

5-Day Cement Industry Training Course In

CRUSHING PROCESS (SITE VISIT)

Cairo - Egypt, 27 – 31 July 2026

COURSE LEVEL: BASIC

COURSE OVERVIEW:

The crushing process serves as the initial and most critical mechanical stage in the cement manufacturing value chain. This course defines the fundamental principles of size reduction, transitioning raw extracted limestone and additives into a manageable size for downstream processing. By understanding the mechanical forces of impact, attrition, and compression, participants will gain a technical grasp of how raw materials are prepared for homogenization.

The scope of this training encompasses the entire primary and secondary crushing circuit, including the feeding mechanisms, various crusher types, and the screening systems that ensure particle size consistency. It covers the operational parameters of jaw, gyratory, and impact crushers, along with the technical specifications of grizzly feeders and apron conveyors. Furthermore, the course addresses the vital role of moisture management and the prevention of material plugging within the circuit.

Coverage includes detailed modules on equipment safety, wear part maintenance, and the optimization of throughput rates. Through an immersive site visit to a primary crushing station, participants will observe the real-time operation of heavy-duty machinery and the physical characteristics of materials before and after reduction. Attendees will learn to identify operational inefficiencies and implement basic troubleshooting protocols to maintain continuous material flow.

COURSE OBJECTIVES:

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

- Describe the role of the crushing department within the overall cement plant layout.
- Identify the mechanical components of jaw, gyratory, and impact crushers.
- Explain the physical principles of primary, secondary, and tertiary crushing.
- Operate feeding equipment safely to maintain a consistent material flow.
- Analyze the impact of raw material hardness and moisture on crusher performance.
- Conduct basic inspections of wear liners and blow bars for maintenance planning.
- Interpret granulometry charts to evaluate the efficiency of the crushing cycle.
- Troubleshoot common mechanical issues such as bridging and belt misalignment.
- Manage dust suppression systems to ensure environmental and safety compliance.
- Coordinate with quarry teams to balance material supply and crushing capacity.
- Implement lockout tagout procedures specific to heavy crushing equipment.
- Monitor energy consumption to optimize the cost per ton of crushed material.

TARGET AUDIENCE:

This course is intended for Junior Production Engineers, Crusher Operators, Maintenance Technicians, Quarry Supervisors, and Safety Officers.

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: PRINCIPLES OF COMMINUTION**

- Introduction to size reduction theory and energy laws.
- Physical properties of limestone, clay, and corrective materials.
- Relationship between feed size and final product requirements.
- Mechanical forces: Compression, Impact, Attrition, and Shear.
- Overview of the crushing circuit flow sheet.

MODULE 2: PRIMARY CRUSHING TECHNOLOGIES

- Jaw crusher design, operation, and toggle plate functions.
- Gyratory crusher mechanics and eccentric movement principles.
- Selecting the right primary crusher based on quarry output.
- Gap adjustment and the impact on primary granulometry.
- Lubrication requirements for heavy-duty primary units.

MODULE 3: SECONDARY AND TERTIARY CRUSHING

- Impact crusher operations: Rotors, blow bars, and aprons.
- Cone crusher principles and mantle wear management.
- Hammer mill configurations for softer raw materials.
- Managing the recirculating load in closed-circuit crushing.
- Product quality control and sieve analysis.

MODULE 4: FEEDING AND CONVEYING SYSTEMS

- Operation of apron feeders and vibrating grizzly feeders.
- Belt conveyor design: Idlers, pulleys, and tensioning units.
- Managing material spillage and belt cleaning systems.
- Magnetic separators and metal detection protocols.
- Weigh-feeders and flow rate measurement techniques.

MODULE 5: SCREENING AND MATERIAL CLASSIFICATION

- Types of vibrating screens and deck configurations.
- Screen efficiency calculations and the "blinding" phenomenon.
- Selecting screen media: Steel, polyurethane, and rubber.
- Managing oversized material and return circuits.
- Impact of moisture on screening performance.

MODULE 6: OPERATIONAL SAFETY AND HAZARD CONTROL

- Risk assessment for high-vibration and high-noise areas.
- Safe entry procedures for crusher cavities.
- Emergency stop systems and pull-cord safety switches.
- Fall protection and working at heights on conveyor galleries.
- Fire safety and dust explosion prevention.

MODULE 7: WEAR MANAGEMENT AND MAINTENANCE

- Wear patterns in different crusher types and rock abrasive indices.
- Planning for liner changes and blow bar rotations.
- Bearings, seals, and hydraulic system maintenance.
- Vibration monitoring as a predictive maintenance tool.
- Welding and hard-facing techniques for wear components.

MODULE 8: DUST AND ENVIRONMENTAL MANAGEMENT

- Operation of bag filters and dust extraction units.
- Water spray systems and chemical dust suppressants.
- Noise abatement strategies for crushing plants.
- Environmental regulations for quarry and crushing emissions.
- Waste material handling and recycling protocols.

MODULE 9: ELECTRICAL AND AUTOMATION CONTROLS

- Soft starters and Variable Frequency Drives for crushers.
- Sequential start and stop logic in the control room.
- Interlock systems between feeders, crushers, and conveyors.
- Using PLC and SCADA for real-time monitoring.
- Troubleshooting sensor failures and instrumentation errors.

MODULE 10: SITE VISIT: PRACTICAL INSPECTION

- Walk-through of the primary and secondary crushing stages.
- Observation of feeding patterns and material behavior.

- Visual inspection of wear parts and structural integrity.
- Review of the local control panel and safety signage.
- Field demonstration of belt tensioning and tracking.

MODULE 11: TROUBLESHOOTING AND PROCESS OPTIMIZATION

- Identifying the root causes of material plugging and bridging.
- Optimizing the ratio of primary to secondary crushing.
- Managing "hot rocks" and foreign object removal.
- Reducing downtime through effective shift handovers.
- Analyzing downtime data to improve equipment availability.

MODULE 12: DATA ANALYSIS AND FINAL ASSESSMENT

- Calculating the cost per ton of production.
- Reviewing production logs and maintenance history.
- Final knowledge assessment and group discussion.
- Course feedback and continuous improvement ideas.