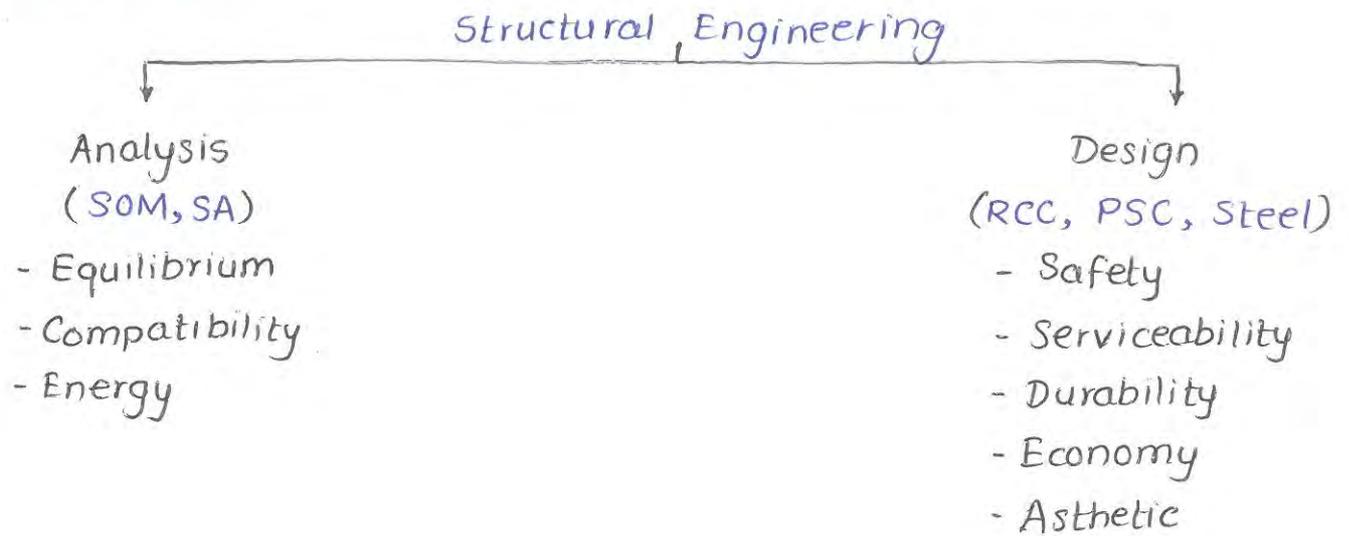


# 1. Basic Concepts

## 1.1 Introduction:



### i) Safety:

A structure must be safe with appropriate factor of safety [FOS] for loading that may come on it during its intended life.

### ii) Serviceability:

A structure should provide the service for which it is constructed.

### iii) Durability:

A structure should sustain loading for which it was designed and should perform well with safety and serviceability upto its whole life

Durability without serviceability or less margin of safety [FOS]

iv) has no meaning

### iv) Economy:

Design and construction of any structure should be economical without affecting safety, serviceability and durability.

### v) Asthetic:

IF huge investment is involved in design and construction

of a structure then aesthetic also plays an important role.

Ex. Considering a beam:

- i) Safety: Reinforcement is provided.
- ii) Serviceability: Doubly reinforced section instead of singly reinforced section to reduce depth of section.
- iii) Durability: Nominal cover, selection of material.
- iv) Economy: Monolithic casting of beam and slab designed as T-section.
- v) Aesthetic: Half round section instead of rectangular section.

## 1.2 Cement Concrete:

It is a mixture of binding material [cement], fine aggregate [sand], coarse aggregate, water and admixture in proper proportion to achieve concrete of desired properties at fresh state and hardened state.

### 1.2.1 Concrete Mix:

a) Nominal Mix:

- Based on experience.
- Mixing may be by weight or by volume. By weight is preferable
- Quantity of water is not fixed. It is provided as per site requirement.
- Nominal mix is allowed for M5 to M20.

	C	FA	CA
M10	1	3	6
M15	1	2	4
M20	1	1.5	3

b) Design Mix:

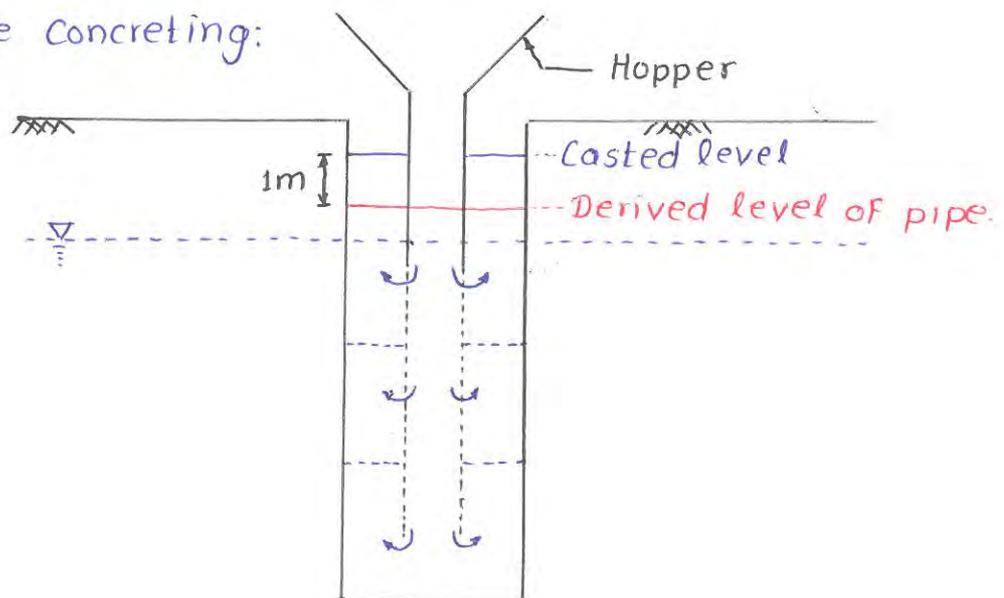
- Based on calculation as per **IS10262 (2009)**
- Proportioning must be by weight.
- Quantity of water is also fixed.
- Design mix is allowed for **M10 to M100**.

1.2.2 Fresh Concrete:

Workability is the most important property of fresh concrete which is simply defined as "Ease to work with."

Sr. No.	Degree of Workability	Use	Slump	Compacting Factor	Vee-bee time (sec)
1.	Very low	- Road Construction. - Shallow Section.	-	0.75-0.8	10-20
2.	Low	- Mass concreting. - Lightly reinforced section	25-75	0.8-0.85	5-10
3.	Medium	- Heavily reinforced section - Concreting by concrete pump.	50-100	0.85-0.92	2-5
4.	High	- Piling	100-150	0.92-above	-
5.	Very High	- Tremie pipe concreting.	-	0.92-above	-

\* Tremie Pipe Concreting:



\* Workability of Concrete can be measured by following methods.

1. Slump test

3. Vee-bee Test

2. Compacting factor Test

4. Flow Test

### 1.2.3 Hardened Concrete:

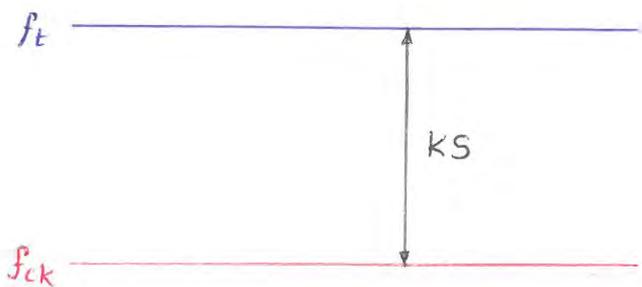
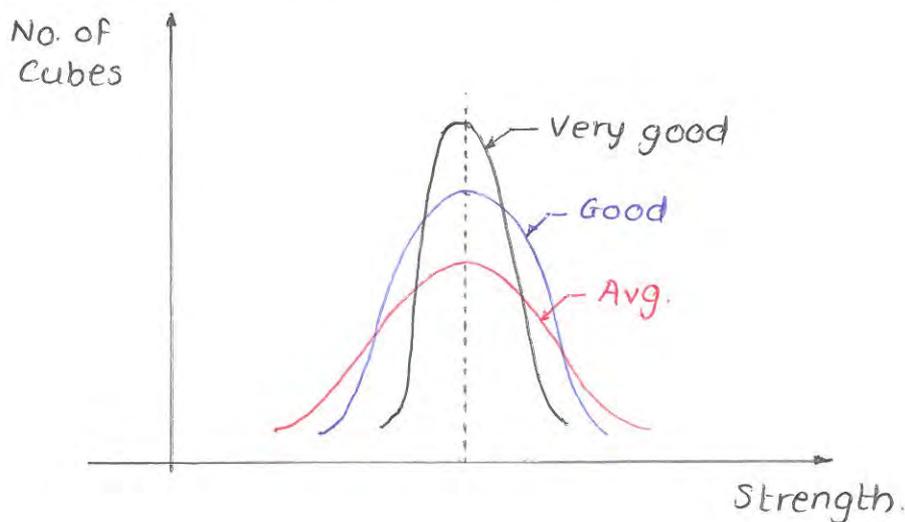
After final setting time, concrete is assumed to be hard and it keeps on gaining strength for very long time [1 to 5 years]

#### a) Compressive Strength of Cube:

This is the compressive strength of cube size 150mm subjected to uniaxial compression after 28 days from day of casting.

#### b) Characteristic Compressive Strength of Cube:

It is the strength below which not more than 5% test results are expected to fall.



$$f_t = f_{ck} + KS$$