

### 3. BUILDING CONSTRUCTION

#### 1. INTRODUCTION

Technician requirements in civil engineering works are growing day to day. Builders, Real Estate owners need number of technicians in this area. Hence this course has several advantages that will enable a student to get engaged in any civil engineering work area.

#### 2. OBJECTIVES OF THE COURSE

1. To identify the construction materials required for the assigned work.
2. Know the simple testing methods of cement.
3. Able to take up civil construction works. [Brick works, Cement work, etc.]
4. Know the curing of cement slabs.
5. Can be able to take up sewage repair works.

#### 3. SKILLS TO BE PROVIDED

1. Able to construct the brick walls as per specifications.
2. Able to fabricate R.C.C. beams, columns etc.
3. Able to take up repairs for various roads [Ex. C.C. Roads, Gravel Roads, etc.]
4. Able to adopt proper curing methods.

#### 4. EMPLOYMENT OPPORTUNITIES

1. As an Assistant for Civil Engineer.
2. As a Mason for Construction of different Buildings.
3. Work Inspector for Draftsman Civil in Govt. Departments like R&B, P.R.
4. Fixing and maintenance of water supply and sanitary appurtenances. (Plumber)

#### 5. Schemes Of Instruction Per Module

Module	Theory		On Job Training		Total	
	Hours	Weightage	Hours	Weightage	Hours	Weightage
I	72	30	216	70	288	100
Total	72	30	216	70	288	100

## Schemes Of Instruction Per Week

Module	Theory	On the Job Training	Total
Modules I/II/III	6 Hours	18 Hours	24 Hours

### 6. SYLLABUS

The syllabus consists of three modules. The syllabus division is as follows:

#### MODULE: 1

#### BASICS OF BUILDING CONSTRUCTION

Week No.	Theory	On the Job Training
1.	<p>Introduction about the trade. Different Engg. Materials used for the trade</p> <p>Stones – Rock Classification and examples, characteristics and available places of important stones, methods of quarrying of stones.</p>	<p>Safety precautions about the trade. Identification of different materials and its properties.</p> <p>Requirement of important stones for various Engg. Works – Buildings, Roads, etc. Usage, properties and availability of aggregates.</p>
2.	<p>Bricks – Ingredients of good brick earth, description of manufacture of bricks, classification of bricks</p> <p>Sand – Natural sources of sand, classification of sand, bulking of sand.</p> <p>Cement – Composition of ordinary cement, manufacturing of cement, types, properties and uses of cement, Terra Cotta – Brief properties and uses of earthenware and stoneware.</p> <p>Steel – main properties and types of steel used in building works, market forms of steel - angle sections, channel sections, etc.</p>	<p>Standard sizes and general properties of bricks, tests on bricks – water absorption test, crushing strength of bricks.</p> <p>Sieve analysis for sand, building of sand, percentage of voids in coarse and fine aggregate.</p> <p>Tests on Cement – fineness of Cement, Initial and final setting times of cement, field tests on O.P.C. stacking and storage of cement.</p> <p>Identifying various types of steel rods and calculating the weight of rods per given length, bonding as per drawing, placing, fixing of main, bent-up bars.</p>
3.	<p>Mortar – Definition, purpose types and properties of mortar</p> <p>Concrete – Definition, purpose, preparation of cement concrete.</p> <p>Miscellaneous materials, properties, uses of paints, varnishes, glass, ferrous and non-ferrous metals, P.V.C. fittings.</p>	<p>Methods of mixing mortars.</p> <p>Batching, mixing, transporting, depositing and placing of concrete – curing of concrete, Cube Testing.</p> <p>Painting of wall, preparation of glass, doors, fixing of bolts and nuts.</p>

4.	Surveying – Definition, Principles Of Surveying. Chain Surveying – Instruments used in Chain Surveying, Ranging and Chaining. Plane Table Survey – Accessories, Methods of Plane Table Survey.	Calculation of areas – Triangulation Survey, Cross-Staff Survey.  Traversing with plane table of a small colony.
5.	Leveling – Definition of terms like datum, elevation, benchmark etc. Dumpy level, Staff – Description.  Theodolite Survey – Description of Theodolite, Definition of terms transiting, swinging, etc.	Booking and reducing levels by H.I. Method, Rise and Fall method.  Measurements of Horizontal and vertical angles with Theodolite.
6.	Engg. Drawing – Instruments used, Conventional signs – Drawings of foundations, doors, windows, roofs, stairs.	Drawing of conventional signs, drawings of foundations, doors, windows, roofs, stairs.
7.	Building planning – Principles, terminology for important terms in building construction – Foundation, Footings, Plinth etc.	Arrangements of rooms for residential buildings.  Drawing of plan, section, elevation of residential buildings, public buildings.
8.	Detailed study of R.C.C. work for beams, columns, slabs etc.	Drawing of steel – details of beams, columns, slabs etc.
9.	Introduction of estimating and costing, main items of construction of work.  Methods of building estimates long wall and short wall method.	Units of measurements of various items of construction. Estimate of single room buildings, two room building office buildings.
10.	Methods of building estimates by centre line method  R.C.C. works – Study of drawings	Estimate of residential buildings, office buildings, estimate of water tank.  Estimate of beams, columns, slabs lintels.
11	Analysis of rates – Study of SSR, Standard Data Book	Analysis of Rates for E/W excavation. Lime concrete, C.C. in foundation. R.C.C. work in beams, slabs, columns, stone and brick masonry, painting and plastering, floors, roofs, preparation of abstract estimates.
12	Test	Test

**MODULE: 2**  
**BUILDING CONSTRUCTION PRACTICES**

1	Building Construction – Introduction, classification of buildings. According to NBC, component parts of a building with their functions  Foundations – types of foundations, formwork for pillar construction.	Tools used in building construction, clearing the site, approved drawings, reading, marking center lines, trench marking.  Examination of ground bearing capacity of soils  Details about foundation for pillars proportions of
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	formwork for pillar construction.	mortar mixing.
2.	Details about plinth construction, materials used for D.P.C. methods of preventing dampness	Construction of plinth beams and basements. Filling in the basements. Grouting, curing of foundations.
3	Masonry:  Types, thickness of walls, mortar joints  Principles to be followed while construction of stone and brick masonry.	Construction of stone and brick masonry. Per pends vertical joints. Unit-wise constructions – curing for super structures.
4.	Scaffolding – Definition, types and materials used shoring.  Bonds – Types of use of King and Queen Closers, Squint Corners.	Preparation of scaffolding for different works.  Joints at Junction, laying of bricks at squint corners and junctions. Construction for splayed corners as per drawings. Construction of different bonds.
5	Carpentry Joints – Housing framing, paneling and moulding  Sizes of cupboards, doors and windows, ventilators.	Preparation of door and windows of different types. Fixing of doorframes. Construction of drops for cupboards. Fixing of Hold-Fasts.
6 & 7	Form work – Materials used  R.C.C. works – Bar Bending schedule – Reinforcement details for different items – Proportions of mixing concrete.	Form works details, Form work for different items like columns, walls, stairs, etc.  Centering & shuttering for R.C.C. works – Bending bars – Arrangement of main, bent up bars – Pouring concrete. Construction of R.C.C. lintels and sunshades – Curing.
8 & 9	Floors – Different types construction details  Polishing – Hand & Machine  Stairs – Definitions of terms like tread, rise etc. types, materials	Working knowledge on construction of different floors, construction of upper floors including water proofing, polishing  Form work for staircase, construction details of different types of stairs.
10	Details of pitched roofs including King & Queen post truss. Connection for steel roof truss.  Construction details of R.C.C. Slab, Construction of Arches.	Construction of Pitched roofs with wood and steel.  Laying of tiles over sloped roof. Fixing of A.C. Sheets.  Reinforcement details, mixing, placing and curing of concrete on the R.C.C. Slab, Arches.

11.	Construction of compound walls, parapet walls railing.  Plastering – Types, different coats, mixing of proportions.  Painting – Types of Paints	Construction of compound walls. Fixing of gates. Construction of parapet walls  Construction details about overhead tank.  Plastering work for inside and outside walls – sponge finishing – curing.  Mixing, painting of walls
12	Test.	Test

### MODULE – 3

#### BASICS OF WATER SUPPLY AND ROAD ENGINEERING

1	<u>Water supply Engineering:</u> Objectives of community water supply system. Sources of water, Rain water harvesting and ground water Recharging.	Layout of water supply system in a building.  Construction details of Rain water collection pits.
2 & 3	Quality of water – Impurities in water, water borne diseases – contamination and prevention, treatment of water – sedimentation, filtrations, Disinfection.	Layout of water treatment plant. Visit to water treatment plant. Fixing of water supply pipes, connections to taps and overhead tanks. Fixing and laying of plumbing.
4 & 5	Distribution of water – Intakes – pumping and storage system. Pipe-joints, fittings – C.I. pipes, steel pipes, R.C.C. pipes, plastic pipes.	Sketches showing different types of intakes. Layout of distribution system. Identification and fixing of different types of pipes, pipe joints, valves.
6 & 7	Sanitary Engg. – Methods of collection and conveyance of City waste – Sewer pipes – Sewer maintenance, Sewerage Works.	Construction of Sewers, Sewer maintenance, construction details of Manholes, Street inlets, Automatic Flushing tanks.
8 & 9	Roads – Introduction, Road Transport characteristics, benefits of a good system of roads.  Classification of roads – National, State Highways, etc.	Classification of Roads – Details about natural earth roads, gravel roads, WBM roads, bituminous roads, C.C. Roads  Traffic signs – study of different types of signs.
10 & 11	Construction Management – Introduction, Contract System, Construction Planning, Construction Labour, Methods of carrying out works – Departmental, through Contractors	Case Study: Let an invitation for the tender for construction of a building was advertised in the newspaper. How a contractor who wants to do this job, acts? Explanation of each step – Tender Document, Quotations, Analysis of work programme (Division of work activities) etc.
12	Test	Test

#### 7. LIST OF TOOLS & EQUIPMENT

- 1) Shovel
- 2) Pan M.S. 35 cms diameter

- 3) Forma wooden for measuring aggregate
- 4) Bucket C.I. 35 cms diameter
- 5) Masons Plumb Rule with Spirit level
- 6) Masons Square 30 cms x 30 cms
- 7) Sieve for Sand 1/16 inches, 100 x 60 cms.
- 8) Sieve for Sand 1/8 inches, 100 x 60 cms.
- 9) Trowel 10" x 3 1/2"
- 10) Tool Cutting Set of 6
- 11) Brick Hammer with Handle
- 12) Rule 4 folds wooden 60 cms.
- 13) 6" Painting Trowel
- 14) Line Pins Corner Block
- 15) Motor Board
- 16) Wire Board
- 17) Wooden Float
- 18) Steel Float
- 19) Spirit Level 12"
- 20) Chisel 1/2" hammer headed
- 21) Bolster
- 22) Claw Hammer
- 23) Spade
- 24) Measuring tape 100' (Steel)
- 25) Ladder aluminium 10 feet height
- 26) Pick Axe
- 27) Rammer Axe
- 28) Crow bar 1" diameter 5 feet long
- 29) Hand Hammer 2 lbs.

#### 8. QUALIFICATION FOR TEACHING FACULTY

Degree in Civil Engineering or

Diploma in Civil Engineering (with 3 years of experience).

**Instructor** : I.T.I. (Civil Draftsman) with one year field experience

**OR**

: Experience Mason with SSC

#### 9. REFERENCE BOOKS

- 1) Building materials – Rangwala
- 2) Surveying and leveling – B.C. Punmia
- 3) Estimating and costing – B.N.Dutta
- 4) Engg. Drawing – N.D.Bhatt
- 5) Civil Engg. Drawing – Shahane
- 6) Building construction – Rangwala
- 7) Water supply and Sanitary Engg. – Rangwala
- 8) Environmental lab manual – By Shivaji Rao

#### 10. LIST OF PARTICIPANTS

<p><b>B. HARINATH REDDY</b> J.L. in Vocational (C.T) New Govt. Junior College, Malakpet, Hyderabad.</p>	<p><b>B. SWARNALATHA</b> Training Officer, ITI, Mallepally, Hyderabad</p>
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