

Concrete Inspection & Repair Series – 41st Run

By Er. Teo Ee Huat

Supported with Skillsfuture Credit Funding

(Terms & Conditions apply)

Introduction

Reinforced concrete is still commonly used for building and construction in Singapore and around the world. Sustainability considerations in recent years have resulted in an increased focus on the repair and refurbishment of all types of concrete structures rather than demolition and redevelopment. Furthermore, defects are now more evident in building constructed during the boom years of economic growth when buildings are erected at a very fast pace.

Resident Engineers (REs) and Resident Technical Officers (RTO) are the first line of defense to prevent concrete defects as they are directly involved in supervision of concreting works, they may be involved in development projects requiring addition and alteration of existing buildings in conjunction with new developments.

This series of programme will provide the participant with the technical knowledge on the causes of structural and non-structural defects in concrete, their remedies, repairs and the preventive maintenance needed to upkeep these structures.

Objective

The specific objectives of Module 1 on Corrosion of Steel in Concrete and Concrete Defects are to familiarize the participants with how corrosion of steel reinforcement occurs in concrete. Participants will also understand other types of concrete defects and how to reduce the formation of these defects.

The specific objectives of Module 2 on Structural Inspection and Repair Techniques are to familiarize the participants with the common repair and strengthening methods for concrete structures with defects. Participants will also understand the procedure for structural investigation and effects of fires on reinforced concrete structures.

Speaker's Profile

Er. Teo Ee Huat graduated from Nanyang Technological University with a B.ENG (Civil) degree in 1996 and has since completed MSc in Civil Engineering (NUS) and MSc in International Construction Management (NTU). He actively involved in education and has completed M.Ed with University of Western Australia in 2010. He is a Singapore registered Professional Engineer and Qualified Erosion Control Professional. He is currently serving as the Co-chairman of Qualified Erosion Control Professional Panel, IES and has trained Professional Engineers as Qualified Erosion Control Professionals and also trained construction site supervisors in implementation, inspection and maintenance of Earth Control Measures. He has written papers in International journals on issues related to Construction Management and other issues.

Programme Details

Date:	26 February 2019, Tuesday
Time:	3pm – 10pm
CPD Programme:	6 PDU, 6 STU(Structural) (To be confirm)
Course Fee*:	\$246.10 (IES Members) \$288.90 (Non Members)
Venue:	IES Academy@Jurong East 80 Jurong East Street 21 #04-10 Devan Nair Institute

***Inclusive of 7% GST**

***Certificate of Attendance will only be given to participants with 100% attendance.**

Course Outline

Concrete Defects and Testing Techniques

Concrete Defects

1. Corrosion of steel in reinforced concrete
 - a. 2 stages corrosion process
 - b. Carbonation process
 - c. Chloride transport and attack mechanism

2. Defects in hardened concrete
 - a. Honeycombing
 - b. Surface blowholes
 - c. Segregation and grout loss
 - d. Rusting and lack of cover

3. Chemical attack on concrete
 - a. Acid attack
 - b. Sulphate attack
 - c. Alkali-aggregate reaction

4. Cracks
 - a. Structural cracks
 - b. Non-structural cracks

Concrete Testing Techniques

1. Strength testing
 - a. Core testing
 - b. Surface hardness test (rebound hammer)
 - c. Ultrasonic pulse velocity test
 - d. Penetration resistance test

2. Test associated with durability
 - a. Cover measurement
 - b. Half-cell potential meter
 - c. Carbonation test
 - d. Permeability test

3. Chemical analysis
 - a. Cement type
 - b. Cement content
 - c. Chloride content
 - d. Sulphate content

Structural Inspection and Repair Techniques

Course Outline

1. Objective for appraisal of structures
2. Inspection process
3. Recording of results

Repair & Strengthening Methods

1. Requirements of repair system
2. Repair materials
3. Methods of repair
4. Sealing cracks

5. Steel plate bonding
6. Bonding with composite materials

Fire-Damaged Structures

1. Effects of fire
2. Assessment of fire-damaged structures
3. Recommendations

Course Schedule

Time	Topics
2.30pm - 3.00pm	Registration
3.00pm - 3.45pm	Corrosion of steel in reinforced concrete
3.45pm - 4.00pm	Afternoon break
4.00pm - 5.00pm	Defects in Hardened Concrete / Chemical Attack on Concrete/Cracks
5.00pm - 5.45pm	Strength Testing
5.45pm - 6.15pm	Test Associated with Durability / Chemical Analysis
6.15pm - 7.00pm	Dinner
7.00pm - 8.00pm	Structural Inspection
8.00pm - 9.00pm	Repair & Strengthening Methods
9.00pm - 10.00pm	Fire-Damaged Structures
10.00pm	End of programme

REGISTRATION FORM

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Date: 26 February 2019, Tuesday
Time: 3pm – 10pm
Duration: 6 hours
Venue: (to be confirm) IES Academy@Jurong East
80 Jurong East Street 21 #04-10
Devan Nair Institute (e2i) S(609607)
Course Fee (incl. GST): \$246.10(IES Members); \$288.90 (Non Members)
CPD Programme: 6PDU / 6 STU(Structural) – To be confirm
Course Coordination: Sean Ng
Contact: 6460 4248 | Email: sean.ng@iesnet.org.sg
Closing Date for Registration: 19 February 2019 or till class is full (whichever comes first)

Participant's Details:

Name _____ NRIC/FIN: _____
(as per NRIC): _____
Company: _____ Designation: _____
Address: _____
Postal Code: _____
Tel: _____ Fax: _____
Email: _____

IES Member No: Non Member RTO/RE/PE No:

Please indicate: Sponsored by Company Special Meal Request ~ **Vegetarian**
(no egg, garlic and onion)

Contact Person (HR/Accounts Department)

Name: _____ Designation: _____
Mailing Address _____
(for invoice): _____ Tel: _____ Fax: _____
Email: _____
Payment: Cash/Nets/Cheque No: _____ Amount: _____

- Cheque to be made payable to '**ENGINEERS SINGAPORE PTE LTD**'
- Written notice via email to course coordination is required for Cancellation or Withdrawal from Course, 7 working days prior to course date
- Course fee is inclusive of 7% GST, course materials and Halal refreshments
- Certificate of Attendance will be issued to participants with 100% Attendance
- No-Show of participant would not be accepted as reason for withdrawal or cancellation from course. Thus course fee is chargeable
- One-time replacement of participant is allowed with written notice to course coordinator, 3 working days prior to course date. Fee top-up is applicable between IES member's course fee and non-member's

Acceptance of Terms & Conditions for Registration of IES Academy Courses / Events

I have read, deemed understood and accept the Terms & Conditions of IES Academy courses and events.

Name: _____

Signature: _____ Date: _____

TERMS & CONDITIONS COURSE REGISTRATION

Registration

Any registration, whether on-line or fax will be on a ***first-come-first-served basis*** and will only be confirmed upon receipt of full payment by Engineers Singapore Pte Ltd unless otherwise invoice to company.

All registrations must be submitted with duly completed registration form.

Closing Date & Payment

The closing date of the event will be 1 week prior to event commencement date or earlier. Cheques should be crossed 'A/C payee only' and made payable to '**Engineers Singapore Pte Ltd**', with the ***Title of The Event indicated clearly written on the back of the cheques***, and submitted with the duly completed registration forms to:

Attn: Sean Ng
IES Academy@Jurong East
Devan Nair Institute for Employment and Employability,
80 Jurong East Street 21, #04-10
Singapore 609607

Confirmation of Registration

Confirmation of registration will be given at least 1 week before the commencement date via email. ***If you do not receive the said confirmation email, you are required to contact IESA at 6463 9211 during office hours.***

IESA reserves the right to allow only confirmed registrants to attend the Event.

Withdrawals/Refunds of Fees

Written notice ***at least 1 week in advance*** before the commencement of the event
Full course fee shall be refunded subjected to 4.5% transaction charge.

➤ **NO** refund otherwise.

No show of participant would not be accepted as a valid reason for withdrawal/refund.

One time replacement is allowed only if written notice is received by us at least 1 week before the commencement of the event. However, when an IES member is replaced by a non-member, the participant has to pay the difference in the relevant fees.

Cancellation/Postponement

Changes in Venue, Dates, Time and Speakers for the Events can occur due to unforeseen circumstances. IES reserves the full rights to cancel or postpone the Event under such circumstances without prior reasons. Every effort, however, will be made to inform the participants or contact person of any cancellation or postponement.

Fees will be refunded in FULL if any Event is cancelled by IESA.

UTAP (Union Training Assistance Programme) is an individual skills upgrading account especially for NTUC members. As a member, you enjoy UTAP funding at 50% of the unfunded course fee capped at \$250 every year.

SkillsFuture Credit (SFC) "All Singaporeans aged 25 and above can use their \$500 SkillsFuture Credit from the government to pay for a wide range of approved skills-related courses. Visit the SkillsFuture Credit website (www.skillsfuture.sg/credit) to choose from the courses available on the SkillsFuture Credit course directory."

Please visit [here](#) for more information on SFC & UTAP claim.

PERSONAL DATA PROTECTION ACT

I consent to the processing by Institution of Engineers, Singapore of personal data, including sensitive personal data as defined in the Data Protection Act 2014, about me for the proper purposes of Institution of Engineers, Singapore (IES). I undertake to observe the provisions of the Data Protection Act 2014 in relation to any personal data I may myself hold and process as a Members of Institution of Engineers, Singapore, and I agree to indemnify Institution of Engineers, Singapore from liability for any claims or damages that may arise from the processing of this data. For more information kindly refer to [here](#).

Enquiries

For further enquiries, please contact IESA general office at Tel: 6463 9211.