NANYANG TECHNOLOGICAL UNIVERSITY

School of Civil and Environmental Engineering

Admission is Free!
All are welcome!
Seats are limited. Registration will stop once seats are full.

The School of Civil and Environmental Engineering
cordially invites you to the
Tan Swan Beng (TSB) Public Lecture Series on Sustainable Urban Living

TSB Public Lecture on

Multi-Scale Modelling and Asset Management of Concrete Infrastructure

by **Professor Koichi MAEKAWA**

Tan Swan Beng Endowed Professor
Distinguished Professor, Department of Civil Engineering
School of Engineering, The University of Tokyo, Japan

Friday, 8 April 2016 • 12:30 pm to 5:15 pm
Lecture Theatre 1A, LT1A-01-01 @ North Academic Complex New Venue
Nanyang Technological University, Singapore

Abstract of TSB Public Lecture on "Multi-Scale Modelling and Asset Management of Concrete Infrastructure"

Structural performances depend on the states of constituent materials. All at once, the damage and soundness of materials are also affected by how structures have been used in service. In principle, performance assessment of concrete infrastructures cannot be conducted without coupling of microscopic behaviours of cementitious composites and macroscopic structural concrete.

Since 1990, multi-scale and multi-chemo and mechanical modelling have been investigated in many fields of study and the scheme is being applied to engineering solution. First, the past and current development of multi-scale and multi-chemo physics modelling of structural concrete is summarised. The scope of multi-scale simulation is being extended to the volumetric change of concrete caused by drying, self-desiccation, steel corrosion, ASR and freezing-thawing actions. The applicability related to mechanistic actions are being expanded from statics to dynamics as well as high cycle fatigue loads of great importance for transportation facilities. The recent engineering application of multi-scale simulator to practical problems for infrastructure management is reported.

The assimilation of inspection data and numerical simulation is highlighted. For life assessment, the initial conditions at casting and past curing states of structural concrete are hardly known in practice. Then, the current inspection data is used as the initial condition for future prediction. Actual examples of remaining life of damaged bridge RC decks will be presented from case studies. In these examples, non-destructive radar and acoustic technology as well as visual inspection are combined with numerical simulations.

Biography of Speaker

Professor Koichi MAEKAWA is currently a Distinguished Professor at the Department of Civil Engineering of the University of Tokyo. He is also a Vice President of Japan Society of Civil Engineers (in charge of natural disaster and promotion of civil engineering technology), and a Coordinator of an R&D team on Asset Management of Infrastructures under the Cabinet Office of the Japanese Government.

Professor Maekawa obtained his Doctor of Engineering from the University of Tokyo (Dept. of Civil Eng.) in 1985. His research interests include Constitutive laws for concrete and reinforced concrete, Nonlinear mechanics of reinforced concrete, Nonlinear dynamic analysis and seismic design of RC, Cementitious high performance concrete, Thermo-dynamics of concrete, Mass transport in cementitious porous media, Multi-scale dynamics of structural concrete, soil foundations and water.

Research related to Sustainability Urban Living

As our world marches unabatedly towards intensive urbanisation, mega cities invariably are created with increasing tension and conflict towards resource and space utilisation. As a highly urbanised city state, Singapore is faced with an increasing challenge to maximise our limited land and space resources. Moving forward, equitable distribution and intelligent exploitation of our finite resources are clear prerequisites towards long-term sustainability, productivity and liveability. To overcome stresses that accompany rapid post-modern urbanisation and limited land resources, carefully planned and executed research to provide relevant solutions are necessary. In this connection, the School of Civil and Environmental Engineering (CEE) at NTU has embarked on numerous publicly funded research projects, which endeavour to provide state-of-the-art solutions to overcome such pressure and challenges imposed by urbanisation. Two of these projects have been selected to be showcased after the Tan Swan Beng Public Lecture, namely "Research for Solutions for Urban Sustainability" and "A Novel Approach to Reutilise Incineration Bottom Ash (IBA) for Civil Engineering Applications: IBA Aerated Concrete".

One of the new challenges or opportunities for researchers in civil engineering is to provide new solutions for sustainable development. Several approaches toward urban sustainability will be discussed in the presentation of the first project "Research for Solutions for Urban Sustainability". These include (1) use of sustainable construction materials; (2) use of waste materials; and (3) use of new construction methods that make construction processes more cost-effective and sustainable.

The title of the second project is "A Novel Approach to Reutilise Incineration Bottom Ash (IBA) for Civil Engineering Applications: IBA Aerated Concrete". As an island city-state with limited land space and resource, it is crucial for Singapore to develop strategies to prolong the lifespan of landfills and to recover waste into resources. Although incineration can greatly reduce the volume of garbage, there is a need to manage the incineration ash. Nearly 500,000 tons of incineration bottom ash (IBA) are produced annually and are disposed of by landfilling. This project aims to address abovementioned two challenges through reutilising IBA as raw material to produce aerated concrete for civil engineering applications.

Programme

1230 Hrs Registration (outside LT 1A)

1300 Hrs Welcome by **Professor WANG Rong,** Chair, School of CEE, NTU

1305 Hrs Tan Swan Beng Public Lecture on **Multi-Scale Modelling and Asset Management of Concrete Infrastructure (Part 1)**
by **Professor Koichi MAEKAWA,** Tan Swan Beng Endowed Professor, NTU

1435 Hrs Afternoon Refreshment Break (outside LT 1A)

1515 Hrs Tan Swan Beng Public Lecture on **Multi-Scale Modelling and Asset Management of Concrete Infrastructure (Part 2)**
by **Professor Koichi MAEKAWA,** Tan Swan Beng Endowed Professor, NTU

1615 Hrs Presentation 1 on **Research for Solutions for Urban Sustainability**
by **Professor CHU Jian,** School of CEE, NTU
Director, Centre for Usable Space (CUS)
Interim Co-Director, NTU-JTC Industrial Infrastructure Innovation Centre (I3C)

1645 Hrs Presentation 2 on **A Novel Approach to Reutilise Incineration Bottom Ash (IBA) for Civil Engineering Applications: IBA Aerated Concrete**
by **Assistant Professor YANG En-Hua,** School of CEE, NTU

1715 Hrs End of Programme

For any enquiries,
please contact **Ms Debbie Low** at **6790-5285**
or Email: d-ptrc@ntu.edu.sg

Accreditation
- 3 PDU Points
- 2 STU Points