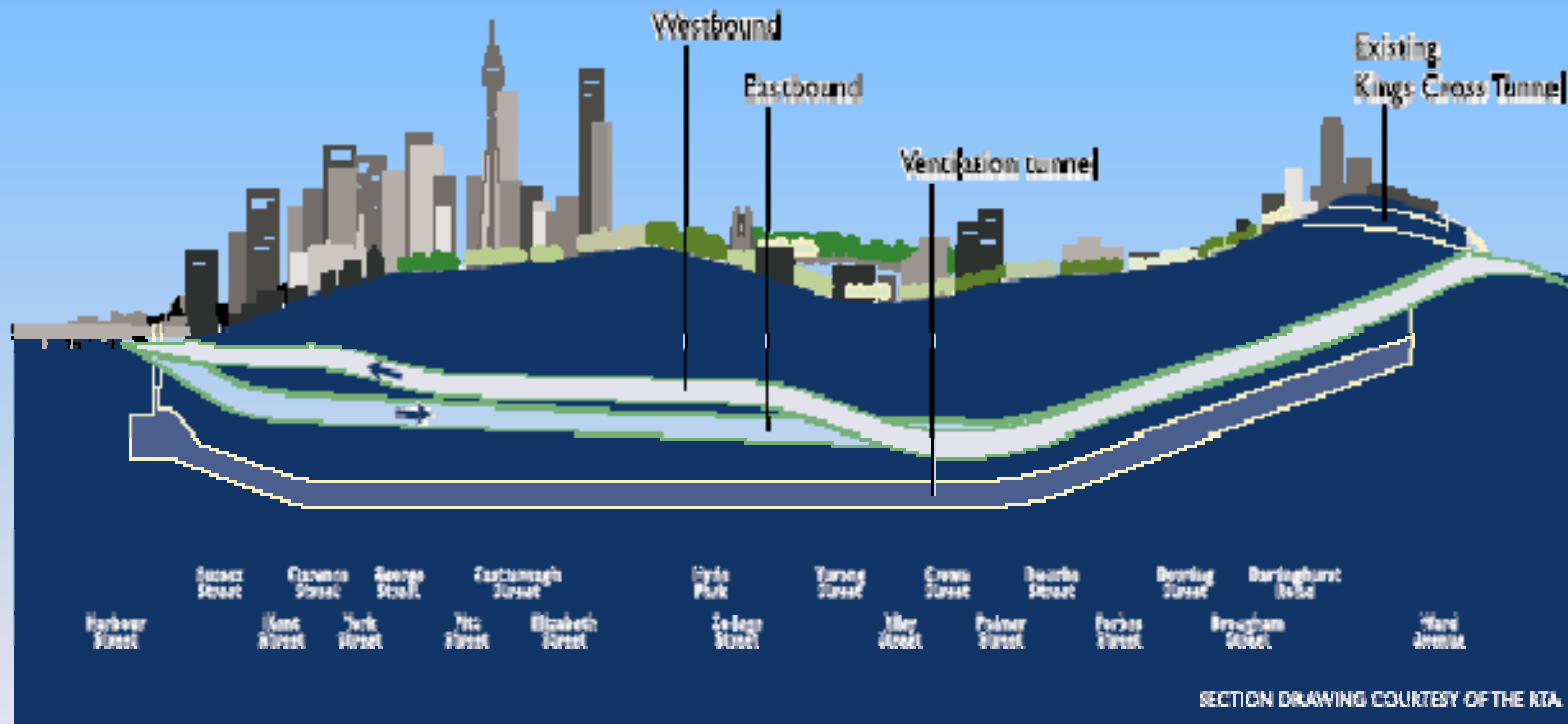
Cross City Motorway – Sydney, Australia

Cross City Tunnel Route Map

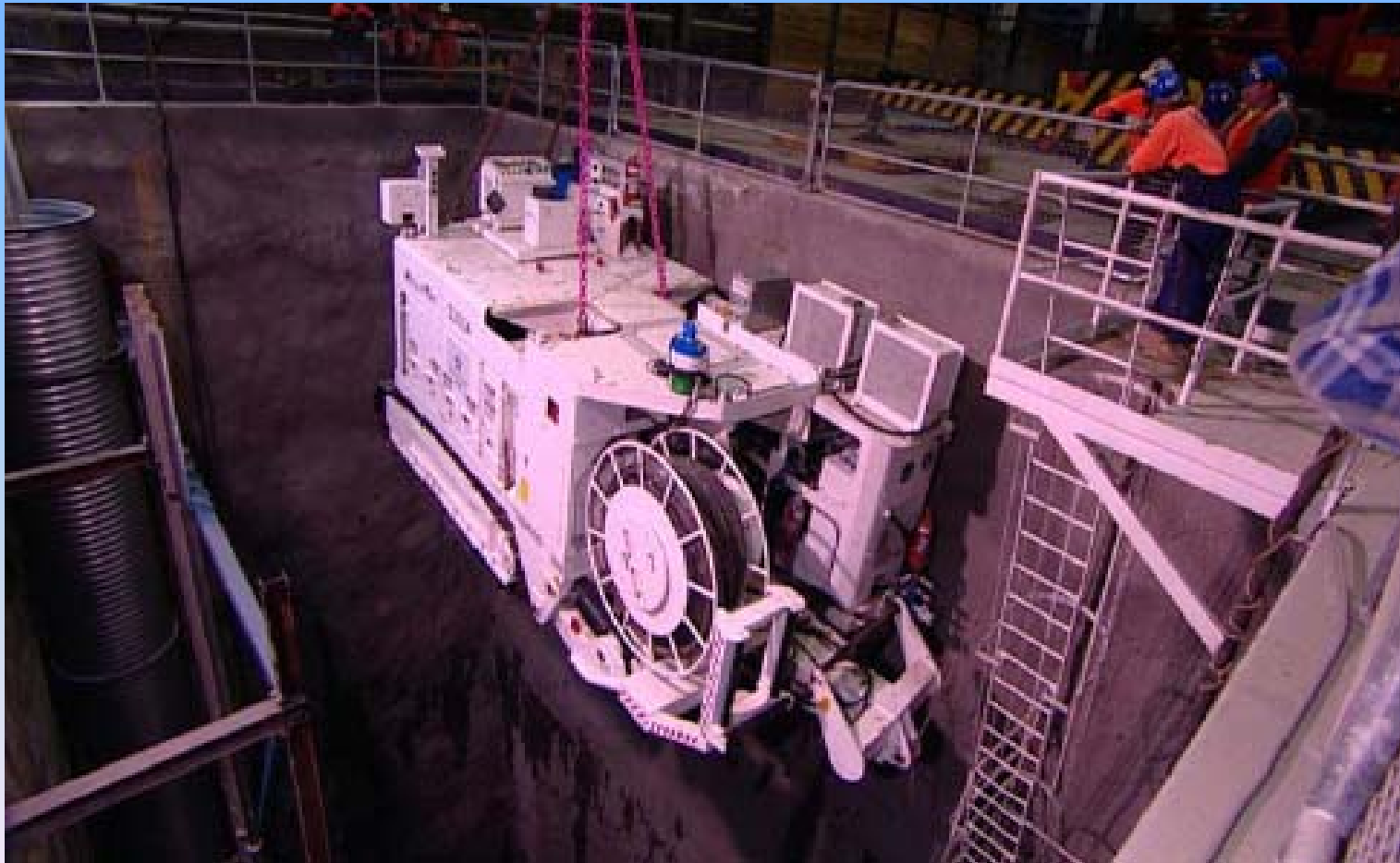


Map shows proposed traffic arrangements which are current at the time of printing. Copyright 2005 CrossCity Motorway Pty Ltd.

Cross City Motorway – Sydney, Australia



Cross City Motorway – Sydney, Australia



Cross City Motorway – Sydney, Australia

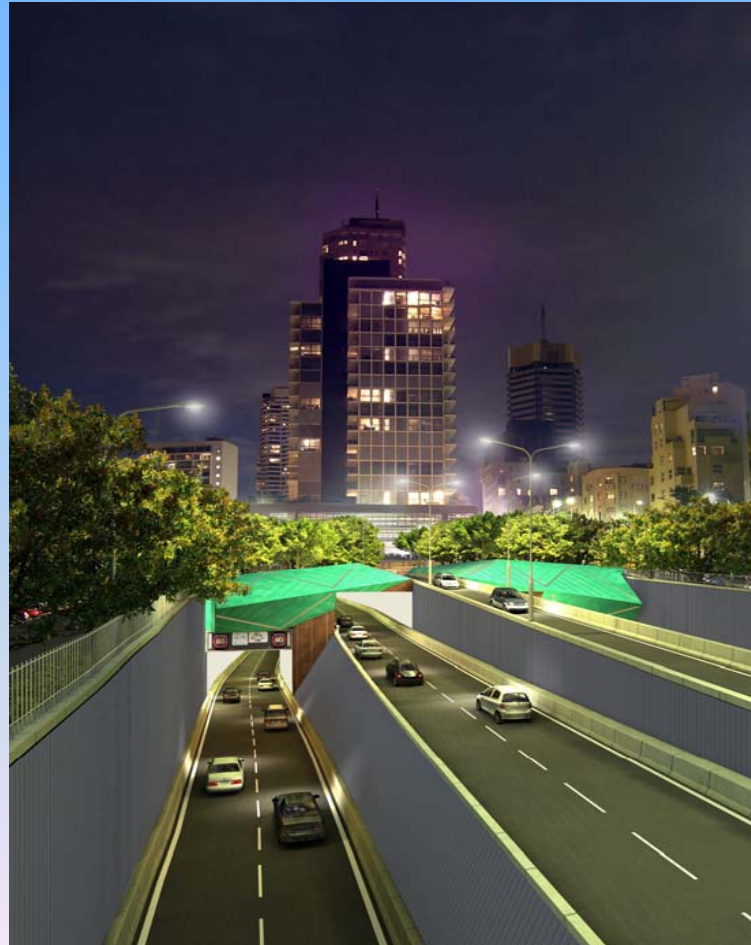


Cross City Motorway – Sydney, Australia

Overall view of vehicle detection system



Cross City Motorway – Sydney, Australia



Sea-to-Sky Highway Improvement Project British Columbia, Canada

Project Highlights

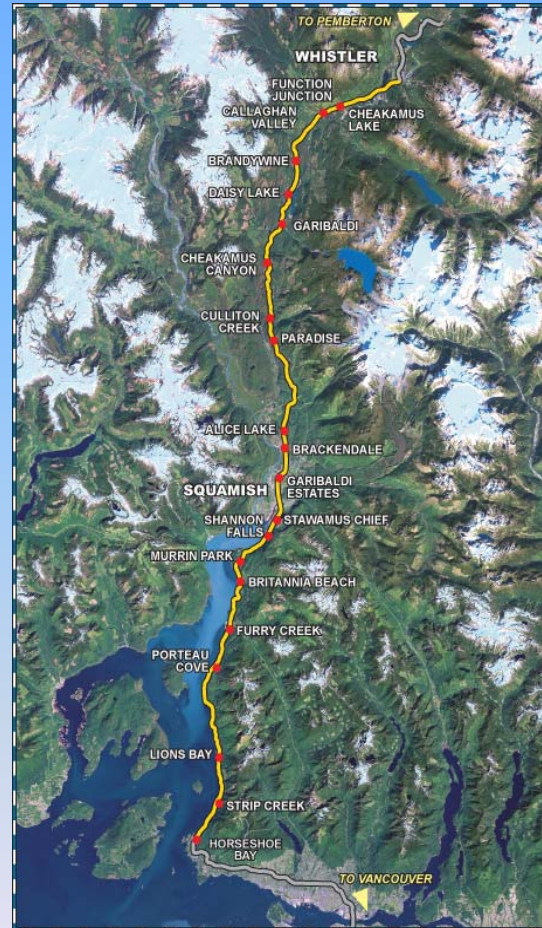
- An existing 2-lane undivided highway between Vancouver and Whistler, a ski resort and site for the 2010 Winter Olympics
- Highway requires improvements by adding extra lanes. Total investment: approximately C\$600-650 million
- DBFO project with 25 years concession period (shadow toll)

Engineering Innovations

- Some sections of the highway are located in mountainous terrain. Innovative lane widening schemes were developed to comply with improvement requirements within tight site constraints

Sea-to-Sky Improvement Project British Columbia, Canada

Location Map



Sea-to-Sky Improvement Project British Columbia, Canada



Sea-to-Sky Improvement Project British Columbia, Canada



Sea-to-Sky Improvement Project British Columbia, Canada



Sea-to-Sky Improvement Project British Columbia, Canada



Sea-to-Sky Improvement Project British Columbia, Canada





Guangzhou East-South-West Ring Road Guangzhou, China

Project Highlights

- 45-km dual 3-lane expressway within the urban area of Guangzhou with large bridge structures crossing the Pearl River
- Total investment: RMB 4.5 billion
- BOT project with 30 years concession period

Engineering Innovations

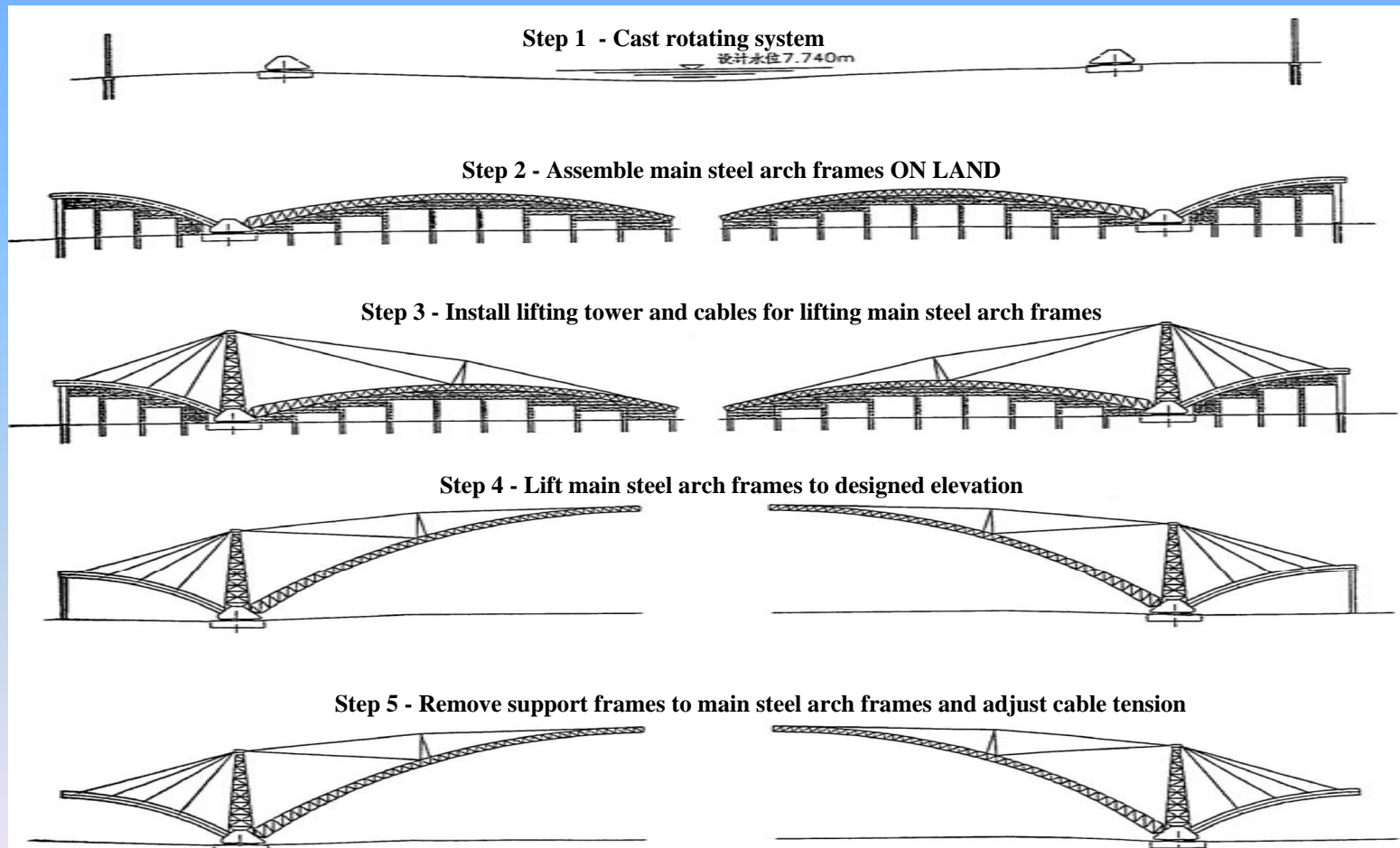
- A 350m-span steel arch bridge (the Ya Ji Sha Bridge) was constructed across the Pearl River with no marine works and no disruption to marine traffic
- Each half of the steel arch structure was assembled on opposite shore and then successfully rotated in place and connected at the crown point



Guangzhou East-South-West Ring Road Guangzhou, China

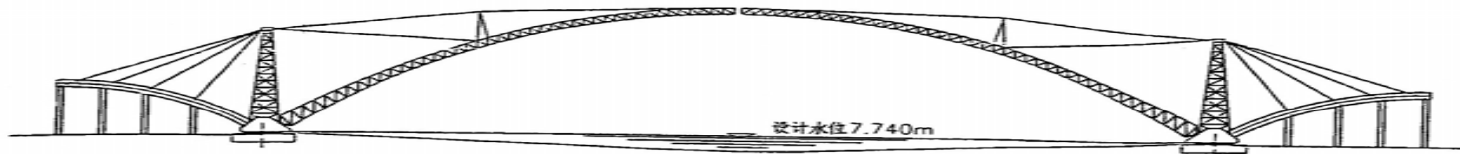


Guangzhou East-South-West Ring Road Guangzhou, China

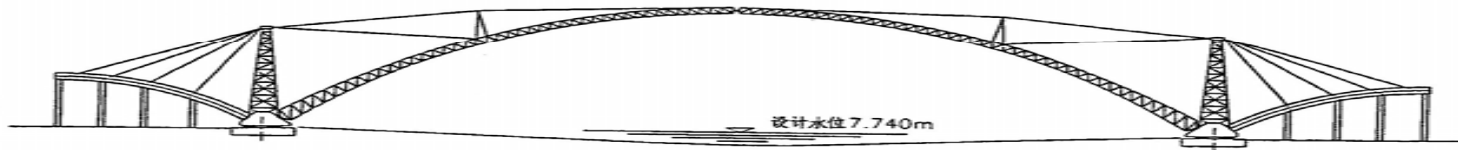


Guangzhou East-South-West Ring Road Guangzhou, China

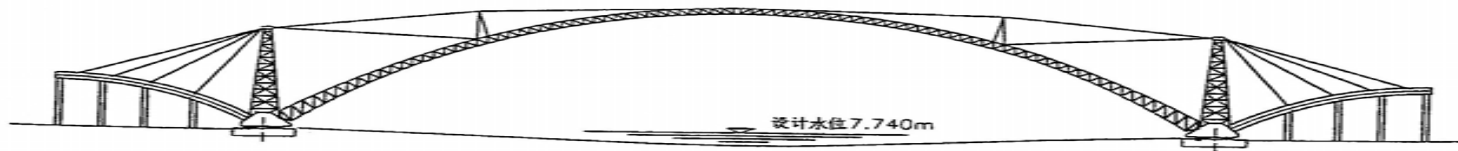
Step 6 - ROTATE both steel arch frames horizontally from shore to meet approximately at centre of river provide support to approaching arch frames



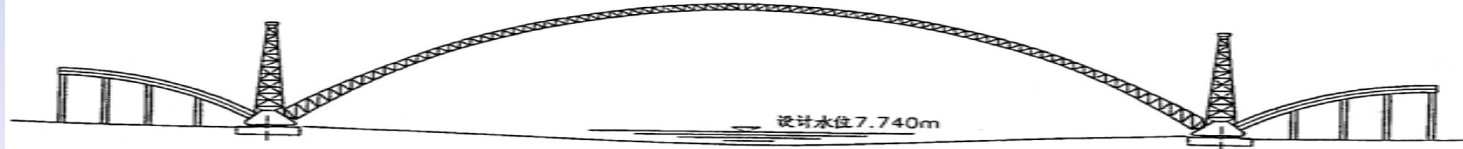
Step 7 - Weld 1-M centre piece in place and adjust cable tension



Step 8 - Complete arch assembly



Step 9 - Remove support cables and complete concreting of arch support



Guangzhou East-South-West Ring Road Guangzhou, China



Guangzhou East-South-West Ring Road Guangzhou, China



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Guangzhou East-South-West Ring Road Guangzhou, China





Conclusions

- In the transportation sector, the adoption of DBFO or BOT models for project delivery provides opportunities in infrastructure investment as well as a market for competent engineering consultancy services.
- Clients' expectations of Engineering Consultants go beyond competence in engineering designs. Engineering innovations, effective project and risk management, willingness to share risks and cognizance in project financing issues and requirements are key to the delivery of winning designs.

Conclusions

- Effective integration between the Engineering Consultants and the construction contractor is essential for the delivery of bankable projects
- Based on CKI's experience in developing and operating transportation infrastructure projects in China, there are rooms for improvements in the integration between Engineering Consultants and construction contractors in the delivery of BOT projects.