

Concrete Technology

Topic – Concrete Mix Design(Unit 6)

Concrete

- It is obtained by mixing cement, fine aggregate, coarse aggregate and water in required proportions.
- The hardening of concrete is caused by chemical action between water and the cement due to which concrete gain its strength.
- The strength, durability and other characteristics of concrete depend upon the properties of its ingredients, proportion of the mix, the method of compaction and other conditions during placing, compaction and curing.

Mix Design

- Design of concrete mixes involves determination of the proportions of the given constituents namely, cement, water, coarse aggregate and fine aggregate with admixtures if any.
- Workability is specified as the important property of concrete in its plastic state. For hardened state compressive strength and durability is considered as important properties of concrete.

Methods of concrete mix design

1. ACI Mix design method
2. USBR Mix design method
3. British Mix design method
4. Mix design method according to Indian standard

Factors to be considered in Mix design (as per SP23-1982)

- **Grade of concrete**
- **Type of cement**
- **Maximum nominal size of aggregate**
- **Minimum water cement ratio**
- **Workability**

Grade of Concrete

Grade Designation	Specified Characteristic Compressive Strength In N/mm ² At 28 Days Curing
M10	10
M15	15
M20	20
M25	25
M30	30
M35	35
M40	40
M45	45
M50	50
M55	55
M60	60

Grade of Concrete

- M15 and less grades of concrete may be used for lean concrete bases and simple foundation for masonry walls.
- Grades of concrete lower than M20 shall not be used in reinforced concrete structure as per IS 456-2000.
- Grades of concrete lower than M30 shall not be used in pre stressed concrete structure

Mix design method IS

Step- 1 :determine target mean strength

$$f_m = f_{ck} + (1.65 \times \text{standard deviation})$$

- f_{ck} is the characteristic strength
- in absence of any available data on standard deviation the site, you can choose for M10 to M15 as standard deviation of 3.5 MPa for M20 to M25 rate of you know, concrete 4 MPa. And above M30 up to M50 these are all we are discussing about, normal strength concrete 5MPa.
- Standard deviation of strength is calculated at site by 30 cube sample.

Step- 2 : find out the water cement ratio based upon strength of concrete by a curve given in table 5 of IS:456 code.

Step-3: Determine water content sand content for concretes.

the water content is actually determine on the basis of maximum size of aggregate, then workability requirement and you know workability requirement and shape of the aggregate etc.

Step-4: calculate cement content and aggregate content.

References

- [Wikipedia](#)
- [Nptel.ac.in](#)
- [Google.com](#)

Thank You