

## 5-Day Cement Industry Training Course In

### PRODUCT QUALITY CONTROL (SITE VISIT)

Cairo - Egypt, 02 – 06 Nov. 2026

#### COURSE LEVEL: INTERMEDIATE

#### COURSE OVERVIEW:

Product quality control is the systematic process of ensuring that every ton of cement produced meets stringent internal standards and external regulatory requirements. This course defines the protocols for sampling, testing, and data analysis that safeguard the brand reputation and structural integrity of construction projects. It establishes a rigorous framework for quality assurance from the initial raw material quarrying to the final bag of cement.

The scope of this training covers the physical, chemical, and mineralogical testing methods used in a modern cement laboratory. It addresses the frequency of sampling, the use of automated laboratory systems, and the interpretation of statistical process control (SPC) charts. Furthermore, the course explores the relationship between process parameters—such as kiln temperature and mill fineness—and the resulting performance characteristics of the cement in concrete applications.

Coverage includes hands-on experience in the plant's testing facilities, focusing on standard cement grades and specialized products. Participants will explore the methodologies for measuring compressive strength, setting time, expansion, and chemical composition. Through a guided site visit, attendees will observe the integration of real-time analyzers and the role of the central control room in maintaining quality targets throughout the production cycle.

#### COURSE OBJECTIVES:

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

- Define the key quality indicators for different types of cement.
- Implement a robust sampling plan for raw materials and finished products.
- Understand the operation of automated laboratory sampling systems.
- Interpret chemical analysis reports from XRF and XRD equipment.
- Conduct physical tests for Blaine fineness and residue on sieves.
- Perform standard setting time and soundness tests.
- Prepare mortar prisms and conduct compressive strength testing.
- Use Statistical Process Control (SPC) to monitor quality trends.
- Correlate kiln process data with clinker quality results.
- Manage the quality of additives and secondary cementitious materials.
- Troubleshoot quality deviations and implement corrective actions.
- Ensure compliance with international standards such as ASTM and EN.

**TARGET AUDIENCE:**

This course is intended for Quality Control Technicians, Laboratory Supervisors, Production Engineers, and Plant Operators.

**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 CEMENT QUALITY STANDARDS**

- Overview of ASTM C150, C595, and EN 197-1 standards.
- Classification of cement types: OPC, Blended, and Sulfate Resistant.
- Quality as a competitive advantage in the construction market.
- Regulatory compliance and third-party certification.
- Safety protocols for laboratory and plant site visits.

**MODULE 2: SAMPLING THEORY AND PRACTICAL APPLICATION**

- Importance of representative sampling for process control.
- Operation of cross-belt samplers and pneumatic sample transport.
- Manual vs. automatic sampling frequency and locations.
- Sample preparation: Drying, grinding, and pelletizing for analysis.
- Retention and storage of quality control samples.

**MODULE 3: CHEMICAL ANALYSIS FOR PROCESS CONTROL**

- Daily monitoring of Lime Saturation Factor and Silica Ratio.
- Measuring Magnesium Oxide, Alkalis, and Chlorides.
- Role of the X-Ray Fluorescence (XRF) analyzer.
- Interpreting clinker mineralogy via X-Ray Diffraction (XRD).
- Managing "Free Lime" levels for kiln stability.

**MODULE 4: PHYSICAL TESTING OF FINISHED CEMENT**

- Principles of the Blaine air permeability test.
- Measuring residue on 45 and 90-micron sieves.
- Particle Size Distribution (PSD) and its impact on performance.
- Specific gravity and density measurements.
- Color control and consistency in cement production.

#### **MODULE 5: MECHANICAL STRENGTH TESTING (SITE VISIT)**

- Preparation of standard mortar mixes: Sand, water, and cement.
- Casting, vibration, and curing of mortar prisms.
- Testing for 2-day, 7-day, and 28-day compressive strength.
- Understanding the early vs. late strength development.
- Calibration and maintenance of the compression machine.

#### **MODULE 6: SETTING TIME AND VOLUME STABILITY**

- Operation of the Vicat needle for initial and final setting.
- Measuring expansion via the Le Chatelier and Autoclave methods.
- Impact of gypsum types on setting characteristics.
- Managing false set and flash set incidents.
- Temperature and humidity control in the testing room.

#### **MODULE 7: STATISTICAL PROCESS CONTROL (SPC)**

- Building and interpreting control charts (X-bar and R charts).
- Identifying common vs. special cause variations.
- Calculating Process Capability Indices (Cp and Cpk).
- Using data to drive continuous improvement in production.
- Software tools for quality data management.

#### **MODULE 8: QUALITY OF RAW MATERIALS AND FUELS**

- Chemical screening of incoming limestone and clay.
- Managing the quality of coal and alternative fuels.
- Impact of fuel ash on clinker chemical composition.
- Quality control of additives: Fly ash, slag, and gypsum.
- Supplier quality audits and raw material specifications.

#### **MODULE 9: INTERPRETING QUALITY-PROCESS CORRELATIONS**

- Impact of kiln cooling rate on clinker mineral structure.
- Relationship between mill temperature and cement setting.
- Effect of "False Air" in the process on final product quality.
- Collaborative troubleshooting between the Lab and the CCR.
- Optimizing the process for high-strength requirements.

#### **MODULE 10: NON-CONFORMANCE AND DOCUMENTATION**

- Standard Operating Procedures for out-of-spec batches.
- Root cause analysis of quality failures.
- Maintaining the Laboratory Information Management System (LIMS).



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YOUR GATE TO HANDS-ON TRAINING

- Preparing Mill Test Reports (MTR) for customers.
- Course review, site visit discussion, and final assessment.