5-Day Cement Industry Training Course
In

CEMENT AND CONCRETE TESTING AND EQUIPMENT (SITE VISIT)

Cairo - Egypt, 27 Apr. – 01 May 2026

COURSE LEVEL: INTERMEDIATE

COURSE OVERVIEW:

The rigorous testing of cement and concrete is the primary safeguard for structural integrity and longevity in the construction industry. This course defines the standardized physical and chemical testing procedures required to verify that materials meet international quality benchmarks such as ASTM and EN standards. By understanding the correlation between laboratory results and field performance, participants will gain the expertise needed to ensure material reliability.

The scope of this training encompasses the full range of laboratory operations, from the initial sampling of cement to the destructive and non-destructive testing of hardened concrete. It covers the calibration and maintenance of specialized equipment, including compression machines, Vicat apparatus, and blaine permeability testers. Furthermore, the course addresses the statistical analysis of test data to identify trends in quality and to manage production variances effectively.

Coverage includes detailed modules on the chemical analysis of cementitious binders, the workability of fresh concrete, and the durability testing of cured specimens. Through an immersive site visit to a certified testing facility, participants will observe the execution of strength tests, setting time determinations, and fineness measurements. Attendees will learn how to interpret test reports and troubleshoot discrepancies in results to maintain the highest standards of quality assurance.

COURSE OBJECTIVES:

After completion of this course, the participants will be able to:

- Describe the fundamental physical properties of cement and their impact on concrete.
- Operate standard laboratory equipment for cement and concrete testing safely.
- Perform fineness testing using the Blaine air permeability method.
- Determine the normal consistency and setting times of cement pastes.
- Conduct compressive strength tests on mortar cubes and concrete cylinders.
- Analyze the chemical composition of cement through titration and XRF methods.
- Evaluate the workability of fresh concrete using the slump and flow table tests.
- Perform non-destructive testing (NDT) such as Schmidt hammer and ultrasonic pulse velocity.
- Understand the importance of curing conditions on the development of strength.
- Calibrate and maintain testing machinery according to manufacturer specifications.
- Identify the causes of testing errors and implement corrective actions.

- Interpret testing data to ensure compliance with project specifications and codes.

TARGET AUDIENCE:

This course is intended for Quality Control Technicians, Civil Engineers, Laboratory Managers, Construction Supervisors, and Material Inspectors.

TRAINING COURSE METHODOLOGY:

A highly interactive combination of lectures, discussion sessions, and case studies will be employed to maximize the transfer of information, knowledge, and experience. The course will be intensive, practical, and highly interactive. The sessions will start by raising the most relevant questions and motivating everybody to find the right answers. The attendants will also be encouraged to raise more of their questions and to share in developing the right answers using their analysis and experience. There will also be some indoor experiential activities to enhance the learning experience. Course material will be provided in PowerPoint, with necessary animations, learning videos, and general discussions.

The course participants shall be evaluated before, during, and at the end of the course.

COURSE CERTIFICATE:

National Consultant Centre for Training LLC (NCC) will issue an Attendance Certificate to all participants completing a minimum of 80% of the total attendance time requirement.

COURSE OUTLINE / COURSE CONTENT:

MODULE 1: INTRODUCTION TO QUALITY STANDARDS

- Overview of ASTM, EN, and ISO standards for cement and concrete.
- The importance of sampling and sample preparation techniques.
- Understanding the role of a certified laboratory in construction.
- Basic units of measurement and conversion in material testing.
- Safety protocols for laboratory environments and chemical handling.

MODULE 2: CEMENT FINENESS AND DENSITY TESTING

- Principles of the Blaine air permeability test.
- Determining the specific gravity of cement using Le Chatelier flasks.
- Sieve analysis and particle size distribution.
- Correlation between fineness and the rate of hydration.
- Maintenance and calibration of the Blaine apparatus.

MODULE 3: CONSISTENCY AND SETTING TIME OF CEMENT

- Preparing the standard cement paste.
- Using the Vicat apparatus for normal consistency and setting time.
- Factors affecting initial and final setting times.
- Understanding the chemical causes of flash set and false set.
- Environmental impacts on setting time results.

MODULE 4: SOUNDNESS AND EXPANSION TESTING

- The importance of volume stability in cement.
- Le Chatelier expansion test for lime-related soundness.
- The Autoclave expansion test for magnesia-related soundness.
- Identifying the risks of delayed expansion in concrete structures.
- Corrective measures for cement failing soundness tests.

MODULE 5: MECHANICAL STRENGTH TESTING OF MORTAR

- Mixing procedures for standard mortar according to EN 196-1.
- Preparation and vibration of mortar cubes and prisms.
- Curing tank requirements: temperature and humidity control.
- Operating the compression and flexural testing machines.
- Calculating and reporting strength results at 2, 7, and 28 days.

MODULE 6: CHEMICAL ANALYSIS OF CEMENTITIOUS MATERIALS

- Determination of Loss on Ignition (LOI) and insoluble residue.
- Chemical titration for lime, silica, alumina, and iron content.
- Principles of X-ray Fluorescence (XRF) for rapid analysis.
- Testing for sulfate (SO_3) content and its role in expansion.
- Analyzing chloride content for reinforced concrete safety.

MODULE 7: FRESH CONCRETE TESTING ON SITE

- Sampling fresh concrete from mixers and delivery trucks.
- Slump test and slump flow for workability assessment.
- Measuring air content in fresh concrete using the pressure method.
- Determining the temperature and unit weight of concrete.
- Preparing cylinders and cubes for laboratory compression tests.

MODULE 8: DURABILITY AND PERMEABILITY TESTING

- Water absorption and sorptivity tests.
- Rapid Chloride Permeability Test (RCPT).
- Testing for Carbonation depth in existing structures.
- Alkali-Silica Reaction (ASR) testing and mitigation.
- Resistance to sulfate attack and freeze-thaw cycles.

MODULE 9: NON-DESTRUCTIVE TESTING (NDT) METHODS

- Using the Schmidt Rebound Hammer for surface hardness.
- Ultrasonic Pulse Velocity (UPV) for internal defect detection.
- Rebar locating and cover meter surveys.
- Core drilling and testing as a confirmatory method.
- Interpreting NDT results for structural health assessment.

MODULE 10: LABORATORY EQUIPMENT CALIBRATION

- Requirements for traceability in measurement.

- Calibrating load cells and pressure gauges in compression machines.
- Verifying temperatures in drying ovens and curing tanks.
- Software and data management systems for testing labs.
- Organizing a preventive maintenance schedule for lab gear.

MODULE 11: SITE VISIT: PRACTICAL LABORATORY SESSION

- Demonstration of the full cycle of cement testing.
- Hands-on participation in concrete slump and air content tests.
- Viewing the crushing of concrete specimens in real-time.
- Tour of the chemical analysis and XRF facility.
- Review of laboratory documentation and quality logs.

MODULE 12: DATA INTERPRETATION AND FINAL ASSESSMENT

- Statistical control charts for monitoring quality trends.
- Dealing with outlier results and re-testing protocols.
- Final exam covering all testing methodologies.
- Group discussion on real-world quality failure cases.