MERCURY

Structural Analysis and Design For Concrete Buildings

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Introduction:

Concrete is everywhere! It is used in pavements, building structures, foundations, motorways/roads, overpasses, parking structures, brick/block walls and bases for gates, fences, poles, and many more. Concrete is used more than any other man-made material on the planet. It has been said that instead of naming our era the Nuclear Age, it Should be called the Concrete Age, as almost all of our modern lifestyles and constructions Depend on this material.

This five-day course on structural analysis and design for concrete buildings covers concrete manufacturing, designing, and maintaining. It includes details about ingredients and their quality, quantity, and effect on the final product of concrete. Concrete designing, its Specifications, standards, and codes, and the concrete mix design are discussed in detail, along with various procedures and precautions for field manufacturing of concrete.

The defects, investigations, remedial measures and repairs are covered in detail, and modern concepts like ready mix concrete, precast and prestressed concrete and their applications are also reviewed. The basics, from concrete ingredients to repair and maintenance, are covered throughout the training on structural analysis and design for concrete buildings, which would be very useful to every technician who works with concrete.

Advanced Design of Concrete Structures:

This course on structural analysis and design for concrete buildings delves into the advanced design of concrete structures, providing comprehensive knowledge of structural analysis and engineering technology required for creating durable and resilient concrete buildings. You will learn complex design solutions, building design and analysis integration, and a thorough understanding of the structural analysis of buildings.

Targeted Groups:

- Engineers.
- Architects.
- Designers.

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Course Objectives:

At the end of this course on structural analysis and design for concrete buildings, the participants will be able to:

- Understand what concrete is and why it is used everywhere for construction.
- Study the ingredients of concrete and their importance in the quality control of the concrete.
- Learn the chemistry of concrete.
- Be able to do simple concrete mix designs.
- Learn everything about concrete manufacturing.
- Know about testing, inspection, and quality control of the concrete.
- Understand the defects that can occur in concrete at different stages or shortcoming and their remedies.
- Study modern concepts like ready-mix concrete, precast and prestressed concrete.
- Learn the methods of protection and maintenance of concrete.
- Know the safety precautions to be taken while working with concrete.
- Understand the concrete prepared for particular purposes and the admixtures that can affect the properties of concrete.

Targeted Competencies:

By the end of this training on structural analysis and design for concrete buildings, the participant's competencies will:

- Design of concrete with requisite strength.
- Concrete manufacturing.
- Testing, inspection, and quality assurance.
- Ready-mixed concrete.
- Concrete admixtures.
- Concrete - shortcomings.
- Protection from concrete abrasion, corrosion, and chemical attack.
- Concrete repair.
- Special purpose concrete.

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Course Content:

Unit 1: Understanding Concrete:

- The history of concrete.
- Principal constituents of concrete and their characteristics.
- Cement.
- Aggregates and mineral additions.
- Water.
- Chemistry of concrete.
- Cement chemical properties.
- Hydration of cement.
- Characteristics of concrete.
- Strength.
- Durability.
- Workability.
- Permeability.
- What makes concrete develop strength?
- What makes concrete durable?
- Deterioration common reasons.
- Related to ingredients, chlorides, sulfates, and aggregate-alkali reaction.
- Related to climate - temperature hot/cold and humidity.
- Manufacturing and workmanship mixing, transportation, compaction, cold joints, and large mass.

Unit 2: Design of Concrete with Requisite Strength:

- Standard specifications, codes, and guidelines.
- Concrete mix design is the fundamentals.
- Target strength.
- Cement content.
- Aggregate sizing.
- Water cement ratio.
- Mix design procedures.
- Specification development.
- Mandatory requirements.
- Durability parameters.
- Investigating defects.

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Unit 3: Concrete Manufacturing:

- Raw material storage and handling.
- Concrete mixing and production.
- Transportation of concrete.
- Dealing with temperature.
- Formwork and its influence on durability.
- Placement of fresh concrete.
- Treatment to joints.
- Consolidation and compulsion procedures.
- Curing and care of green concrete.

Unit 4: Testing, Inspection and Quality Assurance:

- Laboratory and full-scale trial mixes.
- Quality assurance.
- Processes.
- Acceptance criteria.
- Sampling and testing of ingredients.
- A sampling of concrete.
- Tests on hardened concrete.
- Analysis of Concrete.
- Non-destructive testing methods for concrete.

Unit 5: Ready-Mixed Concrete:

- Advantages.
- Types of RMC.
- Specifications and tolerances.
- Quality assurance.
- Production and transportation.

Unit 6: Concrete Admixtures:

- Benefits of admixtures.
- Types of admixtures.
- Water-reducing admixtures.
- Plasticizers.
- Accelerator.
- Retarder.
- Air entraining agents.
- Property enhancing admixtures.
- Waterproofing agents.

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Unit 7: Concrete - Shortcomings:

- Cracking.
- Crazing and shrinkage.
- Creep.

Unit 8: Protection of Concrete Abrasion, Corrosion and Chemical Attack:

- Designing a protection strategy.
- Surface Preparation.
- Improving abrasion and wear resistance.
- Design and construction techniques.
- Hardeners.
- Coatings and toppings.
- Protection against corrosive environments.
- Sealers and coatings.
- Toppings and linings.
- Cathodic protection and metalizing.
- Preventive maintenance and monitoring.

Unit 9: Concrete Repair:

- Inspection and investigation.
- Procedures of repair or replacement.
- Pressure grouting.
- Shotcrete.
- Encasing.
- Demolition of old concrete.
- Repair of delaminated structure.

Unit 10: Special Purpose Concrete:

- High-strength concrete.
- Fiber-reinforced concrete.
- Cellular concrete.
- Polymer concrete.