# Engineering Training Programs

## Part 2

# Civil Engineering Programs

## Civil Engineering Programs

Supervising the implementation of bridge projects

**COURSE CONTENTS:**

- Introduction to the structural design of the bridge
    1. loads
    2. Methods for choosing a structural system
    3. Design Specifications
    4. How to choose the materials used in the project
    5. Project specifications and measurements
- Structural systems for bridges
    1. Slab bridges
    2. Bridges made of beams
    3. Box beams of reinforced concrete and prestressed concrete
    4. Bridges over waterways
    5. Steel bridges
- Implementation of bridges
    1. Different tension systems
    2. Structural joints
    3. pillars Links and lace length
    4. Prefabricated Element Connections
    5. Live ends and dead ends with prestressed elements
- Shallow and deep foundations
    1. An overview of the different types of soil
    2. Methods of implementing the foundations
    3. Piling implementation methods
    4. Entrance slabs
    5. Implementation of foundations in waterways

## Civil Engineering Programs

Diagnose reinforced concrete defects and judge the safety of structures

## COURSE OBJECTIVES:

Introducing the engineer to the different methods of diagnosing defects in reinforced concrete structures.
Introducing the engineer to the methods of judging the integrity of the origin.
Studying traditional and modern methods of treating defects and strengthening concrete structures.
Study real examples of defective facilities and study how to diagnose and treat them.

## COURSE CONTENTS:

- Concrete defects
    1. Iron rust
    2. Concrete crumble
    3. Humidity effect
    4. The effect of temperature difference
    5. Increased loads on the structure
    6. Manufacturing defects
    7. Facilities evaluation
- Test methods
    1. Identification of defective areas of concrete
    2. Iron rust gauge
    3. carbonation depth
    4. Identification of voids, cracks and concrete nesting
    5. Iron locating
    6. Determine the properties of concrete
    7. Facilities Monitoring
- Facility repair
    1. concrete surface treatment
    2. Choosing the right materials
    3. Crack repair methods
    4. Reinforcing &Strengthening the facilities
    5. column reinforcement
    6. Reinforcement of slabs and beams
    7. Structural details
- Realistic examples :
    1. Examples of evaluating facilities.
    2. Examples of reinforcement of concrete structures

## COURSE CONTENTS:

- Introduction
    1. General behavior of concrete
    2. General behavior of rebar
    3. Method of designing concrete elements using boundary cases
    4. Beams and slabs
    5. columns
    6. Shear and torsion moments
    7. global codes
    8. American specifications
    9. British Specifications
- Facility modeling using SAP
    1. Finite element
    2. 2-D
    3. 3-D
    4. SAP2000
    5. Nodes (restraints, constraints, springs)
    6. Elements (Frame, shell)
    7. Materials (concrete, steel)
    8. Loads (point loads, uniform loads, temperature, ….)
    9. Output of SAP structural modeling beams
    10. Frame slabs
    11. Concrete foundation
- Examples
    - Example No. (1) concrete frame
    - Example No. (2) Steel frame
    - Example No. (3) Concrete slab installed on beams
    - Example No. (4) concrete slab without beams

Course contents:

- Introduction
    1. The purpose of using prestress
    2. Various applications (buildings - bridges - foundations)
    3. Types of steel used for prestressing
    4. Pre-tensioned work methods (Pre-tensioned - Post-tensioned)
    5. Design Methods
- properties of material
    1. Steel used for prestressing Concrete
    2. Concrete and the effect of time factors on it
    3. grout
- Types of Prestress
    1. Full and partial prestressing
    2. Bonded vs. unbonded tendons
    3. Straight and curved tendons
    4. Beam design
    5. Comparing the behavior of PS beams and RC beams in bending
    6. Permissible stresses under operating loads
    7. Ultimate limit states Shear
    8. Design for shear
    9. Examples
- Applications to prestressed concrete structures
    1. Precast prestressed beams
    2. Bridges (Segmental bridges - Bridge decks)
    3. Post-tensioned slabs foundations
- Quality control
    1. Tests
    2. Designer and Executor Responsibilities
    3. Problems to be avoided

## Course contents:

- Different types, properties and materials of concrete (cement - sand - large aggregate - chemical additives - mineral additives - steel reinforcement) (9 h)
- Specifications of concrete under different exposure conditions (2 h)
- Conditions for accepting concrete mixes (2 h)
- Inspection of ready-mix concrete plants (2 h)
- Problems and precautions for pouring concrete in hot weather (2 h)
- Quality Control Tests for Concrete and Its Materials (3h)

## TARGET PARTICIPANTS:

Quality control engineers, Implementation Engineers Design engineers & technical office