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

Innovation and Sustainable Underground Space Development

18 – 19 April 2017

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Calls for Registration

Organized by:

The Institution of Engineers, Malaysia

TUNNELLING AND UNDERGROUND SPACE TECHNICAL DIVISION

An event endorsed by:

ASSOCIATION INTERNATIONALE DES TUNNELS ET DE L'ESPACE SOUTERRAIN
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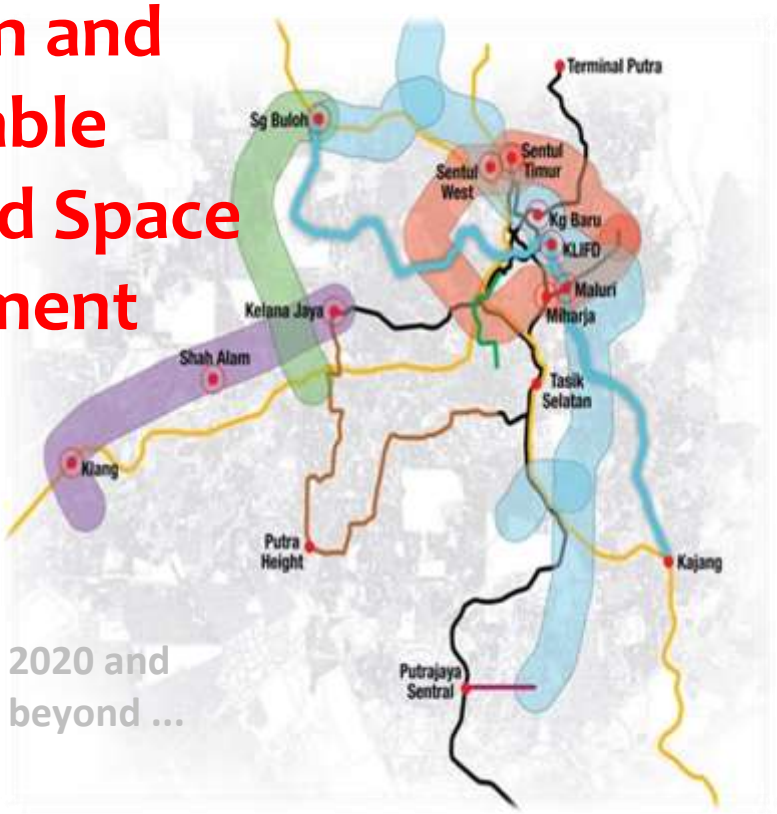
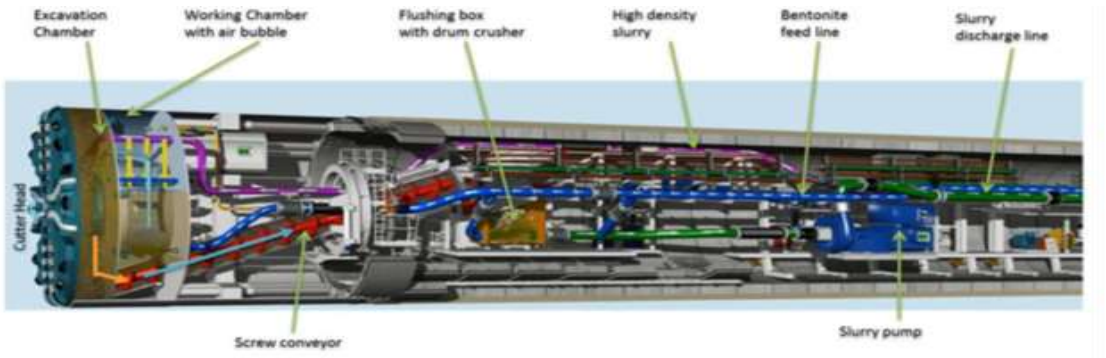
CONFERENCE THEME

Innovation and Sustainable Underground Space Development



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.



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 2nd 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.

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.

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.

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.

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.

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.

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.

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).

ABSTRACT OF THE 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 10,000 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 will present the challenges of the significant tunnelling projects in China, including the projects built, under construction and to be built in the near future. The challenges and their countermeasures of "long" (super long tunnel), "deep" (extra deep overburden), "big" (big cross section), "high" (high ground stress) and "complex" (complex geology) will be also covered.

GROUND IMPROVEMENT IN TUNNELLING AND UNDERGROUND CONSTRUCTION – FACTS AND FALLACY

Prof Er Yong Kwet Yew
BBM, PBM, PPA, PhD, BEng (Hons), FIES, PEng, Accr.Adjudicator
Professor of Civil Engineering and Vice-President
National University of Singapore

Ground improvement is being used increasingly in many complex tunnelling and underground projects to mitigate ground movements and/or ground water lowering water associated with these constructions. This is especially needed to overcome significant construction challenges, including mixed face tunnelling, bored tunnelling in consolidating ground and underground construction close to and undercrossing existing structures and buildings. Ground improvement is also needed to deal with issues that have arisen as a consequence of loss of ground and groundwater drawdown.

This paper presents some guidance on the pragmatic use of ground improvement – the facts and fallacy on the use of jet grouting, deep soil mixing, recharge wells and fissure grouting, used separately or in combinations, to mitigate ground loss and groundwater drawdown. Through case histories, the paper will remind engineers that its application is not a panacea for all tunnelling and underground construction problems and the trade-offs need to be better managed. The choice and operating parameters of TBMs including tunnel face pressures, and sensible construction sequence are equally important to ensure that the tunnelling and underground basement construction are completed with minimal impact to the surrounding structures. Finally, the impact of the ground improvement on the structure it is trying to protect should not be underestimated as it may lead to undesirable consequences.

STATE-OF-THE-ART TUNNELLING RESEARCH AT HKUST

Charles W.W. NG
Hong Kong University of Science and Technology (HKUST)

To increase the use of underground space for infrastructural needs while minimizing environmental impacts, an increasing number of tunnels and ever deeper basements are being constructed in densely populated cities like Bangkok, Shanghai and Tokyo. Engineers and designers are also facing tougher and tougher geotechnical challenges. In this keynote lecture, recent advances in tunnelling related research at the Hong Kong University of Science and Technology will be reported, illustrated and discussed. By making use of the state-of-the-art geotechnical centrifuge facility and three-dimensional numerical simulations, this keynote will cover (i) twin tunnelling effects on existing single pile and pile group; (ii) three-dimensional interaction between perpendicularly multiple cross tunnels; (iii) effects of tunnel shape on perpendicularly crossing tunnels; (iv) passive tunnelling failure and deformation mechanisms; and (v) deep excavation effects on existing tunnel. New findings, insights and design implications from these five areas of research will be explained and highlighted.

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

Poh Seng Tiok
Mass Rapid Transit Corporation (MRTC)

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 Classification for all elements within the Models. The paper will provide an update of the BIM implementation for SSP.

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 has been improved to ensure quality outcome will be shared.

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.

POSITIONING TO UNDERTAKE UNDERGROUND WORKS CONTRACTS
– A MALAYSIAN EXPERIENCE

Dato' Ir Paul Ha
Gamuda Berhad

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 resources.

SPECIAL LECTURES

DEEP EXCAVATIONS IN KAOHSIUNG, TAIWAN AND CENTRAL JAKARTA, INDONESIA

Bin-Chen Benson Hsiung[1], Kuo-Hsin Yang[2], Louis Ge[3], Ching Hung[4] and *Tzyy Hwa Yong*[5]
[1]*National Kaohsiung University of Applied Sciences, Kaohsiung, Taiwan*
[2]*National Taiwan University of Science and Technology, Taipei, Taiwan*
[3]*National Taiwan University, Taipei, Taiwan*
[4] *National Cheng-Kung University, Tainan, Taiwan*
[5] *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 not consistent with reality as the said behaviour is three-dimensional. Furthermore, effects from system stiffness of the excavation, which include factors such as excavation depth, thickness and depth of retaining wall, horizontal and vertical spacing of struts and excavation geometry, could influence the deformations of deep excavations considered. Thus, production of plane strain ratios (PSR) in deep excavation for both Kaohsiung and Central Jakarta are presented in order to assist in transferring 2D results into 3D behaviours. Interpretation of 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 soil modulus 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 IN RECENT MRT UNDERGROUND CONSTRUCTION OWING TO THE RISE OF GROUNDWATER PRESSURE IN BANGKOK SUBSOILS

Noppadol Phienwej
Asian Institute of Technology & TUTG, Thailand

Difficulties were experienced in the second phase of the Bangkok MRT underground tunnel and station construction in Bangkok due to the recent situation of ground water pressure rise in Bangkok subsoils. The rise was the rebound of ground water pressure in the confined sand layers resulted from the exercise of strict control of groundwater usage in Bangkok metropolis to mitigate the phenomenon of land subsidence caused by deep well pumping from aquifers in Bangkok. The excessive deep well pumping in the past resulted in the maximum drawdown in the sand layers in inner Bangkok city area around 1996-1997 during which the pressure head was as low as 24-25 m below the ground surface. Subsequently, after the exercise the water pressure had gradually recovered and now the head is 13-14 m below the ground surface, with the average rate of rise during the past 5 year of slightly less than 1 m per year.

The rise of ground water pressure was linked to the water ingress problem through the segmental rings in the tail area of an EPB shield tunnelling in the MRT project in 2012 that led to a six-month delay for grouting work and TBM repair. The increase in the water head in the sand layer underlying the stiff clay layer also caused complication in the design and construction of three underground stations excavated with concrete diaphragm walls of the same project that was related to potential base failure from hydraulic uplift of the stiff clay layer below the base of the excavation. One station suffered difficult water inrush situation due to the base uplift failure. The second station utilized full base grouting method and the third station utilized staged compartment excavation approach to avoid the problem. The decision on the adopted methods of preventive measures depended on the conditions of subsoil and groundwater pressure head of each of the stations that needed to be investigated in sufficient details for the entire perimeter of the station. These kinds of geotechnical difficulty had never been experienced in the EPB shield tunnelling and deep excavations with diaphragm walls in early projects in Bangkok including the first phase MRT underground project constructed 15 years ago. The ease of past tunnelling and deep excavation works in Bangkok benefited from the effect of the drawdown of ground water pressure. The situation reverses at present and will be worse in the future.

"EUROPEAN MASS TRANSIT PROJECTS USING RM METHODS"

Dipl.-Ing.Dr.sc Davorin KOLIC
ITA_AITES Executive Council Member

After most of the highway networks in countries of EU has been competed transit projects in the region of EU are nowadays considering development of high-speed rail lines between cities or new urban transit lines in cities.

Risk management areas of application has evolved in last decades from usage for safety sector during construction only, over checking sequences of construction process toward design optimization and cost control. Therefore, in order to optimize project development and to reduce planned costs application of risk mitigation methods is more often in design and earlier project development phases.

At HS rail projects RM methods are used for coordination and cost control during design phases and during construction period as a fast tool to react on unexpected parts of projects specially in the case of "functional tendering" project type.

On subway projects RM methods are to be applied as supporting tool to discover different possible constraints in urban construction conditions and pertinent increase of total construction costs.

Following projects and performed risk analyses will be used as examples:

- HS Rail Ulm-Stuttgart, Germany;
- Prologation of subway U2/U5 lines in Vienna
- Railway tunnels Koralm and Semmering, Austria;
- New railway line Divaca – Koper, Slovenia

RISK MANAGEMENT CONCEPTS IN UNDERGROUND WORKS

Harald Wagner
Consulting Engineer & ITA EXCO Expert

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.

Risk control experiences during the past decade in planning of numerous water conveyance tunnels as well as in urban tunnelling, predominantly in tunnel boring machine (TBM) drives for Metro tunnels and Hydro Electric Power Plants in South East Asia, with disappointing results have been analyzed as indicated in following project examples.

Development of Projects may involve various sorts of risks at different stages, viz. planning, design and construction stage. Management of various sorts of risks involved in different stages of the project should be carried out through the use of Risk Assessments and Risk Registers. The primary use of the above is to define various risks, to identify measures to be taken in case the risk materializes and to allocate the risk to various parties i.e., employer and contractor so that they can make a better estimate of potential cost to each party and take account of the above in insurance cover.

Risk register should be updated regularly during project execution as per the mutual agreement between employer and contractor. Risk register should be a part of the contract document. This together with GBR and BOQ (please define) can take care of risk allocation.

THE BIGGEST DEVELOPMENT IN TUNNELLING TECHNOLOGY IN THE LAST TWENTY YEARS; THE VARIABLE DENSITY SLURRY TBM.

Gus Klados
MMC-Gamuda KVMRT

The author describes the experiences gained during the SMART Project using two large diametre slurry shields in the karstic limestone formation of the eastern part of Kuala Lumpur (KL) and the demands imposed by the new Sungai Buloh – Kajang (SBK) MRT Line tunnels mostly located under and around the most expensive real estate in downtown KL, where significant subsidence induced by tunnelling, let alone sinkholes were just not acceptable. These circumstances demanded to develop a new tunnel boring technology to be used in karst, more suitable to handle mixed face conditions imposed by sudden relief in rockhead levels or hitting partially filled cavities allowing the face support medium – bentonite slurry – to escape, losing face support pressure and face loss resulting in depressions or sinkholes. The new technology had to prevent the escape of slurry to the surface with similar consequences.

The new machine configuration had to allow a 'simple' conversion to EPB configuration since some of the planned drives in the SBK Line had to pass the transition area from KL Limestone to the Kenny Hill Formation, where the EPB method is the obvious choice.

The designated supplier of the TBMs, Herrenknecht, together with the contractor MMC Gamuda JV developed the new technology and named it the Variable Density Slurry or Mixshield TBM. A significant contributor was the Ruhr - University in Bochum, Germany, where all the tests to find the best face support slurry mixes were done. The University also proved by tests and calculations that the high density slurry can support the tunnel face even if the usual bentonite membrane does not develop on the face.

Notable of the cooperation and trust of the partners that MMC Gamuda ordered six Variable Density Slurry TBMs (VD TBMs) of the drawing board for the project.

The author demonstrates the success of the said VD TBMs in use on the KVMRT SBK Line, where the number of subsidence incidents were significantly reduced in comparison to the SMART Project in similarly difficult ground conditions. The selection of the right technology allowed the contractor to complete the tunnels within budget and on schedule.

The new technology is successfully used in Hong Kong at the time of writing and it is the specified method in the new in Perth Forrestfield - Airport Link, Australia.

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

Zaw Zaw Aye, M. ASCE and Thayanan Boonyarak, PhD
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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 modeled 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 experience 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 preexisted deep foundation of the overpass was back-analyzed using finite element method. For numerical simulation, an advanced hardening soil model with small strain stiffness was adopted. Back-analyzed responses of force in piles, movement and stress in soil due to excavation and construction time are discussed.

A RE VISIT OF THE GROUND MOVEMENTS ASSOCIATED WITH THE CONSTRUCTION OF WANCHAI STATION HONG KONG

J.A. Davies
Senior Consultant, Arup Singapore Ltd

With the construction of more and deeper excavations in an urban environment the prediction and control of ground movements resulting from the construction is becoming more critical as the public becomes more aware.

With the advent of "the computer" in the early 1980's fairly simple programs (such as FREW or Wallup) were available to assess the perimeter wall deflections and, the resulting ground movements outside of the site assessed, based on empirical charts such as those of Peck.

Current computer programs such as Plaxis allow the engineer to assess directly these ground movements but the accuracy depends on the appropriateness the strength and stiffness parameters adopted for the soils. Routinely engineers are now using advanced models such as HSS (rather than the

traditional MC model) without a deep understanding or justification for the models adopted.

A critical role therefore still exists for engineers to observe the movements due to construction, and to compare with predictions to provide more confidence in the use of such advanced soil models. It should also be noted that there still remains the valuable opportunity to use the observational approach as part of the design as described recently by Nicholson et al (2016).

This paper re assesses the predictions and observations of ground movements due to the excavation of a deep station made some 30 years ago in Hong Kong using more "*up to date soil models* " to assess their validity and provide more confidence in the prediction of the resulting ground movements .

GROUT INJECTION BENEATH THE HONG KONG EXPRESS RAIL LINK, WEST KOWLOON TERMINUS PERIMETER WALL

A. Mackay[1], and A.W.K. Chan[2]
[1]HSS Integrated, Malaysia
[2]Leighton Asia Limited – Gammon Joint Venture, Hong Kong

The mass Transit Railway Corporation (MRTC) West Kowloon Terminus (WKT) will be 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 TUNNELING IN ALTERNATING GROUND CONDITIONS WITH LOW OVERBURDEN

Dipl.-Ing. Andreas Raedle
Arup, Singapore, 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 listed buildings, sensitive structures, operational railway tracks with low overburden and close to existing subway tunnels in an urban environment. Several additional measures such as compensation grouting, micro piles and an intensive real-time monitoring have been carried out to ensure a safe tunnelling process. During the drive underneath the River Thames, the tunnels had only an overburden of approximately 12m. The effect of pressure variation due to the tidal River Thames has to be taken into account for the control of the face support pressure. After finishing the two main tunnels, four cross passages were opened using a sprayed concrete lining. To reduce the water inflow in the chalk aquifer fissure grouting has been executed prior to construction of the cross passages.

Also the good experience made with Steel Fibre Reinforced Concrete (SFRC) Tunnel Segmental Lining Design in combination with usage of two-component tail void grouting design will be described and presented.

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. Assessment of Jacking Force in Highly Fractured Rocks Based on Numerical Modelling of Pre-bored Pressuremeter Tests
9. Development of Laboratory based Jacking Mechanism Considering Soil-pipe Interaction
10. Observation and Validation of Arching Effect via Discrete Element Modelling and GeoPIV
11. Tunnelling Activities in Malaysia – A Review
12. The Present and Future Sustainable Use of Underground Space in Malaysia
13. Ground Response due to Rectangular Tunnelling Machine for Trenchless Construction of Underpass in Singapore Thomson Line Project
14. Mitigation Measures for Bored Tunnelling in Challenging Bukit Timah Formation Mixed Ground for Singapore Thomson Line Great World Station and Associated Tunnels
15. Design Considerations for Single Twin-Track Railway Tunnel over Mountainous Terrain
16. Design Considerations for the Underground Works for the Ulu Jelai Hydroelectric Power Scheme, Malaysia
17. Investigation on Segment Joint to Improve Soil-Tunnel Interaction
18. Using Digital Advancement as Risk Management Tool in Underground Construction
19. Tunnel Repair – Lessons Learned
20. Flood Drainage Tunnel in Bangkok
21. Tunnel Segment Lining Concrete-Challenges and Remedies
22. Underground Watertight Structures, Myth or Fact?
23. Geo-mechanical Correlation of Subsurface Deformations Induced by Tunnel Excavation for KVMRT
24. Underground Structure Behaviour and Deformation Monitoring with Distributed Fibre Optic Sensor
25. Design of Grouted Rock Bolts based on the Rock Reinforcement Principle

TENTATIVE CONFERENCE PROGRAMME

SEACETUS2017 @ Dorsett Grand Subang, Subang Jaya, Selangor, Malaysia

MONDAY, 17 APRIL 2017	Time \ Venue	Melati Room @ Mezzanine Floor	
	18:00 - 20:00	Registration	
	Time \ Venue	Foyer of Selangor Ballroom	
	After 22:00	Setting-up of Exhibition Booths	
TUESDAY, 18 APRIL 2017	Time \ Venue	Selangor Ballroom	
	08:00 - 08:30	Registration	
	08:30 - 09:00	Opening Ceremony	
	09:00 - 09:45	Opening Keynote Address	
	09:45 - 10:30	Keynote Lecture 1	
	10:30 - 11:00	Morning Coffee / Tea Break	
	11.00 - 11.45	Keynote Lecture 2	
	11.45 - 12.15	Special Lecture 1	
	12.15 - 12.45	Special Lecture 2	
	12:45 - 13:45	Lunch	
	13.45 - 14.15	Special Lecture 3	
	14.15 - 14.45	Special Lecture 4	
	14:45 - 15:30	1) 2) 3)	Technical Papers (15 minutes each)
	15:30 - 16:00	Afternoon Coffee / Tea Break	
	16:00 - 18:00	4) 5) 6) 7) 8) 9) 10) 11)	Technical Papers (15 minutes each)
	19:00 - 23:00	Conference Banquet	
WEDNESDAY, 19 APRIL 2017	Time \ Venue	Selangor Ballroom	
	08:30 - 09:15	Keynote Lecture 3	
	09:15 - 10:00	Keynote Lecture 4	
	10.00 - 10.30	Special Lecture 5	
	10:30 - 11:00	Morning Coffee / Tea Break	
	11.00 - 11.30	Special Lecture 6	
	11.30 - 12.00	Special Lecture 7	
	12.00 - 12.30	Special Lecture 8	
	12:30 - 13:30	Lunch	
	13.30 - 14.00	Special Lecture 9	
	14:00 - 15:30	12) 13) 14) 15) 16) 17)	Technical Papers (15 minutes each)
	15:30 - 16:00	Afternoon Coffee / Tea Break	
	16:00 - 17:45	18) 19) 20) 21) 22) 23) 24)	Technical Papers (15 minutes each)
	17:45 - 18:00	Closing Remark	

SEACETUS2017 – REGISTRATION FORM

SEACETUS2017 Secretariat
c/o IEM Training Centre Sdn. Bhd.
No. 33-1A (1st 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

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: