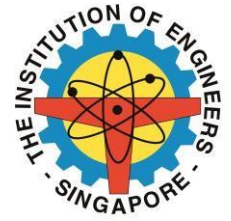


CONCRETE INSPECTION & REPAIR SERIES

**** SUPPORTED BY SFC**



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.

OBJECTIVES

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.

TRAINERS' 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.

DETAILS

Date : 17 August 2020

Time : 3:00PM-10:00PM

Duration: 6 hours (1 day training)

Venue : IES Academy@Jurong East

80 Jurong East Street 21, #04-10 Devan Nair Institute for Employment and Employability Singapore 609607

CPD : 6 STU (Structural) / 6 PDU / 6 CEng (PDU) –All are confirmed

Fee (include GST):

IES Member: \$246.10

Non-member: \$288.90

Target Audience

- Resident Engineers (REs)
- Resident Technical Officers (RTO)

IES Academy@Jurong East

80 Jurong East Street 21, #04-10

Devan Nair Institute for Employment and Employability

Singapore 609607

Contact Person: Lee Jing Min (Ms)

DID: 6460 4247 | Main Line: 6463 9211

E-mail: jingmin.lee@iesnet.org.sg

COURSE OUTLINE

CONCRETE DEFECTS & TESTING TECHNIQUES (3:00PM – 6:00PM)

CONCRETE DEFECTS

Corrosion of steel in reinforced concrete

2 stages corrosion process

- Carbonation process
- Chloride transport and attack mechanism

Defects in hardened concrete

- Honeycombing
- Surface blowholes
- Segregation and grout loss
- Rusting and lack of cover

Chemical attack on concrete

- Acid attack
- Sulphate attack
- Alkali-aggregate reaction

Cracks

- Structural cracks
- Non-structural cracks

CONCRETE TESTING TECHNIQUES

Strength testing

- Core testing
- Surface hardness test (rebound hammer)
- Ultrasonic pulse velocity test
- Penetration resistance test

Test associated with durability

- Cover measurement
- Half-cell potential meter
- Carbonation test
- Permeability test

Chemical Analysis

- Cement type
- Cement content
- Chloride content
- Sulphate content

COURSE OUTLINE

STRUCTURAL INSPECTION AND REPAIR TECHNIQUES (7:00PM – 10:00PM)

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

REPAIR & STRENGTHENING METHODS

- Requirements of repair system
- Repair materials
- Methods of repair
- Sealing cracks
- Steel plate bonding
- Bonding with composite materials

FIRE-DAMAGED STRUCTURES

- Effects of fire
- Assessment of fire-damaged structures
- Recommendations

COURSE SCHEDULE

Timing:	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

CONCRETE INSPECTION & REPAIR SERIES 43RD RUN

**** Supported by SFC**

Date: 17 August 2020 (Monday)

Time: 3:00PM - 10:00PM

Venue: IES Academy@Jurong East

80 Jurong East Street 21, #04-10 Devan Nair Institute for Employment and Employability Singapore 609607

Fee (include GST): IES Member: \$246.10

Non-member: \$288.90

Please register online/email the completed form by **10/08/2020 before 3pm** to:

Contact Person: Lee Jing Min (Ms)
IES Academy@Jurong East
80 Jurong East Street 21, #04-10
Devan Nair Institute for Employment and Employability
Singapore 609607
Tel: **6463 9211**

Participant Details

*Name : _____ *NRIC : _____
(Please written in BLOCK Letter)

Company : _____ *Designation : _____

*Address 1 : _____
(For mailing of invoice and receipt)

*Postal Code : _____ Sex : _____ Male / Female

*Contact No. : _____ Fax : _____

*Your Email : _____
(For sending of confirmation email, preferable personal unless companysponsored)

Please indicate: IES members IES M'ship No.: _____ P.E. No.: _____ (if applicable)

Non-members Affiliated member: _____

Sponsored by company (Please indicate the Contact person detail)

Contact Person Details (if different from participant)

#Name : _____ #Designation : _____

#Contact No. : _____ Fax : _____

#Email : _____

Payment Details

Bank / Cheque No : _____ Amount (\$) : _____

~ All Fees are inclusive of 7 % GST.

~ Cheque make payable to Engineers Singapore Pte Ltd.

Acceptance of Terms and Conditions for Registrations of IES Academy's Events

I agree to abide by the Terms and Conditions for Registration of IES Academy's Events.

Name : _____ Signature : _____

***Mandatory entry**

#Compulsory Entry for participant who choose to be INVOICE to your company

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

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:

Attention to: Lee Jing Min (Ms.)
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.

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."

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.