COURSE OVERVIEW SE0095
Advanced Materials for Construction and Repair of Concrete

Course Title
Advanced Materials for Construction and Repair of Concrete

Course Date/Venue
May 25-29, 2025/Meeting Plus 9, City Centre Rotana, Doha, Qatar

Course Reference
SE0095

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

Course Description

This practical and highly-interactive course includes practical sessions where participants will visit reinforced concrete structures. Practical sessions will be performed in order to apply the theory learnt in the class.

While reinforced concrete is a durable material used for a wide range of construction projects in civil engineering, certain factors must be considered during its design, construction, and maintenance. This includes a variety of conditions impacting strength and performance relevant to specific structural systems, and the application of numerous codes. This course discusses both traditional and new systems in concrete structures, outlines the advantages and disadvantages of each system and its importance to construction durability and reliability, and presents the latest advanced materials and construction techniques currently used in reinforced concrete structures.

This course is designed to provide delegates with a detailed and up-to-date overview of advanced materials for construction and repair of concrete. It covers the concrete strength, dimensional stability and durability of concrete; the classifications, specifications and characteristics of hydraulic cements, aggregates and admixtures; the procedures and methods of proportioning concrete mixtures, concrete curing, testing and controlling concrete quality; the characteristics of various types of concrete; the other advanced concrete technology and the methods of repair and rehabilitation of damaged concrete.

Course Objectives

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

- Apply and gain an advanced knowledge on materials for construction and repair of concrete
- Evaluate and determine concrete strength, dimensional stability and durability of concrete
- Identify the classifications, specifications and characteristics of hydraulic cements, aggregates and admixtures
- Apply the procedures and methods of proportioning concrete mixtures, concrete curing, testing and controlling concrete quality
- Differentiate and identify the characteristics of various types of concrete such as structural light weight concrete, high-strength concrete, self-consolidating concrete, high performance concrete, shrinkage-compensating concrete and fiber-reinforced concrete
- Discuss other advanced concrete technology including polymer concrete, radiation shielding concrete, mass concrete and roller-compacted concrete
- Carryout the methods of repair and rehabilitation of damaged concrete

Who Should Attend

This course provides an overview of all significant aspects and considerations of advanced materials for construction and repair of concrete for civil engineers, structural engineers, material specialists, quality control and quality assurance experts, construction supervisors, engineers and contractors.

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**.*

Training Methodology

This interactive training course includes the following training methodologies as a percentage of the total tuition hours:-

30% Lectures
20% Workshops & Work Presentations
30% Case Studies & Practical Exercises
20% Software, Simulators & Videos

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

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

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**. 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 Fee

US$ 6,000 per Delegate. This rate includes H-STK® (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

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:

Mr. Steve Magalios, MSc, BSc, is a **Survey & Pipeline Engineer** with over **30 years** of extensive **On-shore/Offshore** experience in the **Oil & Gas**, **Construction**, **Refinery** and **Petrochemical** industries. His expertise widely covers in the areas of **Reinforced Concrete Structures**, **Concrete Structure Assessment**, **Concrete Monitoring Techniques**, **Damage Assessment**, **Civil Engineering Design**, **Civil Building Maintenance**, **Structural Reliability Engineering**, **Materials & Methods for Construction & Repair**, **Reinforced Concrete Structures Protection**, **Geosynthetics & Ground Improvement Methods**, **Blueprint Reading**, **Blue Print Interpretation**, **Blue Print Documentation**, **Drafting & Interpretation**, Mechanical **Drawings**, **P&ID**, **Diagrams**, **Design Drawing** Interpretation, **Flow Diagram** Symbols, **Land Surveying & Property Evaluation**, **Drawing Interpretation**, **Cartographic** Representation, Soil Classification, **Cadastral Surveying** & Boundary Definition, **Project Engineering** & Design, **Construction** Management, **Construction** Supervision, **Project Planning** & Execution, **Site Management**, **Site Supervision**, Effective **Resource Management**, **Project Evaluation**, **FEED** Management, **EPC Projects** Design, **Engineering Management** & Coordination, Formulating **Strategies**, **Project Management** & Implementation, **Project Completion & Workover**, **Strategic Planning** Activities, Field Inspections, Quality Control and Team Management. He is also well-versed in Lean Gas, Sour Gas, Condensate, **Compressors**, **Pumps**, Flare Knockout Drum, Block **Valve** Stations, New Slug Catcher, Natural **Gas Pipeline** & Network, Scraper Traps, Burn Pits, Fibre Optic Cable, Control Rooms, SCADA System, Risk Assessment, HSE Plan & Procedures, Quality Plan & Procedures Assessment & Control, Safety & Compliance Management, Permit-to-Work Issuer, ASME, API, ANSI, ASTM, BS, NACE, ARMCO & KOC Standards, MS Office tools, AutoCAD, GIS, ArcInfo, ArcView, Autodesk Map and various programming languages such as FORTRAN, BASIC and AUTOLISP. He is currently the **Construction Team Leader & Lead Pipeline Engineer** of **Penspen International Limited**, wherein he is responsible in overseeing the implementation of health, safety, environment system as well as quality assurance and quality control system of the projects.

During his career, Mr. Magalios has gained his expertise and thorough practical experience through challenging positions such as a **Project Manager**, Deputy **PMS Manager**, **Project Site Construction Manager**, **Environmental Auditor**, **Supervision Head**, **Onshore & Offshore Engineer**, **Project Construction Lead Supervising Engineer**, **Lead Site Engineer**, **Senior Site Engineer**, **Chartered Professional Surveyor Engineer**, **Lead Engineer**, Contractor, Regional Planner, R.O. W. Coordinator and Site Representative from various international companies such as Eptisa Servicios De Ingenieria S.L., J/V Karayiannis S.A. – Intracom Constructions S.A, Ergaz Ltd., Elpet Valkaniki S. A. – Asprofos S.A., J/V Depa S.A. / Ple Hellas Ltd, Strabo S.A., just to name a few.

Mr. Magalios has **Master** and **Bachelor** degrees in **Surveying Engineering** from the **University of New Brunswick**, **Canada** and the **National Technical University of Athens**, **Greece**, respectively. He has further obtained a Level 4B Certificates in Project Management from the National & Kapodistrian University of Athens, Greece and Environmental Auditing from the Environmental Auditors Registration Association (EARA). Moreover, he is a **Certified Instructor/Trainer**, a **Chartered Engineer** of Technical Chamber of Greece and has delivered numerous trainings, workshops, seminars, courses 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: ***Sunday, 25th of May 2025***

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0930	***Overview of Concrete*** *Formation of Portland Cement • Portland Cement: Composition • Individual Cement Compounds • Cement Paste • Models of Hydrated Cement • Concrete Properties • Durability of Concrete*
0930 – 0945	*Break*
0945 – 1100	***Concrete Strength and Dimensional Stability*** *Strength-Porosity Relationship • Failure Modes in Concrete • Compressive Strength and Factors Affecting It • Behavior of Concrete Under Various Stress States • Types of Deformations & Their Significance • Elastic Behavior • Drying Shrinkage & Creep • Thermal Shrinkage • Thermal Properties of Concrete • Extensibility & Cracking*
1100 – 1215	***Durability of Concrete*** *Water as an Agent of Deterioration • Permeability • Classification of the Causes of Concrete Deterioration • Surface Wear • Crystallization of Salts in Pores • Frost Action • Effect of Fire • Deterioration of Concrete by Chemical Reactions • Reactions Involving the Formation of Expansive Products • Sulfate Attack • Alkali-Aggregate Reaction • Hydration of Crystalline MgO and CaO • Corrosion of Embedded Steel in Concrete • Development of Holistic Model of Concrete Deterioration • Concrete in the Marine Environment*
1215 – 1230	*Break*
1230 – 1420	***Hydraulic Cements*** *Hydraulic & Non Hydraulic Cements • Portland Cement • Hydration of Portland Cement • Heat of Hydration • Physical Aspects of the Setting & Hardening Process • Effect of Cement Characteristics on Strength & Heat of Hydration • Types of Portland Cement • Special Hydraulic Cements • Trends in Cement Specifications*
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: ***Monday, 26th of May 2025***

0730 – 0930	***Aggregates*** *Classification & Nomenclature • Natural Mineral Aggregates • Light Weight Aggregate • Heavy Weight Aggregate • Blast-furnace Slag Aggregate • Aggregate from Fly Ash • Aggregates from Recycled Concrete & Municipal Waste • Aggregate Production • Aggregate Characteristics & their Significance*
0930 – 0945	*Break*

0945 – 1100	***Admixtures*** *Nomenclature, Specifications And Classifications • Surface-Active Chemicals • Set-Controlling Chemicals • Mineral Admixtures*
1100 – 1215	***Proportioning Concrete Mixtures*** *General Considerations • Specific Principles • Procedures • Sample Computations • ACI tables in the Metric System • Proportioning of High-Strength and High-Performance Concrete Mixtures • Methods of Determining Average Compressive Strength from the Specified Strength*
1215 – 1230	*Break*
1230 – 1420	***Concrete at Early Age*** *Batching, Mixing and Transport • Placing, Compacting, and Finishing • Concrete Curing and Formwork Removal • Workability • Slump Loss • Segregation and Bleeding • Early Volume Changes • Setting Time • Temperature of Concrete • Testing and Control of Concrete Quality • Early Age Cracking in Concrete*
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: ***Tuesday, 27th of May 2025***

0730 – 0930	***Non-Destructive Testing Methods*** *Surface Hardness Method • Penetration Resistance Techniques • Pullout Tests • Maturity Method • Assessment of Concrete Quality from Absorption and Permeability Tests • Stress Wave Propagation Methods • Electrical Methods • Electrochemical Methods • Electro Magnetic Methods • Tomography of Reinforced Concrete*
0930 – 0945	*Break*
0945 – 1100	***Structural Light Weight Concrete*** *Definition and Specifications • Mix-Proportioning Criteria • Properties • Applications*
1100 – 1215	***High-Strength Concrete*** *A Brief History of Development • Definition • Significance • Materials • Mixture Proportioning • Microstructure • Properties of Fresh and Hardened Concrete • High-Strength, Light Weight Aggregate Concrete*
1215 – 1230	*Break*
1230 – 1420	***Self-Consolidating Concrete*** *Definition and Significance • Brief History of Development • Materials and Mixture Proportions • Properties of SCC • Applications*
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: Wednesday, 28th of May 2025

0730 – 0930	***High-Performance Concrete*** *A Brief History of Development • ACI Definition and Commentary on High-Performance Concrete • Field Experience • Applications • High-Performance, High-Volume Fly Ash Concrete*
0930 – 0945	*Break*
0945 – 1100	***Shrinkage-Compensating Concrete*** *Definition and the Concept • Significance • Materials and Mix Proportions • Properties • Applications*
1100 – 1215	***Fiber-Reinforced Concrete*** *Definition and Significance • Toughening Mechanism • Materials and Mix Proportioning • Properties • Development of Ultra-High-Performance Fiber-Reinforced Composites • Applications*
1215 – 1230	*Break*
1230 – 1420	***Other Advanced Concrete Technology*** *Polymer Concrete • Radiation Shielding Concrete • Mass Concrete • Roller-Compacted Concrete • High Strength Precision Concrete for Structural 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 Four*

Day 5: Thursday, 29th of May 2025

0730 – 0930	***Repair & Rehabilitation of Damaged Concrete*** *Protection Against Aggressive Substances • Moisture Control of Concrete • Repair Materials Properties • Repair Materials Types*
0930 – 0945	*Break*
0945 – 1100	***Repair & Rehabilitation of Damaged Concrete (cont'd)*** *Repair Methods & Techniques • Technical Specifications • Replacement of Damaged Concrete • Strengthening of Building Components • Epoxy bonding Agents for Repairs of Concrete • Cement-based Flexible Coatings • Concrete Crack-sealing resins*
1100 – 1215	***Repair & Rehabilitation of Damaged Concrete (cont'd)*** *Improvement of the Physical Resistance of Concrete • Improvement of the Chemical Resistance of Concrete • Restoring Reinforcement Passivity • Epoxy-based Zinc-rich Primer for Steel Protection*
1215 – 1230	*Break*
1230 – 1345	***Repair & Rehabilitation of Damaged Concrete (cont'd)*** *Control of Cathodic Areas of Reinforcement • Cathodic Protection of Reinforcement • Control of Anodic Areas of Reinforcement*
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*

Practical Sessions/Site Visit

Site visit will be organized during the course for delegates to practice the theory learnt:-

Course Coordinator

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