مركز المستشار الوطني للتدريب
National Consultant Centre For Training
YOUR GATE TO HANDS-ON TRAINING

5-Day Cement Industry Training Course
In

REFRACTORY MATERIALS IN CEMENT INDUSTRY (SITE VISIT)

Cairo - Egypt, 12 – 16 Jan. 2026

COURSE LEVEL: INTERMEDIATE

COURSE OVERVIEW:

Refractory materials are the essential protective linings that allow the cement kiln to operate at temperatures exceeding 1450°C while protecting the steel shell. This course defines the physical types, installation methods, and maintenance requirements of the various bricks and castables used in the pyro-processing line. It establishes the practical knowledge needed to manage one of the plant's most significant recurring maintenance costs.

The scope of this training involves the hands-on inspection of refractory installations in the kiln, preheater tower, and clinker cooler. It covers the mechanical principles of brick lining, including "Keying," "Expansion Joints," and the use of refractory jacks. Furthermore, the course addresses the operational factors that lead to premature refractory wear, such as mechanical "Red Spots," thermal shock, and improper heating-up procedures.

Coverage includes a comprehensive site visit to the refractory storage warehouse and the kiln interior (during a shutdown or using mock-ups). Participants will explore the differences between "Basic" and "High Alumina" materials and the application techniques for "Shotcreting" and "Gunning." Through the study of wear patterns and failure modes, attendees will gain the skills to perform effective "Refractory Audits" and to supervise professional installation crews.

COURSE OBJECTIVES:

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

- Identify the different zones of the kiln and their specific refractory needs.
- Distinguish between refractory "Bricks" and "Monolithics" (Castables).
- Understand the importance of "Taper" and "Shape" in brick installation.
- Describe the process of "Keying-off" a refractory ring.
- Inspect the condition of "Anchors" in castable installations.
- Understand the impact of "Red Spots" on the kiln shell and lining.
- Perform a visual "Refractory Audit" to estimate residual life.
- Describe the "Heating-up Curve" and its role in refractory drying.
- Identify common installation errors that lead to "Brick Falls."
- Understand the safety protocols for working in confined spaces (Kiln).
- Manage the storage and "Shelf Life" of refractory castables.
- Evaluate the quality of "Refractory Joints" and "Mortar" application.

TARGET AUDIENCE:

This course is intended for Maintenance Technicians, Refractory Supervisors, Kiln Operators, and Junior Engineers.

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: TYPES OF REFRACTORY MATERIALS

- Introduction to Basic bricks (Magnesite-Spinel) for the burning zone.
- Understanding High-Alumina and Fireclay bricks for the transition zone.
- Insulating bricks vs. Working lining: Functions and differences.
- Role of Silicon Carbide (SiC) in preventing preheater build-up.
- Physical properties: Cold Crushing Strength (CCS) and Porosity.

MODULE 2: REFRACTORY INSTALLATION EQUIPMENT

- Operation of the "Bricking Machine" (Rig) in the rotary kiln.
- Use of pneumatic "Pogo Sticks" and hydraulic jacks.
- Equipment for "Gunning" and "Shotcreting" castables.
- Mixing tools for monolithics: Paddle mixers vs. Drum mixers.
- Safety inspection of scaffolding and internal kiln lighting.

MODULE 3: KILN BRICKING TECHNIQUES (SITE VISIT)

- The "Screw Jack" method vs. the "Bricking Machine" method.
- Establishing the "Master Line" and ensuring alignment.
- Proper use of "Steel Shims" (Spacers) for expansion.
- The critical step of "Keying" the final brick in a ring.
- Handling "Ovality" and shell deformations during installation.

MODULE 4: CASTABLE AND ANCHOR TECHNOLOGY

- Selection and welding of "V-Anchors" and "Y-Anchors."
- Mixing water requirements and the "Ball Test" for consistency.
- Pouring, vibrating, and "Formwork" for castable repairs.
- Understanding "Gunning" waste (Rebound) and quality control.
- Expansion joints in monolithic linings: Cardboard vs. Foam.

MODULE 5: REFRACTORY IN THE PREHEATER AND COOLER

- Specific challenges of the "Preheater Cyclones" and "Dip Tubes."
- Lining the "Tertiary Air Duct" (TAD) and "Calciner."
- "Bullnose" and "Roof" refractory in the clinker cooler.
- Impact of clinker "Abrasion" on cooler sidewall castables.
- Inspecting for "Anchor Corrosion" and lining "Bulging."

MODULE 6: MANAGING THERMAL SHOCK AND HEATING UP

- Why rapid cooling kills refractory: The "Spalling" effect.
- Managing "Emergency Stops" to protect the kiln lining.
- The "Heating-up Schedule": Time vs. Temperature increments.
- Use of "Tempil Sticks" and thermocouples for monitoring.
- Removing "Curing Water" safely to prevent steam explosions.

MODULE 7: VISUAL AUDIT AND WEAR MONITORING

- Identifying "Mechanical Pinching" and "Cobblestone" wear.
- Recognizing "Chemical Infiltration" and "Glazing" of bricks.
- Using "Shell Scanners" as a diagnostic tool for lining thickness.
- Measuring residual brick thickness during a shutdown.
- Developing a "Refractory Mapping" report for the kiln.

MODULE 8: WAREHOUSE AND MATERIAL LOGISTICS

- Proper pallet storage to prevent moisture absorption.
- Managing "Expiry Dates" for hydraulic-bonded castables.
- Identifying brick shapes (ISO vs. VDZ standards).
- Inventory management for "Emergency Patching" materials.
- Transportation and handling safety for heavy pallets.

MODULE 9: REFRACTORY SAFETY AND CONFINED SPACE

- Hazards of "Brick Falls" and unstable linings.
- Dust control (Crystalline Silica) and PPE requirements.
- Heat stress management during "Hot Repairs."
- Confined space entry (CSE) permits and "Hole Watch" duties.
- Safe removal of "Coating" and "Rings" before inspection.

MODULE 10: SITE VISIT REVIEW AND FINAL ASSESSMENT

- Practical demonstration of brick measurement and layout.
- Inspection of a recently completed refractory repair.

- Discussion of the "Post-Shutdown" performance targets.
- Final quiz on refractory identification and installation.