



FACULTY OF ENGINEERING & TECHNOLOGY

TOPIC : CONCRETE (L-6)

Today , it will be discussed :

- ❖ **Definition**
- ❖ **Physical Properties of Concrete**
- ❖ **Uses of Concrete in Comparison to Other Building Materials**
- ❖ **Advantages and Disadvantages of Concrete.**
- ❖ **Important Terms in Concrete**

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Concrete is a composite material composed of fine and coarse aggregate bonded together with a fluid cement (cement paste) that hardens (cures) over time.

When aggregate is mixed with dry Portland cement and water, the mixture forms a fluid slurry that is easily poured and molded into shape. The cement reacts with the water and other ingredients to form a hard matrix that binds the materials together into a durable stone-like material that has many uses.

Types Of Concrete Based On Binding Materials:

- ❖ **Mud Concrete** is composed of clay, sand and brick ballast homogeneously mixed with water. It is used in foundation and flooring of Mud Houses
- ❖ **Lime Concrete** consists of lime, fine and coarse aggregates homogeneously mixed with water, to yield lean concrete, which is used in foundation and base of floors. It is also used in water proofing on flat slabs and temperature resistant coating. This concrete is lean concrete and requires ten days curing.
- ❖ **Cement Concrete** is produced when Cement replaces lime as binding material. The production of concrete includes fixing of form work, batching and mixing of ingredients, transportation, placing, compaction, finishing, curing and removal of form work.

Physical Properties of Concrete:

- Strength
- Durability
- Workability
- Consistency

Strength

Plain and Reinforced Cement Concrete is widely used in Civil Engineering Works. The Concrete resists Compressive Stresses only as its tensile strength is only 10-15% of its Compressive Strength and therefore concrete is characterised by its Compressive Strength and is categorized into different grades as per Indian Standards. The strength of concrete is affected by

- Type and strength of ingredients of concrete
- Proportioning of ingredients
- Compaction of concrete
- Curing of Concrete



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Durability of Concrete

Durability can be achieved by use of best quality of cement and aggregates, adopting appropriate water-cement ratio, proper batching and homogeneous mixing of ingredients, full compaction and adequate curing of concrete. Use of Unsound Cement and poor quality of aggregates produce low durable concrete. The Concrete disintegrates quickly due to entry of water, salts and gases enter into pores of concrete and frequent changes in temperature.

Workability of Concrete

Workability of concrete prevents Segregation and Bleeding of concrete easing transportation, placing, compaction and finishing of concrete. Water Content play significant role in the workability of concrete to a limited extent as excess water content will adversely affect the strength of concrete. Use of Mixing and Compaction equipments facilitates homogeneous mixing, proper placing and compaction of concrete.

Consistency of Concrete

Consistency of Concrete is tendency of concrete to flow as liquid in plastic state to reach every nick and corner of form work. More the quantity of water, lesser will be consistency of concrete. Consistency of Concrete and Workability of Concrete complement each other, which is determined by Slump Test at site and laboratory.

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Production of Quality Concrete

The concrete shall be depends in such a way that it can be poured easily in desired shape and size in plastic state and desired strength in the hardened state. Concrete has to be dense, durable and impervious as well as economical in its production. This will depend on

- Selection of ingredients
- Proportioning or Batching
- Water-cement Ratio
- concreting Operations



Selection of ingredients means standard quality of cement and aggregates from known sources. Fresh Cement has to be use d as strength of cement decresaes with time in storage, preferably use within 90 days or 12 weeks from date its manufacture. Use of Aggregates of proper shape, size and grading is essential. Ingredients must conform to relevant IS..

Proportioning of ingredients is necessary to meet strength requirements of concrete. It is therefore essential and important to adopt proper method of proportioning..

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Water-Cement Ratio of Concrete

The Strength of concrete depends on Water-cement ratio as strength of concrete decreases with increase in water-cement ratio and therefore water-cement ratio shall also lead to proper measures to achieve desired Workability of concrete.

Concreting Operations means proper batching or proportioning and homogeneous mixing of ingredients, transportation, placing, compaction, finishing and adequate curing of concrete.

Uses of Concrete In Comparison to Other Building Materials

- ❑ Construction of Residential, Public, Institutional and Commercial Structures- Plain and Reinforced Cement Concrete in foundations, floors, parapet, beams, lintels, sun shades, chajjas, columns and slabs.
- ❑ Public Health Engineering Projects-Construction of Water and Waste Water Treatment Plants, Water Supply and Sanitary Projects and Lines, Water Storage Reservoirs and Over Head Tanks.
- ❑ Construction of Roads and Bridges- Pavements, Foundations, Piers, Abutments and Deck Slabs, Kilometre Stones, Kerb Stones, etc.
- ❑ Construction of Airports-Runways, Taxi ways, hangers, Terminal Buildings, etc.

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- ❑ Construction of Harbour and other Marine Structures-Ports, Light Houses,
- ❑ Irrigation Projects-Construction of Canals, Dams, Falls, River Bridges, Culverts, Hydraulic and Other Irrigation Structures
- ❑ Construction of Hydro-power, Thermal Power and Other Power Projects
- ❑ Construction of Railway and Metro-rail Projects- Permanent Way, Stations and Yards, Sleepers, Signal Posts, Railway Over Bridge, Boundary stones, etc.
- ❑ Construction of Tunnels – lining
- ❑ Construction of Bunker, Silos, Chimneys, Foundation Piles, etc.
- ❑ Construction of Major Industrial Projects
- ❑ Construction of Precast , Pre-stressed and Composite Structures



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Advantages of Concrete:

- Ingredients of Concrete are easily and cheaply available almost everywhere.
- Ease in Production of Concrete.
- Concrete can be cast in desired shape and size of desired strength.
- Compressive Strength of Concrete is more than that of bricks and timber.
- Concrete is safe against sun, fire, temperature, rain, water, dampness, etc.
- Concrete is termite, insect and fungi resistant.
- Concrete is strong and durable product.
- Concrete has less maintenance cost.
- Strength of concrete increases with its age
- Concrete is relative cheaper for special and heavy structures.

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Important Terms in Concrete:

- Lean Concrete** means concrete of very low compressive strength.
- Rich Concrete** means concrete of high compressive strength.
- Dense Concrete** means concrete with minimum air voids making it impervious.
- Mass Concrete** means casting of huge quantity of concrete like that in dams.
- Green Concrete** means in situ concrete which is set and has not gained strength
- Hardened Concrete** means concrete which is set and has started gaining strength
- No Slump Concrete** means concrete which has negligible or almost zero slump.
- Normal Weight Concrete** means concrete which has density of 2400 Kg/m^3
- Heavy Weight Concrete** means concrete which has density of 3400 Kg/m^3 – 4200 Kg/m^3
- Reinforced Concrete** means concrete which has provision of bars for resisting tensile stresses.
- Pre-stressed Concrete** means concrete with high tensile stresses which has provision of cables pre-stressed mechanically and loaded thereafter.
- Ready Mix Concrete** means concrete batched and mixed at centralised location and thereafter transported for placing, compaction, finishing and cured at site of casting.
- Fibre Reinforced Concrete** means concrete which is reinforced with steel, polymer or glass fibres.

Thank You

