



# SOUTHEAST ASIAN CONFERENCE AND EXHIBITION IN TUNNELLING AND UNDERGROUND SPACE 2017(SEACETUS2017)

Innovation and Sustainable Underground Space Development  
18 – 19 April 2017  
Dorsett Grand Subang, Subang Jaya, Selangor, Malaysia

## Bulletin No. 3



**10++ CPD/PDP Hours (applying)  
20 Hours CCD  
(CIDBHQ/C/2017/0016)**

Organized by:



**TUNNELLING AND UNDERGROUND  
SPACE TECHNICAL DIVISION**

An event endorsed by:



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**IEM TRAINING CENTRE SDN. BHD**

## INTRODUCTION

The Tunnelling & Underground Space Technical Division of The Institution of Engineers, Malaysia (IEM TUSTD) is hosting for the first time the Southeast Asian Conference and Exhibition in Tunnelling and Underground Space (SEACETUS2017) in Subang Jaya, which is approximately 27 km from Kuala Lumpur City Centre. The conference will offer case studies and strategies that demonstrate innovation, skills and best practices, and help delegates understand the technologies and techniques guiding the Tunnelling and Underground Space Development Industry.

Its aims are to promote the sharing of knowledge, experience, skills, ideas and achievements in the designing, financing and contracting as well as construction, operation and maintenance of tunnels and other underground facilities among the ASEAN Countries on an organised basis and with agreed aims. International paper contributions are also welcomed.

### **The Conference covers:**

- Tunnelling projects – this includes past and present projects;
- Collaboration among researchers, governments, developers, consultants, contractors and specialists tunnel & trenchless contractors;
- Standards, legal, social, economic, safety & risk management and related topics on the use of underground space.

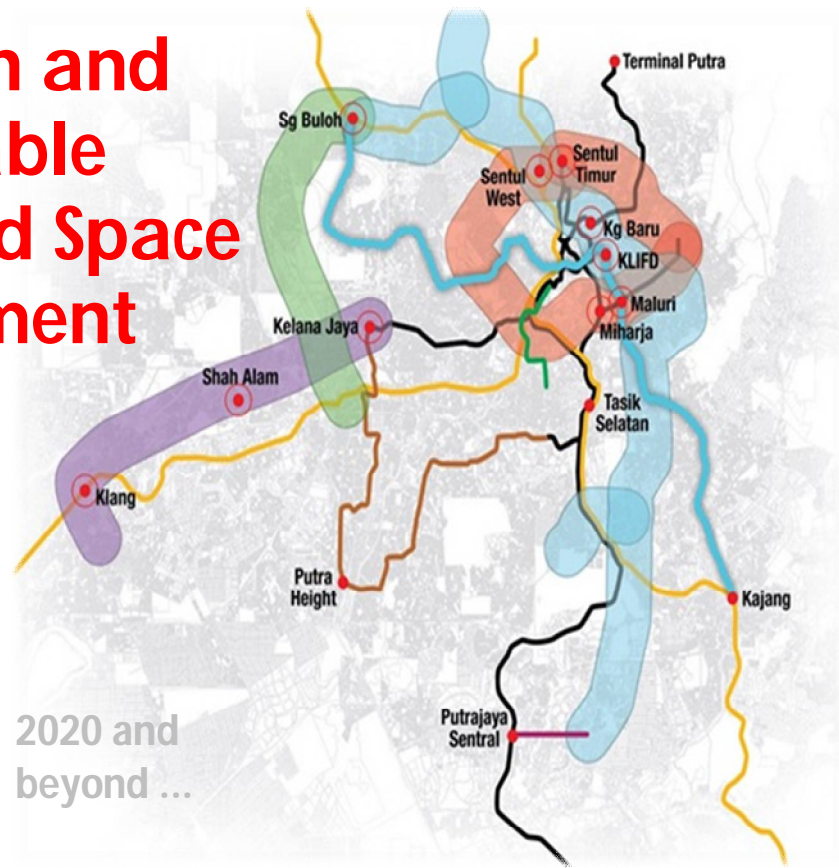


This Conference is supported by:





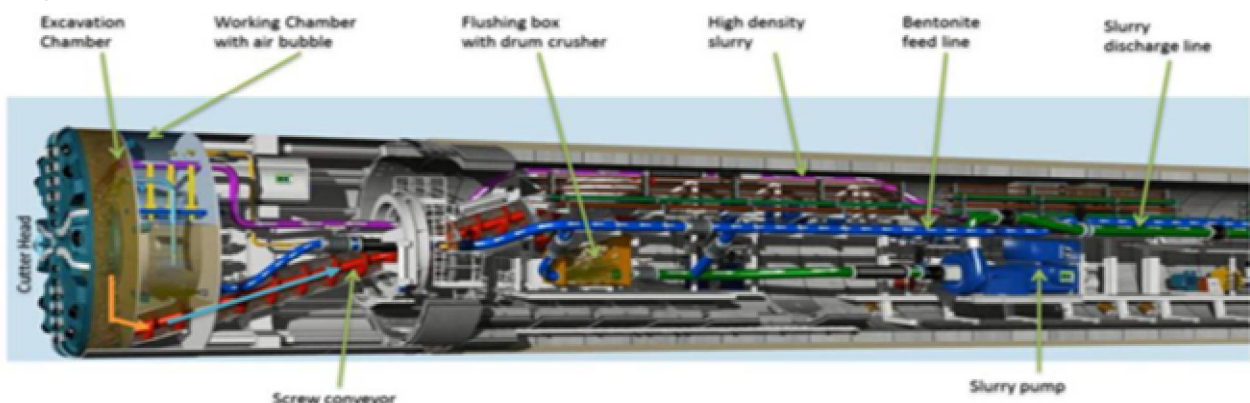
# Innovation and Sustainable Underground Space Development



2020 and beyond ...

This conference is aimed at providing a forum for practising professionals – engineers, consultants, contractors, technologists, researchers, academicians, manufacturers and suppliers to share their experiences, research, studies and views so as to contribute to the advancement of Sustainable Tunnelling and Underground Space Development in general and particularly in Asia. A wide range of high quality scientific and technical papers of International or Regional significance on Tunnelling and Underground Space Development is expected on the following topics:

- ▶ Tunnelling to include process, operation, ventilation and maintenance.
- ▶ Trenchless Technology such as micro-tunnelling, pipe-jacking, directional drilling and rehabilitation.
- ▶ Related areas such as detection and inspection services, robotic development, sewerage services and structural aspects.
- ▶ Safety health environmental quality and legal aspects.
- ▶ Machine development and designs, latest models presentation from manufacturers of tunnelling and related machines.
- ▶ Geotechnical aspects with particular references to tunnelling and underground space development.
- ▶ Research and recent development and progress related to tunnelling & the use of underground space.



# Tunneling & Underground Space Use Activities

## Bandar Malaysia Underground City



## IMPORTANT DATES

The Organising Committee of the SEACETUS2017 cordially invites you to submit abstract(s) of not more than 200 words for the Conference by e-mail to: [tunnelpaper2017@gmail.com](mailto:tunnelpaper2017@gmail.com).

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The Conference language shall be English.



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Members: Mr. Lai Sang Lee

## INVITED SPEAKERS

### Opening Keynote Address:

**Prof. Jingxiu Yan** (*Vice President, ITA*)

### Keynote Lectures:

**Prof. Kwet Yew Yong** (*National University of Singapore*)

**Prof. Charles W.W. Ng** (*Hong Kong University of Science and Technology*)

**Er. Seng Tiok Poh** (*MRT Corporation*)

**Ir. Dato' Paul Ha** (*Gamuda*)

### Special Lectures:

**Dr. Benson Hsiung**  
(*National Kaohsiung University of Applied Sciences*)

**Prof. Noppadol Phien-wej**  
(*Asian Institute of Technology*)

**Dr. Davorin Kolic**  
(*ITA Croatia*)

**Dr. Harald Wagner**  
(*ITA Thailand*)

**Mr. Gus Klados**  
(*MMC-Gamuda KVMRT*)

**Mr. Zaw Zaw Aye**  
(*SEAFCO*)

**Mr. John Davies**  
(*Jururunding Arup*)

**Mr. Alexander (Sandy) Mackay**  
(*HSS Intergrated*)

**Mr. Andreas Raedle**  
(*Arup Singapore*)



**Renowned speakers  
from Southeast Asia**



## BIOGRAPHY OF THE INVITED SPEAKERS



**Professor Jinxiu Yan** is currently the Vice President of the International Tunnelling and Underground Space Association (ITA); Vice President of the Chinese Tunnelling and Underground Works Society and Deputy General Manager of China Railway Academy Co., Ltd. Prof. Yan has worked as consulting engineer for many major tunnel projects for 30 years. In the past 3 years, she has delivered 10 international Keynotes or lectures in Asia, Europe, America and Middle East.

As research team leaders or experts appointed by the governments or the project owners, she have been involved in the construction of many major railway, highway tunnels and metro projects as well as long subsea tunnels in China such as the longest 32km long Guanjiao Railway Tunnel which is under construction; 18km long

Qinling Railway Tunnel which has been completed in 1999; 13 km long Yesahnguan Tunnel in Karstic geology which has been completed in 2010; 18km Qining Zhongnanshan Highway Tunnel which has been completed in 2009; the longest (7.8km long) subsea highway tunnels in China, the Qingdao Jiaozhou Bay Subsea Highway Tunnel which has been completed in 2011 as well as 8.6km long Xiamen Xiang'an Subsea Highway Tunnel which has been completed in 2010.

Prof Yan has won the Winner for 2012 China Economic Female Entrepreneur Figures; Expert for enjoyment of China State Council Special Allowance for Outstanding Contribution to Engineering in 2011; Winner for the 5th Talent Prize of China Zhantianyou Development Foundation for Railway Science and Technology in 2008 as well as Winner for Tip-top talent by the Ministry of Railways, P.R.China in 2000.



**Er Prof Yong** is Professor of Civil Engineering and Vice President at the National University of Singapore. Since joining NUS in 1979, he has held senior leadership positions including Head of Civil Engineering, Founding Director of Centre for Soft Ground Engineering and Chairman of NUS-MINDEF Centre for Protective Technology. His research is a microcosm of the infrastructure development in Singapore. He has published over 200 technical publications and translated research to practice in areas of pile foundation, land reclamation, ground improvement, deep excavations, tunneling and underground construction. He has been consultant and adviser on many major infrastructure projects in Singapore, ASEAN and China including the Singapore underground MRT lines and the Klang Valley MRT system.

Prof Yong chairs/chaired several professional and government committees including the Association of Geotechnical Societies in Southeast Asia, the Building and Construction Authority Accredited Checkers Selection Panel, the Ministry of National Development-National Research Foundation R&D Committee on Land & Livability and the high-level Development Projects Advisory Panel that review large public infrastructure projects for the Ministry of Finance. He also serves on several boards including the Land Transport Authority (LTA). He chaired LTA's Independent Investigation Panel on Nicoll Highway Collapse in 2004 and was a member of the MEWR Expert Panel on Enhancing Flood Protection in Singapore in 2011/12.



**Professor Charles W.W. Ng** is an Associate Vice-President for Research and Graduate Studies and a Chair Professor in the Department of Civil and Environmental Engineering at the Hong Kong University of Science and Technology. He obtained PhD degree from the University of Bristol in 1993. After carrying out a period of post-doctoral research at the University of Cambridge between 1993 and 1995, he returned to Hong Kong and joined HKUST as Assistant Professor in 1995 and rose through the ranks to become Chair Professor in 2011.

Professor Ng was elected an Overseas Fellow from the Churchill College, Cambridge University, in 2005 and Changjiang Chair Professor in Geotechnical Engineering in 2010. He is Fellow of the Institution of Civil Engineers (FICE), the American Society of

Civil Engineers (FASCE), and the Hong Kong Academy of Engineering Sciences.

Professor Ng is an Associate Editor of the *Canadian Geotechnical Journal* and has served in many other editorial boards. Professor Ng has solely supervised and graduated 30 Ph.D and 35 M.Phil students. He has published some 220 SCI journal articles (most of them published in *Géotechnique*, *Géotechnique Letters*, *Canadian Geotechnical Journal*, *Journal of Geotechnical and Geoenvironmental Engineering*, *ASCE, Computers and Geotechnics*) and delivered about 50 keynotes, general reports and state-of-the-art reports in 5 continents worldwide. He is the main author of two reference books (i) *Soil-structure Engineering of Deep Foundations, Excavations and Tunnels* and (ii) *Advanced Unsaturated Soil Mechanics and Engineering*. He has received many awards including the R. M. Quigley Award from the Canadian Geotechnical Society twice for his two best papers. Professor Ng is the recipient of the first Tan Swan Beng Award by the Southeast Asian Geotechnical Society. He was conferred the 2003 Mao Yisheng Youth Award by the Chinese Institute of Soil Mechanics and Geotechnical Engineering for his significant contributions in Geotechnical Engineering. Also he is one of the recipients of the 2<sup>nd</sup> Prize of 2015 Scientific Advancement Award by the State Council of China and also the First Prize of 2013 Scientific Advancement Award by the Ministry of Education, China.

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**Er. Poh Seng Tiok** has more than 20 years' experience in large scale mass transit, railway design and construction projects in Singapore, Hong Kong, Malaysia and other parts of Asia. Currently, he is the Planning and Design Director for Mass Rapid Transit Corporation (MRTC) in Malaysia, implementing the MRT projects in Kuala Lumpur. He manages the MRTC design group covering disciplines such as Architectural, Civil & Structural, Alignment, Geotechnical & Tunnels, Interface Coordination, BIM/GIS, Programme & Planning, Development Building Control and Transport Planning.

He leads the multi-disciplinary team in supporting the implementation of the KVMRT Line 1 of 51km railway as well as Line 2 with 53km of railway. Concurrently, he also provides technical leadership on the Engineering Feasibility Study for future Line 3, which is a circle line connecting all the radial MRT lines and other forms of public transport.

Prior to joining MRTC, he was an Associate Director with Arup Singapore Private Ltd. Besides being the Project Manager on various Architectural and Engineering detailed design contracts, he also led Singapore Arup's infrastructure group's Tunnelling, Railway Engineering, Rail Civil & Structural and Alignment team. Seng Tiok was also a practising Professional Engineer in Singapore for major MRT projects such as Singapore's first steel fibre reinforced concrete bored tunnels in Singapore Downtown Stage 3 Contract C933.

From 2008 to 2010, Seng Tiok worked in Hong Kong with Aecom HK on design and feasibility studies for few railway projects in Hong Kong such as Shatin Central Link and also in Mainland China. Before 2008, Seng Tiok worked in the Singapore Land Transport Authority (LTA) and was involved in almost all the major railway projects in Singapore such as Down Town Line Stage 1, Circle Line stage 1 to 5 and North East Line.

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**Dato' Ir Paul Ha** is the deputy group managing director of Gamuda Berhad. A board member since 1990, he plays a major role in managing Gamuda's local and international business divisions which covers engineering & construction, property development and infrastructure concession.

The multiple award-winning Stormwater Management and Road Tunnel project, popularly known as Kuala Lumpur's SMART Tunnel and the Kaohsiung Metropolitan Mass Rapid Transit in Taiwan are among some of the past projects that were successfully managed by Dato' Ha.

Currently, he oversees Gamuda's key role in implementing the Klang Valley MRT project which spans until 2022.

A civil engineer by profession, Dato' Ha has to his name 38 years of experience in the fields of engineering and construction, particularly in large scale design-and-build projects both in Malaysia and abroad.

He holds a Bachelor of Engineering degree from University Malaya and is a Professional Engineer registered with the Board of Engineers, Malaysia. He is also registered with various international professional bodies including as a Chartered Engineer with the Engineering Council of UK.

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**Dr. Bin- Chen Benson Hsiung** is from Taiwan and completed his Master degree in University of Illinois, Urbana- Champaign, United States in 1996. After Dr. Hsiung graduated from US, he came back to Taiwan and then joined an engineering consulting firm there as a geotechnical engineer for approximately 1 year before he went to University of Bristol to study for his PhD.

Dr. Hsiung got his PhD at the end of 2001 and then moved to work for an international consulting firm, Maunsell (now AECOM) for several large- scale infrastructure projects in both UK and Taiwan, such as HS1 and Taiwan High Speed Rail. Dr. Hsiung came back to Taiwan and joined Department of Civil Engineering, National Kaohsiung of Applied Sciences as a full- time academic staff in August 2003.

Dr Hsiung is a well- qualified British chartered civil engineer and also country representative in Taiwan of Institution of Civil Engineering. He was promoted to be associate professor in the university since 2010. From 2011 to 2015, Dr. Hsiung was on leave for his replacement work in industry for 4 years, mainly involved in promotion and operation of overseas projects, such as Jakarta MRT in Indonesia. Dr. Hsiung's main research interests are deep excavation, TBM tunnelling, soil- structure interaction analysis and geotechnical monitoring etc.. Dr. Hsiung is also currently the secretary of Asian Technical Committee 6 "Urban GeoEngineering" under ISSMGE Up to now he has published approximately 50 international journal and conference papers and supervised more than 30 PhD & MSc students in total.



**Dr. Noppadol Phienwej**, a faculty member at Asian Institute of Technology, has 29 years of experience in geotechnical engineering as an academician and consultants. His areas of interest and expertise are underground excavations, tunnelling, dam engineering and slope stability. He is also heavily involved with professional society and community service activities for instances, twice as advisors to the Minister of Transport of Thailand, advisors to a number of state enterprises responsible for infrastructure and utilities development.

He is now the president cum the honorary secretary of the Southeast Asian Geotechnical Society. He used to serve as a liaison person of Thailand National Group of the International Tunnelling and Underground Space Association (TUTG) and was the past chairman of the group. He used to serve as editor of the Geotechnical Engineering Journal and serves on editorial board of two leading international journals, i.e. Tunnelling and Underground Space Technology and Tunnelling and Geomechanics. He was also the past chairman of the Geotechnical Committee of the Engineering Institute of Thailand and was also a member of its Executive Committee.

He has been involved with a number of major infrastructure development projects in Thailand and Southeast Asian countries (building foundations, hydropower dams, irrigation dams, transport and utilities tunnels, long water diversion tunnel projects, MRT projects, airports, etc.). On research front he has been recently conducting research on application of advanced numerical computation to gain better understandings on problems related to piled raft foundation and urban tunnelling.



**Davorin Kolić, PhD, MSc, BSc, PE, CE** was born in Zagreb in 1961, earned PhD level from Faculty for Civil Engineering, University Zagreb with the core methodology using and developing risk analysis techniques. Won 3 times Rector's Price of the University of Zagreb. In 2000 was awarded first price for the best international consultant of Austria as a member of a team for the Wanjiazhai Yellow River Diversion Project in China.

Since 1990 active in underground projects with special expertise in risk analysis and risk management. Risk analyses were performed on different projects in Singapore, Hungary, Puerto Rico, Austria, Denmark, Germany, Hong Kong, Russia, Turkey, Croatia and Slovenia since 1996.

Co-author of the Austrian guidelines on "Cost Estimation for Transport Infrastructure Projects Considering Project Relevant Risks". Author of more than 100 scientific and technical papers, co-author of 1 book, 3 guidelines on design and construction of underground structures in Austria and EU. Editor of 6 further proceedings on tunnelling, lecturer on master studies in Torino (TBM Tunnelling) and Salzburg (International competence in management), president of Croatian association for tunnels and underground structures ITA Croatia, member of Executive Council of ITA-AITES.

Recently project manager on project preparation and risk analysis of a new mostly underground railway line Divaca-Koper, Slovenia.



**Dr. Harald Wagner** has received his initial postgraduate experience in Foundation Engineering with Prof. Steinfeld in Hamburg, Germany, after he received his academic education from Technical University (TU) in Graz, Austria. He obtained his PhD in 1974 for studies on stabilization of landslides in soft soil slopes. Further to his postdoctoral training he has been teaching "Soil Mechanics for Architects" at TU Graz.

In 1975 he became deputy director in construction for planning and design of underground mass transit project in Bochum, Germany, where he pioneered urban mined tunnel technologies. In 1976 he became the technical director in design and construction for all underground works in Innsbruck, where he worked for more than 10 years. In the course of this work period he experienced Drill & Blast as well as TBM construction of major highway tunnels and hydro tunnels in all types of ground in Austria and Germany.

In 1985 he established his consulting company in Linz/Austria. For the next 25 years he worked as managing director and chief professional engineer, and expanded the company in Europe, in both Americas and in Asia. He worked on mined underground infrastructures in Austria, Japan, Mexico and USA, with emphasis on innovative solutions. He globally transferred European Tunneling Practice e.g. for WMATA's Wheaton Station in Washington/USA, the first mined soft ground metro station in North America.

Harald Wagner is recognized for his pioneering works in mined infrastructures. He has received multiple international awards including one from the Austrian President. He was working as a member, animateur and tutor within several ITA working groups, sharing his professional experience in underground infrastructures globally with the tunneling industry and with universities.

During more than 3 decades he has been the driving force behind innovative technological concepts in both conventional drill & blast, and mechanized TBM tunneling. His engineering works are reflected and globally used in multiple patent applications. In 2002 he became a member, and in 2004 he became Vice President of ITA's Executive Council. He is acting as an Expert, Arbitrator, Tunnel Lecturer and Surveyor of ITA CET's Foundation.

Living and working in Bangkok as a consulting engineer and underground construction specialist since 2009, he was appointed in 2015 from KMITL University, Faculty of Engineering, Department of Civil Engineering, as Professor (Adj.) for "Tunnel Engineering" and Director for International Programs of the University.

The President of ITACET Foundation awarded the ITACET AWARD 2016 to Harald Wagner for his significant contribution to the activities of ITA. The award was handed over to Dr. Wagner during Opening Ceremony of ITA's World Tunnel Congress WTC 2016 in San Francisco, USA. In 1985 he established his consulting company in Linz/Austria. For the next 25 years he worked as managing director and chief professional engineer, and expanded the company in Europe, in both Americas and in Asia. He worked on mined underground infrastructures in Austria, Japan, Mexico and USA, with emphasis on innovative solutions. He globally transferred European Tunneling Practice e.g. for WMATA's Wheaton Station in Washington/USA, the first mined soft ground metro station in North America.

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**Gus Klados** is the Director, Tunnels for the Underground Works Package Contractor MMC Gamuda KVMRT (T) Sdn. Bhd. for the Sungai Buloh – Serdang – Putrajaya (SSP) Line and has been the Project Manager for the Sungai Buloh – Kajang (SBK) Line in Kuala Lumpur.

Gus has forty plus years' experience in tunnelling and related construction worldwide on major infra-structure projects out of which twenty two years in South and South-East Asia.

He started in Budapest on the M2 and M3 metro lines. His first foreign assignment was in Belgrade, then in Yugoslavia on the Vračar rail tunnel. Gus spent altogether 7 years in India on the Calcutta- and Delhi Metros. Later Gus worked in England on the Channel Tunnel, in South Africa on the Lesotho Highlands Water Project, in Greece on the Athens Metro Lines 2 & 3, in Singapore on the Deep Tunnel Sewer System, in Malaysia on the SMART project, always as contractor in managerial positions. For a real change Gus returned to Hungary, his native country, after 28 years of absence as project director of the Client on the Budapest Metro M4 Line. He was recalled to Kuala Lumpur in March 2011 to assist the MMC Gamuda JV to tender for, win and construct the underground works contract for the SBK Line and to win the tender and build the tunnels for the SSP Line, the first and second MRTs or heavy metro lines in the Klang Valley in Malaysia.

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**Mr. Zaw Zaw Aye** is currently working as an Executive Vice President in SEACO PUBLIC COMPANY LIMITED of Thailand. He has over 25 years of extensive experience in technical and management role in design, supervision and construction of deep underground excavations, bored pile foundations and tunneling projects. He is an active member of American Society of Civil Engineers and a Fellow of the Geological Society of London.

Zaw Zaw Aye is well-recognized alumnus of AIT where he obtained his Master's Degree from Geotechnical and Transportation Engineering Division of the School of Civil Engineering in 1991. He authored over 50 international publications of which many of them are peer-reviewed. Zaw Zaw Aye has been delivering keynotes and special lectures in deep foundations, deep excavations and tunnelling in various conferences and seminars in different parts of the world. He is an editor of the Current Practices in Deep Foundations and Diaphragm Wall Construction in Thailand. He gave special lectures to Master's Program students in the Asian Institute of Technology (AIT) on deep foundations, deep excavations and geotechnical instrumentation. He also served as an external committee member for Master's Degree Thesis in geotechnical and geo-environmental engineering program of the AIT. Zaw Zaw Aye is an appointed Expert of Tunnelling and Underground Space Association Executive Council (ITA ExCo). He is a Vice Chairman of Myanmar Tunnelling and Underground Space Committee of Myanmar Engineering Society and also an advisor of Thailand Underground and Tunnelling Group of the Engineering Institute of Thailand.

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**John Davies** is resident in Kuala Lumpur and a Senior Consultant in the Arup Singapore Infrastructure Group. He is currently Project Manager for the reference design for the underground portion of the KL MRT Line 2. He has been Project Director on Land Transport Authorities Detailed Design Consultancies for a number of metro projects including the initial 5kms section of the Downtown 3(DTL3) through the centre of Singapore, approximately 11kms of the Thomson Line (packages TSL A&D) and 5kms of the Eastern Region Line (ERL).

John has provided geotechnical advice for a wide range of projects in Asia, Africa & Europe, including projects involving innovative foundations and basement designs as well as, slopes, reclamations and geotechnical processes. The railway projects have included advice on all the major metro railways in Hong Kong for MTRC and KCRC as well as underground railway projects in Taiwan, Singapore, Korea, Indonesia and Thailand.

He is a past chairman of the HKIE Geotechnical Division and has published widely on geotechnical aspects of design.

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**Alexander (Sandy) Mackay** is a Civil and Mining Engineer with 30 years' experience practicing in 19 countries. He has been the project manager, designer and supervisor for multi-discipline infrastructure projects with expertise in Tunnel Boring Machines and drill and blast excavation. He is now the General Manager for the Mass Rail Transit (MRT) Design Checks for underground works for the Klang Valley Mass Rail Transit 2 (KVMRT2). Past posts include being the Contractor's Engineering Manager for the US\$ 4.5 bill. Gold Line Metro, Qatar, 2015 to 2016; Corporate Manager for Nishimatsu Construction Co. Ltd, HK, 2012 – 2015 responsible for tender bids up to HK\$21 bill and Team Leader for the US\$ 23.5 bill. Sakhalin Island pipelines, Russia. He has published over 70 technical publications, is a Chartered Engineer, a Chartered Geologist and a Fellow of the ICE, HKIE and IOM3.

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**Andreas Raedle** is working for ARUP as Tunnel Leader in Singapore since more than 1 1/2 year. He is currently involved in design and construction of several challenging major underground infrastructure projects in Singapore, Malaysia and Thailand such as for example Thomson Line (Package A and D), Cross Island Line, IGMS Mover Tunnel (all in Singapore), Bangkok Orange Line and Kuala Lumpur Phase 2 Metro. Before moving to Singapore, he was working for Hochtief Murphy JV for 5 years in London – as Technical and Risk Manager on Crossrail C310 Thames Tunnel and as Project Manager for Thames Tideway Tunnel East.

He also was member of the BTS Committee from May 2014 to May 2015 and is still active member of BTS working group for "Compressed Air works in TBM Tunnelling". In former roles with Hochtief and others he has held various positions for various tunnelling projects around the world (TBM Tunnelling projects and sprayed concrete lined tunnels in Germany, Austria, Israel, Mexico, Italy, Iran, Sweden and Denmark).

## ABSTRACTS OF KEYNOTE / SPECIAL LECTURES

### KEYNOTE LECTURES

#### **CHALLENGES OF THE SIGNIFICANT TUNNELLING PROJECTS IN CHINA**

*Jinxiu Yan*

*Vice President, International Tunnelling and Underground Space Association (ITA),  
Professor and Deputy General Manager, China Railway Academy Co., Ltd.*

In the past 15 years, the length of the tunnels built is 3 times the total length of all tunnels built before the year of 2000. Around 40,000km tunnels have been built in China, including railway tunnels, highway tunnels, metro tunnels as well as water tunnels. Moreover, around 20,000 km tunnels are currently under construction and a large number of tunnels under design to be built in the near future. Many of the projects are challenging due to the huge size, complicated geology, sensitive or unfavorable surrounding condition of the projects. This paper presents the challenges and countermeasures of "long" (super long tunnel), "deep" (extra deep overburden), "large" (large cross section), "high" (high ground stress) and "complex" (complex geology) issues during construction of significant tunneling projects in China. Moreover, the new challenges will be the design and construction of super long subsea tunnels for China in the years to come.

#### **SOME CHALLENGES IN THE CONSTRUCTION OF SINGAPORE THOMSON-EAST COAST LINE**

*Prof Er Yong Kwet Yew*

*Professor of Civil Engineering and Vice-President  
National University of Singapore*

The Thomson-East Coast Line (TEL) is the sixth Mass Rapid Transit (MRT) line in Singapore. TEL, which is fully underground, will be 43-km long with 31 stations of which 7 are interchange stations. Construction of the Thomson part of TEL (Stage 1 to 3) started in June 2014 and the East Coast part of TEL (Stage 4 and 5) started in early 2016. TEL will connect the northern region of Singapore to the south, running parallel to the existing North South Line before turning east and running parallel to the coastline. The line will be operational in phases from 2019 - 2024. The paper presents some engineering challenges in the TEL project constructed in highly variable ground conditions and densely developed areas. These challenges include the Four-in-One Integrated Depot, construction in reclaimed land and excavation above the Kallang-Paya Lebar Expressway (KPE). The paper also presents the pragmatic use of ground improvement (jet grouting, deep soil mixing), recharge wells and fissure grouting, separately or in combinations, to mitigate ground loss and groundwater drawdown associated with the tunnelling and station construction.

#### **THREE-DIMENSIONAL INTERACTION OF MULTIPLE PERPENDICULARLY CROSSING TUNNELS WITH CIRCULAR AND HORSESHOE-SHAPED CROSS-SECTIONS**

*Charles W.W. Ng<sup>1</sup>, Zaw Zaw Aye<sup>2</sup>, Thayanan Boonyarak<sup>2</sup> and Wang Ran<sup>1</sup>*

*<sup>1</sup>Hong Kong University of Science and Technology, Hong Kong, HKSAR*

*<sup>2</sup>Seafco Public Company Limited, Bangkok, Thailand*

To increase the use of underground space for infrastructure systems while minimizing environmental impacts, densely populated cities like Bangkok, Shanghai and London are constructing an increasing number of tunnels and excavating ever deeper basements. At the same time, engineers and designers are also facing tougher and a greater number of geotechnical challenges. This keynote lecture starts off by briefly describing a number of recent advances in tunnelling-related research conducted at the Hong Kong University of Science and Technology (HKUST). It then examines in depth the interaction of multiple perpendicularly crossing tunnels. In particular, the factors influencing crossing-tunnel interaction are studied using the state-of-the-art geotechnical centrifuge at HKUST and three-dimensional numerical simulations. These factors include construction sequence, cover depth, pillar depth, shielding and shape of the existing tunnel (i.e., circular versus horseshoe). New findings, insights and design implications are explained and highlighted.



## **ADVANCES IN ENGINEERING TECHNOLOGY AND ITS APPLICATIONS IN KVMRT LINE 2 (SSP LINE)**

*S. T. Poh and B. H. Yeap  
Mass Rapid Transit Corporation, Malaysia*

The Klang Valley Mass Rapid Transit (KVMRT) Project involves the construction of a rail-based public transport network, Mass Rapid Transit (MRT) system, together with the existing urban rail network, will form the backbone of the public transport system in the Greater Kuala Lumpur/Klang Valley region. The first MRT line implemented is the 51km Sungai Buloh-Kajang Line (SBK Line). Construction of the line began on 8 July 2011 and is scheduled to be operational in 2 phases, Dec 2016 and Jul 2017 accordingly. The MRT SSP Line is the second MRT line to be developed. The line will serve a corridor with a population of around 2 million people stretching from Sungai Buloh to Putrajaya. The SSP alignment is 52.2km of which 13.5km is underground. A total of 37 stations, 11 of them underground, will be built. Mass Rapid Transit Corporation (MRTC) as the owner and developer for the MRT SSP Line embraces the latest advances in engineering technology and incorporate them into the implementation of the project. Notably, MRTC has mandated Building Information Modelling (BIM) maturity level 2 throughout the design, construction and asset management and operation stages for SSP Line. SSP project will likely be the first Metro Project in Asia mandating Level 2 BIM and benchmarking BS1192 (2007) collaborative workflow using a Common Data Environment (CDE). MRTC also produced our own unique KVMRT Classification for all elements within the Models. The paper will provide an update of the BIM implementation for SSP. Applications of other advances in Engineering technology employed in the project such 3-D Laser Survey in verification of as-built tolerances and Geographical Information System (GIS) integrated with the BIM process will be highlighted and explained. Ground investigations making use of the advances in geophysics and in-situ testing were employed in this project. Of interest is the use of Gravity Survey method as a useful reconnaissance tool for assessing potential ground risks and assist in the planning of further soil investigations. Some lesson learnt from the past and how the Gravity Survey procedures within the urbanized city environment have been improved to ensure quality outcome will be shared.

## **POSITIONING TO UNDERTAKE UNDERGROUND WORKS CONTRACTS – A MALAYSIAN EXPERIENCE**

*T. T. Ha and L. H. Ooi  
Gamuda Berhad, Damansara Perdana, Malaysia*

The demand for sustainable infrastructures to cater for the continuous influx of people into the city requires an effective urban transportation system such as the mass rail transit system. The MRT system will reduce the traffic congestion into the city thereby improving the social and economic wellbeing of city dwellers and is also environmentally more conducive. The demand for space to accommodate these initiatives would inevitably lead to the use of underground space. As a contractor with the vision to help the nation to achieve such objectives and to be developed nation, we have to be prepared and position ourselves to undertake major projects involving tunnelling and underground stations. This paper presents the road map of how we have position ourselves as a local contractor to undertake such projects with the primary objectives of developing and utilising local expertise and resource.

## **SPECIAL LECTURES**

### **RISK MANAGEMENT CONCEPTS IN UNDERGROUND WORKS**

*Harald Wagner  
Consulting Engineer & ITA EXCO Expert, Bangkok, Thailand & Vienna, Austria*

There are mixed conceptions on experiences with mined tunnels in various types of projects. Problems of different kinds have been experienced. There has been time and cost overrun and disputes between the owner and the contractor. With the use of project specific designed equipments and by making suitable provisions in the contract documents to deal with various kinds of hazards during execution, it is expected that these challenges can be dealt with better success in the future. Newer experiences projects between 2009 until 2014 result in underlining in particular the importance of the GBR (Geotechnical Baseline Report). The GBR should progress throughout design and construction. It furthermore underlines the importance of the RMP (Risk Management Plan) in advanced tunnel contracts. Like other underground infrastructure projects of public interest, tunnels are well under extreme time pressure.

## **THE BIRTH OF A NEW TECHNOLOGY - THE VARIABLE DENSITY TUNNEL BORING MACHINE**

*G. Klados, H.W. Ng and W.H. Hew  
MMC-Gamuda KVMRT (T) Sdn Bhd, Kuala Lumpur, Malaysia*

The Variable Density TBM (VDM), first of its kind in the world, was a joint effort between MMC-GAMUDA of Malaysia and Herrenknecht of Germany in 2010 for use in the construction of the 9.5km twin tunnels in Klang Valley Mass Rapid Transit (KVMRT), SBK Line project. The last VDM successfully broke through at Pasar Seni station in 11 April 2015. All VDMs were proven to work remarkably in mitigating the risk of tunnelling through Kuala Lumpur limestone formation, which is known to be amongst the most challenging conditions for tunnelling works. The same six VDMs are now being refurbished in Malaysia for further use together with four new ones in the new KVMRT SSP Line.

## **GEOTECHNICAL ASPECTS OF CUT-AND-COVER TUNNEL CONSTRUCTION UNDER EXISTING FLYOVER IN BANGKOK**

*Zaw Zaw Aye and Thayanan Boonyarak  
Seafco Public Company Limited, Bangkok, Thailand*

This paper presents the practical solution for cut-and-cover tunnel construction under existing overpass at one of the busiest road-intersection in Bangkok. Geotechnical aspects of cut-and-cover tunnel design and construction is focused. Pore pressure development in soft Bangkok clay during deep excavation work is reported. Effects of construction time on movement of diaphragm wall was modelled and compared with the measured results. Effective construction method using diaphragm wall integrated with top-down construction to minimize traffic congestion during construction is demonstrated. Discussion is also made on difficulties experienced during construction under the existing flyover and application of post-tension method for roof slab of cut-and-cover tunnel. Interaction between the cut-and-cover tunnel and existing deep foundation of the overpass was back-analysed using finite element method. For numerical simulation, an advanced hardening soil model with small strain stiffness was adopted. Back-analysed responses of forces on piles, movements and stresses in soil due to excavation and construction time are discussed.

## **EUROPEAN MASS TRANSIT PROJECTS USING RM METHODS**

*D. Kolic  
GEODATA Tunel Ltd., Zagreb, Croatia*

Mass transit lines sometimes have some underground parts or are located completely underground as in the case of urban transit lines. They are complex projects that include different structural parts, need a lot of financial resources for development and require a long time for construction. Such projects are therefore very much sensitive to many unpredictable moments that may cause additional costs. Risk management analyses and measures used for the control of the project development does not consider safety of labour only but investigate possibly discrepancies from the planned project schedule and respective planned costs. Several examples and applied risk management with cost control are presented on few projects performed in the last decade in Europe and results gained during their control.

## **CASE STUDIES OF DEEP EXCAVATIONS IN KAOHSIUNG, TAIWAN AND CENTRAL JAKARTA, INDONESIA**

*Bin-Chen Benson Hsiung<sup>1</sup>, Kuo-Hsin Yang<sup>2</sup>, Ching Hung<sup>3</sup>, Tzyy Hwa Yong<sup>4</sup> and Louis Ge<sup>2</sup>*

*<sup>1</sup>National Kaohsiung University of Applied Sciences, Kaohsiung, Taiwan*

*<sup>2</sup>National Taiwan University, Taipei, Taiwan*

*<sup>3</sup>National Cheng-Kung University, Tainan, Taiwan*

*<sup>4</sup>Georealtime Sdn Bhd, Kuala Lumpur, Malaysia*

In this paper, ground behaviours induced by deep excavations in both Kaohsiung, Taiwan and Central Jakarta, Indonesia are first reported, respectively. Suffering from the limitation of time and budget, it is common that two-dimensional finite element analysis is conducted for evaluation of displacements induced by deep excavation in engineering practice but this is inconsistent with reality as the said behaviour is three-dimensional. Furthermore, effects from relative system stiffness of the excavation, including factors such as excavation depth, thickness, and depth of retaining wall, the horizontal and vertical spacing of struts and excavation geometry, could affect the deformations of deep excavations considered. Thus, production of plane strain ratios (PSR) in the deep excavation for both Kaohsiung and Central Jakarta are presented in order to assist in transferring 2D results into 3D behaviours. Interpretation of relative system stiffness is delivered also and its impacts on lateral wall movements are explored and discussed. It is concluded that factors of deep excavation geometry, corner effect, and ground conditions could affect the result of PSR. Finally, applications of real-time automatic monitoring in deep excavations and tunnelling, as well as its values, are described.

## **DIFFICULTIES DUE TO RISE IN GROUNDWATER PRESSURE IN RECENT MRT UNDERGROUND CONSTRUCTION IN BANGKOK**

*N. Phienwej<sup>1</sup>, A. Asanprakit<sup>2</sup>, P. Kittiyodom<sup>2</sup>, B. Lehak<sup>3</sup>*

*<sup>1</sup>Asian Institute of Technology, Pathumthani, Thailand*

*<sup>2</sup>Geotechnical & Foundation Engineering Co.,Ltd., Bangkok, Thailand*

*<sup>3</sup>Ch.Karnchang Public Company, Bangkok, Thailand*

Difficulties were experienced in the tunnel and station construction of the Bangkok MRTA Blue Line Extension Project owing to the rebound of groundwater level following the cease of land subsidence from deep well pumping situation. The rise of groundwater head of about 10 m in the sand layers of Bangkok from the level existing during the construction of the Blue Line Initial System Project (about 16 years earlier), had caused the complication and problem in the design and construction of station excavation related to potential hydraulic uplift instability of the excavation base and troublesome water ingress situation in EPB shield tunnelling. One station excavation suffered chronic water inrush situation resulted in much delay in completion. The others utilized full base grouting method and the phased compartment excavation approach to avoid the problem. The decision on the adopted methods depended on the conditions of subsoil and groundwater head existing at each of the stations that needed to be investigated in sufficient details for the entire perimeter of the station.

## **DESIGN AND CONSTRUCTION OF WANCHAI MTR STATION REVISITED**

*John A. Davies*

*Arup Singapore Pte Ltd, Singapore*

Wanchai Station was constructed as part of the Mass Transit Railway Corporation's Island Line in the early 1980s. The Station was built top down within a perimeter diaphragm wall. The maximum depth of excavation was approximately 26 meters below the street level. At that time the calculations of bending moments, shear stresses and deflections of the diaphragm wall during basement excavation was based on simple soil/structure interaction computer models such as the OASYS program BILL. The soil on either side of the wall was represented by a series of linear elastic springs with active and passive cut offs whilst the wall was modeled as beam elements. On the basis of these models and the observations made at Chater Station in the late 1970's predictions of the wall and ground movements were made. Over the last 30 years developments in an understanding of soil behavior has shown that there is a significant non-linear variation in the stiffness of the soil with shear strain. The Rankine Lectures of Simpson (1992), Atkinson (2000) and Clayton (2011) have highlighted this aspect of soil behavior. This paper revisits the observations made during the construction of the Wanchai Station in the context of these new ground models.

## **GROUND CONDITION OVERVIEW AND GROUT INJECTION CONSIDERATIONS BENEATH THE HONG KONG WEST KOWLOON TERMINUS STATION PERIMETER WALL**

*A. Mackay<sup>1</sup>, and A.W.K. Chan<sup>2</sup>*

*<sup>1</sup>HSS Integrated, Malaysia*

*<sup>2</sup>Leighton Asia Limited – Gammon Joint Venture, Hong Kong*

The Mass Transit Railway Corporation (MTRC) West Kowloon Terminus (WKT) will be the arrival for the high speed Express Rail Link (XRL) from the People's Republic of China (PRC) to the Hong Kong Special Administrative Region (HKSAR). To form the WKT the removal of 6 million cubic metres (Mcum) of material, to about 30 metres below ground surface (m bgs), and installation of a robust groundwater cut-off injection extending beneath the perimeter wall to prevent groundwater inflow is needed. The ground conditions within the WKT footprint include reclamation fill over superficial deposits, saprolites, partial weathered (PW) rock and bedrock, with groundwater levels approximately corresponding with the tidal fluctuations. This paper provides an overview of the project and ground and groundwater conditions relevant to the perimeter wall foundation grout injection groundwater cut off design and construction.

## **CROSSRAIL C310 THAMES TUNNEL – MIXSHIELD TBM TUNNELLING IN ALTERNATING GROUND CONDITIONS WITH LOW OVERBURDEN**

*Andreas Raedle*

*Arup, Singapore*

The Contract C310 is part of the current biggest infrastructure project of Europe "Crossrail" which is a major new cross-London rail link project and comprises the construction of the North Woolwich Portal, Plumstead Portal and the twin tube Thames Tunnels with a length of approximately 2.6km. Two Mix-Shield TBMs (diameter 7.12m) were driving through differing challenging ground conditions below the ground water table. The two tunnels underpassed several sensitive structures with low overburden and close to existing subway tunnels in an urban environment. Measures such as compensation grouting, micro piles and an intensive real-time monitoring have been carried out to ensure a safe tunneling process. The effect of pressure variation due to the tidal River Thames had to be taken into account for the control of the face support pressure.



## LIST OF TECHNICAL PAPERS

1. Pipe Roofing Installation by Micro Tunnelling Method
2. Biogrouting for Seepage Control for Underground Construction
3. Geology vis-à-vis Tunnelling in the Kuala Lumpur Area
4. Geotechnical Design Aspects for an Underground Cut-and-Cover Tunnel over an Existing Road Tunnel Box
5. Using Hoek-Brown Failure Criterion Parameters to Optimise the Design of Excavation and Lateral Support in Rock
6. Numerical Study of Application of Buttressed Diaphragm Wall to Reduce Tunnel Movements Induced by Deep Excavation
7. Design and Construction of the Lai Chi Kok Drainage Tunnel, Hong Kong
8. Development of Laboratory based Jacking Mechanism Considering Soil-pipe Interaction
9. Tunnelling Activities in Malaysia – A Review
10. The Present and Future Sustainable Use of Underground Space in Malaysia
11. Ground Response due to Rectangular Tunnelling Machine for Trenchless Construction of Underpass in Singapore Thomson Line Project
12. Design and Construction Consideration of Bored Tunneling in Challenging Bukit Timah Formation for Contract T220 Great World Station and Associated Tunnels
13. Design Considerations for Single Twin-Track Railway NATM Tunnel over Mountainous Terrain in Kenny Hill Formation
14. Design Considerations for the Underground Works for the Ulu Jelai Hydroelectric Power Scheme, Malaysia
15. Investigation on Segment Joint to Improve Soil-Tunnel Interaction
16. Using Digital Advancement as Risk Management Tool in Underground Construction
17. Tunnel Repair – Lessons Learned
18. Flood Drainage Tunnel in Bangkok
19. Tunnel Segment Lining Concrete - Challenges and Remedies
20. Underground Watertight Structures, Myth or Fact?
21. Greenfield Surface Settlement of KVMRT Line 1 in Kenny Hill Formation
22. Underground Structure Behaviour and Deformation Monitoring with Distributed Fibre Optic Sensor
23. Design of Grouted Rock Bolts based on the Rock Reinforcement Principle
24. A New Form of Precast Concrete Closed Spandrel Arch for Cut and Cover Tunnel
25. Stabilization of a Pylon to Mitigate the Impact of Future Underground Works
26. Retaining a Soil Connectivity from an Overhang Feature in Karstic Limestone
27. The Construction of Maluri Adit Using Pipe Roofing Method
28. 3D FE Modelling for Design of Vertical Shafts, Mined Tunnels, Bored Tunnels and Associated Works in Urban Areas
29. Preliminary Analysis of the Time-dependency behavior of Steel Fiber Reinforced Shotcrete Lining using the Shotcrete Model
30. Design Considerations and Construction Methodology of MCX Underpass
31. A Revolution in Site Investigation for New Tunnelling Lines from Ambient Seismic Noise Measurements
32. Environmental Friendly and High Frictional Facebolts
33. Some Aspects of Challenges in Underground Space, Foundation and Retaining Walls Design for the Damansara Town Centre Redevelopment
34. Subsurface Characterization using Inverse Distance Weighted-Boolean Filter Model for Twin Bored Tunnels Construction beneath Urban Environment
35. Successful EPB-Tunnel Drives in Complex Geological Ground Conditions
36. Geospatial Simultaneous Localisation and Mapping Technology (GS-SLAM) for Tunnel Assets Management (TAM)
37. Fibre Reinforced Concrete Precast Segmental Tunnel Linings with High Strength Steel Fibre Reinforcement
38. GRP Pipe System Application in Water and Sewerage Industries

# CONFERENCE PROGRAMME

SEACETUS2017 @ Dorsett Grand Subang, Subang Jaya, Malaysia		
MONDAY, 17 APRIL 2017	Time \ Venue	Melati Room @ Mezzanine Floor
	18:00 - 20:00	Registration
	Time \ Venue	Foyer of Selangor 1
	After 22:00	Setting-up of Exhibition Booths
TUESDAY, 18 APRIL 2017	Time \ Venue	Selangor 1 & 2
	08:00 - 08:30	Registration & Light Breakfast @ Foyer of Selangor 1
	08:30 - 09:00	Opening Ceremony Opening Keynote Address
	09:00 - 09:45	Challenges of Significant Tunnelling Projects in China <i>by Jingxiu Yan</i> Chairperson: Ir. Tan Yean Chin
	09:45 - 10:30	Keynote Lecture 1 Some Challenges in the Construction of Singapore Thomson-East Coast Line <i>by K.Y. Yong</i> Chairperson: Ir. Dr. Ooi Telk Aun
	10:30 - 11:00	Morning Coffee / Tea Break @ Foyer of Selangor 1 Keynote Lecture 2
	11:00 - 11:45	Three-Dimensional Interaction of Multiple Perpendicularly Crossing Tunnels with Circular and Horseshoe-shaped Cross-sections <i>by Charles W.W. Ng, Zaw Zaw Aye, Thayanan Boonyarak and Wang Ran</i> Chairperson: Ir. Syed Rajah Hussain Shaib bin A.H. Mohd Haniff
	11:45 - 12:15	Special Lecture 1 Risk Management Concepts in Underground Works <i>by Harold Wagner</i> Chairperson: Ir. Ong Sang Woh
	12:15 - 12:45	Special Lecture 2 The Birth of a New Technology – The Variable Density Tunnel Boring Machine <i>by G. Klados, H.W. Ng and W.H. Hew</i> Chairperson: Er. Poh Seng Tiok
	12:45 - 13:45	Lunch @ Selangor 3 Special Lecture 3
	13:45 - 14:15	Geotechnical Aspects of Cut-and-cover Tunnel Construction under Existing Flyover in Bangkok <i>by Zaw Zaw Aye and Thayanan Boonyarak</i> Chairperson: Professor Charles W.W. Ng
	14:15 - 14:45	Special Lecture 4 European Mass Transit Projects Using RM Methods <i>by D. Kolic</i> Chairperson: Professor Jinxiu Yan
	14:45 - 15:15	Special Lecture 5 Case Studies of Deep Excavations in Kaohsiung, Taiwan and Central Jakarta, Indonesia <i>by Bin-Chen Benson Hsiung, Kuo-Hsin Yang, Ching Hung, Tzyy Hwa Yang and Louis Ge</i> Chairperson: Prof. Noppadol Phienweij
	15:15 - 15:45	Afternoon Coffee / Tea Break @ Foyer of Selangor 1
	Time \ Venue	Selangor 1
		Session 1: Design Analysis and Modelling (20 minutes each) Chairperson: Andreas Raedle Co-chairperson: Dr. Rini Asnida Abdullah
	15:45 - 16:05	1 Numerical Study of Application of Buttressed Diaphragm Wall to Reduce Tunnel Movements Induced by Deep Excavation <i>by K.H. Low and F. Cheah</i>
	16:05 - 16:25	2 Design and Construction of the Lai Chi Kok Drainage Tunnel, Hong Kong <i>by A.D. Mackay and J. Gauffre</i>
	16:25 - 16:45	3 Design and Construction Consideration of Bored Tunneling in Challenging Bukit Timah Formation for Contract T220 Great World Station and Associated Tunnels <i>by G.C. Ng and Z.Y. Liu</i>
	16:45 - 17:05	4 Design Considerations for Single Twin-Track Railway NATM Tunnel over Mountainous Terrain in Kenny Hill Formation <i>by Esam Ahmad S. Al-Samarraee, Lee Choon Lian, Khoo Chee Min and Andrew Yeow Pow Kwei</i>
	17:05 - 17:25	5 Design Considerations for the Underground Works for the Ulu Jelai Hydroelectric Power Scheme, Malaysia <i>by A.D. Mackay</i>
	17:25 - 17:45	6 3D FE Modelling for Design of Vertical Shafts, Mined Tunnels, Bored Tunnels and Associated Works in Urban Areas <i>by J. Lee, A. Zheng, W. Soo and T. Shibano</i>
	19:00 - 23:00	Conference Banquet @ Selangor 3
		Selangor 2
		Session 2: Technological Advancement (20 minutes each) Chairperson: Ir. Lee Loong Tat Co-chairperson: Ilanchelvan Polanippan
	15:45 - 16:05	1 Biogrouting for Seepage Control in Underground Construction <i>by S. Wu, C. Wu, Y. Yang, V. Stabnikov and J. Chu</i>
	16:05 - 16:25	2 Using Digital Advancement as Risk Management Tool for Underground Construction <i>by P.T. Chong</i>
	16:25 - 16:45	3 Underground Structure Behaviour and Deformation Monitoring with Distributed Fibre Optic Sensor <i>by Bun Pin Tee, Rini A. Abdullah, Ahmad S. A. Rashid, Hisham Mohamad, Mun Fai Chong and Koh An Ang</i>
	16:45 - 17:05	4 A New Form of Precast Concrete Closed Spandrel Arch for Cut and Cover Tunnel <i>by C.Y. Ong, K.K. Choong and F.K. Wong</i>
	17:05 - 17:25	5 A Revolution in Site Investigation for New Tunnelling Lines from Ambient Seismic Noise Measurements <i>by A. Pierre Frappin, Clément Mogenier, Simon Robert and Florent Brenautier</i>
	17:25 - 17:45	6 Subsurface Characterization using Inverse Distance Weighted-Boolean Filter Model for Twin Bored Tunnels Construction beneath Urban Environment <i>by S. P. Lim and M. A. M. Ismail</i>



WEDNESDAY, 19 APRIL 2017	Time \ Venue	Selangor 1 & 2	
	08:00 - 08:30	Light Breakfast @ Foyer of Selangor 1	
	08:30 - 09:15	<b>Keynote Lecture 3</b> <i>Advances in Engineering Technology and Its Applications in KVMRT Line 2 (SSP Line)</i> <i>by S.T. Poh and B.H. Yeap</i> Chairperson: Ir. Dr. Ooi Teik Aun	
	09:15 - 10:00	<b>Keynote Lecture 4</b> Positioning to Undertake Underground Works Contracts – A Malaysian Experience <i>by T.T. Ha and L.H. Ooi</i> Chairperson: Ir. Khoo Chee Min	
	10:00 - 10:30	<b>Special Lecture 6</b> Difficulties due to Rise in Groundwater Pressure in Recent MRT Underground Construction in Bangkok <i>by N. Phienweij, A. Asanprakit, P. Kittiyodom and B. Lehak</i> Chairperson: Ir. Neo Boon Kheng	
	10:30 - 11:00	Morning Coffee / Tea Break @ Foyer of Selangor 1	
	11:00 - 11:30	<b>Special Lecture 7</b> Design and Construction of Wanchai MTR Station Revisited <i>by John A. Davies</i> Chairperson: Ir. Dr. Chan Swee Huat	
	11:30 - 12:00	<b>Special Lecture 8</b> Grout Injection beneath the Hong Kong Express Rail Link, West Kowloon Terminus Perimeter Wall <i>by A. Mackay and A.W.K. Chan</i> Chairperson: Ir. Dr. Ooi Lean Hock	
	12:00 - 12:30	<b>Special Lecture 9</b> Crossrail C310 Thames Tunnel – Mixshield TBM Tunnelling in Alternating Ground Conditions with Low Overburden <i>by Andreas Raedle</i> Chairperson: Ir. Frankie Peng Leong Cheah	
	12:30 - 13:30	Lunch @ Selangor 3	
WEDNESDAY, 19 APRIL 2017	Time \ Venue	Selangor 1	Selangor 2
		<b>Session 1: Design Analysis and Modelling</b> (20 minutes each) Chairperson: Dr. Benson Hsiung Bin-Chen Co-chairperson: Ir. Er. Dr. Victor Ong Chee Wee	<b>Session 2: Technological Advancement</b> (20 minutes each) Chairperson: Gus Klados Co-chairperson: Ir. Chong Chi Koong
	13:30 - 13:50	7 Preliminary Analysis of the Time-dependency behavior of Steel Fiber Reinforced Shotcrete Lining using the Shotcrete Model <i>by Heyam Shaalan, Mohd Ashraf Mohd Ismail and Romziah Aziz</i>	7 Environmental Friendly and High Frictional Facebolts <i>by Y. Yokota, K. Date and T. Yamamoto</i>
	13:50 - 14:10	8 Design Considerations and Construction Methodology of MCX Underpass <i>by Regine Chloe S. Albea, Roy Anthony C. Luna, Ramon D. Quebral, Michael Paolo V. Folloso, Benjamin R. Buensuceso, Melito A. Cruz and Victor A. Corredor</i>	8 Geospatial Simultaneous Localisation and Mapping Technology (GS-SLAM) for Tunnel Assets Management (TAM) <i>by M. Ashraf M. Ismail, N. Sabahiah A. Sukor, N. Aqilah A. Taji, Norhayati Ahmad and A. Fuad Hamzah</i>
	14:10 - 14:30	<b>Session 3: Tunnel &amp; Tunnelling</b> (20 minutes each) Chairperson: Dr. Benson Hsiung Bin-Chen Co-chairperson: Ir. Er. Dr. Victor Ong Chee Wee	9 GRP Pipe System Application in Water and Sewerage Industries <i>by B.K. Neo</i>
		1 Tunnelling Activities in Malaysia – A Review <i>by T.A. Ooi and C.M. Khoo</i>	<b>Session 4: Case History</b> (20 minutes each) Chairperson: Gus Klados Co-chairperson: Ir. Chong Chi Koong
	14:30 - 14:50	2 Geology vis-à-vis Tunnelling in the Kuala Lumpur Area <i>by B.K. Tan</i>	1 The Present and Future Sustainable Use of Underground Space in Malaysia <i>by T.A. Ooi and C.M. Khoo</i>
	14:50 - 15:10	3 Development of Laboratory based Jacking Mechanism Considering Soil-pipe Interaction <i>by M.I. Peerun, D.E.L. Ong and C.S. Choo</i>	2 Successful EPB-Tunnel Drives in Complex Geological Ground Conditions <i>by E. Kleen, C. Budach and N. Hörlein</i>
	15:10 - 15:30	4 Investigation on Segment Joint to Improve Soil-Tunnel Interaction <i>by S.N. Jusoh, A. Marto, H. Mohamad, R.A. Abdullah, N.M. Yunus, M.A.A.Kadir and C.S Tan</i>	3 Retaining a Soil Connectivity from an Overhang Feature in Karstic Limestone <i>by C.W. Boon, C.E. Ooi and L.H. Ooi</i>
	15:30 - 16:00	Afternoon Coffee / Tea Break @ Foyer of Selangor 1	
	Time \ Venue	Selangor 1	Selangor 2
		<b>Session 3: Tunnel &amp; Tunnelling</b> (20 minutes each) Chairperson: Alexander (Sandy) Mackay Co-chairperson: Ir. Dr. Law Kim Hing	<b>Session 4: Case History</b> (20 minutes each) Chairperson: John A. Davies Co-chairperson: Maheswaran Gantheil
	16:00 - 16:20	5 Flood Drainage Tunnel in Bangkok <i>by Oravit Hemachudha and Vichai Somboon</i>	4 Greenfield Surface Settlement of KVMRT Line 1 in Kenny Hill Formation <i>by A.S. Abd Rashid and H. Mohamad</i>
	16:20 - 16:40	6 Tunnel Segment Lining Concrete - Challenges and Remedies <i>by Shivram B Bagade, Jennifer Hoh and Swee Ong Chow</i>	5 Challenges in Technical and Legal Aspects of Foundation and Retaining Walls Designs for A Major Redevelopment Project in Malaysia <i>by T.A. Ooi, Y.G. Tan, V.W. Pong, K.K. Chia, C.C. Ng, C.W. Ong</i>
	16:40 - 17:00	7 Fibre Reinforced Concrete Precast Segmental Tunnel Linings with High Strength Steel Fibre Reinforcement <i>by Gan Cheng Chian and Benoit de Rivaz</i>	6 Tunnel Repair – Lessons Learned <i>by K. Zeidler</i>
	17:00 - 17:20	8 Pipe Roofing Installation by Micro Tunnelling Method <i>by H.W. Ng, K.C. Lin, I. Leong and D. Hafez</i>	7 Ground Response due to Rectangular Tunnelling Machine for Trenchless Construction of Underpass in Singapore Thomson Line Project <i>by C.C. Ng, H.W. Lim, I.C.Y. Yeo, B.Y.F. Wong, W.H. Sum, K.C. Soh, Y.H. Li, J.S. Thein, J. Stabler and K.C. Lee</i>
	17:20 - 17:40	Closing Remark @ Selangor 1	



## INTRODUCTION OF KUALA LUMPUR

Kuala Lumpur (KL) is like a melting pot of all the wonderful cultures that make up Asia. As the capital of Malaysia, it epitomises the nation's slogan "simply Asia". From art to history to food, one's senses are embraced by the city's dynamic surroundings.

This is a majestic city that was founded in 1857 and now in the 21st Century it brings together the past, the present and the future. There is so much to see in Kuala Lumpur - Chinatown with charming old buildings and makeshift shops, then there's Little India while the Jamek Mosque, which celebrates its centenary in 2014, is one of the oldest mosques in the city.



These historical landmarks blend in superbly with the modern-day ones. The KL Tower is one of the world's tallest concrete structures, which functions as a telecommunication tower. The skyline of Kuala Lumpur is dominated by a structure that is famous the world over - the tallest Twin Towers in the world known as the Petronas Twin Towers.

If it's food that's your thing, then KL is the place to be because this place is a feast for the senses and will tempt any taste bud from the many hawker centres through to some of the finest restaurants. Another activity that you could definitely look forward to is shopping in KL.

## CONFERENCE VENUE

The conference will be held at Dorsett Grand Subang in Subang Jaya. Nestled in the heart of Subang Jaya, Dorsett Grand Subang offers opulent hotel guest rooms and suites in the city's most upscale entertainment hub, shopping district and tourist attraction. Located just 35 minutes from Kuala Lumpur International Airport, KLIA2 and Sepang International Circuit, the hotel is just a 30-minute drive from Kuala Lumpur City Centre. Hotel facilities include:-

- Business centre
- Laundry and valet service
- Clark Hatch Fitness Centre
- Handicap access
- Parking facilities for up to 350 cars
- Parking space for up to 2 coaches
- Concierge service
- Babysitting service
- Foreign exchange
- Complimentary scheduled shuttle service to designated destinations
- Valet parking
- High-speed Internet access
- Beauty shop
- Tanjung Wellness Spa
- Non-smoking Rooms

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2. Sunway Geotechnics (M) Sdn Bhd
3. Jack-in Pile (M) Sdn Bhd
4. Aneka Jaringan Sdn Bhd
5. MMC-Gamuda KVMRT (T) Sdn Bhd
6. Peri Formwork Sdn Bhd
7. Denka Infrastructure Technologies Pte Ltd
8. KWL Marketing Sdn Bhd
9. Tang Xing Machinery
10. Herrenknecht AG
11. Mapei (M) Sdn Bhd
12. Geonamics (M) Sdn Bhd
13. Logic Technologies
14. Orica Civil Services
15. MC Bauchemie (M) Sdn Bhd
16. Sika Kimia Sdn Bhd
17. Plaxis Asiapac Pte Ltd
18. GDS Instruments Sdn Bhd
19. Soil Instruments (M) Sdn Bhd
20. Excel Pipes Sdn Bhd
21. Datgel
22. Tencate Geosynthetics Asia Sdn Bhd
23. Smart Sensing Technology Sdn Bhd
24. RNC Integral Concrete Technology (M) Sdn Bhd
25. Impianti Sdn Bhd
26. John Holland Rail & Civil Sdn Bhd
27. Fuchi Engineering (M) Sdn Bhd
28. GCP Applied Technologies Inc.



## EXHIBITION

A Technical Exhibition will be organised as an integral part of the conference. Project experience, design solutions, and application of tunnelling and trenchless technology and state-of-the-art information will be highlighted. The standard shell booth is 3 metres by 3 metres (9sqm) with rear and dividing walls of 2500 mm high using white powder coated aluminium system. The following items will be provided:

No.	Item	Description	Units	Rates (RM)
1	Electrical	40 Watt fluorescent Lights	2	No charge
		13 Amps single phase power point	1	No charge
2	Furniture	Information desk	1	No charge
		Foldable chairs	2	No charge
		Wastepaper basket	1	No charge
3	Graphics	Company's name and booth number in self-adhesive PVC letterings		No charge

### Exhibitors are entitled to the following:

- Two (2) Exhibitor Tags in charge of exhibition booth.
- One (1) complimentary participant for the Conference. Please complete the Booking Form and return by fax or email to the Conference Secretariat as soon as possible.
- Teas and lunches will be provided during duration of the exhibition.
- One (1) full coloured A4 size advertisement in the Conference Souvenir Programme.

### Layout Plan For Foyer, Selangor Ballroom at Grand Dorsett Subang Hotel

Selangor 3 Hall					Selangor 2 Hall			Selangor 1 Hall			Main Entrance																					
<div>Section B</div> <table><tr><td>Soil Instruments S/B</td><td>Sika Kimia Sdn bhd</td></tr><tr><td>Excel Pipes</td><td>Implanti</td></tr><tr><td>Datgel</td><td>Plaxis</td></tr><tr><td>Tencate</td><td>Georealttime Sdn Bhd</td></tr><tr><td>Smart Sensing Technology</td><td>GDS Instruments</td></tr></table>					Soil Instruments S/B	Sika Kimia Sdn bhd	Excel Pipes	Implanti	Datgel	Plaxis		Tencate	Georealttime Sdn Bhd	Smart Sensing Technology	GDS Instruments	<div>Section A</div> <table><tr><td>Geotest(S) Pte Ltd</td><td>Perl Formwork Sdn. Bhd.</td></tr><tr><td>RNC</td><td>Denka</td></tr><tr><td>Logic Technologies</td><td>KWL Marketing Sdn Bhd</td></tr></table>			Geotest(S) Pte Ltd	Perl Formwork Sdn. Bhd.	RNC	Denka	Logic Technologies	KWL Marketing Sdn Bhd	<div>Section PREMIER</div> <table><tr><td rowspan="2">Orica Civil Services</td><td>Tang Xing Machinery</td></tr><tr><td>Herrrenknecht Asia</td></tr><tr><td>MC Bauchemie (M) Sdn Bhd</td><td>Mapel (M) Sdn Bhd</td></tr></table> <div>MMC-GAMUDA</div>			Orica Civil Services	Tang Xing Machinery	Herrrenknecht Asia	MC Bauchemie (M) Sdn Bhd	Mapel (M) Sdn Bhd
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	Herrrenknecht Asia																															
MC Bauchemie (M) Sdn Bhd	Mapel (M) Sdn Bhd																															

# SEACETUS2017 - REGISTRATION FORM

## SEACETUS2017 Secretariat

c/o IEM Training Centre Sdn. Bhd.

No. 33-1A (1<sup>st</sup> floor), Jalan 52/18, P.O. Box 224 (Jalan Sultan)

46720 Petaling Jaya, Selangor Darul Ehsan, MALAYSIA

Tel. No.: +(603) 7958 6851 Fax No.: +(603) 7958 2851 E-mail: [nora@iem.org.my](mailto:nora@iem.org.my)

### Conference Registration Fees (Fees are inclusive of 6% GST)

Category	Registration Fee (Ringgit Malaysia)		
Participants	**Walk-in Registration	Normal (received after 31 Jan. 2017)	Early Bird (before 31 Jan. 2017)
IEM Members	1,650	1,430	1,320
Presenting Author/ Co-Author	1,430	1,210	1,100
Local Students	990	880	550
Non-Members	2,200	1,980	1,650
Overseas Students	1,100	990	880
Spouse Programme*	880	660	550
Conference Banquet	Not Applicable	330	330

\*Not entitled to attend the Conference, Conference bag and Proceedings

\*\*Entitlement to Conference bag & Proceedings NOT guaranteed. Conference Banquet depends on availability of tickets.

Fee paid is not refundable, however substitute is allowed.

No.	Name of Participant(s)	Category	IEM/PE No.	Amount (RM)
1				
2				
3				
4				
5				

\*Group registration of 5 participants is entitled for one (1) complimentary registration.

Organisation:				
Contact Person:				
Position:				
Postal Address:				
Contact No.:	Office No.:		Fax No.:	
Mobile No.:				
E-mail:				

Date: \_\_\_\_\_ Signature: \_\_\_\_\_ Company Stamp: \_\_\_\_\_

## SEACETUS2017 – EXHIBITION BOOKING FORM

**SEACETUS2017 Secretariat**

**c/o IEM Training Centre Sdn. Bhd.**

**No. 33-1A (1<sup>st</sup> floor), Jalan 52/18, P.O. Box 224 (Jalan Sultan)**

**46720 Petaling Jaya, Selangor Darul Ehsan, MALAYSIA**

**Tel. No.: +(603) 7958 6851**

**Fax No.: +(603) 7958 2851**

**E-mail: [nora@iem.org.my](mailto:nora@iem.org.my)**

### Booking Fees

Section	Cost / Booth	No. of Booth(s)	Amount
A	RM15,900.00		
B	RM10,600.00		
*Fees are inclusive of 6% GST		Sub-Total	
		Total	

Organisation:				
Contact Person:				
Position:				
Postal Address:				
Contact No.:	Office No.:		Fax No.:	
Mobile No.:				
E-mail:				

Date: \_\_\_\_\_

Signature: \_\_\_\_\_

Company Stamp:

## SEACETUS2017 - SPONSORSHIP

Please tick (✓) the appropriate boxes below:

Type of Sponsor	Amount (RM)	Sponsor's Entitlement
(1) <input type="checkbox"/> Platinum	Above 60,000.00	(a) Acknowledgement in the Conference Proceedings (b) 2 Top organisation managers invited to official functions (e.g. : conference opening/closing ceremony & dinner) (c) 4 Free conference participants
(2) <input type="checkbox"/> Gold	50,000.00	(a) Acknowledgement in the Conference Proceedings (b) 2 Top organisation managers invited to official functions (e.g. : conference opening/closing ceremony & dinner) (c) 2 Free conference participants
(3) <input type="checkbox"/> Silver	30,000.00	(a) Acknowledgement in the Conference Proceedings (b) 1 Top organisation manager invited to official functions (e.g. : conference opening/closing ceremony & dinner) (c) 1 Free conference participant
(4) <input type="checkbox"/> Bronze	15,000.00	(a) Acknowledgement in the Conference Proceedings (b) 1 Top organisation manager invited to official functions (conference opening ceremony only) (c) 1 Free conference participant
(5) <input type="checkbox"/> Conference Bags	40,000.00	(a) Acknowledgement in the Conference Proceedings (b) 1 Top organisation manager invited to official functions (e.g. : conference opening/closing ceremony & dinner) (c) 2 Free conference participants (d) Inscription & Company Logo printed on conference bag (e) 3 Sample bags will be given for record
(6) <input type="checkbox"/> Lunch	40,000.00	(a) Acknowledgement in the Conference Proceedings (b) 1 Top organisation manager invited to official functions (e.g. : conference opening/closing ceremony & dinner) (c) 2 Free conference participants
(7) <input type="checkbox"/> Banquet	40,000.00	(a) Acknowledgement in the Conference Proceedings (b) 1 Top organisation manager invited to official functions (e.g. : conference opening/closing ceremony & dinner) (c) 2 Free conference participants (d) 1 Top organisation manager invited to the sponsored banquet (e) Pamphlet distribution & Display banners at banquet hall entrance
(8) <input type="checkbox"/> Welcoming Reception	20,000.00	(a) Acknowledgement in the Conference Proceedings (b) 1 Top organisation manager invited to official functions (e.g. : conference opening/closing ceremony & dinner) (c) 2 Free conference participants

Please add 6% Goods & Services Tax (GST).



## SEACETUS2017 – SPONSORSHIP FORM

**SEACETUS2017 Secretariat**  
c/o IEM Training Centre Sdn. Bhd.  
No. 33-1A (1<sup>st</sup> floor), Jalan 52/18, P.O. Box 224 (Jalan Sultan)  
46720 Petaling Jaya, Selangor Darul Ehsan, MALAYSIA  
Tel. No.: +(603) 7958 6851 Fax No.: +(603) 7958 2851 E-mail: [nora@iem.org.my](mailto:nora@iem.org.my)

### **Sponsorship**

We would like to sponsor the SEACETUS2017 as ticked in the box and enclosed herewith

Banker's Cheque / Local Cheque No. \_\_\_\_\_ issued to “**IEM TRAINING CENTRE**

**SDN BHD**” for the sum of Ringgit Malaysia \_\_\_\_\_ **(Please add 6% GST).**

Organisation:				
Contact Person:				
Position:				
Postal Address:				
Contact No.:	Office No.:		Fax No.:	
Mobile No.				
E-mail:				

Date: \_\_\_\_\_

Signature: \_\_\_\_\_

Company Stamp:

## SEACETUS2017 – ADVERTISEMENT BOOKING FORM

**SEACETUS2017 Secretariat**

**c/o IEM Training Centre Sdn. Bhd.**

**No. 33-1A (1<sup>st</sup> floor), Jalan 52/18, P.O. Box 224 (Jalan Sultan)**

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**Tel No.: +(603) 7958 6851**

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**E-mail: [nora@iem.org.my](mailto:nora@iem.org.my)**

Tick	Location	Advertisement Rates
	Outside Back Cover Page	RM8,480.00
	Inside Front Cover Page	RM7,420.00
	Inside Back Cover Page	RM6,360.00
	Inside Page	RM3,180.00

We wish to advertise in the Conference Programme as indicated (√) above and enclosed herewith Banker's Cheque/Local Cheque No. \_\_\_\_\_ issued to **“IEM TRAINING CENTRE SDN BHD”** for the sum of Ringgit Malaysia \_\_\_\_\_

Contact Name:	
Organisation:	
Position:	
Mailing Address:	
Contact No.:	
E-mail:	

Date: \_\_\_\_\_

Signature: \_\_\_\_\_

Company Stamp:

**Southeast Asian Conference and Exhibition  
in Tunnelling and Underground Space  
SEACETUS2017  
Selangor, Malaysia 18 – 19 April 2017**

