



TUNNEL DESIGN & CONSTRUCTION ASIA 2011

14 CPD
points
for Engineering
Professionals

**Best Practices in Geotechnical Investigation, EPC Contracting,
Project Funding and Risk Management for Asia's Tunnel Infrastructure**

Pre-conference masterclass: **21 June 2011**

Main conference: **22 - 23 June 2011**

Post-conference technical workshop: **24 June 2011**

Post-conference site visit: **24 June 2011**

Venue: **Amara Sanctuary Resort, Sentosa, Singapore**

Asset owners presenting masterplans

Dr. Firdaus Ali,
Member,
**JAKARTA WATER SUPPLY REGULATORY
BOARD, INDONESIA**

R W R Pemasiri,
Director General,
**ROAD DEVELOPMENT AUTHORITY,
SRI LANKA**

Ir. Dr. Zullkefle Bin Norden,
Deputy Director,
**MINISTRY OF ENERGY, GREEN
TECHNOLOGY AND WATER, MALAYSIA**

Top experts speaking

Dr. Manoj Verman,
Vice Chairman, Tunnelling Group (Global),
GOLDER ASSOCIATES

Axel Emil Christenson,
Market Director - Tunnels,
RAMBOLL

Joe Paveley,
Senior Associate - Fire Engineering,
ARUP

Top Tunnel case studies

- Multi-Purpose Deep Tunnel, **Indonesia**
- Gotthard Base Tunnel, **Sweden - Germany**
- Chongming Tunnel, **China**
- Femharn Belt, **Denmark - Germany**
- Delhi Metro Rail Tunnels, **India**
- Himalayan Rail Tunnels, **India**
- Marina Coastal Expressway, **Singapore**
- Kishangarh Hydro Tunnel, **India**
- Downtown Line 1 Tunnel, **Singapore**
- Pahang - Selangor Raw Water Transfer Tunnel, **Malaysia**



**Heinz Ehrbar, Chief
Construction Officer,
ALPTRANSIT GOTTHARD AG
Keynote Speaker at
IQPC's Tunnel Design &
Construction Asia 2011**

Introduction letter from IQPC

Dear Tunnel industry stakeholder,

Tunnelling for transport, water and wastewater, hydro energy and utilities is a fast growing industry in Asia which requires clearer understanding of the opportunities and the challenges. Enhancing coordination with all the stakeholder groups will ideally grow the industry.

I am pleased to present you with **Tunnel Design & Construction Asia 2011**, the regional tunnelling conference which assembles leaders from the subsurface infrastructure industry in Asia - asset owners from regional governments, AEC firms, geotechnical investigators and EPC contractors.

Tunnel Design & Construction Asia 2011 will examine:

- Master plans and upcoming projects for road/rail, water/wastewater and utility tunnel infrastructure
- Funding, legal and contractual requirements
- Best practices in geotechnical investigations and instrumentation
- Urban tunnelling techniques
- Optimal selection of construction procedures in NATM and Mountain tunnelling
- TBM selection procedures for different soil/rock conditions
- Handling technical and construction contract risks
- Fire safety and ventilation design for long and immersed tunnels

With the help of over 15 case studies in three streams of focused presentations, a masterclass, a technical workshop and a site visit, the event will provide an excellent learning and networking opportunity.

I look forward to welcoming you at **Tunnel Design & Construction Asia 2011**.

Regards,



I B Saravanan
Conference Director
IQPC

PS. If you are looking to complement your learning, register for the site visit, technical masterclass and post-conference workshop.

Welcome letter from your advisory board member

Dear friends and colleagues,

Efficient underground space utilisation is capturing the imagination of asset owners around the world, more so in fast urbanising Asia. Numerous tunnel projects for transportation, hydropower, water/wastewater and utilities are becoming an inseparable part of governments' master plans and infrastructure allocations.

A few key challenges still remain. **Resolving contractual risks, achieving cost efficiency in design and construction and better fire and ventilation safety features** will enable subsurface infrastructure as a viable and preferred option to the asset owners. Tunnelling through the Himalayas, one of the most difficult mountainous regions of the world, poses significant barriers to sustainable hydropower development and resolving some of these issues will go a long way in realising the enormous power generation potential.

I am happy to be speaking at IQPC's **Tunnel Design & Construction Asia 2011** conference. 30 international tunnel experts and asset owners will present their master plans and specific strategies.

I wish all speakers and delegates at **Tunnel Design & Construction Asia 2011** a great networking opportunity and encourage the exchange of best practices to benefit the tunnel industry.

I look forward to welcoming you at **Tunnel Design & Construction Asia 2011**.

Regards,




Dr. Manoj Verman,
Vice Chairman
- Tunnelling Group (Global),
GOLDER ASSOCIATES



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ASSOCIATION DES CENTRES DE RECHERCHE
SUR L'UTILISATION URBAIN DU SOUS-SOL



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Engineering Experts



Society of Project
Managers Singapore

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Agenda at-a-glance

Your Advisory Board

Pre conference masterclass - 21 June, 2011

1000 - 1600: Overcoming Challenges in the Design and Construction of Cost Effective Tunnel Infrastructure

Led by Malcolm Peart, Global Manager - Tunnels, **SMEC**
Eddie Wong, Technical Director, **AECOM**

Conference day 1 - 22 June, 2011

Tunnel Infrastructure Master Plans presented by Asset Owners

0850 -1700: Asset owners, finance institutions and legal firms present master plans and contract development for sustainable tunnel infrastructure

- AlpTransit Gotthard AG
- Thailand Underground Tunnelling Group
- Jakarta Water Supply Regulatory Board, Indonesia
- Japan Bank for International Cooperation
- Road Development Authority, Sri Lanka
- Ministry of Energy, Green Technology and Water, Malaysia

1710: Cocktails and networking reception

Conference day 2 - 23 June, 2011

Stream A:

0850 - 1640:

Best Practices in Geotechnical Investigation and Tunnel Design

Featuring:

- AECOM
- Parsons Brinckerhoff
- Geotechnical Consulting Group
- Ramboll
- URS/Scott Wilson
- McConnell Dowell
- Mott MacDonald
- Aurecon

Stream B:

0850 - 1640:

Efficient EPC Contracting and Risk Management in Tunnel Construction

Featuring:

- Golder Associates
- Samsung C & T
- Tehri Hydro Development Corporation
- Arup
- SMEC
- RITES, India
- Shanghai Tunnel Engineering Corporation
- Bangalore Metro Rail Corporation
- SOMA

Post conference technical workshop - 24 June 2011

0900 - 1200: Risk Analysis - The Key Element for Successful Tunnel Construction

Led by: Heinz Ehrbar, Chief Construction Officer, **AlpTransit Gotthard AG**

Post conference site visit - 24 June 2011

0800 - 1400: Learning from the Design and Construction of one of Asia's Longest Water Tunnels: Pahang-Selangor Raw Water Transfer Tunnel, Malaysia

Led by: **Ministry of Energy, Green Technology & Water, Malaysia & SNUI JV**



Heinz Ehrbar,
Chief Construction Officer,
ALPTRANSIT GOTTHARD AG



Malcolm Peart,
Global Manager - Tunnels,
SMEC



Dr. Manoj Verman,
Vice Chairman - Tunnelling Group (Global),
GOLDER ASSOCIATES



Joseph Lo,
Executive Director - Transportation,
AECOM



Mohan Gupta,
Divisional Director - Tunnels,
MOTT MACDONALD



Tse Hung Lee,
Senior Engineer,
GAMMON CONSTRUCTION

"I was able to meet a lot of professional people in the same industry to share the information and experiences."

Ng Sanwayne, Regional Marketing & Technical Manager, **Maccaferri Asia**



Tunnel sector to benefit from Asia economic growth

Heinz Ehrbar, Chief Construction Officer for AlpTransit Gotthard AG speaks exclusively to Construction IQ on the challenges in developing sustainable and cost effective tunnels.



Heinz Ehrbar joined AlpTransit Gotthard AG in 2001 and became its Chief Construction Officer in 2006. He has extensive experience in the planning, design and construction management of underground structures such as highway and railway tunnels, caverns, shafts and hydro power tunnels.

Heinz also explains why there will be a big need for development in Asia and why financing is a key issue that needs to be overcome with innovative solutions.

Construction IQ: In your opinion what are some of the challenges in developing sustainable and cost effective tunnels?

Heinz Ehrbar: Tunnels are constructed for a better infrastructure and a better future. It is essential to analyse the demands on a underground project at the beginning of the project in detail. Eventual hazards, which can hinder a successful completion of a project have to be analysed during the whole duration of project. Therefore risk management and a high professional level is the key element for developing sustainable and cost effective tunnels.

Construction IQ: Could you please outline the opportunities and challenges for future growth in Asian tunnel infrastructure?

Heinz Ehrbar: Asia is the most dynamic region in the world. There is and will be a big need for the development of the infrastructure in the fast growing cities but also for high speed railways and energy projects. Many of these projects will be realised with a high percentage of underground structures because of the lack of space in urban areas or because of environmental reasons.

Construction IQ: What factors need to be taken into account to address the demand-supply gap in infrastructure investment?

Heinz Ehrbar: Underground structures are comparatively expensive structures. Many projects have a big size. Financing of these type of projects is one key factor. Innovative solutions are necessary.

Construction IQ: What are some of the yet to be explored untapped opportunities in tunnel design and construction?

Heinz Ehrbar: The tunnelling industry has reached a high standard especially in the field of the TBM's but also with new technics for conventional tunnelling. Nevertheless there are still big fields where better techniques can be developed, especially for tunnelling in bad ground conditions, for example: in squeezing rock. Even with the actual high standard, safety of work can and should always be increased.

Construction IQ: With immense infrastructure development and investment throughout Asia, what needs to be done to ensure high tunneling standards throughout the region?

Heinz Ehrbar: The construction material for underground structures is the ground. The properties of this material is often not well known. It's therefore very important to ensure that engineers and miners with sufficient experience are in charge of the projects. Underground projects don't allow trial and error solutions. Scientific organisations such as technical universities should make full use of the experiences for the education of the future generations on a high level.

Heinz Ehrbar is a keynote speaker on day one at 13.30 and is also facilitating the post-conference technical workshop on Friday 24 June at the **Tunnel Design & Construction Asia** conference. To read the complete interview visit www.tunneldesignconstruction.com



Find out what's new in the tunneling industry via news, content and interviews, with the movers and shakers of the tunneling industry for Asia only at www.tunneldesignconstruction.com

Construction 
a division of IQPC

 IQPC
International Quality & Productivity Centre

Day One: Wednesday, 22 June 2011

Tunnel Infrastructure Master Plans presented by the Asset Owners

0830 DAY ONE - Registration & welcome coffee

0850 Opening remarks from the chair

0900 Masterplans for water and wastewater tunnel infrastructure in Malaysia

- The current status of water and wastewater tunnel infrastructure in Malaysia
- Master plans for growth and investment in water/wastewater infrastructure in Malaysia
- Special impetus for water tunnel infrastructure in 10 MP
- Upcoming projects in water and wastewater tunnels

Ir. Dr. Zullkefle Bin Norden,
Deputy Director,
MINISTRY OF ENERGY, GREEN TECHNOLOGY AND WATER, MALAYSIA

0940 Multi-Purpose Deep Tunnel (MPDT): An integrated solution for flood control, road tunnel, sewerage system, public utilities shaft, and as an alternative for raw water provision for Jakarta Metropolitan area

CASE STUDY

- The need for integrated infrastructure solutions for water and wastewater
- Investment, opportunities and challenges in MPDT, Jakarta
- The required skills and technologies for water tunnel construction

Dr. Firdaus Ali,
Member,
JAKARTA WATER SUPPLY REGULATORY BOARD, INDONESIA

1020 Morning tea & networking break

1050 Future growth in Asian tunnel infrastructure: opportunities and challenges

- Overview of the growth of the underground and tunnelling industry in Asia
- Investment opportunities in the next ten years and regions of growth
- Challenges for tunnelling industry stakeholders
- Addressing the challenges and setting best practices for the tunnelling industry

Suchatwee Suwansawat,
President,
THAILAND UNDERGROUND TUNNELLING GROUP

1130 Rebuilding road infrastructure in Sri Lanka: master plans for road tunnels

- Procuring technology and tunnelling skills for Sri Lankan road tunnels
- Upcoming road tunnel projects in Sri Lanka
- Sourcing funding and delivering sustainable tunnel infrastructure

R W R Pemasiri,
Director General,
ROAD DEVELOPMENT AUTHORITY, SRI LANKA

1210 Lunch and networking break

1310 Lessons learnt after the final breakthrough of Gotthard Base Tunnel, Switzerland

KEYNOTE ADDRESS

- Efficient sequencing and scheduling of construction of the Gotthard Base Tunnel
- Challenges encountered in scheduling and how they were handled
- Construction risks encountered in sequential tunnelling and techniques used
- Managing contractual risks

Heinz Ehrbar,
Chief Construction Officer - Gotthard Base Tunnels,
ALPTRANSIT GOTTHARD AG

1350 Hydro tunneling in India: challenges and opportunities

- Outlining the importance of adapting best practices in hydro tunnelling and rock mechanics
- Contractual risk assessment for hydro tunnelling
- Evolution, challenges and opportunities in India's hydro tunnelling sector

Dr. Gopal Dhawan,
Executive Director - Geotechnical,
NATIONAL HYDROELECTRIC POWER CORPORATION, INDIA

1430 Afternoon tea & networking break

1500 Providing sustainable financing for infrastructure growth in Asia

- Estimating investment requirements in Asian transport and water tunnel infrastructure
- How to address the demand-supply gap in infrastructure investment
- JBIC's investment criteria in Asian tunnel infrastructure

Susuma Ushida,
Chief Representative,
JAPAN BANK FOR INTERNATIONAL COOPERATION

1540 Road ahead for tunnel infrastructure investments in Asia

PANEL DISCUSSION

- Opportunities and challenges in the growth of tunnel infrastructure investments in Asia
- Fast growing markets in Asia and investment opportunities
- Addressing bottlenecks in investing into transport/water and wastewater tunnels

Panelists:
Susuma Ushida, Chief Representative,
JAPAN BANK FOR INTERNATIONAL COOPERATION

Dr. Gopal Dhawan, Executive Director - Geotechnical,
NATIONAL HYDROELECTRIC POWER CORPORATION, INDIA

Heinz Ehrbar, Chief Construction Officer - Gotthard Base Tunnels,
ALPTRANSIT GOTTHARD AG

R W R Pemasiri, Director General,
ROAD DEVELOPMENT AUTHORITY, SRI LANKA

Dr. Firdaus Ali, Member,
JAKARTA WATER SUPPLY REGULATORY BOARD, INDONESIA

Ir. Dr. Zullkefle Bin Norden, Deputy Director,
MINISTRY OF ENERGY, GREEN TECHNOLOGY AND WATER, MALAYSIA

Suchatwee Suwansawat, President,
THAILAND UNDERGROUND TUNNELLING GROUP

1630 Chair's summary with Q & A - end of plenary session

1640 Networking cocktail party

Network with stakeholders of regional tunnelling industry in an informal set-up

SAVE ^{UP TO} AN EXTRA 15% WHEN YOU BOOK AS A TEAM.
See the booking form for details



Day Two: Thursday, 23 June 2011

Stream A - Best Practices in Geotechnical Investigation and Tunnel Design

0830 Registration & welcome coffee

0850 Opening remarks from the chair:

0900 Controlling design and construction costs for the world's largest double-deck road tunnel: Chongming Tunnel, China

CASE STUDY

- Understanding interactive behaviours of soil, rock and water for cost control
- Costing based on design codes and tunnel construction methods used
- Risk analysis and cost overrun parameters: what needs to be watched out for?
- Types of construction costs and mitigating risks involved

Eddie Wong,
Technical Director,
AECOM

0940 Efficient design of temporary supports for large scale underground stations

- Trends in bottom-up and top-down tunnel construction
- Constructing cut and cover tunnels close to existing property lines
- Understanding soil-structure interaction in tunnel design
- Strategies for very soft soils and cost effective design and procurement for cut and cover tunnels

Dr. K S Ho,
Divisional Director - Civil & Structural,
PARSONS BRINCKERHOFF

1020 Morning tea & networking break

1050 3D numerical modelling of urban tunnel construction near piled high-rise buildings: MTR rail tunnel, Hong Kong

CASE STUDY

- Techniques in construction of tunnels near existing property lines
- Modern design and construction processes considering piled structures
- 3D numerical analysis for shafts, portals and openings with respect to tunnel excavation

Dr Siew Wei Lee,
Associate Director,
GEOTECHNICAL CONSULTING GROUP

1130 Design, construction and safety features of the world's longest immersed tunnel: Femharn Belt, Denmark - Germany

CASE STUDY

- Complying with new traffic data and pollution emission standards
- Comparing with EuroTAP and other tunnel design benchmarks
- Overcoming the challenges in designing the longest (20 km) immersed tunnel
- Analysing the different options: comparing immersed tunnel against bridge solutions

Axel Emil Christenson,
Market Director - Tunnels,
RAMBOLL

Rikke Juul Gram,
Director - Design,
SCHONHERR

1210 Lunch and networking break

1310 Interpreting geotechnical data in designing transportation tunnels

- Deciding on the appropriate geotechnical investigation method
- Collection and interpretation of geotechnical data in designing
- Alignment of route and depth considerations for urban transportation tunnels

Walter Chan,
Director - Transport Tunnels,
URS/SCOTT WILSON

1350 Design of the earth retaining structure in cut and cover tunnel and the contribution of the DSM (Deep Soil Mixing): Marina Coastal Expressway, Singapore

CASE STUDY

- Design of the temporary earth retaining system in cut and cover tunnels
- Behavior of the temporary earth retaining system during excavation
- Ground improvement of the soft clay in deep layers
- Technical and economical advantages of DSM (Deep Soil Mixing)

Dr. Seok San Lim,
Design Manager,
SAMSUNG C & T CORPORATION

1430 Afternoon tea & networking break

1510 Integrating hydraulic design requirements into the design of ocean outfall tunnels

CASE STUDY

- Understanding the hydraulics of ocean outfall tunnels
- How do the hydraulics impact the design of tunnels
- Effectively overcoming the problems during design and construction

Scott Smith,
Transport Leader,
AURECON

1550 Developing and implementing geological models to provide economic tunnelling solutions for metro rail tunnels, and methods of mitigating risks: Delhi Metro Rail Tunnels, India

CASE STUDY

- Need and benefits of employing geological models in tunnel design
- Effective implementation of geological modelling in mitigating tunnel construction risks
- Overcoming problems of existing property lines in urban areas

Mohan Gupta,
Divisional Director - Tunnels,
MOTT MACDONALD

1630 Chair's summary with Q & A

1640 End of conference

“An excellent opportunity to meet representatives from the regional tunnelling industry. I liked the range of topics - from technical to case studies. Very interesting content. Great networking opportunity.”

Shannon Goff, Senior Staff Engineer, Jacobs Associates

Day Two: Thursday, 23 June 2011

Stream B - Efficient EPC Contracting and Risk Management in Tunnel Construction

0830 Registration & welcome coffee

0850 Opening remarks from the chair

0900 Overcoming the challenges of mountain tunnelling: Himalayan tunnels, India

CASE STUDY

- Challenges of tunnelling in difficult mountain regions of the world - the Himalayas, the Alps and the Andes
- The dilemma of which construction method to choose and why - TBM or drill-&-blast
- Virtues of foresight planning in tackling tunnelling difficulties
- Need for flexible contracts and related risk management

Dr. Manoj Verma,
Vice Chairman, Tunnelling Group (Global),
GOLDER ASSOCIATES

0940 Anticipating and handling risks in underground hydro schemes

CASE STUDY

- Implementing sound geotechnical investigation and interpretation procedures
- Anticipating technical and commercial risks in developing and coordinating with contractors
- Use of geotechnical baseline reports
- Methods of covering risks - evolving insurance procedures

Malcolm Peart,
Global Manager - Tunnelling,
SMEC

1020 Morning tea & networking break

1050 Optimising contracts for hydro tunnels with best practices in design, construction and contract risk management: Kishangarh Hydro Tunnel Project, India

CASE STUDY

- Best practices in long hydro tunnel design and construction
- Handling difficult geotechnical conditions at the tunnelling site
- Hydraulic loading on tunnels - static and transient
- Risk alleviation and contract management in hydro tunnel construction

Rajeev Vishnoi,
Additional General Manager - Civil Design,
TEHRI HYDRO DEVELOPMENT CORPORATION, INDIA

1130 New technologies in ventilation safety systems for long tunnels

Senior Representative from Zitron

1200 Lunch and networking break

1300 Constructing metro rail tunnels with longer service life: Bengaluru Metro Rail, India

CASE STUDY

- Varying design standards for metro rail tunnels to enhance service life
- Latest trends in construction for longer service life
- Controlling cost aspects while maintaining safety and sustainability
- Understanding local geotechnical conditions

Sudhir Chandra,
Director - Project & Planning,
BANGALORE METRO RAIL CORPORATION

1340 Design, construction and safety features of the world's longest immersed tunnel: Femharn Belt, Denmark - Germany

CASE STUDY

- Addressing low tunnel ventilation efficiency in long tunnels
- Designing tunnels for long evacuation time
- Incorporating smoke control and evacuation strategies in rail tunnels

- Using modern fire engineering and simulation tools

Dr. Joe Paveley,
Senior Associate - Fire Engineering,
ARUP

1420 Afternoon tea & networking break

1450 Constructing railway tunnels close to existing operational tunnels and under shallow overburden: Eastern Railway and Mumbai Suburban Rail, India

CASE STUDY

- Surface/sub-surface geotechnical investigations and assessment of tunnelling media
- Status analysis and stability evaluation of the existing tunnel
- Decision on portals and alignment of new tunnel at the positions closest to the existing tunnel
- Analysis and design of tunnel cross section and support system along with the construction scheme

R K Dayal,
Additional General Manager,
RITES

Alok Garg,
Head - Tunnel & Railways Bridges,
RITES

1530 Selecting the ideal tunnelling method in constructing urban metro rail tunnels: Downtown Line 1, Singapore

CASE STUDY

- Tunnel route alignment issues
- Shaft construction methodology
- TBM selection criteria and outcomes for urban tunnelling
- Structure protection during shaft construction

Yan Zhen,
Tunnelling Manager,
SHANGHAI TUNNEL ENGINEERING CORPORATION

1610 Interpreting geotechnical data in designing water tunnels in urban conditions: Mumbai Municipal Water Tunnel, India

CASE STUDY

- Analysing the function and design of water tunnel design with geotechnical data
- Reinforcing single and multiple layers of linings: How can this be achieved?
- Designing for various utilisation criteria: Fire, chemicals, corrosion etc.
- Segment lining construction and installation techniques: What are the challenges?

Rakesh Kumar,
Manager - Planning
(Underground Structures),
SOMA

Sunil Kumar,
Manager - Planning,
SOMA

1650 Chair's Summary with Q & A

1700 End of conference



Masterclass:

10.00 - 16.00 (includes lunch and tea breaks)

Tuesday, 21 June 2011

Overcoming Challenges in the Design and Construction of Cost Effective Tunnel Infrastructure

Led by



Malcolm Peart,
Global Manager - Tunnels,
SMEC

Malcolm has over 30 years of experience with all stakeholders groups in Asia, Europe, Africa, Middle East and South America including transport/hydropower and airport projects. He is a Chartered Engineer, Chartered Geologist and a Project Management Professional.



Eddie Wong,
Technical Director,
AECOM

Eddie Wong has more than 20 years of experience in geotechnical and tunnelling engineering in Asia and Middle East, which includes cut and cover, hard rock, soft ground and immersed tube tunnels. He specialises in numerical modelling, ground movement prediction and soil structure interaction analysis. He was an advisor on both the Chongming and Bund Tunnels in Shanghai and has been involved in metro, railway, highway and water tunnel projects in Hong Kong, China and India. Current projects include the Kolkata and Chennai metro projects in India and railway tunneling projects in Hong Kong.

The cost of tunnel infrastructure, as against bridges, is usually higher. Higher design standards, technologies in construction and safety standards increase the outlay for asset owners and developers. Developing economical and sustainable options in tunnel engineering will make subsurface infrastructure a more viable and attractive option. This interactive masterclass seeks to highlight how this objective can be achieved.

Discussion Points:

- Understanding the need for quality geotechnical investigations
- Trends in evaluation and interpretation of geotechnical data / criteria in selecting the ideal tunnelling method
- How to identify and select various services involved in tunnel construction
- Sustainable methods in tunnel finishing activities

“Very well organised. We received full support from the organisers in meeting our clients.”

Pedro Quiros, Marketing Manager, **Zitron SA**

Site Visit:

PSRWT Tunnel, Hulu Lungat, Selangor, Malaysia

09.00 - 15.00

Friday, 24 June 2011

Learning from the Design and Construction of one of Asia's Longest Water Tunnels: Pahang-Selangor Raw Water Transfer Tunnel, Malaysia

Led by



Ir. Arshad bin Abdul Rashid
Deputy Director - Pahang - Selangor Raw Water Transfer Project
Ministry of Energy, Green Technology & Water, Malaysia



Takashi Kawata
Project Manager - Pahang - Selangor Raw Water Transfer Project
SNUJ JV

Learning objectives:

- Understanding design issues in very long, water tunnels
- Identifying ideal tunnel construction methodologies for different sections of the tunnels
- Construction and contractual issues in integrating various excavation methods
- Lining and corrosion control features for hydro tunnel

The Pahang-Selangor Raw Water Transfer Project will transfer raw water from the Semantan River in the State of Pahang to the States of Selangor and Federal Territory to meet future water supply demands of these areas.



The 44.6 km long transfer tunnel includes the inlet connecting basin, inlet conduit and outlet conduit. The inlet connecting basin is located on the hill about 300 m from the Karak-Telepong road and the outlet conduit ends about 3.5km north of the existing Sg. Langat treatment plant.

The tunnel route passes through the main central mountain range which typically has elevations exceeding EL. 1,200m.

The tunnel has a diameter of 5.2m in sections excavated by TBM and a longitudinal slope of 1/1,900. The tunnel will operate under free flow conditions with a design discharge of 27.6m³/s.

The transfer tunnel is directly connected to the treatment plant with pipelines maintaining gravity flow. Thus the outlet water level is set at EL. 61.2m.

Tunnel excavation will primarily be made by Tunnel Boring Machine (TBM) for 35km. The upper and lower ends will be excavated with the conventional New Austria Tunneling Method (NATM). Four adits are provided for construction of the tunnel, and hence three TBM cutting-faces and four conventional cutting-faces are planned.

The inlet and outlet conduits are designed as cut-and-cover type culverts of horseshoe shape with vertical walls. They will be 4.0m in width and 4.7m in height.

*All delegates must bring passport and relevant visas to enter Malaysia. Lunch and coffee/tea breaks are provided.

Technical Workshop:

09.00 - 12.00

Friday, 24 June 2011

Risk Management - The Key Element for Successful Tunnel Construction

Led by



Heinz Ehrbar,
Chief Construction Officer,
ALPTRANSIT GOTTHARD AG

Heinz Ehrbar joined AlpTransit Gotthard AG in 2001 and became its Chief Construction Officer in 2006. He has graduated from the Swiss Federal Institute of Technology, Zurich. He has extensive experience in the planning, design and construction management of underground structures such as highway and railway tunnels, caverns, shafts and hydro power tunnels.

Tunneling is a very special field of civil engineering. In contrast to most of the civil work the main construction material in tunneling - the ground - is very often not well known. A systematic risk management from the first steps in a project until the completion of the work is absolutely necessary for a successful realization of an underground project. A systematic risk analysis and the definition of mitigation measures to handle potential hazards are crucial for a fast reaction on unforeseen conditions.

The technical workshop, based on the experiences of Gotthard base tunnel, provides insights into developing a risk management regime for long, mountainous tunnel construction.

Learning Objectives:

- The main steps of a systematic risk management
- Who will classify hazards and chances
- Risk evaluation and strategies to successfully avoid risks
- Principles of risk sharing by the contractual partners



Excavation work with conventional tunnelling in squeezing rock conditions, Sedrun northern drive.



Malcolm has over 30 years of experience with all stakeholders groups in Asia, Europe, Africa, Middle East and South America including transport/hydropower and airport projects. He is a Chartered Engineer, Chartered Geologist and a Project Management Professional.

Building cost effective tunnels still a challenge in Asia

Malcolm Peart, Global Manager Tunnels at SMEC, speaks exclusively to Construction IQ on the opportunities and challenges in the industry. Here is a brief snapshot of the dialogue.

Construction IQ: With immense infrastructure development and investment throughout Asia, what needs to be done to ensure high tunnelling standards throughout the region?

Malcolm Peart: Tunnelling is a high risk activity. Although the likelihood of hazardous events or circumstances being realised may be low, the severity of some of the outcomes will always remain as catastrophic in both physical as well as financial terms.

By managing and reducing risks the standards of tunnelling may be increased, and this has been clearly demonstrated on many tunnelling projects around the world. However, standards of tunnelling vary and without the benefit of exposure to 'best practice' some tunnelling environments leave much to be desired.

Although there are codes of practice for safe tunnelling, risk management in tunnels and model specifications tunnelling is generally self regulated but often times suffer from 'over-regulation' once something adverse or untoward has happened. This type of regulatory approach often stultifies tunnelling and leads to a prescriptive approach to tunnelling which may not only be inefficient but can lead to problems and a lack of application of 'tunnelling savvy'.

In order to ensure high tunnelling standards there must be a requirement to follow 'good industry practice'. This will require practitioners to adopt codes produced by other countries and also concepts that are not necessarily adopted. A concept that is not universally accepted is, 'risk' and it may be necessary to adopt a 'risk based approach' rather than the absolute process prescribed in some codes of practice.

The British Tunnelling Association and Association of British Insurers have issued a Joint Code of practice for the Risk Management of Tunnel Works in the UK which is also adopted 'in principal' in several parts of the world. The International Tunnelling Insurance Group has issued a similar document as has the ITA (International Tunnelling Association). However, and although these codes are not 'mandatory' they are followed by many practitioners.

In any event the provision of high standards in tunnelling is essential to the successful delivery of a tunnel project be it from a safety, quality, cost or time perspective. The specification and adoption of 'good practices' from the outset together with independent check or review of such good practice during the planning and execution stages can only benefit the cause of 'high standards'.

Malcolm Peart is a speaker (day two, stream B at 9.40) at the **Tunnel Design & Construction Asia** conference.

To read the complete interview visit

www.tunneldesignconstruction.com

Who should sponsor?

Tunnel Design & Construction Asia 2011 will be the only regional event which:

- Presents asset owners from regional governments
- Announces upcoming tunnel infrastructure master plans
- Assembles and facilitates networking with all stakeholders groups - Owners, Geotechnical investigators, AEC firms, EPC contractors and service/material suppliers

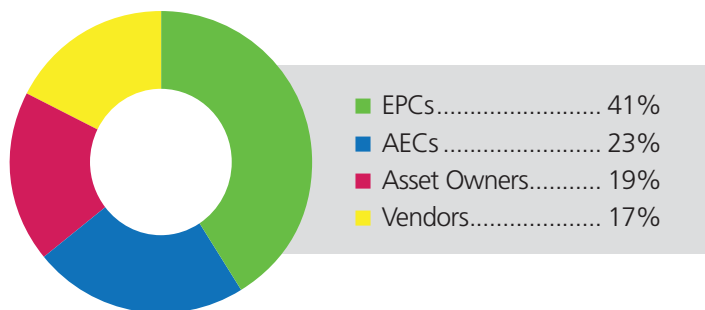
If you provide any of the following services and are looking to achieve your business objectives, **Tunnel Design & Construction Asia 2011** is the event you have to be at.

- | | | | |
|--|---|--------------------------------|--|
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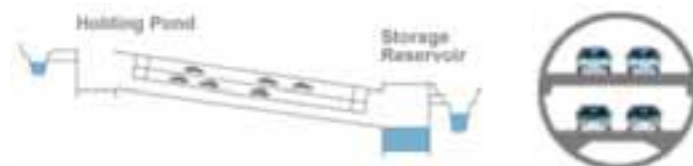
Dr. Lim Seok San,
Geotechnical
Manager,
Samsung

Dr. Lim Seok San talks about the economic growth to outline regional status of tunnels in Asia

Dr. Lim Seok San, Geotechnical Manager for Samsung outlines the challenges in developing sustainable and cost effective tunnels. He also shares his thoughts on the opportunities and challenges for future growth in Asian tunnel infrastructure and tells us why tunnel construction outside of earth may be a possibility.

Construction IQ: In your opinion what are some of the challenges in developing sustainable and cost effective tunnels?

Dr. Lim Seok San: In economically developed areas, infrastructure is already provided to a certain level and the benefit of additional tunnel development is doubtful from the point of view of cost. Traditionally, tunnels have been developed for a single purpose such as road, rail, power, water supply and sewer, and communications. This kind of single purpose tunnel is frequently developed by individual clients, often operating under the same government organization. The multi-purpose tunnel can provide a cost benefit as well as taking account of environmental aspects. Planning a multi-purpose tunnel obviously takes more time and generates more discussion between clients but this kind of time-consuming discussion, if approached in a well organized manner, can be accommodated in these developed areas. One good example of this is the SMART (Stormwater Management Road Tunnel) in Malaysia, which can provide storm water control and meet traffic needs at the same time. Below picture is the example of the SMART system.



1. No storm, low rainfall

No flood water will be diverted into the SMART system.



2. Moderate storm

The SMART system will be activated and flood water will be diverted into the bypass tunnel in the lower channel of the motorway.



3. Major storm

The SMART system will be activated and the motorway will be closed to traffic.

Construction IQ: Could you please outline the opportunities and challenges for future growth in Asian tunnel infrastructure?

Dr. Lim Seok San: The opportunities and challenges for future growth in Asian tunnel infrastructure may depend on the regional status of the economical growth and the priority of clients' needs. The common aspect of the Asian major city is considered as the high population and the difference is the status of the infrastructure currently available. In less developed areas, provision of utility tunnels such as road tunnel, subway tunnel, power and communication, and sewer tunnel

is essential. Ground level developments, while reducing initial cost, commonly cause future environmental and land development issues as well as problems associated with future upgrading of the facilities. In developed areas, emphasis is placed on the environmental aspect of development as well as on enlarged facility supply. For example, the deep road and rail tunnel currently under planning in Seoul will draw traffic away from ground level, leaving surface areas free for redevelopment as green / recreational, to enrich people's lives. Another example of underground development is the mined underground parking lot built at Sydney Opera House. This kind of mined underground parking lot can be developed so as not to disturb city views. Below pictures are the planned road and rail deep tunnel at 40-60m depth in Seoul.



Construction IQ: What factors need to be taken into account to address the demand-supply gap in infrastructure investment?

Dr. Lim Seok San: In order to reduce the demand-supply gap in infrastructure investment, in-depth research to understand political and economical needs is required. Based on statistical and quantitative research, priority of investment supply can be determined. The beneficial relationship between each investment should be studied, and the higher beneficial items identified and prioritised.

Construction IQ: What are some of the yet to be explored untapped opportunities in tunnel design and construction?

Dr. Lim Seok San: In the Asian region, tunnel design and construction has focussed on developing civil infrastructure of the type already mentioned. Untapped opportunities for the future could be deep tunnelling and utilisation of space created below ground. Construction of underground facilities such as stadia, theme parks, museums, and hotels could be considered to replace old facilities in city centres, providing easy access. Use of this kind of underground space has advantages by way of energy saving, land use and earthquake resistance. Of course, implementing plans for such use of below ground space would need wide social agreement. Another interesting topic is the study of tunnel design and construction based on different gravity conditions. This will provide the technique and ideas for the possible future construction of tunnels in, say, the Moon or Mars so as to develop space camps.

Construction IQ: With immense infrastructure development and investment throughout Asia, what needs to be done to ensure high tunnelling standards throughout the region?

Dr. Lim Seok San: Regardless of cultural and economical diversity, high tunnelling standards can be adopted in all countries in the Asian region. Information and experience of lessons learned in development of infrastructures in one country can readily be shared by other Asian peoples due to increasing cultural and economical exchanges.

Considering the diversity of the geological conditions, climate, economical needs and construction accuracy in the region, tunnelling standards dealing with structural safety will need to be different, based on individual country needs. However, the serviceability condition such as lighting systems, width of lane, ventilation can be discussed so as to develop high international standards.

