COURSE OVERVIEW SE0495
Advanced Inspection, Assessment & Repair of Concrete Structure

Course Title
Advanced Inspection, Assessment & Repair of Concrete Structure

Course Date/Venue
Please see page 3

Course Reference
SE0495

Course Duration/Credits
Five days/3.0 CEUs/30 PDHs

Course Description

This practical and highly-interactive course includes various practical sessions and exercises. Theory learnt will be applied using our state-of-the-art simulators.

This course is designed to provide participants with a detailed and up-to-date overview of the Advanced Inspection, Assessment and Repair of Concrete Structure. It covers the concrete structure types and materials and design principles of concrete structures; the mechanisms of concrete deterioration, early signs of damage and aging and codes and standards in concrete assessment and condition assessment process; the visual inspection and documentation, nondestructive testing (NDT) methods and semi-destructive testing techniques; the reinforcement condition assessment and the durability and service life evaluation; and the structural health monitoring (SHM).

During this interactive course, participants will learn the root cause analysis of structural defects; the selection criteria for repair materials and corrosion control methods; the structural strengthening techniques, quality control in repair projects and concrete surface preparation techniques; the injection and crack sealing technologies and rehabilitation of large structures; the execution planning and sequencing and safety in concrete repair works; the cost estimation and budgeting for repairs and assessment report preparation; the structure and content of condition reports, visuals, grading severity and urgency of repairs and recommendations and prioritization; the performance evaluation of repairs and the use of drones and AI in inspections; and the sustainable and green repair practices.

Course Objectives

Upon the successful completion of this course, each participant will be able to:-

- Apply and gain an advanced knowledge on inspection, assessment and repair of concrete structure
- Discuss concrete structure types and materials including design principles of concrete structures and mechanisms of concrete deterioration
- Recognize the early signs of damage and aging, codes and standards in concrete assessment and condition assessment process
- Carryout visual inspection and documentation, nondestructive testing (NDT) methods and semi-destructive testing techniques
- Apply reinforcement condition assessment, durability and service life evaluation and structural health monitoring (SHM)
- Employ root cause analysis of structural defects, selection criteria for repair materials, repair materials and corrosion control methods
- Illustrate structural strengthening techniques, quality control in repair projects and concrete surface preparation techniques
- Apply injection and crack sealing technologies including rehabilitation of large structures and execution planning and sequencing
- Implement safety in concrete repair works and cost estimation and budgeting for repairs
- Apply assessment report preparation covering structure and content of condition reports, visuals, grading severity and urgency of repairs and recommendations and prioritization
- Carryout performance evaluation of repairs including the use of drones and AI in inspections and sustainable and green repair practices

Exclusive Smart Training Kit - H-STK®

*Participants of this course will receive the exclusive "Haward Smart Training Kit" (**H-STK®**). The **H-STK®** consists of a comprehensive set of technical content which includes **electronic version** of the course materials conveniently saved in a **Tablet PC**.*

Who Should Attend

This course provides a basic overview of all significant aspects and considerations of advanced inspection, assessment and repair of concrete structure for civil engineers, structural engineers, inspection and quality control personnel, construction managers, maintenance managers, engineering consultants, designers of concrete structures, concrete repair contractors, repair technicians, asset owners (e.g., infrastructure, industrial facilities), facility managers and other technical staff.

Course Date/Venue

Session(s)	Date	Venue
1	June 15-19,2025	Tamra Meeting Room, Al Bandar Rotana Creek, Dubai, UAE
2	September 07-11, 2025	Al Buraimi Meeting Room, Sheraton Oman Hotel, Muscat, Oman
3	January 25-29, 2026	Al Buraimi Meeting Room, Sheraton Oman Hotel, Muscat, Oman
4	April 26-30, 2026	Tamra Meeting Room, Al Bandar Rotana Creek, Dubai, UAE

Training Methodology

All our Courses are including **Hands-on Practical Sessions** using equipment, State-of-the-Art Simulators, Drawings, Case Studies, Videos and Exercises. The courses include the following training methodologies as a percentage of the total tuition hours:-

30% Lectures
20% Practical Workshops & Work Presentations
30% Hands-on Practical Exercises & Case Studies
20% Simulators (Hardware & Software) & Videos

In an unlikely event, the course instructor may modify the above training methodology before or during the course for technical reasons.

Course Fee

US$ 5,500 per Delegate + **VAT**. This rate includes H-STK® (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

Accommodation

Accommodation is not included in the course fees. However, any accommodation required can be arranged at the time of booking.

Course Certificate(s)

Internationally recognized certificates will be issued to all participants of the course who completed a minimum of 80% of the total tuition hours.

Certificate Accreditations

Haward's certificates are accredited by the following international accreditation organizations: -

- British Accreditation Council (BAC)

  Haward Technology is accredited by the **British Accreditation Council** for **Independent Further and Higher Education** as an **International Centre**. Haward's certificates are internationally recognized and accredited by the British Accreditation Council (BAC). BAC is the British accrediting body responsible for setting standards within independent further and higher education sector in the UK and overseas. As a BAC-accredited international centre, Haward Technology meets all of the international higher education criteria and standards set by BAC.

- The International Accreditors for Continuing Education and Training (IACET - USA)

Haward Technology is an Authorized Training Provider by the International Accreditors for Continuing Education and Training (IACET), 2201 Cooperative Way, Suite 600, Herndon, VA 20171, USA. In obtaining this authority, Haward Technology has demonstrated that it complies with the **ANSI/IACET 2018-1 Standard** which is widely recognized as the standard of good practice internationally. As a result of our Authorized Provider membership status, Haward Technology is authorized to offer IACET CEUs for its programs that qualify under the **ANSI/IACET 2018-1 Standard**.

Haward Technology's courses meet the professional certification and continuing education requirements for participants seeking **Continuing Education Units** (CEUs) in accordance with the rules & regulations of the International Accreditors for Continuing Education & Training (IACET). IACET is an international authority that evaluates programs according to strict, research-based criteria and guidelines. The CEU is an internationally accepted uniform unit of measurement in qualified courses of continuing education.

Haward Technology Middle East will award **3.0 CEUs** (Continuing Education Units) or **30 PDHs** (Professional Development Hours) for participants who completed the total tuition hours of this program. One CEU is equivalent to ten Professional Development Hours (PDHs) or ten contact hours of the participation in and completion of Haward Technology programs. A permanent record of a participant's involvement and awarding of CEU will be maintained by Haward Technology. Haward Technology will provide a copy of the participant's CEU and PDH Transcript of Records upon request.

Course Instructor(s)

This course will be conducted by the following instructor(s). However, we have the right to change the course instructor(s) prior to the course date and inform participants accordingly:

Dr. Andrea Mercalli, PhD, is a **Senior Civil Engineer** with over **30 years** of extensive experience. His wide expertise includes **Concrete Mixing & Testing**, Advanced **Concrete Technology**, **Concrete Structural Material**, **Mixing** & **Handling Concrete**, **Structural Analysis** Calculation, **Structural Engineering**, **Concrete** & **Steel Design**, **Reinforced Concrete Structures**, **Concrete Inspection** & **Repair**, **Damage Assessment** & **Rehabilitation**, **Structured Reliability Analysis**, **Engineering Design**, **Building Preventive Maintenance**, **Cement Properties**, **Admixtures**, **Structural Analysis**, Backfiling & Asphalting, Asphalt Paving Installation, **Road Maintenance** & Safety, **Road Design** Skills, **Construction Engineering**, **Engineering Projects Surveying**, **Land Surveyor**, **GPS** and **Building Seismic Designs**. He is currently the **Materials Manager** of **Autostrade per l'Italia**, where he is in-charge of the **tests** on **all the materials** involved in **Structure** and **highway construction** (bituminous pavement, **concrete**, **reinforcement steel**, maintenance and repair) and **research and development of new materials** and techniques collaborating with several Universities and external institutes. The activity also concerns **peculiar types of structures monitoring**.

Dr. Mercalli is a **Senior Researcher** in the field of **corrosion of concrete reinforcement**, and an **author** of **many papers** in this field. He is an **Expert** in the **monitoring of the corrosion state of reinforcement** by means of chemical, physical and electrochemical techniques.

Dr. Mercalli has a **PhD** and **Bachelor's** degree in **Geological Science** from the **Pavia University**, **Italy** as well as **Post Graduate** degrees in **Acoustic Emission Monitoring** and **Corrosion** in **Concrete Monitoring** from the **Cardiff University**, **UK** and **LA Sapienza University**, **Italy** respectively. He participated to the **European Project BRITE – SMART STRUCTURES** concerning the corrosion monitoring on concrete bridges in Denmark and Italy collaborating with Danish partners and Berlin BAM. Further, he was the **Responsible Scientist** for the project "Monitoring of the Corrosion State in Existing Structures" of European concerted action COST 521 "Corrosion of Steel in Reinforced Concrete Structures" (1998-2002). Moreover, he is a **Certified Instructor/Trainer**, a **Certified Internal Verifier/Assessor/Trainer** by the **Institute of Leadership & Management** (**ILM**) and has conducted numerous courses, seminars, workshops and conferences internationally.

Course Program

The following program is planned for this course. However, the course instructor(s) may modify this program before or during the course for technical reasons with no prior notice to participants. Nevertheless, the course objectives will always be met:

Day 1

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830– 0930	***Concrete Structure Types & Materials*** *Types of Concrete Structures & Applications • Constituents of Concrete & Mix Design Basics • Role of Reinforcement & Prestressing • Common Construction Defects from Poor Materials or Workmanship*
0930 – 0945	*Break*
0945 – 1030	***Design Principles of Concrete Structures*** *Load & Structural Behavior Considerations • Concrete Durability & Service Life Design • Reinforcement Placement & Cover Requirements • Crack Control & Joint Design*
1030 – 1100	***Mechanisms of Concrete Deterioration*** *Chemical Attacks (Sulfate, Chloride, Carbonation) • Physical Deterioration (Freeze-Thaw, Abrasion, Erosion) • Alkali-Silica Reaction (ASR) • Corrosion of Embedded Steel*
1100– 1230	***Early Signs of Damage & Aging*** *Visual Indicators of Structural Distress • Microcracking & Surface Degradation • Common Signs of Spalling & Delamination • Load-Induced Cracking versus Environmental Degradation*
1230 – 1245	*Break*
1245 – 1315	***Codes & Standards in Concrete Assessment*** *ACI, BS, EN, ASTM Standards Overview • Durability & Assessment-Related Provisions • Requirements for Repair Design Documentation • Inspection Frequency & Compliance Obligations*
1315– 1330	***Basics of Condition Assessment Process*** *Importance & Scope of Assessment • Phases: Planning, Field Investigation, Reporting • Asset Inventory & Prioritization Strategies • Risk-Based Assessment Approach*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day One*

Day 2

0730 – 0830	***Visual Inspection & Documentation*** *Structured Inspection Checklist • Tools & Technologies (Drones, Cameras, Tablets) • Identifying Crack Types & Locations • Mapping of Damage for Severity Classification*
0830– 0930	***Nondestructive Testing (NDT) Methods*** *Rebound Hammer Test for Surface Hardness • Ultrasonic Pulse Velocity (UPV) for Internal Flaws • Ground Penetrating Radar (GPR) for Rebar Mapping • Infrared Thermography for Moisture Intrusion*
0930 – 0945	*Break*

0945 – 1130	***Semi-Destructive Testing Techniques*** *Core Extraction & Compressive Strength Testing • Pull-Off & Pull-Out Tests • Penetration Resistance Tests • Carbonation Depth Measurement*
1130 – 1230	***Reinforcement Condition Assessment*** *Corrosion Potential Mapping (Half-Cell Potential) • Cover Meter & Rebar Locator Techniques • Chloride Profiling in Concrete • Use of Linear Polarization Resistance (LPR)*
1230 – 1245	*Break*
1245 – 1315	***Durability & Service Life Evaluation*** *Evaluating Permeability & Porosity • Life Prediction Models & Degradation Curves • Environmental Exposure Class Analysis • Indicators of Service Life Reduction*
1315– 1330	***Structural Health Monitoring (SHM)*** *Embedded Sensors & Wireless Systems • Real-Time Monitoring Tools • Applications in Critical Structures • Data Interpretation & Integration*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day Two*

Day 3

0730 – 0830	***Root Cause Analysis of Structural Defects*** *Analytical Approach to Damage Origin • Interaction of Multiple Degradation Mechanisms • Environmental versus Operational Factors • Review of Historical Repair Records*
0830– 0930	***Selection Criteria for Repair Materials*** *Compatibility with Substrate • Mechanical & Durability Requirements • Shrinkage, Bond & Permeability Properties • Environmental & Sustainability Considerations*
0930 – 0945	*Break*
0945 – 1130	***Repair Materials Overview*** *Cementitious Repair Mortars & Grouts • Polymer-Modified & Resin-Based Materials • Fiber-Reinforced Composites • Crack Injection Resins (Epoxy, Polyurethane)*
1130 – 1230	***Corrosion Control Methods*** *Cathodic Protection (Sacrificial & Impressed) • Surface-Applied Corrosion Inhibitors • Re-Alkalization & Desalination Treatments • Coatings & Membranes for Protection*
1230 – 1245	*Break*
1245 – 1315	***Structural Strengthening Techniques*** *Fiber Reinforced Polymer (FRP) Wrapping • Jacketing with Steel or Concrete • External Post-Tensioning Systems • Load Redistribution Techniques*
1315– 1330	***Quality Control in Repair Projects*** *Material Performance Testing • Application Technique Validation • Inspection & Acceptance Criteria • Role of Mock-Up & Pilot Repairs*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day Three*

Day 4

0730 – 0830	***Concrete Surface Preparation Techniques*** *Surface Cleaning Methods (Waterjet, Grit Blasting) • Removal of Damaged Concrete • Surface Profiling Standards (CSP Levels) • Bonding Agent Application Techniques*
0830– 0930	***Injection & Crack Sealing Technologies*** *Epoxy Injection for Structural Cracks • Polyurethane for Water-Bearing Cracks • Low & High Pressure Injection Methods • Crack Stitching & Sealing*
0930 – 0945	*Break*
0945 – 1130	***Rehabilitation of Large Structures*** *Bridge Decks & Columns • Retaining Walls & Tunnels • Water-Retaining Structures & Tanks • Marine Concrete Structures*
1130 – 1230	***Execution Planning & Sequencing*** *Staging & Access Methods (Scaffolding, Lifts) • Weather & Temperature Considerations • Work Timing & Curing Schedules • Coordination with Ongoing Operations*
1230 – 1245	*Break*
1245 – 1315	***Safety in Concrete Repair Works*** *Working at Height Precautions • PPE & Chemical Handling • Confined Space Considerations • Structural Stability During Repair*
1315– 1330	***Cost Estimation & Budgeting for Repairs*** *Quantifying Materials & Labor • Allowances for Access & Protection • Risk & Contingency Factors • Lifecycle Cost Comparison of Repair Options*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day Four*

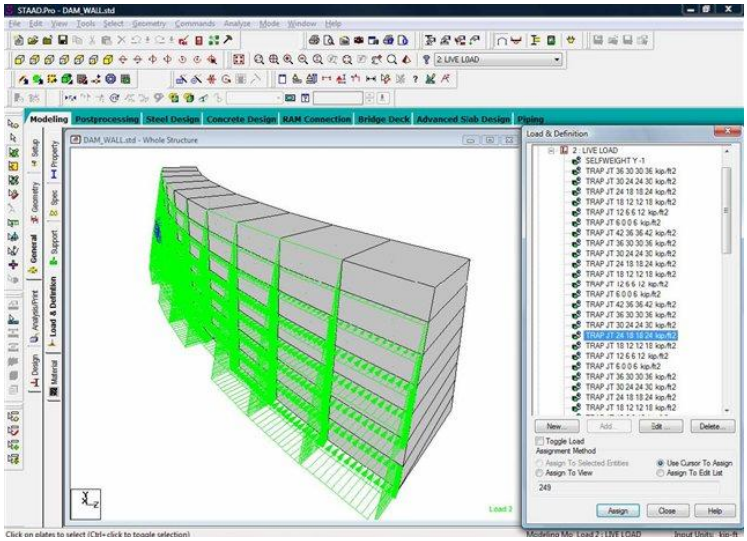
Day 5

0730 – 0830	***Assessment Report Preparation*** *Structure & Content of Condition Reports • Visuals: Photos, Maps, Defect Logs • Grading Severity & Urgency of Repairs • Recommendations & Prioritization*
0830– 0930	***Case Studies of Major Repair Projects*** *High-Rise Façade Repair • Dam Concrete Rehabilitation • Bridge Column Strengthening • Underground Reservoir Sealing*
0930 – 0945	*Break*
0945 – 1100	***Performance Evaluation of Repairs*** *Post-Repair Testing & Monitoring • Service Life Validation • Lessons Learned & Failure Analysis • End-User Satisfaction & Function Validation*
1100 – 1230	***Use of Drones & AI in Inspections*** *Drone-Based Imaging & Defect Detection • AI-Powered Pattern Recognition • Predictive Maintenance Tools • Integration with BIM Systems*
1230 – 1245	*Break*
1245 – 1300	***Sustainable & Green Repair Practices*** *Low-Carbon Repair Materials • Reuse & Retrofitting versus Replacement • Sustainable Demolition & Recycling • LEED & Other Green Certifications*

1300– 1345	***Final Workshop & Group Presentation*** *Real Scenario Assessment (Team Task) • Proposed Repair & Strengthening Strategy • Stakeholder Presentation Techniques • Group Feedback & Course Wrap-Up*
1345 – 1400	***Course Conclusion*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Course Topics that were Covered During the Course*
1400 – 1415	***POST-TEST***
1415 – 1430	*Presentation of Course Certificates*
1430	*Lunch & End of Course*

Simulators (Hands-on Practical Sessions)

Practical sessions will be organized during the course for delegates to practice the theory learnt. Delegates will be provided with an opportunity to carryout various exercises using one of our state-of-the-art simulator "STAAD-PRO".



STAAD-PRO SOFTWARE

Course Coordinator

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