

World Congress on Advances in Structural Engineering & Mechanics 2017 on “Code Developments in Regions of Low-to-moderate Seismicity”

CIVIL AND STRUCTURAL ENGINEERING TECHNICAL DIVISION

reported by



Dr Daniel Looi Ting Wee



Ir. Lim Ek Peng

This article reports on the two IEM-sponsored technical papers presented at ASEM17, a three-day world conference in structural engineering held at KINTEX II, Ilsan, Seoul, South Korea on 29-31 August, 2017. ASEM17 was chaired by Professor Chang-Koon Choi from KAIST University, who is an alumnus of The University of Illinois at Urbana Champaign.

The biannual event gathers structural engineering researchers and practitioners from around the world to participate and present state-of-the-art findings on various perspectives of structural engineering. Many of the papers were of good quality and some were selected to be published in various SCI-indexed journals (for example, Earthquakes and Structures, Structural Engineering and Mechanics, Steel and Composite Structures, Computers and Concrete) in Techno-Press series of publications.

The IEM-sponsored papers were presented at the mini symposia, “Code Developments in Regions of Low-to-moderate seismicity, Part I and II”. Engineers and researchers

from countries and regions of similar seismicity to Malaysia – South Korea, China, Hong Kong, India, Sri Lanka and Australia – also took part in the symposia which was chaired by Prof. Han-Seon Lee from Korea University and Professor Nelson Lam from University of Melbourne Australia.

The authors and the titles of the two papers are listed below; the published

proceedings can be downloaded from the internet links given:

1. D.T.W. Looi*, H.H. Tsang and M.C. Hee, “Seismic Hazard Modelling for Malaysia and Singapore” in Part (I): Seismic hazard studies. (1) http://www.i-asem.org/publication_conf/asem17/6.ES/W4F.1.ES2372_3460F1.pdf
2. D.T.W. Looi, E.P. Lim* and M.C. Hee,



Presenters and chairpersons at the ASEM17 banquet.
From left: Dr H.H. Tsang, Dr Ir. Goman Ho, Associate Professor Dr T.M. Chan, Prof. Nelson Lam and wife, Prof. Han-Seon Lee, Dr Daniel Looi and Ir. E.P. Lim.

ASEM17/ANBRE17 Programme At a Glance

AUG 28 MON	AUGUST 29 TUESDAY	AUGUST 30 WEDNESDAY	AUGUST 31 THURSDAY
	08:30 - 17:00 Registration	08:30 - 17:00 Registration	08:30 - 12:00 Registration
	09:00 - 09:10 Opening Ceremony T10: Opening Remarks (Chang-Koon Choi)	09:00 - 09:35 Keynote Lectures IV W1A: On the reduction methods of structural finite element models (Phill-Seung Lee, Korea) W1B: Performance Based Earthquake Engineering in a Moderate-Seismicity Region: South Korea (Han-Seon Lee, Korea)	09:00 - 09:35 Keynote Lectures VI H1A: An orthotropic model for concrete structure subjected to impact loading (Hyo-Gyung Kwak, Korea) H1B: Alkali-Silica Reaction in concrete – numerical modelling: an engineering approach (Andrzej Winnicki, Poland)
	09:10 – 09:50 Plenary Keynote Lecture T1P: KAIST Reform in the Fourth Industrial Revolution (O Ok Park, Korea)	09:40 - 10:15 Keynote Lectures V W2A: Tunnelling on terrace soil deposits: Characterization and experiences on the Bogota-Villavicencio road (Julio E. Colmenares, Colombia) W2B: A Unified Practical Approach for Estimating the Effects of Rare Dynamic Loading on Structures (Nelson Lam, Australia)	09:40 - 10:15 Keynote Lectures VII H2A: Buckling Restrained Braces for Existing and New Reinforced Concrete Frames (Keh-Chyuan Tsai, Taiwan) H2B: New photocatalysts for hydrogen production by water splitting (F.M. Linares, USA)
17:00 ~ 19:30	09:50 - 10:10 Coffee Break	10:15 - 10:30 Coffee Break	10:15 - 10:30 Coffee Break
Registration	10:10 - 10:45 Keynote Lectures I T2A: Topology Optimization of Structures subjected to Stochastic Dynamic Loading (B.F. Spencer Jr., USA) T2B: Robot Technology and the Future (Jun Ho Oh, Korea)	10:30 - 12:00 Concurrent Sessions W3A: Optimum Design of Structural and multidisciplinary (Shutian Liu, Jianhua Rong and Bin Xu) W3B: Composite Members and Structures W3C: Multi-hazard mitigation and sustainability assessment of smart structures (Zheng Yue, Y. Dong and Bu Zhanyu) W3D: Nano chemistry W3E: Modern Multidisciplinary Geomechanical Problems (Hatam Guliyev) W3F: Structures and Materials W3G: Tunneling and Underground Works in Extreme Conditions W3H: Energy	10:30 - 13:00 Concurrent Sessions H3A: Structural Engineering H3B: Steel Construction H3C: Structural Health Monitoring/Nondestructive Evaluation H3D: Recent Advances in Evaluation and Design of Concrete Structures (Hyo-Gyung Kwak) H3E: Bridge Engineering and Tall Structures H3F: Bridge Technology for Life-span Extension and Carbon Emission Mitigation (Hoon Sohn, Taek-Ryong Seong and In-Gyu Kim) H3H: Multiscale & Multiphysics Approach to Environmentally Assisted Cracking (Afrooz Barnoush and Hisao Matsunaga)
	10:50 - 11:25 Keynote Lectures II T2C: Sustainable urbanization through underground development –towards an urban underground future (Antonia Cornaro, Switzerland) T2D: Frontier Technologies in Steel and Composite Structures (Brian Uy, Australia)		
	11:30 - 12:05 Keynote Lectures III T2E: Bioinspired Structural Materials: Virtual Processing and Virtual Testing (C.S. David Chen, Taiwan) T2F: Recent Advances and Innovation in Steel-Concrete Composite Structures (Dennis Lam, UK)		
	12:05 - 13:00 Lunch KINTEX II 3 rd Fl. (Rm #301-302)	12:00 - 13:00 Lunch KINTEX II 3 rd Fl. (Rm #301-302)	

ASEM17/ANBRE17 Programme At a Glance

AUG 28 MON	AUGUST 29 TUESDAY	AUGUST 30 WEDNESDAY	AUGUST 31 THURSDAY
	13:00 - 14:30 Concurrent Sessions T4A: Computational Mechanics T4B: Plasticity, Fatigue and Fracture T4C: Bridge Inspection Using Unmanned Aerial Vehicles (Hyung-Jo Jung) T4D: Computational Technologies in Concrete Bridges & Buildings T4E: Advances in Experimental Testing and Numerical Simulation of Extreme Loadson Structures (Sashi K. Kunnath) T4F: Experimental Investigations of Seismic Performance of Structures T4G: Improvements in Conventional Tunneling T4H: Multi-Physics and Multi-Disciplinary Problems	13:00 - 14:30 Concurrent Sessions W4A: Monitoring based structural modal identification and state assessment (Ting-Hua Yi and Hua-Peng Chen) W4B: Fluid-Structure Interactions I (Alam Md Mahbub) W4C: Structural Health Monitoring of Railway System I (Yi-Qing Ni, Xiao-Wei Ye, Sung-Han Sim and Soo-Jin Cho) W4D: Concrete & RC Structures Construction W4E: Strengthening of reinforced concrete structures using external steel plates (Ray Su) W4F: Code developments in regions of low to moderate seismicity (I); Seismic hazard studies (Nelson Lam and Han-Seon Lee) W4G: Developments in Underground Space Technologies W4H: Structures and Relevant Issues	
17:00 ~ 20:00	14:30 - 14:50 Coffee Break	14:30 - 14:50 Coffee Break	
Registration	14:50 - 17:20 Concurrent Sessions T5A: Robotics T5B: Innovative applications in steel connections (Michael CH Yam) T5C: Smart Structural Systems T5D: Engineering Properties of Advanced Concrete and Concrete Structures (Chao-Wei Tang) T5E: Analytical and qualitative methods in elasticity and plasticity (Sergei Alexandrov) T5F: Base-Isolated Structures and Seismic Analysis T5G: Innovation in Mechanized Tunneling T5H: Nano and Micromechanics for Heterogeneous Materials (Gunjin Yun and Seunghwa Yang)	14:50 - 17:20 Concurrent Sessions W5A: Joint SNU-HIT Mini-Symposium on Structural Design, Behavior and Monitoring (Thomas Kang and Xiangguo Wu) W5B: Fluid-Structure Interactions II (Alam Md Mahbub) W5C: Structural Health Monitoring of Railway System II (Yi-Qing Ni, Xiao-Wei Ye, Sung-Han Sim and Soo-Jin Cho) W5D: Advances in Smart Materials for Civil Infrastructure Systems (H.K. Lee and H.K. Kim) W5E: Super tall building structural design and construction technology (Lan Chung) W5F: Code developments in regions of low to moderate seismicity (II); Structural design of buildings (Han-Seon Lee and Nelson Lam) W5G: Resilience and Sustainability in Underground Space W5H: Advances in Energy for Water and Wastewater Treatment (Jinwoo Cho)	
	18:00 - 19:30 Reception KINTEX II 4 th Fl. (Rm #401-402)	18:00 - 19:30 Banquet MVL Hotel, 2 nd F. Grand Ballroom	

Figure 1: ASEM17 programme. The two papers presented on 30 August during Session W4F and W5F

“A case study of compliant design of building in regions of low-to-moderate seismicity” in Part (II): Structural design of buildings. (2) http://www.i-asem.org/publication_conf/asem17/6.ES/W5F.3.ES2373_3563F1.pdf

The opening ceremony of the conference was held in the morning of the first day (29 August). The conference was launched officially

after the speech for opening remarks given by Prof. Choi. The conference programme comprised four daily sessions over three days, with parallel lectures, concurrent sessions and symposia. Figure 1 shows the ASEM17 programme, including when the two papers were presented on the second day during Session W4F and W5F, on code development in regions of low-to-moderate seismicity

(I) Seismic hazard studies and (II) Structural design of buildings, respectively.

Dr Daniel Looi presented the paper on seismic hazard modelling for Malaysia and Singapore during Session W4F. The presentation was completed in 15 minutes, with another 5 minutes of questions and answers. This was followed by other participants (many were code-

drafters for their respective countries) who presented papers on seismic hazards for Sri Lanka, South Korea, India and Hong Kong. Three key points were found common in all the papers presented and they are briefly elaborated here:

1. A minimum seismic hazard value needs to be established for protection in regions of low-to-moderate seismicity. For example, a minimum peak ground acceleration value of 0.07g should be provided in the code for a nominal 500-year return period for the protection of ordinary building structures.
2. A 2,500-year return period seismic hazard level must be achievable for important lifeline structures such as schools and hospital to achieve the no-collapse performance criteria.
3. The site period parameterisation should be fostered in the development of response spectrum in contemporary seismic code such as in the case of Malaysia, India and South Korea. The use of shear wave velocity at the 30-m soil depth to determine the soil type in common seismic codes for example Eurocode 8 (EC8) (3) which were drafted in the 1990s (considered out-dated) and IBC (4) which were only applicable in certain site conditions in US and Europe, was found to be not appropriate for these countries.

Ir. E.P. Lim presented his paper on a case study of compliant design of a 9-storey RC building situated in regions of low-to-moderate seismicity during Session W5F. The main objective of this paper was to guide practising engineers with little knowledge and experience on seismic analysis and design, so that they are able to estimate the building structural period by hand (or with a simple spreadsheet) and to arrive at a more realistic reduced base shear demand. This was done using an enhanced generalised lateral force method rather than the typical code lateral force method, which anchored upon regional-dependent empirical formula.

During this session, other topics discussed were on real practical applications, such as seismic design in regions of low-to-moderate seismicity for high-rise buildings, transfer structures, steel buildings, RC walls and displacement-controlled torsional response in buildings. The symposia ended with Q&A and discussions.

Readers of this article can follow up on the published proceedings for both Sessions W4F and W5F in ASEM17 at http://www.i-asem.org/asem17_publication.html#ISEM17. The papers are written in such a way so that readers will have a preliminary understanding of and exposure to the current seismic hazard issue and structural and seismic engineering development for low-to-moderate seismicity region.

ACKNOWLEDGEMENT

We thank IEM for its sponsorship of the two papers and the continued support in the facilitation of numerous workshops and meetings over the years, culminating in the drafting of the EC8 NA for Malaysia. The collaboration between the international advisors, Prof. Nelson Lam and Dr Hing-Ho Tsang, and local study group members, chaired by Adjunct Specialist Ir. M.C. Hee is also appreciated. ■

REFERENCES

- [1] D.T.W. Looi*, H.H. Tsang and M.C. Hee (2017), "Seismic Hazard Modelling for Malaysia and Singapore", Proceedings in ASEM17, 29-31 Aug, Ilsan, Seoul, Korea.
- [2] D.T.W. Looi, E.P. Lim* and M.C. Hee (2017), "A case study of compliant design of building in regions of low-to-moderate seismicity", Proceedings in ASEM17, 29-31 Aug, Ilsan, Seoul, Korea.
- [3] Eurocode 8 - Design of structures for earthquake resistance (1998). EN 1998-1 Part 1: General rules, seismic actions and rules for buildings.
- [4] International Code Council (ICC) (2012). International Building Code (IBC), Washington D.C.