GEOTECHNICAL ENGINEERING SEMINAR 2023

Organised by IEM Penang Branch
In Collaboration with MBPP and MBSP

8th
September 2023
8.30am-5.30pm

Non-Members : RM250
IEM Members : RM200
Senior/Graduate Members : RM150
Student Members : RM120
CPD : 5 Hours
Ref. No : IEM23/PG/277/S

Venue:
Ascott Gurney, Penang

Scan for more Details/Registration

The Institution of Engineers, Malaysia
(Penang Branch)

Officiate by,

Dato' Ir. Rajendran A/L P Anthony , Mayor of City Council of Penang Island

Ir. Cheah Chin Kooi, Director of Engineering Department, Majlis Bandaraya Pulau Pinang

Safe Slopes Saves Life

Ir. Chan Yun Cheung, Former Head of Hong Kong Geotechnical Control Department

Studies of Old Masonry Retaining Walls and Gabions

Ir. Chua Beng Seong, Independent Checker & Consultant in Civil & Structural Engineering

Base Shear on Foundation due to Seismic Waves Actions from North Sumatra vs Wind Loads Actions for Buildings in Penang Island

Mr. Thomas Domanski, Director of TDA Geotechnical Services Sdn. Bhd.

Reclamation of Land using Reinforcement Techniques in Form of Stone Columns and Deep Soil Mixing, Case Studies from Hong Kong

Ir. Dr. Ooi Lean Hock, Gamuda Engineering Australia

Geotechnical Challenges in the Construction of MRT

Er. Dr. Goh Teik Lim, Director, Atsunew Giken Pte Ltd (Silent Piler) | Oriental Castle Sdn. Bhd

Culture above Ground, Function Underground

GEOTECHNICAL ENGINEERING SEMINAR 2023

8.30am
Registration

9.00am
Welcoming Speech by Organising Chairman

9.10am
Opening Speech and officiate by
Mayor of MBPP

9.30am
Keynote Speaker

10.00am
Tea Break - Breakfast Refreshment

10.20am
Speaker 1

11.05am
Q&A (Moderator 1)

11.25am
Presentation of Certificates of Appreciation to Sponsors

12.00pm
Lunch

1.15pm
Speaker 2

2.00pm
Speaker 3

2.45pm
Q&A (Moderator 2)

3.05pm
Tea Break - Afternoon Tea Refreshment

3.25pm
Speaker 4

4.10pm
Speaker 5

4.55pm
Q&A (Moderator 3)

5.15pm
Closing Speech by IEM Penang Branch Chairman

IEM
The Institution of Engineers, Malaysia
(Penang Branch)

YES
Young Engineers Section (YES)
The Institution of Engineers, Malaysia (IEM)

Keynote Speaker

Ir. Cheah Chin Kooi,
Director of Engineering Department, Majlis Bandaraya Pulau Pinang

Ir. Cheah Chin Kooi graduated with Bachelor of Engineering (Civil) from McGill University, Canada in 1997. He also obtained his Master of Science (Project Management) from University Of Science Malaysia in 2003. He joined Penang Island City Council in the year of 1998 and held various important engineer positions in Engineering Department from 1998 until today. He was the Deputy Director of Engineering from 2019-2022. Currently he is the Director of Engineering Department, MBPP.

Ir. Cheah obtained his Professional Engineer with Practising Certificate (PEPC) from the Board of Engineers, Malaysia since 2005 and he is a corporate member of The Institution of Engineers, Malaysia (IEM) since 2004.

Ir. Cheah has more than 25 years of experience in the field of Civil Engineering. During his tenure as engineer in Engineering Department, he had supervised and managed various Infrastructure and flood mitigation projects such as Transfer Road Flood Mitigation project, George Town S10 Flood Mitigation, Widening of Bridges in Jalan Ross & Jalan Piggot and etc. He also given the task to comment and process the development plans and engineering plans submitted by practising consulting firms.

Title: ***Safe Slopes Saves Life***

Synopsis:

A hill site development required a proper and careful design. As such, developments may encounter soil erosion, landslide, failure of slope, flood etc. The slope engineering design should achieve the safety engineering requirements. One of the important aspects to ensure slope is stable in long run, is slope maintenance. Often, the slope maintenance is being less important topic in slope design thus resulted many slope failures due to poor maintenance. This topic will cover the understanding of slope maintenance requirements for the existing slopes, and newly formed engineered slope from start of the project, until completion of works, which cover the period after the Certificate of Completion and Compliance (CCC) stage.

Speaker 1

Ir. Chan Yun Cheung,
Former Head of Hong Kong Geotechnical Control Department

Ir. YC Chan graduated in 1975 from the University of Hong Kong with a degree in BSc. Civil Engineering. He was qualified to practice in both civil and structural engineering by 1980, when he decided to change for the geotechnical stream in which experience and judgement counts more. He joined the Geotechnical Control Office in 1980, shortly before he attended an MSc. course on Engineering Geology at the Imperial College of Science and Technology in London. He stayed in the organization, working on slope safety and geotechnical projects, until he retired in 2013 from the position of the Head of the Office. Since retirement, Ir. Chan has taken an interest in geomorphology, for its utility in ground condition appreciation. Ir. Chan is currently the international member of the Penang Technical Advisory Committee for safe hill site development in Penang. He will retire from the committee by the end of 2023, after ten years in the role.

Title: ***Studies of Old Masonry Retaining Walls and Gabions***

<u>Synopsis:</u>

A large part of the city of Victoria was developed on the hill slopes at the north side of Hong Kong, mostly in form of terraces. Each terrace is supported by a masonry retaining wall at the front, and frequently bounded at the back by the retaining that supports the next terrace.

In 1978, an engineering consultant of HK Government reported on a study of old masonry retaining walls in a 0.2 km2 area of the city. It noted that the masonry walls were generally too thin, and in many cases form only a facing. It thence concluded that none of the old masonry walls should be relied upon unless their stability is proven following detailed site investigation and analysis. The view was alarming and yet plausible given the history of masonry retaining failures in the area, the worse of which counted 73 deaths.

There were 131 masonry retaining walls in the study area, and 1764 in the territory. Given the number and the dire stability state of the walls, there was an urgent need for the geotechnical arm of Hong Kong government to gain knowledge and skills to manage potential hazards from the walls. The first effort started in 1979 and lasted for one year, by documenting wall sections exposed by works or failures, for both the dimensions and structure. It also identified failure cases for further study. The documentation effort continued beyond the study. In 1981, I took on the subject as the third study on it. The study was by a combination of literature review, field studies and parametric studies. It covered wall structure, common failure modes and characteristics, factors influencing structural and static stability of walls, investigation and mitigation techniques, and effect of wall trees on wall stability. This talk will focus on wall structure and structural stability of walls, and a case to illustrate how the knowledge was applied to reach a balanced and well-informed engineering solution. ‘Bridge to China’ (Wu Zhi Qiao) is a charity fund to support Hong Kong youths to build bridges in remote part of China. A popular bridge form comprised simply-supported light-weight steel beams on gabions. In 2014, the Civil Engineering Division of the Hong Kong Institution of Engineers obtained funding for such a bridge project. It invited me to brief its project group on good practices of gabion construction. Seeing the gabion as compression members, the starting point was on the safe vertical load it can take. A quick literature search retrieved little information. A simple model was set up to analyses the lateral pressure the wire-mesh panel can offer to the rock fragments for them to resist vertical load. The theoretical examination was then extended into the performance of gabions at various parts of a gabion retaining wall. Together with knowledge of rock fill behavior from the masonry wall study, good practices were drawn up on gabion construction, for reference of the undergraduate members of the group.

Speaker 2

Ir. Chua Beng Seong,
Independent Checker & Consultant in Civil & Structural Engineering

Ir. BS Chua is an Independent Checker & Consultant in Civil & Structural engineering. With over 40 years of experience in both the design and contract administration, his exposure encompassed a broad range of civil & structural designs. This includes implementation of Long-span Structural Steel Frames; Steel Arched Bridge with Post Tensioning Bar System; Composite Structures; High-rise Buildings with Load Bearing Formwork System; Top-down Construction, Deep Basement Works; Cofferdam Design for Power & Petrol Chemical Plants; and in Geotechnical works such as Soil Nailing & Ground Anchorages, Vertical Drains, Micro-piles, Jet Grouting, Barrette piles & Diaphragm Walls.

Ir. BS Chua has been playing an active advisory role in The Institution of Engineers, Malaysia (Penang branch) since 2019. He heads 2 major portfolios, namely (1) Civil & Structural Engineering Subcommittee & (2) Earthquake Engineering Subcommittee.
To-date, through IEM (Pg), he had responded to several urgent requests from MBPP & state government for technical appraisal and forensic investigation into the Structural and Geotechnical failures of some existing properties.

He also heads the collaborative study between IEM (Pg) – USM – UiTM on the feasibility of implementing an Earthquake Design Consideration on Highrise Buildings in Penang Island, a study commissioned at the request of the former Mayor of Penang state government.
Ir. BS Chua's broad experience has been widely appreciated and acknowledged both locally and internationally, where he was accredited with the grade of Fellow from the respective engineering institutions in Malaysia, UK & USA.

Title: ***Base Shear on Foundation due to Seismic Waves Actions from North Sumatra vs Local Wind Loads Actions for Buildings in Penang Island.***

Synopsis:

In 2019, IEM(Pg) established an Earthquake Engineering Subcommittee upon a request from the then Mayor of Penang state government, to study the seismic impact on Highrise buildings in the island due to frequent tremors that had taken place in North Sumatra. This concern arose from the fact that Penang Island is just approximately 500km from Bandar Aceh of North Sumatra and on several occasions, tremors had been reportedly felt by the occupants of Highrise buildings in Penang Island.

Subsequently, a collaborative study between IEM (Pg) - USM - UiTM on the feasibility of implementing an Earthquake Design Consideration on Highrise Buildings in Penang Island was initiated. The collaborative study examines the comparison between lateral loads due to local Wind actions vs Seismic actions based on hypothetical shapes of test buildings. The study aims to derive a theoretical representation on the cost comparison of the Structures with respect to the building shapes that will be built and founded on the typical soft soil condition in the Penang Island. Phase I (Preliminary) report was submitted in 2020. The collaborative study is currently at Phase IV (Final) stage.

This talk will examine some results derived from the collaborative study that are related to the foundation design, specifically, the **Base Shear on Foundation due to Seismic Actions vs Wind Actions.**

The derivation of the above shear forces will be briefly discussed. The analysis of Limit State Design on Wind Load Models and Seismic Models were computed via ETABS modeling software from Computers & Structures, Inc.

Limit State Design of Wind Load Test Models with a 100-year return period of wind speed at V_{100}=28.9 m/s were analysed to EC2 + EC1/MS1553 (G_k + Q_k +W_L). At the same time, minimum occupant comfort requirement to ISO10137 were checked against a 2-year return period of wind speed at V_2=23.4 m/s.

The same test models were also analyzed and designed to EC8 / MS EN 1998-1:2015 (G_k +Q_k + EQ) based on Modal Response Spectrum Analysis (Dynamic Linear Elastic) where the Design Spectrum in horizontal directions were generated based on:

- Elastic Response Spectrum (Annex C of MS EN 1998-1:2015);
- Reference Peak Ground Acceleration (PGA): a_{gR}= 0.05g; (Annex B);
- Design Peak Ground Acceleration: a_g = 0.06g.

The following codes of reference used will be briefly discussed. They are:

I. The basic principles of Reinforced Concrete Analysis & Design:
   a. EC0/EN1990: Basis of structural design;
   b. EC2/EN1992: Concrete Structures General Rules.

II. The analysis and design of Wind model:
   a. EC1/EN1991-1-4:2005: Wind Actions on Structures;
   b. MS1553: 2002: Wind Loadings for Building Structures.

III. The analysis and design of Seismic model:
   a. EC8/EN1998 Part 1: Seismic Design General Rules;
   b. MS EN 1998-1:2015 (National Annex 2017): Malaysia National Annex to EC8.

Speaker 3

Mr. Thomas Domanski,
Director of TDA Geotechnical Services Sdn. Bhd.

Mr. Thomas Domanski currently holds the positions of Senior Consultant and Proprietor of TDA Geotechnical Services Sdn. Bhd. Malaysia, a Company which supports Employers and Contractors in overcoming difficulties in foundation and retaining wall projects.

Thomas goes back on 35 years hands- on construction experience as a Specialist Foundation Contractor. Most of his career he worked in SE Asia for the subsidiaries of Bauer Spezialtiefbau GmbH, Germany, one of the world's leading foundation companies.

He started as Designer, then became Project Manager and finally held the position of Managing Director of Bauer (M) Sdn. Bhd. from 1991 to 2020. From Malaysia he built up the construction activities for Bauer in SE Asia Pacific and India during the years 1998 to 2020. As a consequence, he was appointed in 2002, in addition to his role as Managing Director of Bauer (M,) to be the Regional Director for Bauer in SE Asia Pacific.

During his work in Asia, he gained experience on over 1000 projects which were carried out by his teams under his responsibility. Some of these projects achieved world records like the Offshore Bored Pile Foundation for the Hong Kong Zhuhai Macau Bridge and the up to 150 m deep Bored Piles for the proposed 800 m high KLCC Lot LNM Tower in Kuala Lumpur.

He holds a Master of Civil Engineering majoring in Geotechnical Works and Soil Mechanics, obtained in 1983 at the Technical University Braunschweig, Germany.

He held the Singapore BCA required position of Technical Person and Approved Person for over 20 years. He is a Member of the Malaysian Geotechnical Society.

In July 2020 he retired from the Bauer Group and formed his own geotechnical Consultant firm TDA Geotechnical Services Sdn Bhd which will serve the market as bridging link between Design, Execution (Contracting) and academics /innovations. He is the author of many papers for international conferences to present his experience in ground improvement, deep piling works and retaining structures.

Title: ***Reclamation of Land Using Reinforcement Techniques in Form of Stone Columns and Deep Soil Mixing, Case Studies from Hong Kong***

Synopsis:

The population of our planet earth is growing exponentially. The usable land area may be reduced due to the rising of the sea-level and other influences of climate change. This comes in addition to influences from building, densely next to each other, many heavy Towers in Mega-Cities, loading heavily the surface strata which leads in conjunction with the effects of lowering ground-water tables, to sinking Cities (e.g., Jakarta, Bangkok). Land is getting more valuable than ever. Creating more land for development and for protection of the existing shore and cities will be one of the viable solutions to reduce the impact of the counter directional development of population growth and availability of usable land. Reclamation of Land from the sea is one of the ways to gain additional land area. In the past, the technical method to reclaim land from the sea, was to dredge the soft material, mostly marine clay up to firm alluvium, replace the material by suitable sand and fill the sand up to a safe height above the sea level. The sand fill subsequently would be compacted to satisfy the technical requirements. Many

reclamations have been completed in this manner worldwide. This method requires very large quantities of sand. Sand sources for such huge volumes become naturally smaller. Depending on the location of the reclamation therefore the securing of sufficient sand quantities is getting more difficult and the cost are increasing drastically. As a result of these influences, Employers, Engineers and Contractors turn often away from the traditional dredging and the replacement method and use as alternative the improvement of the soft top layers. The alternative methods applied, follow either consolidation techniques or reinforcement techniques. Consolidation technique mostly used, is the placement of vertical drains in conjunction with a gradually increasing sandfill. This is probably the cheapest alternative to replacement, but requires a long time until the soft materials will have sufficiently consolidated. This means the soft marine clay is kept in place and is consolidated to an extent that sand fill can be placed safely on top without excessive settlements and overstressing the unimproved / in-sufficiently consolidated soft material. Reinforcement methods are either the placement of Stone Columns or deep soft soil mixing (Soil Cement Columns) Which reinforcement method is preferred depends on the specific ground conditions, geographical location of the site, logistics and availabilities of materials and contractors' capabilities. Large amounts of otherwise required sand can be saved in this manner. The current talk will very briefly introduce the different categories of ground improvement techniques and then present one reclamation project in which Stone Columns were used to improve the soft clay, and one project, in which soil mixing was used as reinforcement of the soft clay. These examples will serve to refer to important construction points which need to be considered in the planning and execution of the works.

Speaker 4

Ir. Dr. Ooi Lean Hock,
Gamuda Engineering Australia

Ir. Dr Ooi Lean Hock is a professional civil engineer with more than 30 years of experience in the field of geotechnical engineering design and construction implementation. He graduated with a PhD in Civil Engineering from the University of Sydney in 1989, he is a member of IEM and registered with BEM. Some of the major infrastructure projects that he was involved in are the Klang Valley Mass Rail Transit Projects (both KVMRT underground packages), Electrified Double Track Project (Ipoh - Padang Besar), SMART Project, Hamad International Airport and Dukan Highway in Qatar, Sitra Causeway in Bahrain, Pergau HEP and Sungai Selangor Dam. He is currently attached to Gamuda Engineering Australia working from Melbourne office.

Title: ***Geotechnical Challenges in the Construction of MRT***

Synopsis:

This talk presents some of the geotechnical related challenges related to the construction of MRT in Klang Valley. Firstly, the geotechnical challenges related to tunnelling will be presented. Inherently the challenges could be related to the complex geology or the presence of manmade structure or the sheer proximity of such structures. The challenges related to deep excavation in an urban environment with a narrow corridor that presented many designs and construction related issues will be highlighted. Finally, it will not be complete without presenting the challenges related to deep excavation in Kuala Lumpur extreme tropical karsts. The highly variable bedrock profile with steep sided trough infilled with unconsolidated clayey silts and the inevitable presence of a complex network of dissolution channels present a complicated geotechnical problem. This has led to the meticulous task of investigation, design and development ground improvement schemes and construction sequence to address the anticipated challenges. Having put in all the perceived measures does not guarantee problem-free construction or no surprises. I trust everyone would like to have a trouble-free construction and may this be the impetus for us to develop a better understanding of the problem. Trusting that this will lead to better design/ground improvement techniques and construction methodology ensuring better project outcome.

Speaker 5

Er. Dr. Goh Teik Lim,
Director, Atsunew Giken Pte Ltd (Silent Piler) | Oriental Castle Sdn. Bhd

Dr. GOH Teik Lim has his early education in University of Malaya, Kuala Lumpur, Malaysia. After graduation, he joined OVE-ARUP (KL) as a consulting engineer. Dr. GOH came to Singapore to further his doctorate study in NATIONAL UNIVERSITY OF S'PORE, researching on a deep excavation topic in soft ground. Dr. GOH started practising as a geotechnical engineer in SEMBCORP Engineers & Constructors, specialising in deep excavation works where he was involved in the construction of cut-and-cover road tunnel in Singapore, so called the Kallang and Paya Lebar Expressway (KPE Contract 421). Dr. Goh has then joined GIKEN SEISAKUSHO ASIA as a Technical Manager, and soon thereafter, he was promoted to General Manager, in-charge of ASIA region in promoting the use of SILENT PILER. In Year 2011, Dr. GOH decided to establish his own company, ATSUNEW GIKEN to specialize in sub-contracting of Silent Piler works. Dr. GOH is currently a registered professional engineer in Singapore & Malaysia. Dr. GOH's focus is in geotechnical field with keen interest to implement cost-effective construction solutions in an environmentally responsible manner.

Title: ***Culture Aboveground, Function Underground***

Synopsis:

The urban sprawl in a "two-dimensional" manner has resulted in limited free surface space for cultural activities of vital importance, such as housing, recreation, etc. Most large urban cities are known to be severely affected by pollution, noise, and low quality of life and, in general, modern cities tend to become "user-unfriendly" environments. The re-location of certain functional activities underground would provide sufficient space for the development of the former. A systematic approach is necessary to ensure that more space is freed up to incorporate adequate cultural elements on ground surface. Infrastructures built for basic functional needs such as car and bicycle parks can be re-located underground while sufficient space for housing and office are provided aboveground through the development of high-rise buildings. Underground facilities are significantly less affected by earthquakes compared to surface structures. The access points are generally limited, easily secured, and can be located nearest to the destination. Underground structures have less visual impact than an equivalent surface structure and therefore, it is of great advantage to hide unattractive functional facilities in sensitive locations in order to preserve the beauty of the urban landscape.