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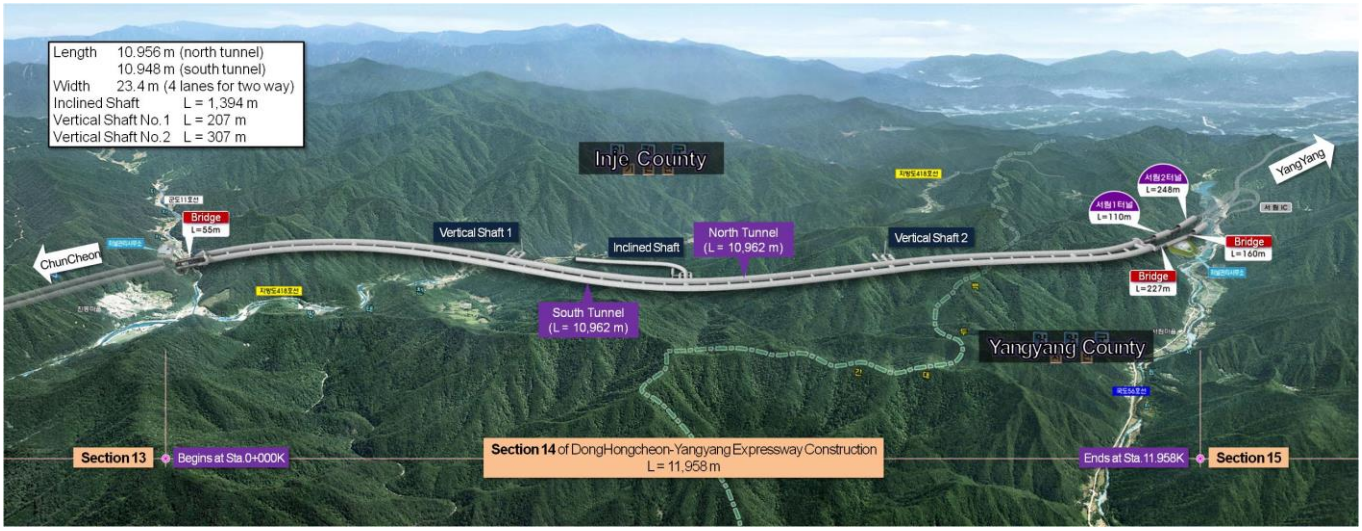
Guest Editor:
Prof. Chang Yu Ou



GEOTECHNICAL ENGINEERING

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EDITORIAL PANEL

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PREFACE

Asia currently is the most fast growing area in economy. Many high rise buildings and infrastructures including subway tunnels in urban areas and mountain tunnels connecting cities are under construction. Some of them are extraordinary in terms of scale and construction difficulty. The strength and stress-strain behavior of soils are seriously considered and monitoring systems are comprehensively implemented in projects. Therefore, as a guest editor of this special issue featuring the urban geotechnical construction, I am very happy to have the papers from distinguished investigators from China, Korea, Singapore and Taiwan. Many thanks for their contribution.

This special issue covers some important aspects of urban geotechnical construction. One of the biggest issues for underground construction in a densely built-up urban environment is the potentially adverse impact on buildings adjacent to deep excavations. Thanks for Mr. Goh and Prof. Mair who present the influence of building stiffness in the assessment of adjacent building safety. Excavation instability sometimes causes catastrophic collapse of the projects. Prof. Zheng and his group introduce the concept of redundancy into the design of retaining structure and develop a design methodology based on the concept of redundancy. Prof. Jeng and his colleagues give a very interesting case study of the largest excavation in Shanghai soft clay. In urban areas, excavations may have a significant impact on the stress and deformation of existing tunnels. Several construction techniques have been developed to reduce the movement of excavations in soft clay. Prof. Wang and his group made a comprehensive study of the effectiveness of these different methods and the interactive impact of the two adjacent excavations in Shanghai soft clay on the crossing tunnel using the numerical method. In the past studies of ground movement induced by deep excavations mostly focus on those due to main excavation, for example, excavation of soil, dewatering, strut installation and demolish and so on. Ground movement induced by diaphragm wall construction is seldom taken into account. Prof. Ou and his group present the behavior of ground movement induced by construction of diaphragm wall based on the monitoring results of the construction of the Taipei metro system. The envelope due to diaphragm wall construction is established in the paper. In the traditional pneumatic caissons, workers have to conduct excavation inside the working chamber under high pressure, temperature, and humidity while in the new pneumatic caissons, soil excavation and removal are completed by remotely controlled equipments. Prof. Peng and his colleagues report the monitored results for the new pneumatic caisson conducted in Shanghai soft clay and numerical approach considering the soil disturbance during construction. The agreement between field monitoring and numerical analysis results are discussed. In densely popular cities, construction of underground tunnels should be kept minimal impact on existing buildings. Instead of shield machines, use of hydraulic jacks to push pipes through the ground is an economic and minimal impact on the existing buildings. Prof. Ding and his coworkers introduce the technologies of pipe-jacking methods to reach micro disturbance to existing buildings. Inje Tunnel, an 11 km-long twin-tunnel, still under construction, will be the longest road tunnel in Korea. Director Cho introduces the details of the tunnel design, including geotechnical consideration, cross-section of the excavation, reinforcement, drainage, ventilation operation, safety facility corresponding with a tunnel fire, and portal planning.

Finally, I would like thank all of the reviewers, who gave excellent and in-depth reviews on the papers. Thanks to the editor-in-chief, Prof. Balasubramaniam, for his gracious invitation as the guest editor of this special issue.

Prof. Chang Yu Ou
Guest Editor

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ACKNOWLEDGEMENT

This September Issue of the Journal is on Urban Geotechnical Construction. This Issue has papers from China, Korea, Singapore and Taiwan. The Guest Editor of this Issue is Prof. Chang Yu Ou, who received his Bachelor's Degree in Engineering in 1977 from National Cheng-Kung University in Taiwan and his Masters and Doctoral Degrees from Stanford University in 1984 and 1987 respectively. Prof. Ou has focused on studies of soil behaviour and excavation problems since beginning to teach in a university and has published many journal and conference papers concerning the subjects. At the same time, working with industrial builders, he has also taken part in many large-scale excavation projects and accumulated experience in analysis and design. Supported by study results and analysis experience, he has opened a course on deep excavation at the university. He is currently the Dean of engineering at the National Taiwan University of Science and Technology, Taipei, Taiwan. He was also the Director of Ecological and Hazard Mitigation Engineering Research Centre of the National Taiwan University of Science and Technology, Taipei, Taiwan. He was also a Visiting Professor at University of California, Berkeley. His areas of interest are deep excavations, soil behaviour, and soft ground tunnelling and ground improvement. We are most grateful to have such an eminent person as Prof. Ou to be the Guest Editor of this Issue.

There are eight technical papers from: K.H. Goh and R.J. Mair; G. Zheng, X.S. Cheng, Y. Diao, and H.X. Wang; Y. M. Hou, J. H. Wang and D-S. Jeng; J. J. Chen, J. H. Wang, G. W. Xiang, S. L. Wen, and Y. Du ; C.Y. Ou and L.L. Yang; F.L. Peng and H.L. Wang; W. Q. Ding, B. Li, S. L. Yuan and J. K. Ge; S. M. Cho, S. D. Lee, and Y. J. Kwon. We are confident that this special issue would be of great interest to all those who are interested in urban geotechnical construction. The most valued help and the untiring efforts and meticulous work of the Guest Editor Prof. Chang Yu Ou and the authors are gratefully acknowledged.

K.Y. Yong
D.T. Bergado
T.A.Ooi
A.S.Balasubramaniam

GEOTECHNICAL ENGINEERING

SEPTEMBER 2011 ISSUE ON DEEP EXCAVATIONS

Prof. Chang-Yu Ou
Guest Editor

This special issue has papers from China, Taiwan, Bangkok, Hong Kong, Singapore etc.

Prof. Chang-Yu Ou received his Bachelor's Degree in Engineering in 1977 from National Cheng-Kung University in Taiwan and his Masters and Doctoral Degrees from Stanford University in 1984 and 1987 respectively. He has focused on studies of soil behaviour and excavation problems since beginning to teach in a university and has published many journal and conference papers concerning the subjects. At the same time, working with industrial builders, he has also taken part in many large-scale excavation projects and accumulated experience in analysis and design. Supported by study results and analysis experience, he has opened a course on deep excavation at the university.

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GEOTECHNICAL ENGINEERING

Special Issue on DEEP EXCAVATIONS

Guest Editor: Prof. Chang-Yu Ou

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Cover Photograph: **Aerial view of InJe Tunnel, the Longest Road Tunnel of Korea**

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PAPER CONTRIBUTIONS

SEAGS & AGSSEA encourage the submission of scholarly and practice-oriented articles to its journal. The journal is published quarterly. Before you submit an article, please review the guidelines stated herein for the manuscript preparation and submission procedures.
Geotechnical Engineering Journal accepts submissions via electronic or postal mail (by sending a CD). The manuscript file (text, tables and figures) in both words and pdf format together with the submission letter should be submitted to the Editor, Geotechnical Engineering Journal, c/o School of Engineering and Technology, Asian Institute of Technology, Room no. 211, AIT Library, Asian Institute of Technology, P.O. Box 4, Klong Luang, Pathumthani 12120, Thailand. Email: seags@ait.ac.th. Papers under review, accepted for publication or published elsewhere are not accepted. The guidelines for author are as follows:-

1. The manuscript including abstract and references must be typed in Times New Roman 9 on one side of A4 paper with a margin of 25 mm on each side.
2. The length of titles must not exceed 70 characters and spaces.
3. The maximum length of papers in the print format of the Journal is 12 two-column pages in single-spaced in Tines New Roman 9 including figures and tables. A Journal page contains approximately 1,040 words. Authors can approximate manuscript length by counting the number of words on a typical manuscript page and multiplying that by the number of total pages (except for tables and figures). Add word-equivalents for figures and tables by estimating the portion of the journal page each will occupy when reduced to fit on a 160 mm x 240 mm journal page. A figure reduced to one-quarter of a page would be 260 word-equivalents. When reduced, the figure must be legible and its type size no smaller than 6 point font (after reduction).
4. Figures: Line art should be submitted in black ink or laser printed; halftones and color should be original glossy art. Figures should be submitted at final width i.e. 90 mm for one column and 185 mm for two columns. The font of the legends should be in Times New Roman and should use capital letters for the first letter of the first word only and use lower case for the rest of the words. Background screening and grids are not acceptable.
5. Each table must be typed on one side of a single sheet of paper.
6. All mathematics must be typewritten and special symbols identified. Letter symbols should be defined when they first appear.
7. The paper must end with a set of conclusions.
8. Practical applications should be included, if appropriate.
9. If experimental data and/or relations fitted to measurements are presented, the uncertainty of the results must be stated. The uncertainty must include both systematic (bias) errors and imprecisions.
10. Authors need not be Society members. Each author's full name, Society membership grade (if applicable), present title and affiliation and complete mailing address must appear as a footnote at the bottom of the first page of the paper.
11. Journal papers submitted are subject to peer review before acceptance for publication.
12. Each author must use SI (International System) units and units acceptable in SI. Other units may be given in parentheses or in an appendix.
13. Maximum of five keywords should be given.

14. REFERENCES

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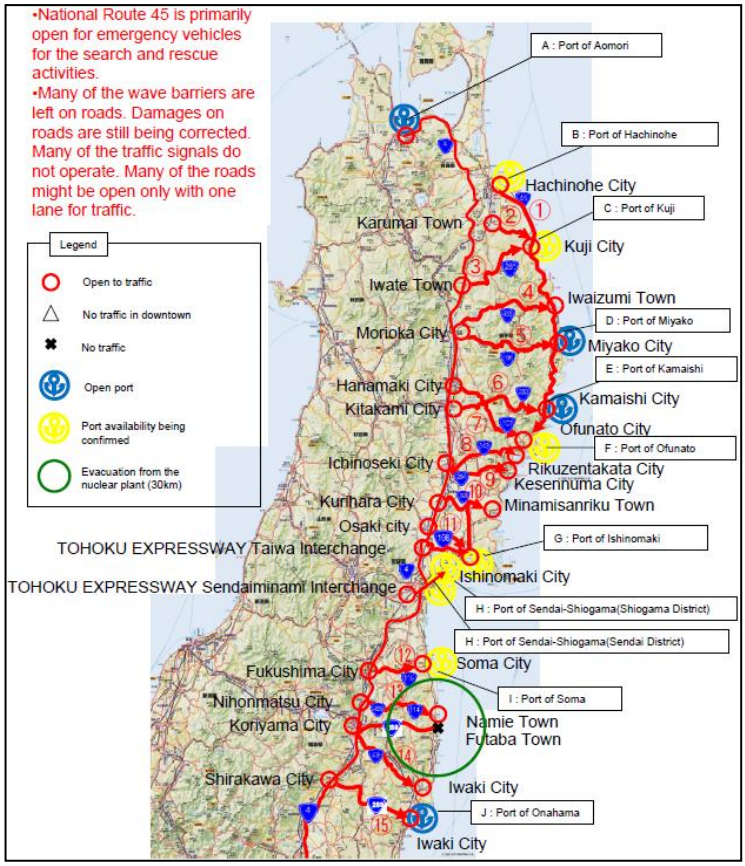
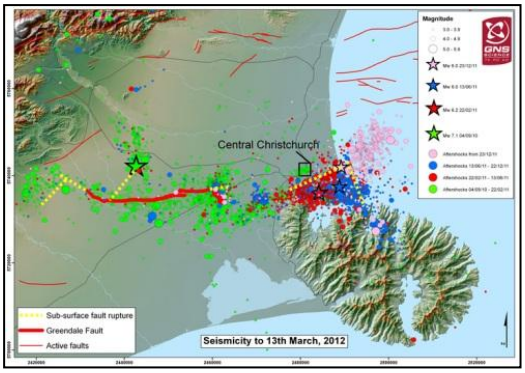
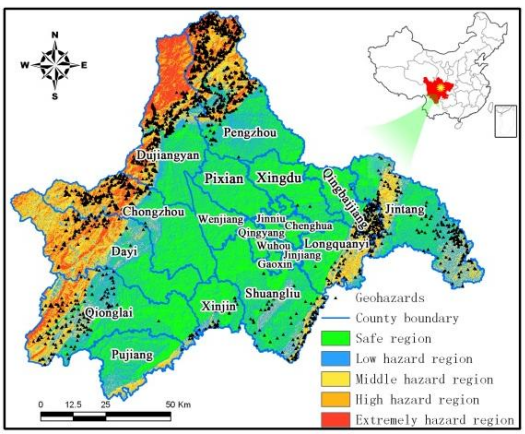
Guest Editors:
Prof. Ikuo Towhata, Prof. Der Wen Chang & Dr. Ivan Gratchev



Tohoku (after Kazama *et al*, 2012)



Christchurch (after Orense *et al*, 2012)



WenChuan (after Yang *et al*, 2012)

GEOTECHNICAL ENGINEERING

PREFACE

I would like to express my deep respect to the geotechnical colleagues in Southeast Asia who have been publishing this prestigious journal for more than 40 years. It is very important that a regional engineering community maintains its own place of publication and is able to freely express its own idea of importance and value. I wish this journal to continue its contribution for a long time from now on.

When I was asked in 2011 to take care of a special issue on geotechnical earthquake engineering, I felt reluctant. This was because of my domestic situations after the gigantic earthquake on March11, 2011, after which I have been working on such a variety of urgent issues as liquefaction vulnerability of subsoil, causative mechanisms of river levee damage, and post-earthquake public appeal among many others. Then fortunately two capable people started to jointly work with me for all the aspects of the publication of this issue. Upon this occasion, I would like to express my sincere appreciation to my Co-Guest Editors, Prof. Der Wen Chang and Dr. Ivan Gratchev without whom the editing and publication of this issue will not be impossible.

The mitigation of natural disaster is an important but difficult task. This is partially because we do not fully understand what happens during disasters. We can scarcely eyewitness the occurrence of a natural disaster. We can only visit sites of damage after the event and report the observation to colleague engineers. It is certainly possible that important and essential keys for mitigation are still overlooked or unknown. In this regard, the study of disaster mitigation is important and fascinating to capable and ambitious people.

In my personal opinion, earthquake problems deserve attention of capable people most significantly in mountain areas. In the mountain areas where many slope failures are triggered by earthquake shaking, not only the seismic shaking but also the ground condition is uncertain or not well known for design purposes. Accordingly, many unexpected things happen. This is the reason why many papers in this issue address earthquake-rainfall interaction, which is called the combined effects, as well as the long-term effect of past earthquakes. These new problems are not studied in details yet and the practice does not know how to deal with them. Conventional approach of geotechnical engineering such as limit equilibrium and factor of safety is too expensive because the action is combined and rare. Consequently, there is no practical approach yet and ambitious people are waited to start positive action to solve the problem. As the chief editor of this issue, I strongly expect such people to read this issue and be stimulated. I am confident that there are many challenges in this field of study that deserve deep devotion of good people. It is desired that this special issue would pave a road to solution of geotechnical earthquake problems that appear abundant in Southeast Asia and have not been well investigated.

Guest Editor
Ikuo Towhata

GEOTECHNICAL ENGINEERING

ACKNOWLEDGEMENT

The June 2012 Issue on Geotechnical Earthquake Engineering has Prof. Ikuo Towhata, Prof. Der Wen Chang and Dr. Ivan Gratchev as Guest Editors. Prof. Towhata has written a comprehensive and scholarly book in this discipline; see Geotechnical Earthquake Engineering, 2008: publisher Springer. We also had great guest editors for the 2011 Issues as: Jie Han; Tatsunori Matsumoto, Der Wen Chang; Chang Yu Ou and Dariusz Wanatowski. The March 2012 Issue had Prof. Charles W. W. Ng and Dr Apiniti Jotisankasa as Guest Editors.

We are most grateful to Prof. Ikuo Towhata, Prof Der Wen Chang and Dr. Ivan Gratchev for helping with the editorial works of the current issue. There are ten contributions as received from authors in Bangladesh, New Zealand, China, Iran, Japan and Chinese Taipei. The Authors are: Tahmeed M. Al-Hussaini, Tahsin R. Hossain and M. Hayeem Al-Noman; RP Orense, MJ Pender and LM Wotherspoon; Yingbin Zhang, Guangqi Chen, Jian Wu, Lu Zheng and Xiaoying Zhuang; Z. Yang, J. Qiao, H. Tian, D. Huang, M. Wang and H. Meng; Abbas Galandarzadeh and Alireza Ahmadi; Hirofumi Toyota M. Kazama, T. Noda, T. Mori and J. Kim; Meei-Ling Lin and Yu-Hung Shu; Ikuo Towhata; and Hongling Tian, Jianping Qiao, Taro Uchimura and Lin Wang.

The material contained in this issue relates to earthquakes in Canterbury (New Zealand), Tohoku, Chi-Chi in Taiwan and Northwest Chengdu, China. Geotechnical hazards including soil liquefaction and seismically induced slope failures are also the topics presented in this issue. Laboratory studies on soil liquefaction resistance and the role of tension-shear mechanism failure in numerical simulation of seismic slope stability are also presented. Changes to building codes incorporating geotechnical earthquake provisions are also described. These contributions will be of great interest to engineers and researchers who are dealing with challenges in geotechnical earthquake engineering.

The guest editors are thanked sincerely for their dedicated contributions. Prof. Der Wen Chang in co-ordination with Prof. Ikuo Towhata and Dr. Ivan Gartchev has worked in a meticulous manner in making this issue feasible and to be released in time. We now look forward to the September and December 2012 Issues as edited by Prof. Malek Bouazza and Tom Lunne and Prof. de Groot respectively.

K.Y. Yong
D.T. Bergado
T.A.Ooi
A.S.Balasubramaniam

GEOTECHNICAL ENGINEERING

March 2012 ISSUE ON GEOTECHNICAL EARTHQUAKE ENGINEERING

Guest Editors:Prof. Ikuo Towhata, Prof. Der Wen Chang & Dr. Ivan Gratchev

Prof. IkuoTowhata

Prof. Ikuo Towhata had his engineering education at the prestigious Tokyo University in Japan and is currently a Professor in the Department of Civil Engineering. Tokyo University is traditionally very strong in Soil Dynamics, Machine Foundations and Geotechnical Earthquake Engineering now for several decades. Also recently, Prof. Towhata has written a comprehensive and scholarly book in this discipline (see Geotechnical Earthquake Engineering, 2008: publisher Springer). Prof. Towhata was also the Editor in Chief of the well-known Journal, Soils and Foundations. He is an active member of several national and international committee on landslides, earthquake engineering. Recipients of several prestigious awards, Prof. Towhata's interests in Geotechnics is very wide and are on deformation characteristics of sands, dynamic analysis of earth structures, soil improvement by densification and grouting, stability of slopes and seabeds under static and dynamic conditions, landslides and debris flows, seismic performance based design of geotechnical structures. Author of more than 250 publications, Prof. Towhata has lectured in many leading universities in most continents.

Prof. Der-Wen Chang

Prof. Der-Wen Chang teaches at The Department of Civil Engineering of Tamkang University (TKU), Taipei, Taiwan for over 19 years. He received Ph.D. in Civil Engineering at The University of Texas at Austin in 1991 and MS in Civil Engineering at Michigan State University in 1987. Prof. Chang has supervised there search work of over 60 Master Thesis and 3 Ph.D. Thesis at TKU, and published more than 160 articles as the Journal, Conf. papers and reports. Nearly all his research studies are related to numerical modeling and dynamic analyses for the geotechnical structures. His research experiences include NDT methods on pavements, seismic behaviors of the pile foundation, constitutive modeling of the soils, and recent study on the performance based design for the earth structures. Prof. Chang is also the visiting Professor at University of Washington at Seattle, US in 2008 and LN Gumilyov Eurasian National University at Astana, Kazakhstan for research studies in 2010. Other than there search works, Prof. Chang devotes himself a great deal to serve the communities. He involves heavily and indeed shows his good performance in the public works related to education and constructions. Prof. Chang is now serving as the Secretary General of Chinese Taipei Geotechnical Society, GC member of SEAGS, Editorial Panel for SEAGS/AGSSEA J. of Geotechnical Engineering, Committee members for Public Construction and Hazard Prevention in Taipei City and Taipei County governments. He will continue to work in the academia and hoping that his studies can better improve the civil engr. technologies.

Dr.Ivan Gratchev

Dr. Ivan Gratchev has spent the last ten years conducting research in the areas of geotechnical and geoenvironmental engineering in Japan, in particular earthquake-induced liquefaction and landslides. He qualified to receive a prestigious scholarship sponsored by the Japanese Government to complete his master and doctoral courses at Kyoto University. After receiving a PhD degree in 2007, he was selected for a highly competitive fellowship by the Japan Society for the Promotion of Science (JSPS) to conduct postdoctoral research at the University of Tokyo. His expertise in field investigation and laboratory testing led to his selection for several reconnaissance teams to assess structural damage and slope failures follow in recent earthquakes in Japan as well as the 2008 Sichuan Earthquake in China, and the 2009 earthquake in Sumatra. Since2010, Dr. Gratchev has been a lecturer at Griffith University, one of the fastest growing universities in Australia. He has produced more than 30 publications in refereed journals, international proceedings, as well as book chapters on research topics such as slope stability, liquefaction, and cyclic behavior of fine-grained soils as well as the effects of contamination on the geotechnical properties of soil.

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Special Issue on Geotechnical Earthquake Engineering
Guest Editors: **Prof. Ikuo Towhata, Prof. Der Wen Chang & Dr. Ivan Gratchev**

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Cover Photograph: **Wenchuan, Christchurch and Tohoku Earthquakes**

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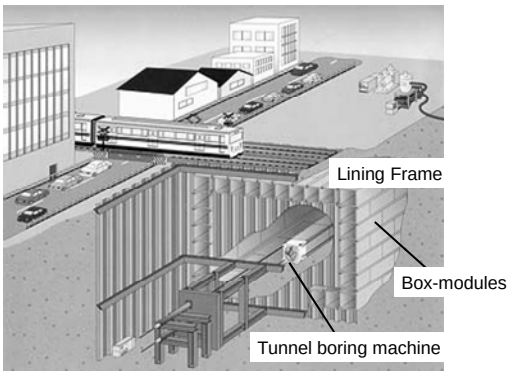
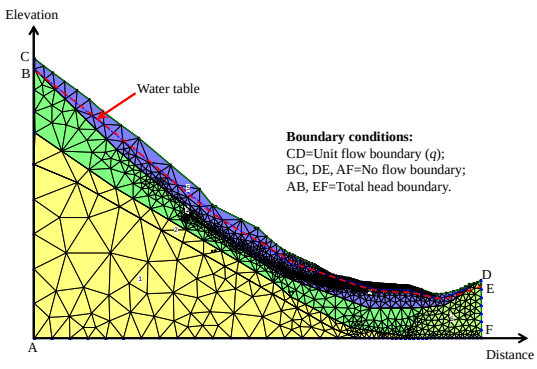
Editors:
Der-Wen Chang & Dariusz Wanatowski

Tunnelling under Shanghai "Chongsi"
(after Ge et. al, 2013)



Box Jacking Tunnelling
(after Komiya and Nakayama, 2013)

Pipe Jacking *(after Le et. al, 2013)*



Rainfall and Stability of Slope *(after Xu et. al, 2013)*

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FOREWORD

The SEAGS and AGSSEA Journal of Geotechnical Engineering has been growing tremendously since the SEAGC in Taipei in 2010. Thanks to all our Guest Editors and also the Editorial Team with Dr. Ooi and IEM Team from Malaysia, and Prof. Bergado and Team from AIT and Prof. Charles NG from the HK Society in using the HKUST Web. In 2010~2012, many important and representative topics had been selected and successfully presented. Apart from a series of special issues on subjects in geotechnical engineering, a considerable amount of contributed papers with wider spectrum have been received.

As a consequence, the 1st issue in 2013 collects eleven excellent papers on the fundamentals of soil behaviours and the lessons learned from different construction technologies. There are papers discussing the deep excavation in clay by Mabrouk and Rowe, a historical overview on consolidation and strength for Taipei clay made by Hwang et al.. Lime stabilization and the acid effects on organic clay was brought by Mohd Yunus et al.. Settlements of the compacted soils and the compaction for mudstones were discussed by Leong et al. and Puttiwonggrak et al., respectively. On the other hand, small-strain behaviour of sand was presented by Lai et al. considering the effects of stress paths.

Additionally, four papers discussing the observations from on-site construction technologies and/or relevant numerical simulation can be found. They are: Joint effect on Pipe Jacking method by Le et al., FE modelling on Box-Jacking tunnel work induced ground behaviours by Komiya and Nakayama, Deformations of historic building due to tunnelling by Ge et al., and Monitoring technology on slope with rainfall infiltration by Xu et al.. Papagiannakis discusses an overview of the state of the art of mechanistic-empirical pavement design, as established by NCHRP Study 1-37A in the United States. It is our belief that all the papers presented in this issue are highly valuable and useful to the engineering work. The editors would like to express their sincere gratitude towards the authors and the reviewers who make this publication possible.

Editors

Der-Wen Chang

Dariusz Wanatowski

GEOTECHNICAL ENGINEERING

ACKNOWLEDGEMENT

We are fortunate to have all the material ready for the March 2013 Issue of the Journal. This Issue is on contributed papers as received from many authors worldwide. It is the intention of the editorial team to have a balanced between those papers which are directly contributed and those published under specific themes. We are most graterful, this issue in 2013 is made feasible with the contributions from Ahmed B. Mabrouk and R. Kerry Rowe (Canada); Richard N. Hwang, Za-Chieh Moh and I-Chou Hu (Taiwan); N.Z. Mohd Yunus, D. Wanatowski and L.R. Stace (UK); E.C. Leong, S. Widiastuti and H. Rahardjo (Singapore); A. Puttiwongrak, H. Honda, T. Matsuoka and Y. Yamada (Japan); Yong Lai, Jian-yong Shi, Xiao-jun Yu and Qiu-rong Cao (China); L.G. Le, M. Takise, M. Sugimoto and K. Nakamura (Japan); K. Komiya and T. Nakayama (Japan); Shi-ping Ge, Dong-wu Xie, Wen-qi Ding, Ya-fei Qiao, Jin-chun Chai (China & Japan); and Dongsheng Xu, Fei Tong, Huahu Pei, and Jianhua Yin(China) and Papagiannakis of United States. The number of papers has also increased to eleven in this Issue.
The geotechnical Engineering Journal has lately been published spot on time since 2010 and this is due to the untiring efforts of our inhouse technical editors, particularly Prof. Der Wen Chang of the Taiwan Geotechnical Society and Dr. Dariusz Wanatowski of University of Nottingham in UK; the Editorial team of IEM under Dr. Ooi; the Ediitorial team of SEAGS at AIT under Prof. Beregado; and last but not least the help of Prof. Charles Ng of the Hong Kong Geotechnical Society and HKUST in using their web.

The June and September Issues of 2013 will be under the Leadership of Prof. Akira Murakami and Prof. Fusao Oka repectively. Their editorial teams will include Prof. Muhunthan, Dr. Hossam Abuel-Naga, , Dr. Suched Likitlersuang, and Prof. Helmut F. Schweiger. Finally, the December Issue containing papers to honour Prof. Bergado is expected to have fourteen papers and edited by Prof. Chai Jin-Chun and Prof. Dr. Shui-Long Shen.

It is a great pleasure to note that we now have papers and commitments till mid 2015 Issue.

K.Y. Yong
D.T. Bergado
T.A.Ooi
A.S.Balasubramaniam

GEOTECHNICAL ENGINEERING

MARCH 2013 SPECIAL ISSUE ON CONTRIBUTED PAPERS

Editors: Prof. Der-Wen Chang and Dr. Dariusz Wanatowski

This issue has articles from researchers in Australia, Bangkok, Japan, Nottingham, UK, Singapore, Taiwan and many other countries. From Japan, Prof. Satoru Shibuya's group also made contributions.

Prof. Der-Wen Chang is a faculty member at The Department of Civil Engineering of Tamkang University (TKU), Taipei, Taiwan for over 21 years. He received his Ph.D. in Civil Engineering at The University of Texas, Austin in 1991 and MS in Civil Engineering at Michigan State University in 1987. Prof. Chang has supervised the research work of over 60 Master Thesis and 3 Ph.D. Thesis at TKU, and published more than 160 articles in Journal, Conference proceedings and reports. Nearly all his research studies are related to numerical modelling and dynamic analyses for the geotechnical structures. His research experiences include NDT methods on pavements, seismic behaviours of the pile foundation, constitutive modelling of soils, and recent study on the performance based design for the earth structures. Prof. Chang is also the visiting Professor at University of Washington at Seattle, US in 2008 and LN Gumilyov Eurasian National University at Astana, Kazakhstan for research studies in 2010 and 2011. Other than the research works, Prof. Chang devotes himself a great deal to serve the communities. He involves heavily and indeed shows his good performance in the public service related to education and constructions. Other than the Secretary General at Chinese Taipei Geotechnical Society (2009~2011), Prof. Chang is the current GC member of SEAGS, Editorial Panel for SEAGS/AGSSEA J. of Geotechnical Engineering, Committee members for Public Construction and Hazard Prevention in Taipei City and New Taipei City governments. He is also a TC212 member at ISSMGE who puts a lot of research efforts on seismic behaviours and performance of the pile foundations.

Dr Dariusz Wanatowski is a Lecturer in Geomechanics in the Department of Civil Engineering at the University of Nottingham, United Kingdom. He graduated in Civil Engineering from Poznan University of Technology, Poland in 1999. Between 1999 and 2001 he worked as a teaching and research assistant at the same university where he was lecturing soil mechanics and foundation engineering courses. He was also involved in several research projects, including effects of various improvements of subgrade on its bearing capacity and experimental investigation of engineering properties of various organic soils. He obtained his PhD from Nanyang Technological University in 2006. Prior to joining the Nottingham Centre for Geomechanics in February 2006 Dr Wanatowski also worked as a researcher at NTU on effects of strength and stiffness anisotropy of geomaterials on the stability and deformation of tunnels. Dr Wanatowski's general research interests are focused on experimental geomechanics, particularly strain softening and instability behaviour of granular soils, strain localization in sands, strength and stiffness anisotropy of geomaterials, and effects of intermediate principal stress on the strength and deformation characteristics of soils. He has consulting experience in the areas of laboratory and in situ testing of soils. He is also an Honorary Secretary for East Midlands Geotechnical Group in the UK.

GEOTECHNICAL ENGINEERING

March 2013: Contributed papers

Editors: D W Chang and Dariusz Wanatowski

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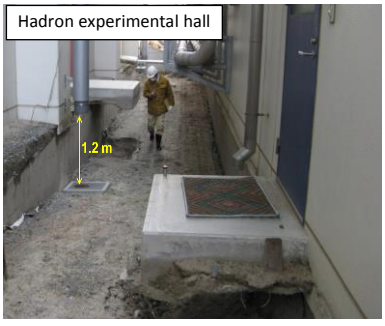
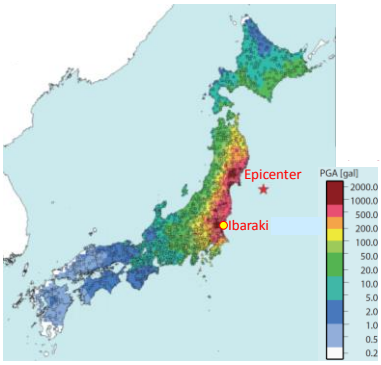
AIT Asian Institute of Technology

Editors: Prof Tatsunori Matsumoto, Prof Jurgen Grabe & Prof Der Wen Chang

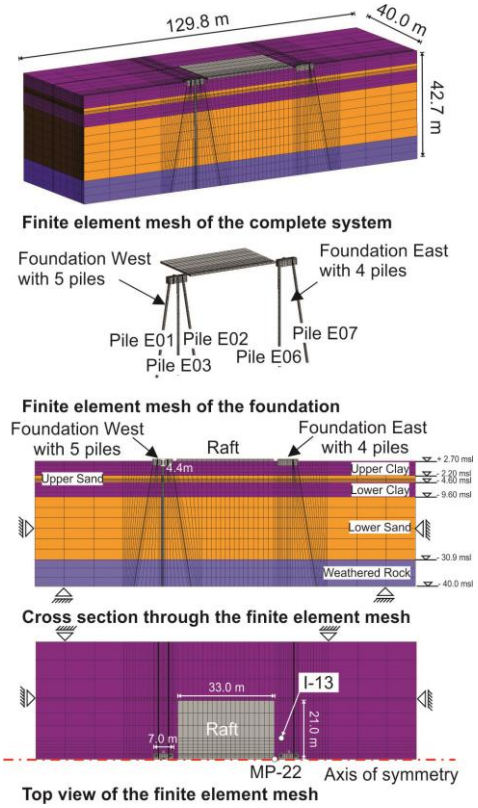


(a) Ground subsidence along building



(b) PGA map derived from strong motion records (Kunugi et al., 2012)

Piled Raft Foundation subjected to Strong Seismic Motion (After K. Yamashita *et al*, 2014)



Numerical study on pile groups subjected to lateral soil movements (After O. Reul *et al, 2014)*

GEOTECHNICAL ENGINEERING

FORWARD

The theme of the 2014 June issue is Deep Foundations. Prof. Tatsunori Matsumoto at Kanazawa University, Japan and Prof. Jurgen Grabe at Hamburg University of Technology, Germany are the guest editors while Prof. Der-Wen Chang at Tamkang University, Taiwan is the in-house editor. Prof. Der Wen Chang also undertook all the administrative works related to the review of the articles and co-coordinating with the Guest Editors, Authors and Reviewers. After 18-month of preparations, thirteen papers were finally selected and are published in this Issue.

The content of this issue covers up mainly the task force studies 1~5 of ISSMGE TC212. More than half of the technical papers are based on observations of the experimental works. Axial bearing capacity and static cyclic loading behaviors of the model piles and/or pile group are respectively examined by Aoyama *et al.*, Hwang *et al.* and Ünsever *et al.*. Case studies on Response of Laterally Loaded Nonlinear Piles are shown by Wei Dong Guo. Seismic performance of the piles from field measurements are discussed by Yamashita *et al.*. Seismic soil-structure-foundation behaviors with liquefaction concerns from the shaking table test with numerical comparisons are discussed in the study made by Zhang *et al.*. An overview of the deep foundation systems of the high-rise buildings can be found by Katzenbach and Dr. Leppla.

On the other hand, a number of numerical studies can be found on simulating the pile foundation behaviours. The topics include: energy pile with feasible material modelling by Ma *et al.*, passive loading effects on piles by Moormann and Aschrafi, dynamic load testing on pipe piles compared to case study by Ta *et al.*, laterally loaded nonlinear piles by Wei Dong Guo, seismic performance of the piles using Reliability method by Chang *et al.*, and bearing behaviours of pile group and/or piles respectively discussed by Wu and Yamamoto, Reul *et al.* and Ünsever *et al.*.

It is the sincere wish of the editors that this issue can provide a good record for the advanced works on deep foundation research. Sincere gratitude is expressed by the editors to the delegates and the reviewers who have contributed tremendous time and efforts in making this Remarkable Issue feasible and to complete the work within very strict timelines.

Tatsunori Matsumoto
Jurgen Grabe &
Der Wen Chang

GEOTECHNICAL ENGINEERING

ACKNOWLEDGEMENT

This special Issue on Deep Foundations as edited by Prof. Tatsunori Matsumoto, Prof. Jurgen Grabe and Prof. Der Wen Chang have thirteen excellent papers. Each paper being reviewed by at least two reviewers and some by more than two. The authors of the papers as per the Table of contents and in that order are: C. Moormann and J. Aschrafi; Xiaolong Ma, Gang Qiu and Jürgen Grabe; L. Phan Ta , T. Matsumoto and H. Nguyen Hoang; K. Yamashita, T. Hashiba, H. Ito and T. Tanikawa; Y.S. Unsever, T. Matsumoto, S. Shimono and M.Y. Özkan; J.H. Hwang, Z.X. Fu, P.Y. Yeh and D.W. Chang; D.W. Chang, Y.H. Lin, H.C. Chao, S.C. Chu and C.H. Liu; Wei Dong Guo; Y. Wu and H. Yamamoto; F. Zhang, R. Oka, Y. Morikawa, Y. Mitsui, T. Osada, M. Kato and Y. Wabiko; S. Aoyama, L. Danardi, L. Bangan, W. Mao, S. Goto and I. Towhata; O. Reul, J. Bauer and C. Niemann; and R. Katzenbach and S. Leppla

Indeed the papers are excellent and deal with: Numerical investigation of passive loads on piles in soft soils; Simulation of an energy pile using thermo-hydro-mechanical coupling and a visco-hypoplastic model; studies on dynamic load testing of an open-ended pipe pile with a case study; Performance of piled raft foundation subjected to strong seismic motion; Static cyclic load tests on model foundations in dry sand; Axial bearing behaviour of a model pile in sand under multiple static cycles; Seismic PBD of piles from Monte Carlo simulation using EQWEAP analysis with weighted intensities; Case studies on response of laterally loaded nonlinear piles; Analysis of the effect of pile tip shape on soil behaviour around pile; Shaking table test on superstructure-foundation-ground system in liquefiable soil and its numerical verification; Model loading tests on the bearing behaviour of a group pile and ground deformation; the bearing behaviour of pile groups subjected to lateral pressure due to horizontal soil movements; deep foundation systems for high-rise buildings in difficult soil conditions.

Thus this Issue is unique in its own way in covering, theory, and practice via laboratory and field tests on model piles and under full scale conditions. Both static and dynamic loading conditions as well as earthquake type of loading; also the laboratory tests also include shaking table tests.

The authors of the papers and the editors are to be congratulated for this master-piece of work . Both Prof Tatsunori Matsumoto and Prof Der Wen Chang are also the guest editors of our June 2011 Issue of the journal and this Issue have seen the contributions of Prof. Jurgen Grabe as well as a Guest Editor.

We hope this Issue of the Journal will be of immense value to researchers and practitioners.

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

GEOTECHNICAL ENGINEERING

. JUNE 2014 SPECIAL ISSUE ON DEEP FOUNDATION

Editors: Tatsunori Matsumoto, Jurgen Grabe & Der Wen Chang

Prof. Tatsunori Matsumoto

Prof. Matsumoto is now with Kanazawa University in Japan for nearly 34 years. He was educated at the Kanazawa University and received his Doctoral Degree from Kyoto University for his work on steel pipe piles in 1989. He has extensive research and practical experience on piled foundations and piled raft foundations. Prof. Matsumoto has a Shake Table Facility for the study of dynamic and earthquake type of behaviour of piled foundations. He has also worked on the centrifuge with pile groups and piled raft foundations in collaboration with Taisei Corporation. Prof. Matsumoto also has wide experience in the seismic design of raft and piled raft foundations. Prof. Matsumoto is one of the authors of the computer software PRAB—Piled Raft Analysis with Batter Piles. With this software piled raft foundation can be analyzed with vertical and horizontal loads as well as moment.

Univ.-Prof. Dr.-Ing. Jürgen Grabe

Prof. Grabe was educated in civil engineering at Hannover University/Germany and received his Doctoral Degree from Karlsruhe University/Germany for his work "Experimental and theoretical investigation of entire area compaction control using vibratory rollers" in 1992. Afterwards he worked in geotechnical consulting and construction companies for six years. In 1998 he became head of the Institute of Geotechnical Engineering and Construction Management at Hamburg University of Technology in Germany. He has extensive research and practical experience in physical, theoretical and numerical modelling in geotechnical engineering, especially in pile foundations, and marine geotechnics. Prof. Grabe has a complete soil mechanics laboratory and worked also on physical modelling in centrifuge in collaboration with University of Western Australia.

Prof. Grabe's main research topics are geotechnical engineering in general, and marine geotechnics in particular. His methodical background covers physical modelling (1g model tests and ng model tests in collaboration with UWA), theoretical modelling (single and multiphase models for saturated and unsaturated soils based on continuum approach), numerical modelling (grid and mesh-based methods like FDM, FVM and FEM for continuum approach; meshfree methods like SPH for continuum approach, and DEM for discontinuum approach). Prof. Grabe and his research group produced 257 publications in national and international journals and conferences since 1998. From 2011 Prof. Grabe is vice president of Hamburg University of Technology, and is responsible for research in this function.

Prof. Der-Wen Chang

Prof. Chang has been the Geotechnical faculty member at The Department of Civil Engineering of Tamkang University (TKU), Taipei, Taiwan for over 22 years. He received Ph.D. in Civil Engineering at The University of Texas at Austin in 1991 and MS in Civil Engineering at Michigan State University in 1987. Prof. Chang has supervised the research work of over 60 Master Thesis and 3 Ph.D. Thesis at TKU, and published more than 190 articles as the Journal, Conf. papers and reports. Nearly all his research studies are related to numerical modeling and dynamic analyses for the geotechnical structures. His research experiences include NDT methods on pavements, seismic behaviors of the pile foundation, constitutive modeling of the soils, and recent study on the performance based design for the earth structures. Prof. Chang is also the visiting Professor at University of Washington at Seattle, US in 2008 and LN Gumilyov Eurasian National University at Astana, Kazakhstan for research studies in 2010 and 2011. Other than the research works, Prof. Chang devotes himself a great deal to serve the communities. He involves heavily and indeed shows his good performance in the public works related to education and constructions. Prof. Chang is currently serving as the Int. Secretary General of Chinese Taipei Geotechnical Society, GC member at SEAGS and Editorial Panel for SEAGS/AGSSEA J. of Geotechnical Engineering, and TC212 member at ISSMGE.

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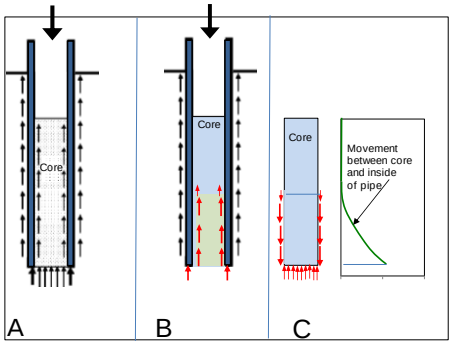
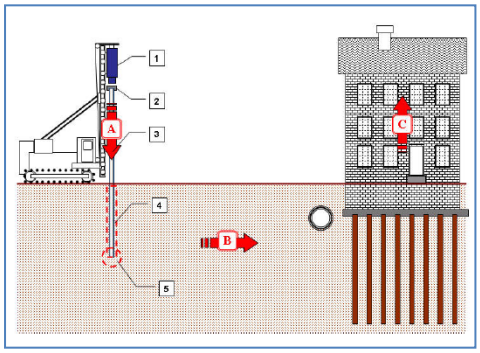
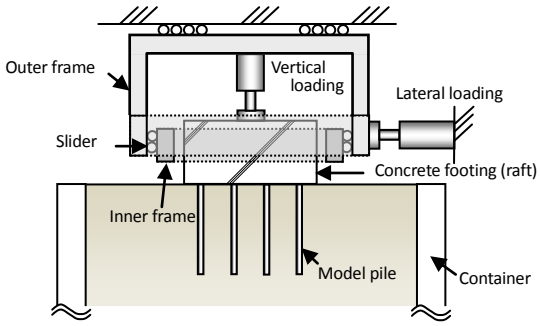


Advancing an open-toe pipe pile
(After Fellenius 2015)

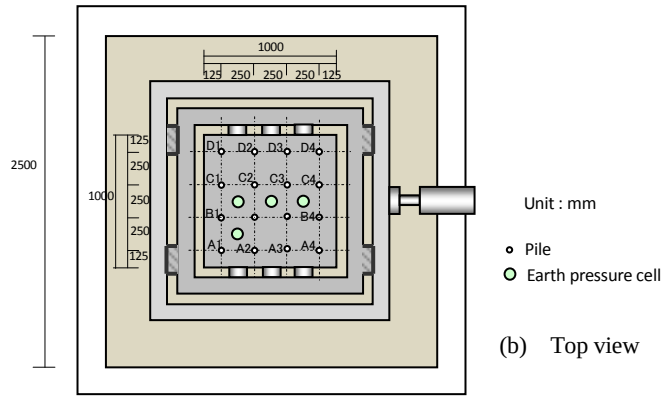


Propagation of stress wave from impact hammer
(After Massarsch and Fellenius 2015)

75 MN pile loading test
(After Lin et al. 2015)



(a) Side view



(b) Top view

Model Pile Testing Setup (after Hamada et al. 2015)

GEOTECHNICAL ENGINEERING

PREFACE

The theme of the 2015 June issue is Pile Foundations. The guest editors for this special issue are Professor San-Shyan Lin at National Taiwan Ocean University, Taiwan, Prof. Charng Hsein Juang at Clemson University, USA, and Prof. Robert Liang at Akron University, USA contributed to the editorial management. Prof. A.S. Balasubramaniam as the Editor-in-Chief and Dr. Teik Aun Ooi as the President of SEAGS strongly supported the launch of this special issue on Pile Foundations.

The topics and scope covered in this special issue are comprehensive and interdisciplinary, ranging from back-analysis of pile load test, piled-raft analysis, ground vibration caused by impact pile driving, analysis of bi-direction-cell test, effect of aging on barrette pile, comparison on dynamic response of a single pile using different approaches, response of "plug" in open-toe pipe pile, effect of toe grouting of IGM socketed drilled shaft, reliability-based design on foundation and ultimate resistance of drilled shaft by probabilistic approach. The issue is comprised of twelve papers with a selection of the authors from seven countries involving Canada, Japan, Lebanon, Sweden, Taiwan, Thailand and USA.

Niazi and Mayne develops new sets of shear stiffness reduction curves from the back-analyses of 299 static axial pile load tests from 61 sites towards the implementation of a non-linear load-displacement response method for pile foundations. Subsequently, the elastic continuum solution is exploited by them to present a methodology for drawing the stiffness reduction curves as functions of depth. These curves are further utilized in modeling the pile as a stack of smaller shaft segments embedded in multi-layered soils. Hamada et al. presents static cyclic lateral loading tests on large-scale piled raft foundations carried out to investigate the influence of vertical load and pile spacing ratios during earthquakes. Yamashita et al. applies and modifies the simple method proposed by Clancy and Randolph (1996) on piled raft analysis. Four case histories in Japan are examined through comparisons with the field monitoring results. Massarsch and Fellenius describe the application of the Swedish standard which regulates permissible ground vibrations caused by driving of piles, sheet piles, or ground compaction. Fellenius explains how to use the bidirectional-cell test data on a pile to establish the load distribution for the pile, which enabled determining the distribution of the effective-stress beta-coefficients for the pile response Teparaksa presents testing process and discusses the result of different barrette pile static load tests, especially on aging effect on pile capacity. Lu and Chang presents a case study on dynamic behaviors of coal ash soils obtained in a landfilled field in north Taiwan and also the dynamic interaction of a single pile foundation sitting in the landfills. Fellenius recommends how to analyze the response of an open-toe pile. A comparison is also provided between the results of a simulated static loading test on a closed-toe and an open-toe pipe pile. Lin et al. presents the axial performance of two heavily instrumented drilled shafts, with and without toe grouting, socket in intermediate geomaterials in Taipei city. Abdallah et al. presents the results of a comprehensive investigation that is conducted to study the effect of choosing different proof-load test programs on the reliability of piles. Luo et al. evaluates and compares existing probabilistic approaches for determining the ultimate resistance of drilled shafts in sands considering the spatial variability of soil properties.

We consider that this special issue presents and illustrates the outcome of some of the state-of-the-art research on pile foundations, and hope that it will make an important contribution to this growing field in the years to come.

San-Shyan Lin
Charng Hsein Juang
Robert Liang

ACKNOWLEDGEMENT

The lead editor of the June 2015 Issue on Piled Foundation is Prof. San Shyan Lin with team members Prof. Charng Hsein Juang and Prof. Robert Liang. Prof. San Shyan Lin is of immense help to the SEAGS-AGSSEA Journal as a Member of the Team of Editor in Chief. It is worthy to mention that the Taiwan Geotechnical Society is the most active supporter of all SEAGS-AGSSEA activities including the Journal. There were many Issues of the Journal editted by members of CTGS (Chinese Taipei Geotechnical Society). They also contribute many articles and this is a most welcome culture which should be a model example to follow by other AGSSEA member countries. Gradually, we have been very successful in engaging members of AGSSEA to contribute to the journal and take much of the responsibility in contributing articles, engaged in reviewing and other aspects related to the journal. The country issues in 2016 and the Anniversary Issues in 2017 will further enhance the success in the active participation of AGSSEA members in the journal.

In the preface , Prof. San Shyan Lin and his team has already covered adequately the contents of the papers from an international set of prestigious authors and all articles were also reviewed by experts in the field. Details of the reviewers will be assembled in the December Issue for all the articles published in 2015. SEAGS-AGSSEA Journal is always very practice oriented and this well reflected in the contributions contained in this issue as well.

There are twelve excellent papers written by well known authors from : USA, Japan, Sweden, Canada, Thailand, Taiwan and other countries. No doubt, this Issue will be most useful to our Profession and all those who are engaged in Pile Foundation Research and Practice. Sincere thanks to all who have contributed to the success of this issue of our journal under the able leadership of Prof. San Shyan Lin

We are grateful to Professor Ikuo Towhata for his contribution of Special Feature Story on “Liquefaction Problems in the 21st Century” in this issue**.**

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

GEOTECHNICAL ENGINEERING

June-2015 Issue: Pile Foundation
Edited By San-Shyan Lin, Charng Hsien Juang and Robert Liang

Prof. San-Shyan Lin

Professor Lin is a Professor at Department of Harbor and River Engineering of National Taiwan Ocean University in Taiwan. He received his Ph.D. degree in Civil Engineering from Washington University in St. Louis, Missouri USA in 1992. Dr. Lin was an engineer at Taiwan Area National Expressway Engineering Bureau from 1992 to 1994. Prof. Lin's research and practical experiences have dealt with drilled shaft foundations, earth reinforced structures and effects of scouring on bridge foundations. Prof. Lin has published more than 110 peer-reviewed journal papers and conference papers. In 2012, Prof. Lin served as chairman of organization committee of 5th Taiwan-Japan workshop of earthquake and heavy rainfall held in Tainan, Taiwan; member of international organizing committee of 7th Asian young geotechnical engineer conference held in Tokushima, Japan; and member of both international advisory committee and technical committee of Geosynthetics Asia 2012 in Bangkok, Thailand. Prof. Lin is currently serving as the member of conference advisory committee of 18th Southeast Asian Geotechnical Conference and member of international advisory committee of International Symposium on Advances in Foundation Engineering. In addition, Prof. Lin is serving as the President of Taiwan Geotechnical Society and the CEO of Sino-Geotechnics Research and Development Foundation in Taiwan. Prof. Lin also served TRB A2K03 Committee on Foundations of Bridges and Other Structures between 1995 and 2004 and serves as a member on the editorial boards for four major international journals in geotechnical engineering.

Prof. Charng Hsein Juang

Dr. Juang received his Ph.D. degree in Civil Engineering from Purdue University in 1981. He joined the faculty of Clemson University in 1982 and has been with Clemson University ever since. Dr. Juang has a broad research interest in the field of geotechnical engineering. His past research work dealt with slope stability, soil-buried pipes interaction, soil and rock properties, pile foundations, fuzzy sets and uncertainty modeling in geotechnical engineering. His current research work deals with liquefaction, site characterization, braced excavation, reliability and probabilistic methods in geotechnical engineering, and fuzzy and neural network applications in geotechnical engineering.
Dr. Juang has received a number of awards and honors. He was proud to be selected by his students through Chi Epsilon for Outstanding Teacher Award in 1985. Among his awards and honors are the Outstanding Research Paper Award by the Chinese Institute of Civil and Hydraulic Engineering (1976), the TK Hseih Award by the Institution of Civil Engineers of the United Kingdom (2001), the Clemson University Board of Trustees Award for Faculty Excellence (2002), election to ASCE Fellow (2007), and appointment to Chair Professor at National Central University, Taiwan.
His professional services include:

- Chair, ASCE/GI Committee on Risk Assessment and Management (2009-2012); Secretary, (2003-2009); Member (1993-present)
- Co-Editor in Chief, Engineering Geology (2012-present)
- Associate Editor & Editorial Board Member, ASCE Journal of Geotechnical and Geoenvironmental Engineering (2004-2012)
- Editorial Board, Journal of GeoEngineering (2006-present)
- Editorial Board, Georisk (2009-present)
- Conference Chair, ASCE Geo Institute Specialty Conference, GeoRisk 2011, Geotechnical Risk Assessment and Management, Atlanta, June 26-28, 2011.

Prof. Robert Liang

Dr. Robert Liang holds a title of University Distinguished Professor in the Department of Civil Engineering at the University of Akron. He also serves as the Director for the Center for Infrastructure Materials and Rehabilitation. Since receiving his Ph.D. in 1985 from the University of California in Berkeley, Dr. Liang has been with the University of Akron. From 1994 to 2000, he served as Civil Engineering Department Chair. Dr. Liang has conducted research in areas such as geotechnical engineering, pavement engineering, and infrastructure materials and rehabilitation technologies. His research has resulted in more than 300 journal and conference papers, with practical impacts on design and construction practices. Dr. Liang is active in ASCE (American Society of Civil Engineers), TRB (Transportation Research Board), and DFI (Deep Foundation Institute) committee works. He serves as associate editor for the ASCE's Journal of Engineering Mechanics and Journal of Geotechnical and Geoenvironmental Engineering. Currently, he is on the editorial board for several international journals, such as Georisk, and Journal of GeoEngineering. Dr. Liang received Wendell R. Ladue award from ASCE Akron-Canton Section for his outstanding contributions to the profession. He also received Louis Hill award from College of Engineering in recognition of his exemplary achievements in both research and teaching. He received outstanding service award from the Great Lakes Geotechnical and Geoenvironmental Engineering Organization for his service as the president of the organization. In recognition of his contributions to civil engineering, Dr. Liang was elected to Fellow of ASCE in 2009.

Prof Ikuo Towhata
President, Japanese Geotechnical Society (2014-2016)
Vice President for Asia, International Society for Soil Mechanics and Geotechnical Engineering (2009-2017)

SPECIAL FEATURE STORY ON "Liquefaction Problems in the 21st Century"

by Prof Ikuo Towhata

Prof Ikuo Towhata

Prof Ikuo Towhata obtained his Bachelor of Engineering degree from the University of Tokyo in 1977. He obtained his Master of Engineering and Doctor of Engineering in 1979 and 1982 respectively from the same university. In 1985 he was Assistant Professor at the Asian Institute of Technology in Bangkok and in 1986 as Associate Professor at Chulalongkorn University in Bangkok. He returned to work in Tokyo University as an Associate Professor in 1987. In 1989 he was Associate research fellow at PWRI Ministry of Construction. He was Professor at Tokyo University from 1994 to 2014 and since 2015 he is Visiting Professor at Kanto Gakuin University, Department of Civil Engineering Yokohama Tokyo Japan. Professor Towhata has 32 years of research experience and his special areas of interest are Deformation characteristics of cohesionless soils; Dynamic analysis of earth structures during earthquakes; Permanent displacement of ground caused by seismic liquefaction; Soil improvement by densification and grouting; Stability of seabed in static and dynamic manners; Thermal effects on mechanical behavior of clays; Microscopic Observation of Granular Behavior of Sand Subjected to Shear; Dynamics of landslide and debris flow. Professor Towhata is active in public service and was Board member of Japanese Geotechnical Society for two terms; Board member of Japan Association for Earthquake Engineering for one term; Board member of Japan Landslide Society for two terms; Chairman of Editing Committee of Soils and Foundations Journal, the Japanese Geotechnical Society in 2005-2008; Chairman of Geotechnical Committee, Japan Society for Civil Engineers in 2007-2008; Vice President, Japan Association for Earthquake Engineering in June 2009-May 2011; President, Japanese Geotechnical Society in 2014-2016; Appointed Board Member and then Vice President for Asia, International Society for Soil Mechanics and Geotechnical Engineering in 2009-2017; Associate Member of Science Council Japan in 2014-2020. He is currently Member of the Japanese Geotechnical Society; Member of the Southeast Asian Geotechnical Society; Member of the International Society of Soil Mechanics and Geotechnical Engineering; Fellow member of the Japan Society of Civil Engineers and Member of the Japan Association for Earthquake Engineering. Professor Towhata has been invited to deliver Keynote Lectures and Special Lectures in many international conferences. He has published more than 600 papers and has published many books notably:

Towhata, I. (1999). Air photographs of the Niigata city immediately after the earthquake in 1964, Japanese Geotechnical Society, ISBN4-88644-054-1.

Towhata, I. (2008) Geotechnical Earthquake Engineering, ISBN 978-3-540-35782-7, pringer Verlag-Berlin Heidelberg.

Towhata, I. and Jiang, Y.-J., 2010. Geotechnical Aspects of 2008 Wenchuan earthquake, China, Chapter 8, Advances in Earthquake Geotechnical Engineering, Springer.

Professor Towhata has won many awards and among them the Japanese Geotechnical Society; Technological Development Award in 2015; Japan Society of Civil Engineers; Best book publication award in 2009; Japanese Geotechnical Society, Award for the Best Paper of the Year 2003; 2004 and the best twelve papers out of 600 at GeoEng2000 Conference at Melbourne in 2000

GEOTECHNICAL ENGINEERING

JUNE 2015: SPECIAL ISSUE ON PILE FOUNDATIONS

Editors: San-Shyan Lin, Charng Hsein Juang, and Robert Liang

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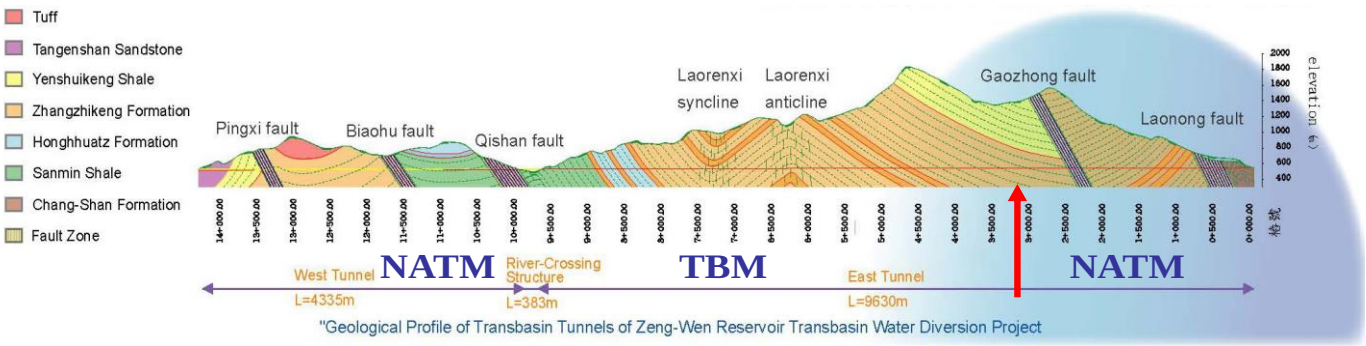
Editor: Prof. Meei-Ling Lin

Satellite Image of the Taipei Basin
(After Yang, Wong and Hwang, 2016)

(b) Before typhoon

(a) After typhoon

Sedimentation of Typhoon Morakot on Wanda Reservoir in central Taiwan.
(After Lee, Wang, Chang Lien and Huang, 2016)



Geological profile along tunnels in TDT project (After Lee, Wang, Chang, Lien and Huang, 2016)

GEOTECHNICAL ENGINEERING

PREFACE

This Issue contains thirteen excellent papers as the country issue from Chinese Taipei Geotechnical Society (CTGS). It is an example of contributions from leading private sectors in Taiwan and also academics.

The first paper by Lee et al deals with the topic of rock tunnelling applied to steady water resources supply in Taiwan, challenges and examples. The authors deal with increasing soil erosion and slope collapse in some catchment area in Taiwan in the past decade. Also, increased sedimentation rates of the reservoirs reducing the effective capacity, and severely affecting the steady water supply. Multiple measures have been proposed for stabilizing the water supply. Tunnelling in the catchment area, even close to a dam, represents serious environmental and engineering risks. The authors present two cases of rock tunnelling as applied to steady water resources supply. Challenges and some distinctive issues, such as the presence of a high-temperature ground, a combustible gas emission ground, and potential instability of rock wedges caused by large underground excavation, are discussed. The authors then present countermeasures with a clever design of an elephant-trunk intake pipe to release turbid water. State-of-the-art tunnelling through rock and some innovative tunnelling technologies are utilized in these two cases.

The second paper by Chiu et al deals with the interesting topic of the state-of-the-art of tunnel maintenance in Taiwan and challenges to sustainable development. Tunnel construction in Taiwan started as early as the late nineteenth century; within the last 125 years, tunnel maintenance in Taiwan went through several stages. In early years engineers dealt with tunnel excavation. Now tunnel inspections, repairs and reinforcement were performed only when serious damages were observed. As the number of damaged tunnels increased, investigations revealed that the degradation of tunnels in Taiwan is inevitable and usually occurred in an exceptionally shot period. Frequent earthquakes, a high ground water level and poorly cemented rock masses provide an environment for such degradation. To adapt more effectively to the environment, tunnel maintenance looked at the entire life cycle of a tunnel. Thus the diagnostic methods have demonstrated to be useful in enhancing the sustainable operation of tunnels.

An interesting contribution by Wang et al dealt with rock tunnel –shaft intersection in projects in Taiwan. The construction of an intersection between a shaft and a rock tunnel is a three-dimensional problem, and requires more complex excavation and support methods than those used in conventional two-dimensional tunnel construction. The paper considered examples of rock tunnelling in Taiwan, and the construction of intersections between shafts and tunnels. Data are collected from case histories first, and the excavation

sequences are classified. Then challenges as encountered to secure construction of the intersections of shafts and tunnels are examined, including the significant scale effects of rock masses on excavations; difficulties in controlling rock deformation near the intersections, and groundwater ingress are also discussed. Strategies and countermeasures as applied to overcome these difficulties in recent projects, and their effectiveness is investigated. Finally, the state-of-the-art design and construction of intersections between shafts and tunnels in Taiwan are presented.

The fourth paper by Hsiao et al dealt with the influence of peak strength degradation in assessing the stability of tunnels in hard rocks. Tunnelling depths are increasing rapidly in Taiwan. The effect of brittle failure on hard rock tunnelling is, however, rarely studied. In this paper, a study is carried out on the importance of the post-peak behaviour using Hoek-Brown failure criterion is investigated; through strength loss experimental studies , a relationship between strength loss parameter and confining stress is established. Subsequently, a numerical analysis model (so-called strength degradation model), is proposed and applied to predict the impact of the post-peak strength degradation on an actual tunnel. The analysis showed that the effect of the post-peak strength degradation on deformation during excavation is becoming more and more pronounced with increasing depth of tunnels. Severe deformation due to the excavation may endanger the tunnel stability during construction in deep overburden. Thus the strength degradation beyond brittle failure shall play an exceptionally important role in the stability of deep tunnelling.

The fifth paper by Hwang et al is on the deep excavations in Taipei Basin and the performance of diaphragm walls. Since movements of diaphragm walls are reduced by the presence of existing underground structures in the vicinity of excavation, comparison of the observed wall deflections with the results obtained by using two-dimensional analyses may lead to erroneous conclusions. Similarly, additions to diaphragm walls, such as buttresses, station entrances, ventilation shafts, etc., will also tend to reduce wall deflections. Thus the authors recommend to compare the results of two-dimensional analyses with the upper envelopes, designated as “reference envelope”, of a family of wall deflection paths of the same geometry of excavation and the same characteristics of the retaining system. Inclinometer readings obtained at Shandao Temple Station of the Bannan Line of Taipei Metro were studied to establish the relationship between wall deflections and depth of excavations. The results are verified by numerical analyses using PLAXIS computer software. Reference envelopes were then developed for estimating maximum wall deflections; and charts were established for correcting inclinometer readings to account for the movement at diaphragm wall toes. The authors found that the width of excavation has significant influence on wall deflections and toe movements. Additionally, the consolidation of the Songshan Formation due to the drawdown of groundwater in the Jingmei Formation reduced the movements of diaphragm wall toes.

In an interesting paper Yang et al studied the hydraulic characteristics of the Jingmei Formation and the Dewatering of Deep Excavations in Taipei Basin. Geotechnical Engineers in Taipei are well aware that the Jingmei Formation is a unique geological feature of the Taipei Basin. It is highly permeable and a water-rich stratum responsible for many failures in underground constructions. The piezometric heads in the Jingmei Formation had to be lowered by pumping for the deep excavations to be carried out safely. The authors thus discuss the hydraulic characteristics of the Jingmei Formation and the experience gained in large scale dewatering schemes. Attempts have been made to establish the relationship between the progression of tides in the river and the fluctuation of the piezometric levels in this Formation. The authors found that, the transmissivity and storage coefficient deduced from the observed groundwater drawdown are affected not only by the pumping rate, but also the duration of pumping; thus the rates required tend to be overestimated as based on the results of pumping tests.

Forensic studies have now become an important field in geotechnical engineering. The seventh paper by Lee et al is on the forensic investigation of a subway tunnel failure during construction. In this paper, the forensic evidences and investigation of a subway tunnel construction failure occurred in Kaohsiung, Taiwan is presented. The studied construction failure occurred during a cross-passage excavation of a shield tunnel construction work of the Kaohsiung Mass Rapid Transit System, and resulted in severe tunnel collapse and extensive ground failure that even reached to ground surface 30m above the tunnel depth. Valuable photo images obtained during and post event, as well as results of special geophysical testing methods were presented and compared to verify aspects of the proposed failure scenario. Information presented in this paper would be helpful to improve engineers' knowledge for preventing similar construction risks.

Typhoon Morakot brought tremendous rainfall of a hundred-year recurrence period in Taiwan. The paper by Chou et al concentrates on the effects as encountered by roads and houses in the middle and southern part of Taiwan; from landslides, debris flows, and floods. Erosion of road foundations, sliding of slopes, and collapse of bridges has paralysed the road system. Using Alishan Route 18 as an example, this paper discusses different causes, types, and renovation methods of slope disasters for future reference.

The paper by Lee et al also deals with the forecast of shallow landslides pertinent to Taiwan in a study which combines rainfall parameters and landslide susceptibility. Catastrophic landslides and debris slides triggered by typhoons such as Typhoon Morakot (2009) have occurred more frequently in the recent years, and caused many casualties and much economic loss in Taiwan. For the purpose of reducing the damage and preventing loss of life resulting from geological hazards, this study collects multiple period landslide inventories which contain the information of occurrence time, location, magnitude, rainfall intensity, and accumulated rainfall to establish the rainfall threshold for shallow landslides on a regional scale. The concept of a hazard matrix which combines the magnitude (landslide ratio of slope units) and the possibility of occurrence (historical disaster records) are investigated to set up the early warning thresholds. Accordingly, the critical rainfall thresholds were built up based on the R_{24} (24 hours

cumulated rainfall) and I_3 (3-hour mean rainfall intensity) of historical records. The model developed can predict the possible sediment hazard on the hillslope 2~9 hours before occurrence of landslides. The web based GIS helped to have early-warning systems to display the real-time rainfall data and the warning signal immediately for disaster prevention through increasing the response time.

Chang et al made dynamic analyses for performance based seismic design of geotechnical structures with examples in deep foundation. Performance-Based Seismic design (PBSD) of geotechnical engineering structures can be evaluated by a number of methods taking into account the uncertainties of the designed influence factors. Despite the fact that the seismic force is known to be a significant factor, the static and/or pseudo static analyses seem to be commonly adopted in design practice. The paper by Chang et al briefly discusses alternate approaches with the emphasis on dynamic analysis. Examples are given with the assessments of two deep foundations located in Taiwan. Dynamic analysis is rather important to the seismic design problems since it can monitor the details of time-dependent structural responses incorporating both peak ground acceleration and duration of the earthquake. Other than the 3D finite element analysis, the simplified solution from 1D wave equation analysis can be very effective and convenient for PBSD analysis on deep foundation.

The eleventh paper in this CTGS Issue is on the time dependent dynamic characteristics during soil liquefaction in saturated sand. Chen et al, conducted model pile tests to quantify the relation between soil stiffness and excess pore water pressure during liquefaction, the test data of a series of shaking table tests on model pile in saturated sand using a large biaxial laminar shear box conducted at the National Center for Research on Earthquake Engineering were analysed. The pile tip was fixed at the bottom of the shear box to simulate the condition of a pile foundation embedded in a firm stratum. The pile head was mounted with steel disks to simulate the superstructure. In addition, strain gauges and mini-accelerometers were placed on the pile surface to obtain the response of the pile under shaking. Therefore, the model pile can be considered as a sensor to evaluate the changes of dynamic characteristics of soil-pile system during the shaking by using the time-frequency analysis and system identification technique. The results showed that the stiffness of the soil would increase with the dissipation of pore water pressure and the recovery of soil stiffness is directly related to the effective stress ratio of soil specimen.

The interesting paper by Shi et al present geological investigation and sliding mitigation in Jiufen Area in Taiwan. Jiufen's orographic and geological characteristics together with frequent typhoons and heavy rain make it potentially vulnerable to landslides. The landslide problems can be disastrous not only to the 2,300 local residents, but also to the constant flow of tourists visiting the town. After the site investigations, it is concluded that both of the colluvium and groundwater are the most important geological factors to the slope stability problems. According to the long-term groundwater level monitoring result, it varied from 8m to 12m during the period of typhoon and heavy rainfall. And the displacement induced by the groundwater level rising was found. Four underground flow lines were

located based on the resistivity image profiling and self-potential investigation. Then five water collection wells were planned to construct according to the locations of underground flow lines. The level lowered down about 15m after the wells completed and the slope became stable. It is suggested that the depth of colluvium in Jiufen area needs to be investigated in more detail.

Finally the last paper thirteenth in this Issue is by Shu et al on the interpretation and analysis of potential fluidised landslide slope. Fluidized landslide, also called hillslope-type debris flow, often occurs on the village side hillslope in the mountain area during extreme weather condition. Fluidized landslide induces more severe damages than the shallow landslide; however its recognition model is still lacked. In this research a recognition model of the potential fluidized landslide slope was developed using 80 cases occurred in the Kaoping River basin, southern Taiwan. 30 fluidized landslides and 30 shallow landslides are employed for the model development and another 10 events of each landslide are applied for verification. Results show that the recognition model composed of 8 discriminant factors including geomorphology factors, hydrology factors and potential landslide factor predicated by SHALSTAB model provides accuracy rate of 85% of the verification events. Thus the model can be of practical use for fluidized landslide interpretation. The model can be used to identify the potential dangerous slope areas and effectively assist the disaster prevention and early warning of villages in mountain area.

The editor of this CTGS Issue is very pleased to be able to present the geotechnical activities in Taiwan through these thirteen contributions and hope that the material would be beneficial to Geotechnical Engineers in SE Asia and elsewhere.

Meei Ling Lin

ACKNOWLEDGEMENT

Thirteen excellent contributions are contained in this Country Issue of the Chinese Taipei Geotechnical Society (CTGS) as edited by Prof. Meei Ling Lin. All contributions are by authors from Taiwan and Prof. Meei Ling Lin must be congratulated for her excellent task. In the Preface Prof Lin have described in great detail the contributions from the authors. It is a pleasure to note that successful country issues are now completed by the Thai Geotechnical Society, The Vietnamese Society and now the Chinese Taipei Society. The contributions from Singapore, Hong Kong and Malaysia will also be released soon. Also, last but not least from Indonesia.

This issue also contains a special feature story on "Recent Diaphragm Wall Technologies and Future Challenges" by Hosoi Takeshi and Matsushita Shinya; a historical note on "Experiences of Geotechnical Development in Japan and Future Directions" by Masami Fukuoka and an "Obituary of Masami Fukuoka" by Fumio Tatsuoka. The passing away of Prof Masami Fukuoka on 27 January 2016 is a great loss to the engineering communities.

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GEOTECHNICAL ENGINEERING

JUNE 2016 ISSUE: CTGS ISSUE

Edited by Meei-Ling Lin

Professor Meei-Ling Lin

Dr. Lin is a Professor at Department of Civil Engineering, National Taiwan University. She received her Ph.D. degree in Civil Engineering from University of Texas, Austin, USA, in 1987. Dr. Lin has been a member of the General Committee of the Southeast Asia Geotechnical Society since 2007. She serves as a committee member of the Jointed Technical Committee 1 (JTC1 on Landslide) of the International Society for Soil Mechanics and Geotechnical Engineering, the International Association for Engineering Geology and the Environment, the International Society for Rock Mechanics, and the International Geo-textile Society. She also serves as a committee member of Technical Committee 303 (TC-303 on Flood) and Asian Technical Committee-1 (ATC-1 on Climate Change) of ISSMGE.

Prof. Lin's research interests and experiences include: potential analysis and simulation and behaviors of debris flow and slope stability, seismic slope behavior and stability, dynamic soil behaviors associated with soil liquefaction and ground responses analysis, mapping and micro-zonation of related debris flow, seismic slope stability potential, and seismic ground response. She lead a group to initiate a drafted Code for the Engineered Slope for the Ministry of Transportation and Communication, Executive Yuan, Taiwan. She has been invited as a Keynote speaker of international conferences, a special lecture speaker of International Landslide Symposiums and a panel reporter by ISSMG Conferences, and recently delivered an Opening Keynote for the Fourth Italian Workshop on Landslides.

SPECIAL FEATURE STORY ON

"Recent Diaphragm Wall Technologies and Future Challenges"
By Hosoi Takeshi and Matsushita Shinya.

Dr. Hosoi Takeshi

Dr. Hosoi Takeshi is a Technical Advisor at WSP Parsons Brinckerhoff, Singapore. He received his PhD with research focused on "Bearing Capacity of Diaphragm Wall Foundation and various Issues during its Construction" from Kyoto University, Kyoto, Japan in the year 1993.

Dr. Hosoi has more than 50 years of experience in design and construction of underground structures, tunnelling, bridge foundations and marine works. He is an international expert in diaphragm wall, barrette and bored pile foundation, shield tunnelling, NATM tunnelling, and other complex geotechnical works.

He is a Professional Engineer (PE) in Japan Since 1983, Fellowship of Japanese Society of Civil Engineer and International Member of Japanese Geotechnical Society. He coordinated the Asian Ocean Seminar sponsored by Japanese Ministry of Port and Harbour for 10 years. He was also a national member in "E-Defence Project" in Japan.

He served as a General Manager of Technical Research & Earthquake Technology Research Institute for 8 years and General Manager of Design Department of Nishimatsu Construction Co. Ltd. for 7 years.

Mr. Matsushita Shinya

Mr. Matsushita Shinya has been a Chief Engineer of Matsushita M&C Lab Co. Ltd. Since 2013. He was graduated from Nagoya University (Department of Science) in 1972 and joined Matsushita M&C Lab Co. Ltd.in 1972. He served as CEO of Matsushita M&C Lab. Co. Ltd. from 2003-2013. He is a Member of Japanese Geotechnical Society. He has been involved in a lot of big diaphragm wall projects in Japan for more than 40yers. In 1982 he was engaged in the experimental diaphragm wall construction for practical use of high DS polymer slurry and in 1984 he was joined the diaphragm wall construction project for Nagoya Subway 6 Line to lead successful adoption of polymer slurry. He was involved in Diaphragm Wall Foundation of Aomori Bay Bridge in 1988 and also in 1991 Diaphragm Wall Shaft at Kawasaki Artificial Island for Trans Tokyo Bay Highway Road. From 1992 to 1994 he was invited by the Grand Hi-Lai Hotel project and the Tuntex project（the Tuntex & Chien Tai Tower）at Kaohsiung, Taiwan as a consultant of Polymer slurry. From 2001 to 2006 he took part in the Water

Cut-off Wall Project at Kansai International Airport for stabilizing land settlement as a chief engineer for quality control of slurry. In 2008 he engaged in the Wall Foundation , “Knuckle Wall ” Project of Tokyo Sky Tree as a chief engineer for quality control of polymer slurry.

HISTORICAL NOTE ON

"Expriences of Geotechnical Development in Japan and Future Directions"

By Masami Fukuoka

Professor Masami Fukuoka

Prof. Fukuoka was born on 12 March 1917 in Okayama Prefecture, Japan. He studied Civil Engineering at the University of Tokyo, and in 1940 he entered the profession fully, taking up a post as a civil engineer for Japan's Public Works Research Institute (PWRI) of the Ministry of Internal Affair. During the Second World War, he served in the Japanese military.

He returned to PWRI after the war ended, and his engineering acumen was immediately needed. Japan experienced a series of severe earthquakes and floods, which further complicated the damage the country had suffered to its infrastructure during the war. It was one of the most difficult times in the history of Japan, he said to me when I was young. As a civil engineer, in particularly, as a geotechnical engineer, he worked to restore Japan's infrastructures from the effects of war and natural disasters. His strength of leadership was an especially important contribution to the design and construction of a great number of important infrastructures; and his work improved projects across a broad range of sectors, including those dealing landslides, road building and pavements, slope stability, flood control, river and coastal dyke engineering, ground investigation and soil test, earth pressure and retaining walls, rock-fill and earth-fill dams, ground subsidence, foundations of long-span bridges, earthquake geotechnical engineering and, eventually, geosynthetic engineering. The breadth of his work was extraordinary, considering how difficult it is to become a specialist in even one of these areas today. After rising to serve as PWRI's director, he retired in 1970 and entered academia and became a full professor of Civil Engineering of the University of Tokyo, where I was studying as doctoral candidate. In 1977, Prof. Fukuoka transitioned to a

professorship at Tokyo University of Science where he remained until his retirement in 1986. As his career progressed; he contributed greatly to multiple professional organizations. He helped establish the Japanese Geotechnical Society (JGS) in 1949 and served as President from 1976 – 1997. He was integral to Tokyo playing host to the 9thInternational Conference on Soil Mechanics and Foundation Engineering, then served as President of the International Society for Soil Mechanics and Foundation Engineering (now ISSMGE) from 1977-1981.During this period, while at Tokyo University of Science, he started the research on geosynthetic-reinforced soil retaining walls and geomembrane lining at the bottom of reservoirs.

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Paper Contribution, Technical notes and Discussions

SEAGS & AGSSEA encourage the submission of scholarly and practice-oriented articles to its journal. The journal is published quarterly. Both sponsors of the journal, the Southeast Asian Geotechnical Society and the Association of Geotechnical Societies in Southeast Asia, promote the ideals and goals of the International Society of Soil Mechanics and Geotechhnical Engineering in fostering communications, developing insights and enabling the advancement of the geotechnical engineering discipline. Thus the publishing ethics followed is similar to other leading geotechnical journals.Standard ethical behaviour of the authors, the editor and his editorial panel, the reviewers and the publishers is followed.

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1. The manuscript including abstract of not more than 150 words and references must be typed in Times New Roman 9 on one side of A4 paper with a margin of 25 mm on each side. The abstract should be written clearly stating the purpose, scope of work and procedure adopted together with the major findings including a summary of the conclusions.
2. The paper title must not exceed 70 characters including spaces.
3. The maximum length of papers in the print format of the Journal is 12 two-column pages in single-spaced in Times New Roman 9 including figures and tables. A Journal page contains approximately 1,040 words. Authors can approximate manuscript length by counting the number of words on a typical manuscript page and multiplying that by the number of total pages (except for tables and figures). Add word-equivalents for figures and tables by estimating the portion of the journal page each will occupy when reduced to fit on a 160 mm x 240 mm journal page. A figure reduced to one-quarter of a page would be 260 word-equivalents. When reduced, the figure must be legible and its type size no smaller than 6 point font (after reduction).
4. Figures: Line art should be submitted in black ink or laser printed; halftones and color should be original glossy art. Figures should be submitted at final width i.e. 90 mm for one column and 185 mm for two columns. The font of the legends should be in Times New Roman and should use capital letters for the first letter of the first word only and use lower case for the rest of the words. Background screening and grids are not acceptable.
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7. The paper must have an introduction and end with a set of conclusions.
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9. If experimental data and/or relations fitted to measurements are presented, the uncertainty of the results must be stated. The uncertainty must include both systematic (bias) errors and imprecisions.
10. Authors need not be Society members. Each author's full name, Society membership grade (if applicable), present title and affiliation and complete mailing address must appear as a footnote at the bottom of the first page of the paper.
11. Journal papers submitted are subject to peer review before acceptance for publication.
12. Each author must use SI (International System) units and units acceptable in SI. Other units may be given in parentheses or in an appendix.
13. Maximum of five keywords should be given.
14. REFERENCES

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