

Course No. 1539

Reinforced Concrete Design Training Course

CIVIL & STRUCTURAL ENGINEERING
INDUSTRIAL ENGINEERING, MAINTENANCE & OPERATIONS

DURATION

5 Days

DELIVERY

Classroom



Course Overview

The Reinforced Concrete Design Training Course is a specialized professional engineering program designed to develop the technical knowledge and practical skills required to analyze and design reinforced concrete elements and structures in accordance with established engineering principles, safety requirements, and performance criteria. The course enables participants to understand the relationship between structural loads, material properties, structural behavior, and design decisions, supporting the development of safe, practical, and constructible reinforced concrete solutions.

The program covers the fundamental principles of reinforced concrete design, including the properties of concrete and reinforcing steel, structural behavior under different loading conditions, ultimate and serviceability limit states, durability, and structural stability. Participants explore the analysis and design of key structural elements such as slabs, beams, columns, and foundations, with emphasis on selecting appropriate dimensions and reinforcement arrangements while considering structural, economic, and construction requirements.

The course also addresses systematic approaches to determining structural loads, load combinations, and their effects on reinforced concrete structures. Participants develop practical skills in evaluating flexural strength, shear resistance, axial capacity, and serviceability performance. The program also emphasizes interpreting structural analysis results and converting them into appropriate engineering design decisions while considering project requirements, site conditions, construction practices, and long-term performance.

A significant part of the course focuses on reinforcement detailing, development and anchorage requirements, reinforcement splicing, structural connection zones, crack control, and deflection. Participants also learn how to review structural calculations and drawings, identify common design and detailing deficiencies, and improve coordination between structural design, architectural requirements, construction activities, and other engineering disciplines.

Through practical applications, engineering case studies, and design exercises, participants develop a structured approach to preparing, reviewing, and evaluating reinforced concrete designs. The course is particularly relevant to engineers and professionals involved in government, commercial, industrial, infrastructure, energy, oil and gas, and large-scale construction projects where structural safety, performance, constructability, and cost efficiency are critical considerations.

Objectives

- Analyze the structural behavior of reinforced concrete and evaluate the roles of concrete and reinforcing steel within structural elements during the course.
- Evaluate structural loads, load combinations, and their effects on reinforced concrete elements and structural systems.
- Apply appropriate reinforced concrete design methodologies to different structural elements and loading conditions.
- Design reinforced concrete beams for flexure and shear while verifying essential strength and serviceability requirements.
- Design reinforced concrete slabs and select appropriate reinforcement arrangements according to structural loading and functional requirements.
- Evaluate reinforced concrete columns subjected to axial loads and bending moments and determine suitable reinforcement requirements.
- Design reinforced concrete foundations while considering structural loads, soil conditions, stability, and load-transfer requirements.
- Apply appropriate reinforcement detailing principles, including development, anchorage, lap splicing, and structural connections.
- Assess cracking, deflection, durability, and other serviceability considerations and identify suitable design measures.
- Review structural calculations and drawings and identify common design, detailing, and constructability deficiencies.
- Improve coordination between structural design, construction requirements, architectural constraints, and other engineering disciplines.
- Develop practical reinforced concrete design solutions that balance structural safety, performance, constructability, and cost considerations.

Who Should Attend

This course is designed for civil and structural engineers involved in the analysis, design, review, and supervision of reinforced concrete structures. It is particularly suitable for structural design engineers, project engineers, site engineers, construction engineers, consulting engineers, engineering reviewers, and professionals responsible for preparing structural calculations, drawings, reinforcement details, and technical design documentation.

The program is also valuable for project managers, engineering managers, design managers, construction managers, quality assurance and quality control engineers, technical contract specialists, engineering consultants, and construction supervisors. It can support professionals responsible for reviewing structural solutions, assessing technical risks, coordinating design and construction activities, and verifying that structural works comply with project specifications and applicable engineering requirements.

The course is especially relevant to professionals working within government entities, ministries, public sector organizations, engineering consultancies, construction companies, real estate developers, industrial facilities, oil and gas projects, energy projects, infrastructure developments, utilities, and major building projects. It is also suitable for professionals who participate in the design, implementation, inspection, or technical review of reinforced concrete structures.

Learning Outcomes

- Explain the structural behavior of reinforced concrete and the complementary roles of concrete and reinforcing steel in resisting structural loads.
- Analyze structural loads and load combinations and evaluate their effects on reinforced concrete elements.
- Determine appropriate preliminary dimensions for reinforced concrete elements based on structural and architectural requirements.
- Design reinforced concrete beams for flexural and shear resistance and verify essential performance requirements.
- Design reinforced concrete slabs and determine suitable reinforcement arrangements for different loading conditions.
- Analyze and design reinforced concrete columns subjected to axial loads and bending moments.
- Design reinforced concrete foundations and verify their ability to safely transfer structural loads to the supporting soil.
- Apply reinforcement detailing principles covering development lengths, anchorage, lap splices, and reinforcement connections.
- Evaluate serviceability requirements related to cracking, deflection, durability, and long-term structural performance.
- Review structural calculations and drawings and identify common design and reinforcement detailing deficiencies.

- Assess the constructability of reinforced concrete designs and improve coordination between structural and other project disciplines.
- Prepare practical engineering recommendations to improve the safety, performance, quality, and efficiency of reinforced concrete designs.

Course Outline

DAY 01

Fundamentals of Reinforced Concrete Design and Structural Behavior

- Properties of concrete and reinforcing steel and their roles within structural systems
- Mechanical behavior of reinforced concrete under different loading conditions
- Fundamental structural design principles and safety requirements
- Ultimate and serviceability limit states
- Types of structural loads and their effects on structures
- Determination of dead, live, environmental, and other applicable loads
- Load combinations and their importance in structural design
- Fundamentals of structural analysis
- Relationship between structural analysis, design, and reinforcement detailing

PRACTICAL APPLICATION

Analyze a structural model, determine applicable loads, and trace the load path through the structure

DAY 02

Reinforced Concrete Beam and Slab Design

- Structural behavior of reinforced concrete beams under flexural loading
- Preliminary beam sizing and reinforcement requirements
- Design of reinforced concrete beams for flexure
- Design of reinforced concrete beams for shear
- Longitudinal and transverse reinforcement arrangements

DAY 02 — CONTINUED

- Development, anchorage, and reinforcement splicing requirements
- Fundamental principles of reinforced concrete slab design
- One-way and two-way reinforced concrete slabs
- Load distribution from slabs to beams and columns
- Crack control and deflection considerations under service conditions

PRACTICAL APPLICATION

Design a reinforced concrete beam and slab and review the resulting reinforcement arrangement

DAY 03

Reinforced Concrete Column and Foundation Design

- Structural behavior of reinforced concrete columns
- Columns subjected to axial loads and bending moments
- Selection of column dimensions and appropriate reinforcement ratios
- Design principles for reinforced concrete columns
- Longitudinal and transverse reinforcement detailing for columns
- Fundamental principles of reinforced concrete foundation design
- Determination of foundation loads and support reactions
- Design of isolated reinforced concrete foundations
- Verification of bearing pressure, shear, and punching shear requirements
- Relationship between structural foundation design, soil conditions, and site requirements

PRACTICAL APPLICATION

Design a reinforced concrete column and foundation and verify the calculation and reinforcement requirements

DAY 04

Structural Detailing, Design Review, and Performance

- Importance of structural detailing in reinforced concrete safety and performance
- Development length, anchorage, and reinforcement splicing requirements
- Reinforcement detailing in flexural, shear, and high-stress regions
- Beam-column and slab-column connection detailing
- Review of structural drawings and reinforcement details
- Common design and construction deficiencies in reinforced concrete structures
- Evaluation of cracks, their causes, and appropriate control measures
- Deflection assessment and its effect on structural and service performance
- Durability requirements and protection against environmental exposure
- Coordination between structural design, construction, and quality assurance

PRACTICAL APPLICATION

Review a structural drawing, identify design and detailing deficiencies, and recommend appropriate improvements

DAY 05

Design Optimization, Advanced Applications, and Project Quality Management

- Methodologies for structural design review and technical verification
- Evaluation of design efficiency from safety, performance, constructability, and cost perspectives
- Optimization of structural dimensions and reinforcement quantities without compromising design requirements
- Review and interpretation of structural analysis results for engineering decision-making
- Use of structural analysis and design tools to support engineering decisions
- Management of design changes and their effects on construction, cost, and project schedules
- Assessment of technical risks associated with structural design and construction
- Coordination between structural engineers and multidisciplinary project teams
- Structural design quality indicators and review of calculations and drawings

DAY 05 — CONTINUED

- Development of systematic approaches for maintaining consistency between design and project requirements

FINAL WORKSHOP

Complete a reinforced concrete design case study from load determination and structural analysis through element design, reinforcement detailing, technical review, and development of an improvement plan

Register or Request More Information

Course page: <https://quest-training.com/courses/reinforced-concrete-design-training-course>

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