



# CONCRETE TECHNOLOGY

By  
Dr. R. P. Rethaliya

**Edition** : 2<sup>nd</sup> Edition : 2018  
**ISBN** : 9789385039317  
**Size** : 170 mm × 235 mm  
**Binding** : Paperback  
**Pages** : 504 + 16 = 520



₹ 300.00 **BUY**

## ABOUT THE BOOK

This book provides the basic principles and sufficient information on the state of art relating to all facets of manufacturing and production processes in the making of structural concrete. To cater to the needs of the undergraduate level courses, more emphasis is laid on the fundamentals and practice.

Entire book has been revised as per the revisions in various B.I.S. codes related to Cement, Sand, Aggregate, Concrete Mix Design, etc. The chapter on Concrete Mix Design is entirely rewritten. A large number of Multiple Choice Questions have been added in each chapter.

In addition to the traditional concrete technology topics dealing with the principles of concrete and concrete – making materials, the current state of the art of self compacting concrete, special concretes, concreting techniques, non-destructive testing (NDT), repairs and strengthening of concrete structures, fly ash concrete, etc. has been included.

The book incorporates relevant information on numerous Indian standard specifications and code of practices relating to cement and concrete including the latest revision of IS : 456–2000.

The entire subject matter is canvassed in the chapters like Cement; Types of Cement; Testing of Cement; Aggregates; Water for Construction; Admixtures; Fresh Concrete; Production of Concrete; Strength of Concrete; Elasticity, Creep and Shrinkage; Durability of Concrete; Testing of Hardened Concrete; Quality Control of Concrete; Concrete Mix Design; Special Concretes and Concreting Techniques; Repair and Rehabilitation of Concrete Structures; Fly Ash Concrete. The book now Contains:

- 194 Self explanatory neat diagrams
- 140 Useful tables
- 18 Worked Examples
- 212 Short Questions with Answers
- 287 Objective Questions
- 229 Exercise Questions.

The book should prove to be extremely useful to the Civil and Structural Engineering students preparing for the Degree Examinations of all the Indian Universities, Diploma Examinations conducted by various Boards of Technical Education, Certificate Courses as well as for the A.M.I.E., U.P.S.C., G.A.T.E., I.E.S., R.R.B. and other similar competitive and professional examinations. It should also prove of interest to the practising professionals.

## CONTENT

- 1 : CEMENT
- 2 : TYPES OF CEMENT
- 3 : TESTING OF CEMENT
- 4 : AGGREGATES
- 5 : WATER FOR CONSTRUCTION
- 6 : ADMIXTURES
- 7 : FRESH CONCRETE
- 8 : PRODUCTION OF CONCRETE
- 9 : STRENGTH OF CONCRETE
- 10 : ELASTICITY, CREEP AND SHRINKAGE
- 11 : DURABILITY OF CONCRETE
- 12 : TESTING OF HARDENED CONCRETE
- 13 : QUALITY CONTROL OF CONCRETE
- 14 : CONCRETE MIX DESIGN
- 15 : SPECIAL CONCRETES AND CONCRETING TECHNIQUES
- 16 : REPAIR AND REHABILITATION OF CONCRETE STRUCTURES
- 17 : FLY ASH CONCRETE
- INDEX

## Checklist

**CONCRETE TECHNOLOGY**  
**DETAILED CONTENTS**

**Chapter 1 CEMENT**

- 1-1. Introduction
- 1-2. History of Modern Cement
- 1-3. Manufacture of Portland cement
- 1-3-1. Wet process in manufacture of cement
- 1-3-2. Dry process in manufacture of cement
- 1-3-3. Semi-dry process
- 1-4. Hydration of cement
- 1-5. Heat of Hydration
- 1-6. Hydration products
- 1-7. Setting and Hardening
- 1-8. False set
- 1-9. Structure of hydrated cement
- 1-10. Water requirements for hydration
- Short questions with Answers 1
- Multiple choice questions (MCQ) 1
- Answers to Multiple choice questions (MCQ) 1
- Exercise 1

**Chapter 2 TYPES OF CEMENT**

- 2-1. Introduction
- 2-2. Types of cement
- 2-3. Use of cement type for different situations
- Short questions with Answers 2
- Multiple choice questions (MCQ) 2
- Answers to Multiple choice questions (MCQ) 2
- Exercise 2

**Chapter 3 TESTING OF CEMENT**

- 3-1. Introduction
- 3-2. Field testing of cement
- 3-3. Storage of cement
- 3-4. Physical properties of Portland cement
- 3-4-1. Fineness test
- 3-4-2. Standard consistency test
- 3-4-3. Initial and final setting time
- 3-4-4. Compressive strength test
- 3-4-5. Soundness test
- 3-5. Physical properties of various types of cement
- Short questions with Answers 3
- Multiple choice questions (MCQ) 3
- Answers to Multiple choice questions (MCQ) 3
- Exercise 3

**Chapter 4 AGGREGATES**

- 4-1. Introduction
- 4-2. Classification of aggregates based on unit weight
- 4-3. Classification of aggregates based on source or parent rock
- 4-4. Classification of aggregates based on size
- 4-5. Classification based on shape
- 4-6. Classification based on texture
- 4-7. Strength of aggregate
- 4-8. Aggregate crushing value test [(IS:2386-1963) Part IV]
- 4-9. 'Ten per cent fines value' Test [(IS:2386-1963) Part IV]
- 4-10. Aggregate Impact value test (IS:383-2016)
- 4-11. Aggregate abrasion value test [(IS:2386-1963) Part IV]
- 4-12. Specific gravity
- 4-13. Bulk density
- 4-14. Absorption and moisture content
- 4-15. Bulking of fine aggregates
- 4-16. Deleterious substances in aggregate
- 4-17. Soundness of aggregate
- 4-18. Alkali Aggregate reaction
- 4-19. Grading of aggregate
- 4-20. Combining aggregates to obtain specified grading
- 4-21. Fineness modulus (FM)

- 4-22. Standard grading curve and grading limits
- 4-23. Gap grading
- 4-24. Thermal properties of aggregates
- 4-25. Flakiness Index
- 4-26. Elongation Index
- Short questions with Answers 4
- Multiple choice questions (MCQ) 4
- Answers to Multiple choice questions (MCQ) 4
- Exercise 4

**Chapter 5 WATER FOR CONSTRUCTION**

- 5-1. Introduction
- 5-2. Quality of water
- 5-3. Effect of impurities in water
- 5-4. Sea water
- Short questions with Answer 5
- Multiple choice questions (MCQ) 5
- Answers to Multiple choice questions (MCQ) 5
- Exercise 5

**Chapter 6 ADMIXTURES**

- 6-1. Introduction
- 6-2. Purposes of using Admixtures
- 6-3. Classification of Admixtures
- 6-4. Accelerating Admixtures (Accelerators)
- 6-5. Retarding Admixtures (Retarders)
- 6-6. Plasticizers (Water reducing admixtures)
- 6-7. Super-plasticizers
- 6-8. Air-entraining admixtures
- 6-9. Pozzolanic admixtures
- 6-10. Grouting admixtures
- 6-11. Water proofing admixtures
- 6-12. Air-detraining admixtures
- 6-13. Bonding admixtures
- 6-14. Corrosion inhibiting admixtures
- 6-15. Gas-forming Admixtures
- 6-16. Colouring Admixtures (Pigments)
- 6-17. Alkali-aggregate expansion inhibiting admixtures
- 6-18. Fungicidal, Germicidal and insecticidal admixtures
- 6-19. Adverse effect of excess use of admixtures
- Short questions with Answer 6
- Multiple choice questions (MCQ) 6
- Answers to Multiple choice questions (MCQ) 6
- Exercise 6

**Chapter 7 FRESH CONCRETE**

- 7-1. Introduction
- 7-2. Workability
- 7-3. Factors affecting workability
- 7-4. Measurement of workability
- 7-4-1. Slump test
- 7-4-2. Compacting factor test
- 7-4-3. Flow test
- 7-4-4. Flow test (As per IS:9103-1999)
- 7-4-5. Vee bee consistometer test
- 7-4-6. Kelly Ball Test
- 7-5. Segregation
- 7-6. Bleeding
- 7-7. Setting time of concrete
- Short questions with Answer 7
- Multiple choice Questions (MCQ) 7
- Answers to Multiple choice questions (MCQ) 7
- Exercise 7
- References

**Chapter 8 PRODUCTION OF CONCRETE**

- 8-1. Introduction
- 8-2. Batching or Measurement of materials
- 8-2-1. Batching of aggregate

**CONCRETE TECHNOLOGY**  
**DETAILED CONTENTS**

- 8-2-2. Batching of cement
- 8-2-3. Measurement of water
- 8-3. Mixing of concrete
- 8-3-1. Hand mixing
- 8-3-2. Machine mixing
- 8-4. Transporting concrete
- 8-5. Placing of concrete
- 8-5-1. Precautions to be taken while placing concrete
- 8-5-2. Slip-form technique
- 8-6. Compaction of concrete
- 8-7. Methods of compaction
- 8-7-1. Hand compaction
- 8-7-2. Compaction by vibration
- 8-7-3. Compaction by pressure and jolting
- 8-7-4. Compaction by spinning
- 8-8. Prolonged vibration and Revibration
- 8-9. General points on using vibrators
- 8-10. Curing of concrete
- 8-10-1. Curing conditions
- 8-10-2. Maturity of concrete
- 8-10-3. Period of curing
- 8-10-4. Methods of curing concrete
- 8-10-5. Application of heat
- 8-11. Form work
- Short questions with Answers 8
- Multiple Choice Questions (MCQ) 8
- Answers to Multiple Choice questions 8
- Exercise 8
- References

**Chapter 9 STRENGTH OF CONCRETE**

- 9-1. Introduction
- 9-2. Water/cement ratio
- 9-3. Gel/space ratio
- 9-4. Effect of Age on strength of concrete
- 9-5. Effect of maximum size of aggregate on strength of concrete
- 9-6. Bond strength
- 9-7. Fatigue strength of concrete
- 9-8. Impact strength of concrete
- 9-9. Relation between compressive strength and tensile strength
- Short questions with Answers 9
- Multiple Choice questions (MCQ) 9
- Answers to Multiple Choice questions (MCQ) 9
- Exercise 9
- References

**Chapter 10 ELASTICITY, CREEP AND SHRINKAGE**

- 10-1. Introduction
- 10-2. Stress strain relation
- 10-3. Modulus of elasticity
- 10-4. Factors affecting modulus of elasticity
- 10-5. Poisson's ratio
- 10-6. Shrinkage
- 10-7. Factors affecting shrinkage
- 10-8. Creep
- 10-9. Factors affecting creep
- 10-10. Measurement of creep
- 10-11. Effects of creep
- Short questions with Answers 10
- Multiple Choice questions (MCQ) 10
- Answers to Multiple Choice questions (MCQ) 10
- Exercise 10
- References

**Chapter 11 DURABILITY OF CONCRETE**

- 11-1. Introduction
- 11-2. Durability

- 11-3. Factors affecting durability
- 11-4. Requirement for durability
- 11-4-1. General environment
- 11-4-2. Effect of weathering – freezing and thawing
- 11-4-3. Exposure to Sulphate Attack
- 11-4-4. Acid Attack
- 11-4-5. Sea water Attack
- 11-4-6. Abrasion, Erosion and Cavitation
- 11-4-7. Carbonation
- 11-4-8. Shape and size of member
- 11-4-9. Requirement of concrete cover
- 11-4-10. Type and quality of constituent materials
- 11-5. Effects of De-icing salts
- 11-6. Efflorescence
- 11-7. Permeability of concrete
- 11-7-1. Importance of permeability
- 11-7-2. Factors affecting permeability
- 11-7-3. Measurement of water permeability
- 11-8. Resistance of concrete to fire
- 11-9. Thermal properties of concrete
- 11-10. Joints in concrete
- Short questions with Answers 11
- Multiple choice questions (MCQ) 11
- Answers to Multiple choice questions (MCQ) 11
- Exercise 11
- References

**Chapter 12 TESTING OF HARDENED CONCRETE**

- 12-1. General
- 12-2. Compression tests
- 12-3. Tensile strength of concrete
- 12-4. Ring tension Test
- 12-5. Factors Influencing strength results
- 12-6. Test cores
- 12-7. Accelerated curing test
- 12-8. In-situ strength assessment
- 12-8-1. Surface hardness test
- 12-8-2. Rebound-Hammer test
- 12-8-3. Ultrasonic pulse velocity test
- 12-8-4. Pull-out testing
- 12-8-5. Pull-off test
- 12-8-6. Penetration Resistance test (Windsor probe test)
- 12-8-7. Radioactive methods
- 12-8-8. Nuclear methods
- 12-8-9. Magnetic methods
- 12-8-10. Electrical methods
- Short questions with Answers 12
- Multiple choice questions (MCQ) 12
- Answers to Multiple choice questions (MCQ) 12
- Exercise 12
- References

**Chapter 13 QUALITY CONTROL OF CONCRETE**

- 13-1. General
- 13-2. Quality control
- 13-3. Quality control, Personnel and Equipment
- 13-4. Advantages of Quality control
- 13-5. Sampling and strength test of concrete
- 13-6. Statistical quality control of concrete
- 13-7. Standard Deviation
- 13-8. Acceptance Criteria
- Short questions with Answers 13
- Multiple choice questions (MCQ) 13
- Answers to Multiple choice questions (MCQ) 13
- Exercise 13

**CONCRETE TECHNOLOGY**  
**DETAILED CONTENTS**

**Chapter 14 CONCRETE MIX DESIGN**

- 14-1. General
- 14-2. Objectives of Mix Design
- 14-3. Basic considerations
- 14-4. Proportioning of ingredients
- 14-5. Factors influencing the choice of mix proportions
- 14-6. Methods of concrete mix design
- 14-7. I.S. method of mix design [IS: 10262-2009]
- 14-7-1. Trial mixes
- 14-8. The ACI method of mix Design
- 14-9. The DOE (British) mix design method
- 14-10. Mix design for pumped concrete
  - Basic considerations for pumped concrete
  - Short questions with Answers 14
  - Multiple choice questions (MCQ) 14
  - Answers to Multiple choice questions (MCQ) 14
  - Exercise 14
  - References

**Chapter 15 SPECIAL CONCRETES AND CONCRETING TECHNIQUES**

- 15-1. General
- 15-2. Light weight concrete
- 15-3. High Density Concrete
- 15-4. Mass concrete
- 15-5. Ready Mixed Concrete (RMC)
- 15-6. VaccUm concrete
- 15-7. Recycled Aggregate Concrete (RAC)
- 15-8. Silica fume concrete
- 15-9. Fibre reinforced concrete (FRC)
- 15-10. Polymer concrete
- 15-11. Cold-weather concreting
- 15-12. Recommended practices and precautions
- 15-13. Hot-weather concreting
- 15-14. Recommended practices and precautions
- 15-15. Pre-packed concrete
- 15-16. Shotcrete or guniting
- 15-17. Ferro cement
- 15-18. Roller compacted concrete (RCC)
- 15-19. Self compacting concrete (SCC)
  - 15-19-1. Materials for SCC
  - 15-19-2. Workability test Methods of SCC
- 15-20. High strength concrete
- 15-21. High performance concrete (HPC)
  - Short questions with Answers 15
  - Multiple choice questions (mcq) 15
  - Answers to Multiple choice questions (MCQ) 15
  - Exercise 15
  - References

**Chapter 16 REPAIR AND REHABILITATION OF CONCRETE STRUCTURES**

- 16-1. Evaluation procedures for repair and strengthening of concrete structures
- 16-2. Tools for evaluation of concrete structures
- 16-3. Cracks in concrete
- 16-4. Classification of cracks
- 16-5. Causes of cracks in concrete
- 16-6. Corrosion of reinforcement in concrete-causes and remedies
  - 16-6-1. Corrosion process and mechanism
  - 16-6-2. Anodic reactions
  - 16-6-3. Causes of corrosion
- 16-7. Repair of concrete structures
- 16-8. Crack repair by epoxyinjection grouting
- 16-9. Cracks repair by routing and sealing
- 16-10. Crack repair by stitching
- 16-11. Providing additional reinforcement
- 16-12. Drilling and plugging
- 16-13. Crack repair by prestressing steel
- 16-14. Crack repair by grouting
- 16-15. Column jacketing
- 16-16. Beam jacketing
- Short questions with answers 16
- Multiple choice questions (MCQ) 16
- Answers to Multiple choice questions (MCQ) 16
- Exercise 16

**Chapter 17 FLY ASH CONCRETE**

- 17-1. General
- 17-2. Fly ash types and characteristics
- 17-3. Fly ash production and utilisation of india
- 17-4. Utilisation of fly ash
  - 17-4-1. Fly ash Bricks
  - 17-4-2. FaL-G technology
  - 17-4-3. Fly ash based aggregate
  - 17-4-4. Fly ash blended cement
  - 17-4-5. Fly ash concret
- Short questions with answers 17
- Multiple choice questions (MCQ) 17
- Answers to Multiple choice questions (MCQ) 17
- Exercise 17
- References

**INDEX**