

Govt. Polytechnic Vaishali

Branch → Civil Engineering

Semester → 3rd

Subject → Concrete Technology (1615305)

Lecture plan → Effective from 01-08-2020

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Unit	Topics to be Covered.	No. of lecture	Book
01	<u>Properties of Cement:</u> <ul style="list-style-type: none">• Physical properties of Ordinary Portland Cement, determination and test on OPC, Hydration of cement.• Physical properties of cement - fineness, standard consistency, initial & final setting times.• Compressive strength & Soundness of cement, different grades of OPC 53, 43, 53 & their specification of physical properties as per relevant IS codes.• Adulteration of cement (field test), storing cement at site, effect of storage of cement on properties of cement/Concrete.• Types of cement. Physical properties, specification as per relevant IS codes & field applications of the following types of cement.<ol style="list-style-type: none">1) Rapid hardening cement.2) Low heat cement.3) Pozzolana Portland Cement4) Sulphate resisting cement.5) Blast furnace slag cement6) White cement	L1 L2 L3 L4 L5 & L6.	B1 B1 B1 B1 B1 B1

Unit
02

Properties of Aggregates:

- Properties of fine aggregates.
Concept of size, shape, surface texture, strength, specific gravity, bulk density, water absorption, surface moisture, soundness, bulking impurities. L7 B1
L8 B1
- Determination of fineness modulus & grading zone of sand by sieve analysis. Determination of silt content in sand & their specification as per IS 383. L9 B1
L10 B1
- Bulking of sand, phenomenon of bulking, its effect on concrete mix proportion. L11 B1
- Properties of coarse aggregates:
Concept of size, shape, surface texture, water absorption, soundness, specific gravity & bulk density. L12 B1
- Determination of fineness modulus of coarse aggregates by sieve analysis, grading of coarse aggregates. L13 B1
- Determination of crushing value, impact value & abrasion value of coarse aggregates, flatness index & elongation index of coarse aggregates & their specifications. L14 B1

Unit
03

Properties of Concrete

- Introduction to concrete
Definition of concrete, necessity of supervision for concreting operation, different grades of concrete (ordinary concrete, standard concrete & high strength concrete as per provision of IS 456-2000), minimum grade of concrete for different exposure conditions, minimum grade of concrete for R.C.C water retaining structure & in sea water construction, durability of concrete. L15 B1
L16 B1
- Water cement ratio
Definition of w/c ratio, Duff Abraham w/c law, significance of w/c ratio, selection of w/c ratio for different grades of concrete prepared from different grades of OPC as per graphs specified in IS 10262-1982, max^m w/c ratio for different grades of concrete for different exposure conditions. L17 B1
L18 B1
- Properties of fresh concrete
Definition of workability, factors affecting workability of concrete. Determination of workability of concrete by slump cone test, compaction factor test, vee bee test & flow table test. Range of values of workability. L19 B1
L20 B1

requirement for different types of concrete works (cohesion, segregation, harshness, bleeding).

• Properties of hardened concrete.

Definition of Compressive strength, durability, Impermeability, elastic properties of concrete: modulus of elasticity of concrete. Creep, factors affecting creep, shrinkage, factors affecting shrinkage.

L21 B1

• Concrete Mix Design

Objectives of mix design, list of different methods of mix design, study of mix design procedure by I.S. method as per IS 10262-1982.

L22 B1

• Determination of design mix proportions by mass for M20 grade of concrete using I.S. method for given data. (Such as grading zone of sand, proportion of 20mm & 10mm metals, specific gravities of cement, sand & aggregate, water absorption of sand & aggregate, Compacting factor & exposure condition).

L23 B1

• Testing of concrete

Significance of testing, determination of compressive strength of concrete cubes at different ages, interpretation & Co-relation of test results.

L24 B1

• Non-destructive testing of concrete

Importance of NDT, method of NDT - rebound hammer test & ultrasonic pulse velocity test, working principle of rebound hammer & factor affecting the rebound index, specification for deciding the quality of concrete by ultrasonic pulse velocity as per I.S 13311 (part 1 & 2)

L25 B1

• Determination of rebound index & compressive strength of concrete by rebound hammer test as per I.S 13311, determination of quality of concrete by ultrasonic pulse velocity test.

L26 B1

Unit 4

Quality Control of Concrete

• Batching, Different types of mixers and vibrators. Volume & weigh batching, Volume batching for nominal mixes & weigh batching for design mixes concrete.

L27 B1

- Types of mixers (tilting & non-tilting type). Different types of vibrator - needle vibrator, surface vibrator, table vibrator, principle & application of each type of vibrator. L28 B1
- Formwork: formwork for concreting, different types of formwork for different works such as beam, slabs, columns, well foundation, materials used for formwork, requirement of good formwork, stripping time for the removal of formwork as per IS 456-2000 provisions for different structural members. L29 B1
L30 B1
- Transportation, placing, compaction & finishing of concrete:
Mode of transportation of concrete, precautions to be taken during transportation and placing of concrete in formwork. L31 B1
- Compaction of concrete, method of compaction, care to be taken during compaction. L32 B1
- Purpose of finishing, types of finishing & methods of application (surface treatment, expose aggregate finish, applied finish, coloured finish), requirement of good finish. L33 B1
- Curing of concrete: definition of curing, necessity of curing, different methods of curing & their application (spraying water, membrane curing, steam curing, curing by infra red radiations, curing by wet gunny bags, ponding methods. L34 B1
L35 B1
- Waterproofing of concrete & joints in concrete construction. Importance & need of waterproofing, methods of waterproofing. L36 B1
- Materials used for waterproofing, types of joints. L37 B1
- Joining old & new concrete, methods of joining, materials used for filling joints. L38 B1

Unit 5

Extreme weather concreting & chemical admixtures in concrete:
Extreme weather concreting

• Effect of cold weather on concrete, effect of hot weather on concrete.

L39 B1

• precautions to be taken while concreting in hot & cold weather conditions.

L40 B1

• Chemical admixture in concrete.

Properties & application for different types of admixtures such as:

L41 B1

accelerating admixture.

L42 B1

retarding admixture.

water reducing admixture

L43 B1

air entraining admixture

super-plasticizer.

Properties of special concrete.

Unit
6

• Properties, advantages & limitations of:

1) Ready mix concrete

L44 B1

2) Reinforced concrete

• 3) Prestressed concrete

L45 B1

• 4) Fibre reinforced concrete

L46 B1

• 5) Precast concrete

L47 B1

• 6) High performance concrete

L48 B1

Book for reference

B1) Concrete technology by M.S. Shetty (S. Chand publication)