

## The 6<sup>th</sup> Asia and Pacific Young Researchers and Graduates Symposium (YRGS 2014): The Structural Engineering for Sustainable Development



Participants of YRGS2014 Symposium

On July 31<sup>st</sup> and August 1<sup>st</sup>, 2014, The 6<sup>th</sup> Asia and Pacific Young Researchers and Graduates Symposium (YRGS2014): The Structural Engineering for Sustainable Development was held at the Sirindhorn International Institute of Technology (SIIT), Thammasat University, Thailand. The symposium was co-organized by Asian Concrete Federation (ACF), Engineering Institute of Thailand (EIT), Thailand Concrete Association (TCA), and Chulalongkorn University.

The Asia-Pacific Young Researchers and Graduates Symposium (YRGS) series is primarily a platform for early-stage structural engineering professors, research scientists, professional engineers, postdoctoral fellows and PhD students to present their latest findings within the context of the wider structural engineering discipline. The series was initiated to promote collaboration, knowledge sharing and friendship among the young professionals. The first YRGS was held at Kunsan National University, Korea in 2009; the second in 2010 at Zhejiang University, China; the third in 2011 at National Taiwan University, Taiwan; the fourth in 2012 at The Hong Kong Polytechnic University, Hong Kong; and the fifth in 2013 at Malaviya National Institute of Technology Jaipur, India.



Prof Somnuk Tangtermsirikul, director of SIIT, addressed an opening and welcome speech for the YRGS2014



Prof Somnuk Tangtermsirikul presented a souvenir of appreciation to Dr Dae-Joong Moon



Prof Somnuk Tangtermsirikul presented a souvenir of appreciation to Prof Toshiharu Kishi

In the YRGS2014 symposium, technical papers from many countries and regions including Australia, China, Hong Kong, India, Japan, Republic of Korea, Malaysia, and Thailand were accepted and presented. In addition to the accepted technical articles, there were two keynote presentations delivered by Prof. Toshiharu Kishi (the University of Tokyo) and Dr. Dae-Joong Moon. The first keynote speaker, Prof. Toshiharu Kishi delivered his recent research on the characteristics properties of cementitious materials dependent on the behavior of water in minute/narrow spaces. The presentation provided very interesting information about the microstructures and water movement in the cement paste. The other keynote speaker, Dr. Dae-Joong Moon, kindly shared his valuable experience in the maintenance management and health monitoring system of cable bridges. The presentation included many very impressive case studies of the structural health monitoring system for long-span bridges.



Dr Jian-Guo Dai presented the 'ACF Best Paper Award' to Dr Isao Kurashige, the award winner

Asian Concrete Federation (ACF) regularly gives the 'ACF Best Paper Award' for the most outstanding technical articles presented in each YRGS symposium. All concrete-related technical papers were evaluated in terms of their research originality, soundness of methodology, as well as impact to the construction industry, etc. The evaluation was performed by a 7-member award judgement panel led by Dr. Jian-Guo Dai, The Hong Kong Polytechnic University, a representative from ACF. Dr. Isao Kurashige from the Central Research Institute of Electric Power Industry, Japan was selected as the only award winner of YRGS2014. His technical paper titled 'Development of a Novel Non-Destructive Test Method to Evaluate the Distribution of Air Permeability in the Depth Direction in Concrete' is concerned with the development of an innovative test method for the on-site evaluation of the air permeability of concrete.



Dr Hwa Kian Chai, the University of Malaya, announced the next YRGS in Kuala Lumpur, Malaysia

YRGS2014 was a very successful and pleasant symposium to all participants. The next YRGS will be held at the University of Malaya, Malaysia.

By



Dr Raktipong Sahamitmongkol & Dr Jian-Guo Dai

## Nhat Tan – Vietnam's Largest Cable-Stayed Bridge



Main Bridge on Nhat Tan Bridge

Nhat Tan Bridge, Hanoi's longest bridge (8.9km), links the main portion of the city with the Noi Bai International Airport. The economic development of Vietnam has seen an increase in vehicular traffic in the Capital, Hanoi City. The Red River flowing across the city has few bridges, curtailing efforts to divert trucks around the city center. The Nhat Tan Bridge is set to solve this problem upon its completion in 2014.

The bridge, constructed with an initial investment of VND 13.6 trillion (US\$ 639.2 million) sourced from the Japan Bank for International Cooperation (JBIC) and the Vietnamese Government's counterpart capital, is scheduled to open to traffic in October 2014.

The bridge is 33.2 metres wide and is designed with eight lanes (four lanes in each direction) and sidewalks for pedestrians. The Main Bridge, a 1500 m long cable-stayed bridge with multiple spans, is very rare type of bridge in the world and it will be one of the longest bridges in South East Asia upon completion. This bridge, the gateway to Hanoi, will also serve as symbol of the friendship between Vietnam and Japan.

The Main Bridge in this project is a unique type of bridge that requires high engineering technologies. IHI Infrastructure Systems Co., Ltd. (IIS) is in charge of the Superstructure, while Sumitomo Mitsui Construction Co., Ltd. (SMCC) is in charge of the Substructure. The two companies are global leaders in their respective industries.



White, blue, orange, green and white color lumps (from Hanoi side) are adopted for each Pylon to create unique night landscape in Hanoi

Source: <http://nhattanbridge.com/> and <http://www.vietnambreakingnews.com/2014/04/nhat-tan-vietnams-largest-cable-stayed-bridge/>

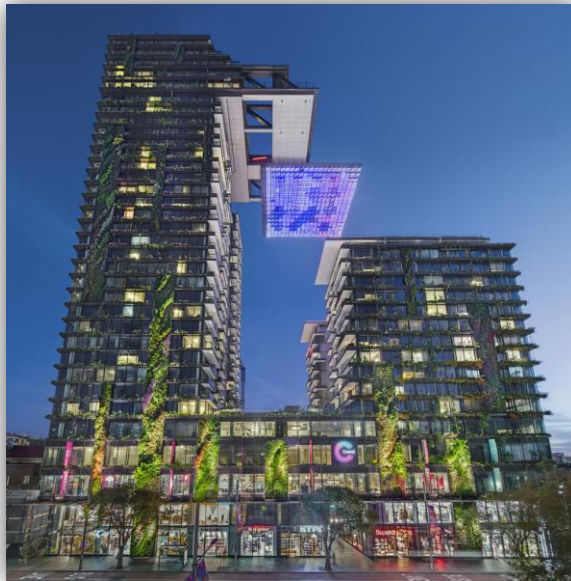


## The Best New Tall Buildings on the Planet

The Council on Tall Buildings and Urban Habitats (CTBUH) recently announced the winners of its Best Tall Buildings Worldwide contest. They declared four regional winners, as well as several finalists. An overall winner will be announced on November 6.

The qualities they're looking for are a strong sustainability commitment, adding to the urban environment, and challenging the traditional perceptions of tall buildings.

The Council received 88 entries from around the world for the awards with the largest entries from Asia and Europe.



**WINNER (Asia & Australasia):** One Central Park, Sydney. The most unique part of this 384-foot-tall residential building is the growth of plants around the outside, which the architects use for shading and to direct sunlight to save energy.  
*By Ateliers Jean Nouvel and PTW Architects*



**WINNER (Americas):** Edith Green-Wendell Wyatt Federal Building, Portland. Standing at 361 feet tall, this office tower was renovated from its original 1970 design into a lightweight, sustainable epicenter.  
*By Cutler Anderson Architects and SERA Architects*



**WINNER (Europe):** DeRotterdam, Rotterdam. At 489 feet, the mixed-use building is the largest in the Netherlands. The three towers will be used for offices, apartments, a hotel, conference facilities, shops, restaurants, and cafes.  
*By Office for Metropolitan Architecture*



**WINNER (Middle East & Africa):** Cayan Tower, Dubai. This residential tower is a 75-story luxury apartment building. Its helical shape turns 90 degrees over the course of its 1,005-foot height, so no room is facing the same way as the one above or below.  
*By Skidmore Owings & Merrill and Khatib & Alami*

# PhD Abstract on Experimental Investigation of the Deformational Behavior of the Phases of Concrete during Freezing and Thawing Cycles



Dr. Evdon Sicat  
Sumitomo Mitsui Construction Co., Ltd.  
Japan

Dr. Evdon Sicat is a structural engineer in Sumitomo Mitsui Construction Co., Ltd., Tokyo, Japan and is particularly involved in the design of precast concrete bridges. In March of this year he received his PhD degree from Hokkaido University, Japan. His Master of Engineering degree was also completed in Hokkaido University while his Bachelor of Engineering was obtained from Tarlac State University, Philippines. Prior to becoming a graduate researcher he supervised the constructions of a number of commercial buildings in the Philippines. His research focused on the frost damage of concrete and his PhD topic was "Experimental Investigation of the Deformational Behavior of the Phases of Concrete during Freezing and Thawing Cycles".

The freeze-thaw cycle (FTC) damage in concrete has long been a durability related problem in cold regions reaching subfreezing temperatures. This is why there is a large volume of research to clarify and understand the frost damage in concrete. However, in spite of the large volume of research there are no consensus on the damage mechanism of concrete due primarily to concrete's heterogeneous characteristics and the complex behavior of moisture during FTC. With this regard, it is the purpose of this study to present the distinct deformational behavior of the constituent parts of concrete (mortar, aggregate and interfacial transition zone - ITZ) to clarify each of their role during FTC and in the overall deformation of concrete.

The study presents diverse experimental methods and results on the deformational behavior of the phases of concrete during FTC. Unlike the common methodologies in FTC research, specimens were sealed in the study's experiments so that moisture and temperature can be controlled. Meso-scale size specimens were used to attain uniform frost damage and temperature in the entirety of the specimens. Specimens were subjected to FTC under different moisture conditions. The increase in void ratio and decrease in elastic modulus associated with frost damage were investigated and related to the change in coefficient of thermal expansion (CTE) of FTC damaged specimens. Significantly, the study investigates the deformational behavior of the ITZ which have not yet been presented in studies of concrete microstructure. The behavior of aggregate during FTC was also investigated.

The findings indicate that the deformational behavior of mortar specimens under FTC is primarily dependent on the amount of

moisture. Increased deformation in both expansion and contraction is observed for specimens with large moisture content. The expansion during FTC is understood and pointed to be caused by the hydraulic pressure caused by increased volume of ice during freezing. The contraction on the one hand is attributed to the removal of gel pore water arising from negative pressures initiated by ice formation.

After FTC tests, results show that the CTE of frost damaged mortar increases and its elastic modulus decreases which are primarily caused by microcracking due to frost damage. The observed increase in void ratio represents and verifies the formation of microcracks in frost damaged specimens. Microcracks act as broken bridges or links which detaches the aggregate from the hardened cement paste and in effect reduces (or removes) the thermal restraint that the (fine) aggregate and cement paste exerts on the other, thus considerably alters (increase) the CTE of the whole composite (mortar). Moreover, microcracks prevent the stress transfer in the material resulting in reduction of elastic modulus.

Aggregates on the one hand did not indicate considerable permanent deformation during the entire FTC though specimens were fully saturated. This verified the common acceptable knowledge that aggregates are unaffected by frost damage. More importantly, the ITZ deformation is determined as distinct (being far higher) from mortar and aggregate behavior which is the crucial reason why the ITZ is treated as a separate phase in concrete. Besides its weaker strength, the much higher deformation of the ITZ during FTC where cracking (and prominent damage) that could extend to the matrix shows the important role of the ITZ during frost damage and other deterioration factors such as wet-dry cycles.

The obtained deformational behavior of the ITZ, mortar, and aggregate in this investigation reflects their commonly described behavior during FTC. The ITZ and mortar deformations agree well with the observed occurrence and non-occurrence of cracks of frost damaged and non-damaged specimens respectively. These indicate the reliability of the presented method and suggest that it can be used as a basis to obtain the deformational behavior of concrete's constituent parts during FTC. Significantly, a complete data on the deformational behavior on each of the phases of concrete have not yet been presented, thus making the results presented here the first. Therefore, the results and methodology in this study are vital in clarifying, understanding and simulation of frost damage in concrete.



## PhD Abstract on Distribution and Its Effect on the Tensile Behavior of Ultra High Performance Cementitious Composites



Dr. Su-Tae Kang  
Daegu University  
Korea

Dr. Su-Tae Kang is an Assistant Professor of Daegu University, Korea. He joined Daegu University since September 2011. He got his B.S. from Yonsei University and received his M.S. and Ph.D. from Korea Advanced Institute of Science and Technology (KAIST) in 2010. His Ph.D. topic was "Distribution and Its Effect on the Tensile Behavior of Ultra High Performance Cementitious Composites".

In the dissertation, it was intended to understand the effect of the fiber orientation distribution on the tensile behavior of Ultra High Performance Cementitious Composites (UHPCC) and to estimate flow-dependent fiber orientation distribution and the corresponding tensile behavior of UHPCC. The composites is characterized with remarkable compressive and tensile strength, but the tensile behavior is greatly influenced by the fiber characteristics, such as shape, amount, orientation, etc.

In particular, even when the composites includes steel fibers having the same shape and in the same amounts, the variation in the fiber orientation distribution has a strong impact on its tensile behavior.

First, the pullout behavior of fiber in UHPCC was investigated and a pullout behavior model of steel fiber in UHPCC was proposed considering fiber inclined angle.

Secondly, pre-cracking and post-cracking tensile behavior of UHPCC was investigated. The tensile model of UHPCC was defined as the combined behavior of the resistance by the fibers and the matrix, and the fiber bridging stress curve was established considering the probability density function for the fiber orientation distribution across the crack surface.

Thirdly, the variation of the fiber orientation distribution along the flow of fluid was predicted through numerical simulation for the idealized shear and radial flow.

Lastly, the variation of fiber orientation distribution according to the flow and the consequent variation of tensile behavior were validated through experiments.

### The 1<sup>st</sup> ACF Symposium

Indian Concrete Institute (ICI) will host the 1<sup>st</sup> ACF Symposium with the theme of 'Ultra High Performance Concrete' on 7<sup>th</sup> October 2015 in Kolkata, India.

Further information can be found at <http://www.indianconcreteinstitute.org>



### The 7<sup>th</sup> ACF International Conference

Vietnam Concrete Association (VCA) will host the 7<sup>th</sup> ACF International Conference with the theme of 'Sustainable Concrete for Now and the Future' on 12<sup>th</sup> -14<sup>th</sup> October 2016 in Hanoi, Vietnam.

Further information can be found at <http://suscon2016.vn> or contact Dr. Le Trung Thanh (VCA) at [letrungthanh.moc@gmail.com](mailto:letrungthanh.moc@gmail.com)



### Secretariat

Ms. Krittiya Kaewmanee [secretary@asianconcretefederation.org](mailto:secretary@asianconcretefederation.org)

### Newsletter

Editorial team [newsletter@asianconcretefederation.org](mailto:newsletter@asianconcretefederation.org)