

CONCRETE SCIENCE AND ENGINEERING PROPERTIES

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Introduction to Concrete: Historical background, Concrete – A Three-Phase System, Importance, Sustainability. *Aggregates:* Production, Physical and Chemical Properties, Classification, Lab Tests, Specifications and Acceptance Criteria. *Cement:* Production, Physical and Chemical properties, Classification, Lab Testings and Specifications. *Cement Hydration:* Hydrated compounds – Importance and characteristic features, Growth and Models; Crystal pressures, Pores and voids – Importance, types and size ranges; Degree of hydration – Volume Relationships, Porosity and permeability – Relationship and Inter-relationship with strength, test methods for porosity. *Concrete Mix Design:* Mixture proportioning – IS & ACI method; Mix design strategies, Problems, Concrete Production Operations: Concrete production operations – Importance of Curing; Curing Methods. *Properties of Freshly Mixed Concrete:* Chemical Admixtures, Workability and Rheology, Setting Time, Air Content, Density, Temperature, etc., Test methods and factors affecting properties. *Properties of Hardened Concrete:* Compressive Strength, Modulus of Elasticity, Creep, Shrinkage (types) and Porosity and Permeability – Test methods and factors affecting properties. Case Studies.