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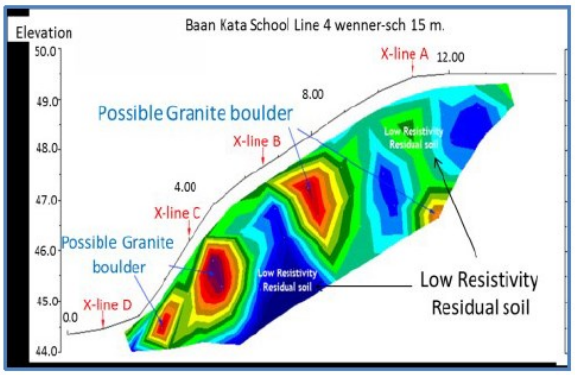
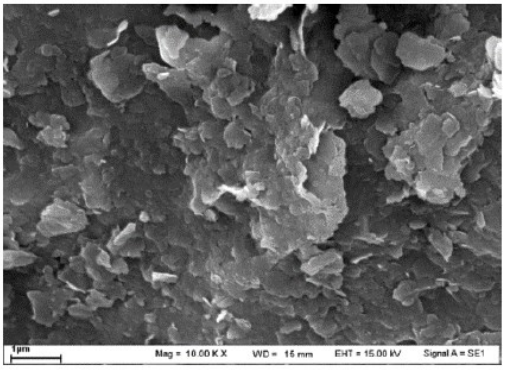
Thailand Second Round of Country Issue

Guest Editors: Prof Noppadol Phienwej, Prof Dennes Bergado, Dr Suttisk, Dr Apiniti, Prof Suched, Dr Geoff Chao et al

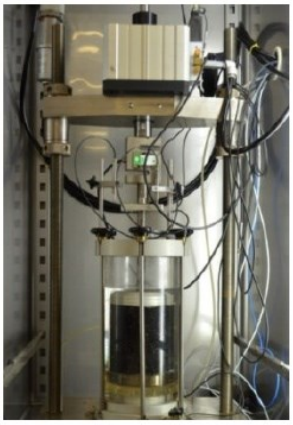
Embankment completed construction works at AIT (After Otha, 2015)



Results of electrical prospecting from resistivity test (After Ohtsu et al., 2015)



SEM photograph of Bangkok clay (After Por et al., 2015)



Dynamic creep test setup in wet condition (After Chompoorat and Likitlersuang, 2015)

SHEET PILED WALLS **SEAGS 50TH ANNIVERSARY PROCEEDINGS**

Test Sites

ANNOUNCEMENT

KINDLY READ THIS NEWS PLEASE on more details of SEAGS-AGSSEA Journals from 1970 - June 2016 in SEAGS WEB and **Free Downloading of Articles** now from 1970 to 2011 Issues; this will be extended to 2012 by end of August and 2013 by end of 2016.

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YOU ARE KINDLY REQUESTED TO CONTRIBUTE ARTICLES IN FUTURE ISSUES AND ALSO HELP IN REVIEWING AS WELL.

1: Contributing Authors:

1: Prof. Noppadol Phienwej
2: Dr Geoff Chao
3: Prof Warakorn
4: Prof Suched
5: Prof Suksun
6: Prof Bergado
7: Dr Apiniti
8: Dr Seah
Oyhers to be Assembled by Suched, Apiniti, Geoff Chao et al

2: Overlapping Timelines (Tentative-subject to change depending on progress)

1: Call for Abstracts & Review - May-August, 2019

2: Call for Papers &Full Paper Submission – May to December 2019: Indvited Papers and contributed papers

3: Review of Papers: Jan –July 2020

2: Release of Issue : End of 2020- Mid 2021

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PREFACE

ACKNOWLEDGEMENT

Fourteen papers are contained in this issue. No doubt the material contained herein would be most valuable to our profession. The editors have adequately described the contributions in the preface. They are to be congratulated for these contributions.

Dr. Teik Aun Ooi
Dr Geoff Chao
Prof. Kwet Yew Yong
Dr. Noppadol Phienwej
Prof. A. S. Balasubramaniam

GEOTECHNICAL ENGINEERING

March 1922 SEAGS –Thai Country Issue Round Two

Editors: Prof Noppadol Phienwej, Dr Suttisak, Prof Suched, Prof Suksun, Prof Bergado et al

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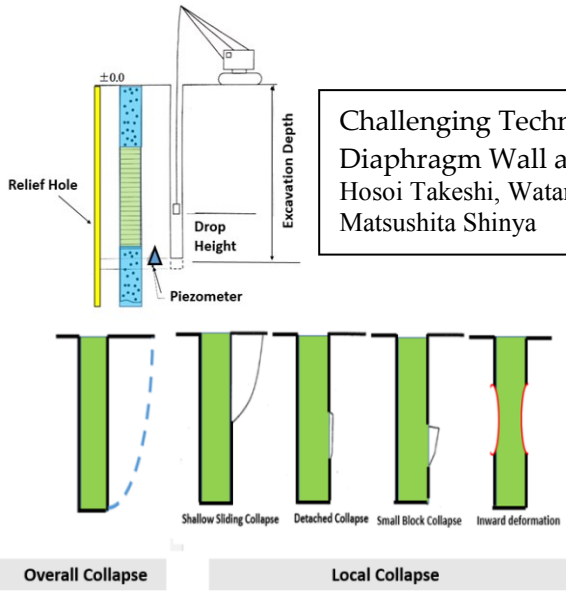
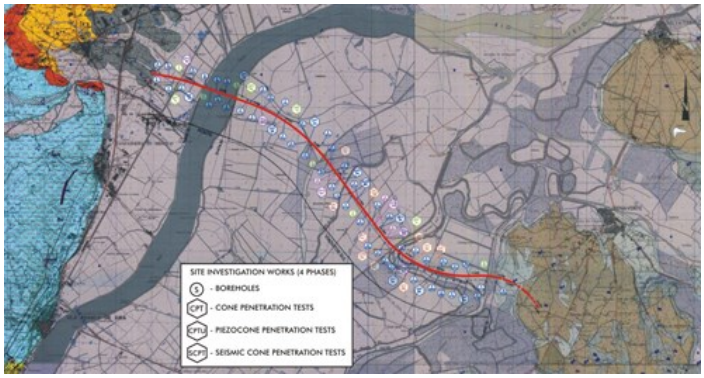
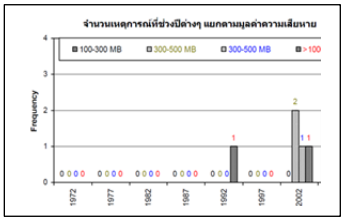


Challenging Technologies of Diaphragm Wall and Bored Pile
Hosoi Takeshi, Watanabe Koji and Matsushita Shinya



Leziria Tagus Bridge-Ground Challenges
By Sêco e Pinto, Pedro



Number of casualties from landslide e
Thailand since 1970 (Soralump, 2007)

Area	1970-2006		Average
	Lives	Economics	Lives
North	286	2,575,600,000.00	8
Central	1	300,000,000.00	0
South	247	1,010,000,000.00	7
Total	534	3,885,600,000.00	14

2

Location, trend and casualties of the major landslides in Thailand (Soralump, 2010

Settlement of river dykes and their adjacent residences on soft clay Deposits: Yasuhara, K et al

GEOTECHNICAL ENGINEERING

PREFACE

The first paper by Ikuo Towhata is on Future Task of Our Discipline: The basic trend of human civilization has changed drastically between the old good 20th Century and the present 21st Century. This change is caused by the limited resources of our planet and the increasing human population. We have to sustain the civilization while improving the living condition of people in both developed and developing countries. Obviously we cannot seek for the past model of engineering and life style in the coming decades. Under this difficult circumstance, what should geotechnical engineering do, collaborating with other disciplines? In this respect, the present paper discusses four directions of future activities which are namely more efficient use of existing resources, energy development, future infrastructures and disaster mitigation.

The second paper is by Warakorn Mairaing and Bunpoat Kulsuwan on Vegetation Effects on Landslides in Thailand: Increasing of rain triggered landslide in the last decade in Thailand is partially related to land use change and vegetation. The natural forest had changed to mono cropping land due to agricultural product demand. The study was done on two watersheds namely Mae Phrong-Mae Phun(MPMP) and Khlong Kram(KK) on the north and south of Thailand respectively. Land use study reveals that on MPMP, decreasing of natural forest is more than 58% of the total area. Where on KK, the change of natural forest is not significant. The largest root spreads of 2.5 to 5.0 m. with root depth of 0.4 to 1.6 m was observed in forest tree group. The orchard land show intermediate root spreads of 1.2 to 3.5 m. with root depth of 0.9 to 1.3 m. The pioneer trees show must less root spread and depth. Root cohesion (C_R) can be calculated from tree distribution in each land use and the characteristics of each tree on that land use. The results show that root cohesion on the natural forest is the highest and less on orchard and pioneer plants respectively. When root cohesions were input to 3-D stability model. The Factor of Safety and probability of failure over the watershed area were obtained. The warning chart can be created from the level of antecedent and triggered rainfall.

The 3rd paper is by John Endicott on Innovations in tunnelling: During the last 50 years there have been so many innovations. Tunneling is no exception. There have been major innovations in all aspects of the industry. There are now many types of versatile tunnel boring machines in use in a range of sizes from micro tunnels of less than one metre in diameter to big machines of over 17m in diameter. Whereas grouting to prevent inflow of water or to solidify weak ground used to be a “black art”, new materials and new methods of grouting can ensure “dust dry” conditions. At the start of the process, more time is spent in planning and more site characterization is the norm and ground investigation includes a whole host of techniques, such as horizontal directional coring that can extend more than a kilometer along the proposed route, geophysical surveys, gravity surveys, resistivity surveys and more. Methods of design and determination of ground movements have been facilitated by numerical methods that were impossible 50 years ago. There has been a major change within the industry with respect to geological risk. Whereas in the past it was common for the Contractor to be required to bear all of the risk almost unseen, now risks are identified upfront, more ground investigation is carried out and made available at the time of tender and contractors include risk sharing mechanisms such as Geotechnical Baseline reports or re-measurement of major items. This paper reflects on some of the milestone achievements and some of the changes that have taken place in the planning, design, and construction of tunnels in S.E. Asia during the last 50 years.

The 4th paper is by Chinkulkijniwat Avirut et al on hydrological criteria of rainfall induced shallow landslide: Understanding the hydrological and physical responses of shallow slopes, subject to rainfall events is vital for the efficiency of a warning system setup. In this research, a series of experiments were undertaken to evaluate the hydrological responses of shallow slopes of varying steepness and when subjected to varying intensities, periods, and inter-storm periods of rainfall. An analysis of infinite slopes were also undertaken to develop a fundamental understanding of rainfall induced shallow slope failure characteristics. The hydrological and physical responses were characterized to wetting and saturation phases. During the wetting phase, the maximum magnitude of water content was found behind the wetting front, termed as the water content behind the wetting front (θ_wb). For a certain soil type, the magnitude of

θ_wb was found to be dependent on the magnitude of rainfall intensity, regardless of the slope gradient and initial water content. Based on the relative depth of the failure plane, the failure can be categorized by three prime modes: 1) along the impervious layer mode, 2) shallow depth mode, and 3) transitional mode. These modes can be characterized by the magnitude of a stability index termed as tanφ′⁄(tanβ)ratio. An infiltration index, termed as ɨk_s ratio, was found to play a role in the depth of failure plane only for the transitional mode.

The 5th paper is by Hosoi Takeshi and Matsushita Shinya on Recent Challenging Technologies For Diaphragm Walls And Bored Piles: Recent challenging technologies for diaphragm wall and bored pile are highlighted from design and construction point of view. In this paper the following technologies are discussed: For fundamental technologies 1) Slurry fluids including new developed polymer slurry 2) Trench stability in special soil conditions 3) High-grade concrete (approximately Grade 100) 4) Re-bar cage up-down movement in the slurry during casting concrete 5) Removal of slime and base grouting method compensate to insufficient removal of slime 6) Load test for bored pile and barrette comparing shape of foundations and influence by bentonite slurry and polymer slurry on bearing capacity. For construction methods, 1) Alternatives of RC Diaphragm wall : Slurry –Cement Diaphragm Wall (Self-hardening slurry wall, in-situ Mixing Hardening wall and Replacing Hardening Wall) and Soil- Cement Diaphragm Wall (In-situ Mixing Wall and Replacing Wall) 2) Enlarged Base Bored Plie to improve end bearing capacity 3) Diaphragm Wall and Bored Pile with Lumps to improve skin friction 4) Large diameter bored pile , deep bored pile and diaphragm wall 5)Underground environmental consideration to mitigate cut-off of natural ground water flow due to installation of permanent continuous diaphragm wall.

The 6th paper is by Askar Zhussupbekov et al on Piling Design Installation and Testing on Problematic Soil Ground in Kazakhastan: The article presents the results of piling designing and installation, and also the static and dynamic tests of soil by piles at the construction site of Cargo offloading facilities (Prorva, Atyrau region, Kazakhstan). The project area is located along the east coast of the North East Caspian Sea, both onshore and offshore, near the Prorva oilfield, Kazakhstan. At present the North Caspian Sea has a limited water depth (maximum 5 to 8 m). The water level in the Caspian Sea depends on a balance between the inflow of river water and evaporation. This has resulted in large variations in sea level in the past. This explains the sequence and soil characteristics of the deposits. Presented are levels Above Mean Sea Level (AMSL). Major Caspian sea level fluctuations are closely related to Pleistocene glacial and interglacial periods. Dynamic tests were conducted by PDA (Pile Dynamic Analyzer) and static tests by the requirements of the American Society for Testing Materials (ASTM). According to the test results have been made design changes in the pile foundation. Static tests (SLT) were carried out on 16 - meter piles and precast concrete joint piles with a total length of 25.5 m and 27.5 m cross-section 40 * 40 cm. SLT is a highly accurate and robust system that enables you to monitor static pile tests whilst also ensuring the safety of site operatives. Featuring a cable, users are able to monitor safely and accurately from distance, eliminating the need for personnel to enter potentially dangerous testing zones.

The 7th paper on Selected Case Histories of Natural Slope and Man Made Slopes Failures, with Their Counter Measures in Indonesia is by Paulus P. Rahardjo , Aris Handoko and Adityaputera Wirawan: Landslides and slope failures frequently occur in most parts of Indonesia region both as natural slope failures or man made slope failures. In case of man made slope failures, several of them may be due to negligence or lack of knowledge in appropriate technology. Natural slopes failures which is more open to public are reported and documented. However in case of man-made slope failures, many of them are not known although the number of occurrence are much more then reported. This paper discusses landslides case histories and technology involved for corrective measures that are generally practiced in Indonesia and also discusses some aspects of the analytical and empirical methods of slope stability analysis. Particular focus is placed on the case histories of failures of man made slopes. Some cases have uncommon causes and become new lessons to consider in slope design and procedure of construction. Some phenomena of slope failure are due to problematic soils which still have some mysteries, or not quite understood. Among these are under-consolidating soils, expansive soils, water sensitive materials like tuff, organics, very soft marine clays and very loose and fine sands and silty sands. In most cases, the paper is based on the author's experience in more then two decades. Although this paper does not explain all types of the landslides

occurrence in Indonesia, the scope of the paper highlight similar events commonly found. This paper represent experience of the author mainly on landslides and slope failures.

The 8th paper by Pedro Pinto is on Leziria Tagus Bridge –Ground Challenges: A brief description of the New Tagus River Leziria Bridge composed by the North Viaduct with a length of 1695 m, by the Main Bridge 970 m long and by the South Viaduct with a length of 9200 m is presented. The observed thickness of the foundation alluvia material varies in general between 35 m and 55 m with a maximum value of 62 m. Laboratory tests namely triaxial tests, direct shear tests, as well reasonant colunm tests and torsional cyclic tests were performed. One of the most important consideration for the designers is the risk of earthquakes since Lisbon was wiped out by an earthquake in 1755 of 8.5 of Ritcher magnitude. The seismic studies related to the design spectra were performed.The liquefaction potential evaluation was performed only by field tests SPT and CPT tests. The shear stress values were computed from a total stresses model that gave results on the conservative side using the program “SHAKE”. The objectives of bridge monitoring during the construction phase and the long term are addressed. Some final considerations are presented.

The 9th paper is by Lin et al on subsurface drainages for the slope stabilization of deep seated large landslides: The Li-Shan landslide had a long history of intermittent large ground movements during torrential rainfall since triggered in 1990. Currently, the landslide has been successfully stabilized by a subsurface drainage system consisted of drainage wells (vertical shaft with horizontal drains) and drainage galleries (longitudinal tunnels with sub-vertical drains). This paper presents the field conditions with emphasis on the construction of subsurface drainages and their stabilization efficiency using three-dimensional (3-D) rainfall induced seepage and slope stability analyses. Monitoring data and numerical results both demonstrate that the subsurface drainages are functional and capable of accelerating the drainage of infiltrated rainwater induced from torrential rainfall during typhoon. The large groundwater drawdown due to subsurface drainages protects the slopes from further deterioration and maintains the slope stability at an acceptable standard.

The 10th paper is on Seismic Hazard Assessment Procedures - Reflection on Bangladesh by Tahmeed M. Al-Hussaini: In a country with a low frequency of earthquakes and no big earthquake event in recent times, the general population of Bangladesh has been complacent about the possibility of a big earthquake event. On the other hand, historical records of large earthquakes in and around Bangladesh and seismotectonics of the region indicate that the threat of a big earthquake event is real. Realizing the risk, the 1993 Bangladesh National Building Code has incorporated the seismic risk, providing seismic zoning maps and earthquake resistant design guidelines. The 1993 code is now in the process of being updated with a revised seismic zoning map. Several seismic hazard assessment (both probabilistic and deterministic) studies have so far been conducted for Bangladesh adopting different procedures. This paper gives a brief introduction to these methods and presents an overview of findings from these studies. Most of the probabilistic studies based on earthquake catalogues appear to be in reasonable agreement with the building code provisions. A very recent research publication has indicated the possibility of a mega earthquake (magnitude 8.2 to 9.0) inside Bangladesh capable of causing catastrophic consequences in major cities of Bangladesh including the capital city of Dhaka. Neo-Deterministic studies are conducted to assess the effects of scenario earthquakes including implications of mega earthquakes. Finally the author's perception of the way forward in seismological research is presented.

The Community Slope Safe Awareness Program at Bukit Antarabangsa, Kuala Lumpur is the title of the 11th paper by F. Ahmad, A. S. Yahaya, M. H. Halim, and M. Azmi: Malaysia is located near the equator line with tropical climates which receives high intensity of rainfall. The rainy weather condition in this country makes Malaysia prone to landslide events as rainfall has a high impact on the slope strength and possible to trigger landslide. When the technology are not cost effective against the landslide, it would be better if the communities and resident of the risk area to be well aware of the hazard and how to react during any landslide event. This study aims to obtain information related to the community’s knowledge on the slope risk awareness for future mitigation process. The target group for the questionnaire is the community that lived near a landslide prone area which in this study is the residents of Taman Wangsa Ukay, Bukit

Antarabangsa, Kuala Lumpur, Malaysia. This questionnaire was distributed and received on 22nd October 2016 during a workshop carried out on the Communities Slope Safe Program. The survey has four main parts which are general information, action and awareness, general view of landslide and slope stability and risk for life and health. The results show that the residents that are of Taman Wangsa Ukay, Bukit Antarabangsa have a good awareness on the slope risk with an overall scale of 4. But still, there are some elements that need further improvement which are mitigation plan, slope monitoring and effective slope repair works.

The 12th paper is on A Parametric Study Using Numerical Analysis to Determine Change in the Location of Neutral Plane for a Single Pile in Soft Clay Layer by T. Awwad, S. Al Kodsi and L. Awwad and L.N. Gumilyov: During the pile driving process, stresses are generated in the surrounding soil. After applying the surcharge load, water dissipates from the soil pores leading soil to settle. Depending on the relative movement of the pile/soil system, positive and negative skin friction develop on the pile's shaft. Negative skin friction (NSF) is the drag force that may be large enough to reduce the pile capacity and/or to overstress the pile's material causing fractures or perhaps structural failure. Neutral plane is the point when the relative movement between the pile and soil is zero and no force is exerted on the pile. In this study, a numerical model was created to simulate the case of a single pile driven in soft clay layer overlying a deep deposit of stiff clay. The model was validated by comparing its results with the results of full scale field test. According to the parametric study results, design charts and equations was obtained herein for practical use and further to provide a design manual for the engineers.

The 13th paper is on A Standardised Detailed Reliability Based Methodology in Determining Risk on Stationary Platforms due to Shallow Gas Geohazard by Kaushik Mukherjee ,M Sapihie B Ayob , and Indra Sati Hamonangan Harahap: The state-of-the-art geotechnical engineering significantly emphasizes on various geohazards issues affecting structures worldwide. Of late, geohazards are playing an important role in designing and safeguarding offshore structures in Malaysian waters. The burning example would be the shallow gas effect on stationary platforms in Peninsular Malaysia. The actual mitigation measures depends on the extent of geohazards and it's level of risk to the structure. The present paper would be concentrating on a standardised detailed Reliability based methodology in determining Risk on Stationary Platforms particularly located in South China Sea due to Shallow Gas Geohazards. Similar works were attempted earlier researchers using simplified and quantitative approach for a particular asset. The present research work formalised a general methodology based on First/Second Order Reliability techniques applicable to any structure affected by shallow gas. The numerical techniques like Monte Carlo Simulations may also be used as an alternate tool. The final results produced by this methodology indicates a good prediction of risk level against similar geohazards at any location.

The last paper is the 14th paper on Reclamation for Al Raha Beach Development, Abu Dhabi, UAE by Suraj De Silva and Henry Wang: Al Raha Beach Development, a 650 (10 km x 0.8 km) hectare upmarket residential and commercial development was undertaken by the Abu Dhabi developer ALDAR to house a resident population of 120,000. The reclamation was built over very soft contaminated silts and clays which had deposited in the channel since it was dredged in the 1970s. Extreme care was therefore necessary in forming the reclamation and the seawalls. The vertical L-shaped precast seawalls in the Western Precincts were founded on marine stone columns. The Seawalls in the Eastern Precincts were formed with diaphragm walls installed from land-after reclamation. The very soft mud layers within the reclamation area were treated by consolidation under the reclamation fill. The reclamation sandfill comprising carbonate sand dredged from nearby islands and was densified to prevent liquefaction and to achieve the design strength by deep vibrocompaction. The near surface reclamation fill was compacted with high impact rollers to achieve an allowable bearing capacity of 150 kPa. This paper describes the reclamation design criteria and approach,

ground treatment techniques used, the testing & verification of treatment and the behaviour of the reclamation upon completion.

ACKNOWLEDGEMENT

Nineteen papers are contained in this issue. No doubt the material contained herein would be most valuable to our profession. The editors have adequately described the contributions in the preface. They are to be congratulated for these contributions.

Dr. Teik Aun Ooi
Prof. San Shyan Lin
Prof. Kwet Yew Yong
Dr. Noppadol Phienwej
Prof. A. S. Balasubramaniam

GEOTECHNICAL ENGINEERING

March 2019: SEAGS 50th Anniversary Papers Part 2

Edited by: S C CHIAN, SAN SHYAN LIN GEOFF CHAO KY YONG AND OOI TEIK AUN

Siau Chen Chian (Darren)

Dr. Chian is an Assistant Professor at the Department of Civil and Environmental Engineering, National University of Singapore. He received his PhD and BEng with gold medal from Cambridge University and Nanyang Technological University respectively. His research interests are in earthquake engineering and ground improvement. Dr. Chian's contribution in earthquake engineering lies in the field of damage vulnerability of underground structures in earthquake induced soil liquefaction. He was funded by the UK Engineering and Physical Sciences Research Council (EPSRC) to carry out reconnaissance missions at the 2009 Padang, 2011 Tohoku and 2016 Muisne earthquakes. Dr. Chian is also an enthusiast of recycling waste material to good use. He is actively involved in collaborative research projects with local government agencies to recycle unwanted and contaminated soils from underground construction projects and sea dredging as construction and fill materials. He is a nominated member of three International Technical Councils under the International Society for Soil Mechanics and Geotechnical Engineering (ISSMGE). Dr. Chian also sits in the technical committee of SPRING Singapore to oversee and provide advice on geotechnical engineering practices in Singapore. He is presently the Vice President of the Geotechnical Society of Singapore (GeoSS). Dr. Chian has been invited to speak in a number of international conferences in Singapore, Malaysia and India. Recently, Dr. Chian's research work at NUS led to his award of the prestigious Top 10 Innovators Under 35 in Asia by the MIT Technology Review in 2016. Other achievements include a 1st Prize in a National Technical Paper Competition and the Best Young Researcher Award at the 8th International Conference on Urban Earthquake Engineering.

San Shyan Lin

Prof. San-Shyan Lin graduated from Chung Yuan University with a BSCE degree in 1981. He then obtained his master degree from Utah State University, Logan, Utah in 1985 and his PhD from Washington University in St. Louis, Missouri in 1992. Before his teaching career at university, Dr. Lin served as an engineer at Taiwan Area National Expressway Engineering Bureau between1992 to1994. Dr. Lin has been serving at Department of Harbor and River Engineering (DHRE) of National Taiwan Ocean University (NTOU) since 1994. He was promoted as a full professor in 2000. Thereafter, he took some university duties by serving as the secretary-general at office of the secretariat between 2001 and 2003; the chairman of DHRE between 2005 and 2006; the acting dean of college of engineering in 2007 and the vice president of NTOU between 2006 and 2012.

Prof. Lin served as a committee member of committee A2K03-Foundations of Bridges and Other Structures of TRB, USA between 1995 and 2004. Currently, he is still serving as a committee member of TC-212 and ATC-1 of ISSMGE and as an editorial board member of four international journals. In addition, Dr. Lin also served as the president of Taiwan Geotechnical Society (2011-2013); Chairman of International Geosynthetics Society- West Pacific Regional Chapter (2002-2004); CEO of Sino-Geotechnics Foundation (2011-2014) etc. Dr. Lin received the distinguished alumnus award from Chung Yuan University in 2009 and the distinguish Engineering Professor Award from Taiwan Pavement Engineering Society in 2011. Prof. Lin's research and practical experiences have been dealt with deep foundations and geosynthetics.

Ir. Dr. Teik Aun Ooi

Ir. Dr. Teik Aun Ooi obtained his Bachelor of Civil Engineering and Master of Engineering from Auckland Universiity in 1966 and 1968 respectively. He obtained his PhD from University of Sheffield in 1980. He was the Co - Organizing Chairman of the recently concluded SEAGC2016. He is the immediate Past President of the Southeast Asian Geotechnical Society (SEAGS), Founder Chairman of the Association of Geotechnical Societies in Southeast Asia (AGSSEA). He is a Past President of the Malaysian Institute of Arbitrators (MIArb). He is the Immediate Past ICE Country Representative for Malaysia (2000 - 2015), Founder Chairman of IEM Tunnelling and Underground Space Technical Division (TUSTD), Founder Chairman of IEM Consulting Engineering Special Interest Group (CESIG), He is an Honorary Fellow of The Institution of Engineers, Malaysia (Hon. FIEM), Fellow of the Institution of Civil Engineers (CEng FICE), Fellow of the MIArb (FMIArb), Fellow of Malaysian Society of Adjudicators (FMSA) and Fellow of Asean Academy of Engineering and Technology (FAAET). Dr. Ooi has fifty years of experience in the Construction Industry. He spent his initial fourteen years with the Public Works Department Malaysia before leaving to work in the private sector where he spent seventeen years working in the construction sector. He play major role in the Johore Baru Causeway widening and the design and construction of Senai Airport in 1970s. He was the Project manager for the Wisma Saberkas Building Project in Kuching in 1980s. He was Project Director for the Design and Construction supervision of the New Kuching Deep Water Port at Kampung Senari in 1990s. He started his consultancy practice in 2000 specialising in Civil and Geotechnical Engineering works. Dr. Ooi is a practicing Consulting Engineer, An Expert Witness in

Court and in Arbitration, An Accredited Checker, An Arbitrator and An Adjudicator. He is a member of the Accredited Checker Committee of the Board of Engineers, Malaysia. Dr. Ooi devoted much of his time in honorable public service in continuing education of engineers and development of Malaysia Annexes for Eurocode 7 and 8. He is an independent executive director of IEM Training Centre Sdn Bhd since 1992. In 2013 he was appointed executive director of the IEM Academy Sdn Bhd. He has been Organizing Secretary and Chairman of numerous IEM Workshops, Seminars, and Conferences since 1970s. He was responsible for forming five active ICE Student Chapters in Universities in Kuala Lumpur. Dr Ooi conducted touring lectures in geotechnical engineering to Malaysia, Vietnam, Thailand, Cambodia, Laos, Myanmar and Philippines. In Malaysia he was invited to deliver the prestigous 19th Professor Chin Fung Kee Memorable Lecture in 2009. He frequently delivered lectures to the final year University engineering students.

GEOTECHNICAL ENGINEERING

March 2019: SEAGS 50th Anniversary Papers Part 2

Edited by: S C CHIAN, SAN SHYAN LIN GEOFF CHAO KY YONG AND OOI TEIK AUN

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ENGINEERING

Journal of the

SOUTHEAST ASIAN GEOTECHNICAL SOCIETY

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ASSOCIATION OF GEOTECHNICAL SOCIETIES IN SOUTHEAST ASIA

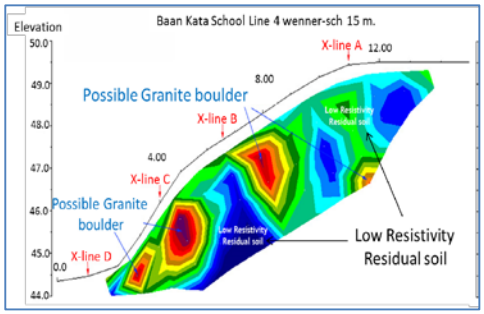
AGSSEA

Sponsored by

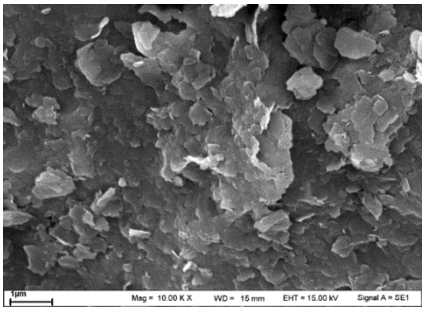
ASIAN INSTITUTE OF TECHNOLOGY (AIT) and
ENGINEERING INSTITUTE OF THAILAND (EIT)

Editors: Suched Likitlersuang, Suksun Horpibulsuk, Suttisak Soralump, Tirawat Boonyatee Suchatvee Suwansawat, and Thanakorn Chompoorat

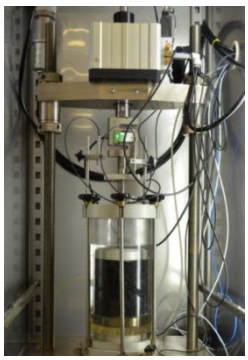
Embankment completed construction works at AIT (After Otha, 2015)



Results of electrical prospecting from resistivity test (After Ohtsu et al., 2015)



SEM photograph of Bangkok clay (After Por et al., 2015)



Dynamic creep test setup in wet condition (After Chompoorat and Likitlersuang, 2015)

GEOTECHNICAL ENGINEERING

PREFACE

Welcome to Geotechnical Engineering Journal of the Southeast Asian Geotechnical Society (SEAGS) and the Association of Geotechnical Societies in Southeast Asia (AGSSEA). It is our great pleasure to serve as the editors for the first issue of 2015 and also the special country issue of Thailand. Our editorial team consists of Prof. Suched Likitlersuang from Chulalongkorn University, Prof. Suksun Horpibulsuk from Suranaree University of Technology, Dr. Suttisak Soralump – President of Thai Geotechnical Society, Dr. Tirawat Boonyatee – Vice president of Thai Geotechnical Society, Prof. Suchatvee Suwansawat – President of Engineering Institute of Thailand, and Dr. Thanakorn Chompoorat from Univerisity of Phayao. We are also supported by Prof. A.S. Balasubramaniam as the editor-in-chief and Dr. Teik Aun Ooi as the president of SEAGS to launch this special issue. The rigorous blind peer-review process has been carried out by international reviewers, while every effort was carefully made to ensure the technical quality of the journal. We highly appreciate our reviewers for their time and effort.

The theme of this special issue is *Advances in Geotechnical Engineering for Infrastructure Developments in Thailand*. The articles cover a wide range of topics from theoretical soil mechanics to geotechnical applications for Thailand's infrastructure developments. This special issue of Geotechnical Engineering Journal of the SEAGS & AGSSEA is comprised of fourteen articles with a selection of authors from four countries including Australia, China, Japan and Thailand.

The first invited paper by Ohta (2015) presents consolidation settlement due to the embankment construction on soft Bangkok clay. The paper also acknowledges the technical communication with Dr. Surachat Sambhandaraksa related to consolidation settlement. Two papers (Ohtsu et al., 2015 and Jotisankasa et al., 2015) present field studies of slope stability due to rainfall in Thailand. The topics related to ground improvement for soft soil are still interested in this issue such as using chemical stabilisation (Horpibulsuk, et al., 2015, Fan, et al., 2015 and Julphunthong, 2015) and vacuum consolidation technique (Shibata et al., 2015). Two papers (Ukritchon and Boonyatee, 2015 and Horpibulsuk and Liu, 2015) related to soil modelling and its parameter calibration are included in this issue as well. Chompoorat and Likitlersuang (2015) summaries mechanical properties of hot mix asphalt for pavement design. Undrained shear strength of Bangkok clays from various laboratory techniques are discussed by Ratananikom et al. (2015). A review of pile foundation design on Bangkok subsoils is presented by Boonyatee et al. (2015). 3D finite element analysis of the potential use of piled raft foundation on Bangkok subsoils is proposed by Watcharasawe et al. (2015). Lastly, Por et al. (2015) presents a laboratory investigation of expansive soil behaviour.

We consider that this special issue summaries some recent advances in geotechnical engineering for infrastructure developments in Thailand. We also hope that it could make an important contribution to other countries in the Southeast Asia.

Suched Likitlersuang
Thanakorn Chompoorat

ACKNOWLEDGEMENT

At the very outset, we would like to acknowledge the skill of Prof. Suched Likitlersuang, who headed the team of Guest Editors in producing this excellent issue. This issue honours the late Dr. Surachat Sambhandaraksa a very long time friend of ours and a past president of the SEAGS. This is also the Thai country issue produced in such a short time, while some other country issues will only appear in 2016. The topics and the authors are adequately described in the Preface. The SEAGS and the AGSSEA as well as the Thai Geotechnical Society (TGS) are very grateful to the Editors, authors and reviewers for their excellent work.

A good teacher is often measured by the quality of his students. Dr. Surachat had graduated from Chulalongkorn University going to almost all the good universities to do doctoral studies. It is appropriate to have a brief biodata of Dr. Surachat.

Dr. Surachat Sambhandharaksa, a past president of the Southeast Asian Geotechnical Society (SEAGS) from 1996 to 1999. A modest and clever achiever, Surachat was the earlier colleague of late Dr. Chai Muktabhant and Prof. Vichien Tengamnuey at Chulalongkorn University. Surachat always had an international outlook with his early education at the University of New South Wales in Australia in 1967; then his master degree from the Asian Institute of Technology (AIT) in 1970; later Surachat went to the Northwestern University and finally obtained his Sc.D. degree from the Massachusetts Institute of Technology (MIT), the United States of America in 1977. When he returned to Chulalongkorn University, Surachat was also a lecturer much in demand at the AIT. He was actively involved in most of the major projects in Bangkok and Thailand. He has real world experience in geotechnical engineering practice with sound knowledge on the fundamentals of soil behaviour. His practice is in embankments and piled foundations. He was a much sort out consultant in Bangkok. At AIT, we needed a person like Surachat to teach our design courses. Surachat also taught a popular course for non-soil engineers and this is really popular. Surachat, received the Outstanding Award of the Teaching from Chulalongkorn University and was voted as the best Geotechnical Engineer in Thailand in 2006. He was also, the chairman of the organizing committee of the 15th Southeast Asian Geotechnical Conference held in Bangkok in November 2004. Popularly called as Sam at MIT, Surachat has a charming personality always joyful and friendly in nature. Surachat hails from a good family with his father as the professor of surgery at the Faculty of Medicine in Chulalongkorn University. We all miss him a lot and his premature death is a great loss to his family and friends.

Finally, Dr. Surachat is highly respected internationally, Prof. Harry Poulos made the comment as follows:

“Dr Surachat was a leading figure in Geotechnical engineering in Thailand for many years, and a person who was vastly experiencing in identifying and solving problems related to foundations in the often-challenging ground conditions in Bangkok. I first met him at one of the early Southeast Asian Geotechnical conferences, and it was quite clear that his knowledge of the characteristics of Bangkok soils was second to none, and that he was well-placed to advise clients on foundation design in these soils. He was also was a congenial host and dinner companion at a number of conferences held in Bangkok. Apart from his practical geotechnical skills, he was able to pass on his knowledge to many students who had the privilege of studying under him at Chulalongkorn University and at AIT. He was very proud of his educational background, first in Australia, and then at MIT, where he studied with some of the pioneers of soil mechanics such as Lambe, Ladd and Whitman. He achieved recognition for his expertise both in Thailand and in Southeast Asia more generally, and with his passing, the Southeast Asian region has lost one of its elder statesmen in the geotechnical profession.”

Finally, We thank the Guest Editors, the authors of the papers and the reviewers , who made the most valued contribution in making this Issue feasible.

K. Y. Yong
N . Phienwej
T. A. Ooi
A. S. Balasubramaniam

GEOTECHNICAL ENGINEERING

March 2015 Issue: Special Country Issue of Thailand – Dr. Surachat Sambhadharaksa Memorial Issue Advances in Geotechnical Engineering for Infrastructure Developments in Thailand

Edited by : Suched Likitlersuang, Suksun Horpibulsuk, Suttisak Soralump, Tirawat Boonyatee Suchatvee Suwansawat, and Thanakorn Chompoorat

Suched Likitlersuang

Suched Likitlersuang graduated with a bachelor degree in civil engineering from Chulalongkorn University in 1998 and received a master in geotechnical engineering from Asian Institute of Technology in 2000. He attained a doctorate in civil engineering from the University of Oxford in 2004. Suched is currently a full professor at the Department of Civil Engineering, Chulalongkorn University. He is members of the Thai Geotechnical Society and the Engineering Institute of Thailand. He is also an Editorial Board member of Geotechnical Research and serves as a Guest Editor of the Southeast Asian Geotechnical Society Journal special issue for Thailand. Suched has published over 70 articles in international conference proceedings and international journals. His research interests include constitutive modelling for geomaterial and asphaltic concrete, stress-strain characteristic of soils, numerical analysis in geomechanics, geo-environments, geotechnical earthquake engineering and soil bioengineering.

Thanakorn Chompoorat

Thanakorn Chompoorat was born in Thailand in 1980. He graduated the Bachelor degree in Civil Engineering from Srinakharinwirot University in 2003. He also received the Master and the Doctoral degrees in Geotechnical Engineering from Chulalongkorn University in 2005 and 2009 respectively. He is currently an Assistant Professor and Assistant Dean for Research and Academic Service of the Department of Civil Engineering, University of Phayao. Thanakorn is a member of the Thai Geotechnical Society as well as the Engineering Institute of Thailand and presently also serves as an Editorial Secretary of the Southeast Asian Geotechnical Society Journal special issue for Thailand. His main research interests are soil behaviour and pavement material behaviour, numerical analysis for soil and pavement material, and constitutive modelling and plasticity.

GEOTECHNICAL ENGINEERING

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