



HindPhotostat



Hind Photostat & Book Store

CIVIL - ENGINEERING

UNACADEMY

R.C.C

Written By-Jaspal Sir

- Theory
- Explanation
- Derivation
- Example
- Shortcuts
- Previous Years Question With Solution

Visit us:- www.hindphotostat.com

Courier Facility All Over India
(DTDC & INDIA POST)
Mob-9311989030

REINFORCED CEMENT CONCRETE

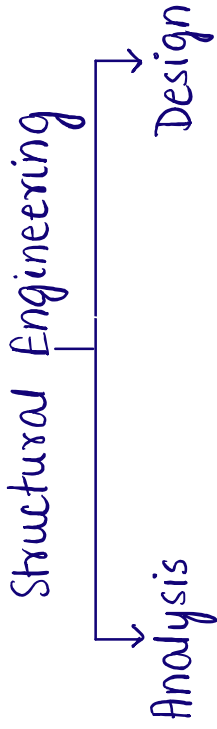
**-JASPAL SINGH
(Ex IES)**



REINFORCED CEMENT CONCRETE



Basic Concept



Analysis

- { SOM, TOS } Aspects
- Compatibility of structure
- Energy of structure
- Equilibrium of structure.

Design

- { RCC, PSC, steel structure aspects }
- Safety.
- Serviceability
- Durability.
- Economic.
- Aesthetic.

* Here, cct is concrete and Rlfⁿ is reinforcement.

1. Safety.

A structure must be safe with sufficient f.o.s. for loading, that is expected to come on it during its design life.

Ex: Designing of beam.

Safety: It is made safe under tensile loading by providing adequate Rlfⁿ.



2. Serviceability.

It signifies that structure should provide service for which it is constructed.

Ex: Doubly R/fⁿ section instead of singly R/fⁿ section is more serviceable.

3. Durability.

A structure should be durable/sustain loading for which it is designed and should perform well within safety limit and serviceability limit.

- Durability without serviceability and less margin of safety is irrelevant.

Ex: By providing nominal cover, selecting

specific type of material for construction.



4. Economy

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

Ex: Monolithic casting of beam and slab, using pozzolona in same proportion with cement.

5. Aesthetic

If large investment is done over design and construction of structure it should be aesthetic (good in appearance).

Ex: By changing the geometry of the section like providing half round section instead of rectangular section

Plain and Reinforced concrete

1. Plain concrete (PCC)

It is a paste which is formed by addi-

tion of water in specified proportion in mixture of binding material (cement), fine aggregate and coarse aggregate and admixture if required.



- PCC is strong in compression, but weak in tension.

- Its tensile strength is increased by reinforcing it by fibres and is termed as R/Fⁿ cement concrete.

- Its tensile strength is one tenth (approx) of its compressive strength.

- PCC is generally used in mass concreting.
Ex: Dam, Small Pedestal etc.

2. Reinforced Cement concrete

It is a CCT with R/Fⁿ embedded in it.

- The embedded R/Fⁿ makes it capable of resisting tension also.

- Steel bars are generally used for R/F of Concrete.

- Steel bars are embedded in tension zone in Cct and relieve it of any tension and take all the tensile loading without separating from the Cct.



- The bond between steel and surrounding ensures strain compatibility i.e., the strain at any particular point in steel and Cct would be same.

- Rlf steel also imparts ductility to the cct which otherwise is brittle material.

- Here ductility means large deflection due to yielding of steel would be observed prior to the failure.

- Tensile stress in Cct arise due to


1. flexural tension.
2. Diagonal tension.
3. Shear.
4. Temperature difference.
5. Shrinkage effect.
6. Restraint to deformation.

- Under these condition Rlf is to be provided across potential tensile crack.



Different grades of Concrete

| Groups | Grade designation. | Specified characteristic compressive strength of 150 mm cube at 28 day |
|------------------------|--------------------|--|
| Ordinary concrete | M10 | 10 |
| | M15 | 15 |
| | M20 | 20 |
| | M25 | 25 |
| | M30 | 30 |
| | M35 | 35 |
| Standard Concrete | M40 | 40 |
| | M45 | 45 |
| | M55 | 55 |
| | M60 | 60 |
| | M65 | 65 |
| | M70 | 70 |
| High strength Concrete | M75 | 75 |
| | M80 | 80 |

| | | |
|------|------|---|
| M85 | 85 |  |
| M90 | 90 | |
| M95 | 95 | |
| M100 | 100. | |

NOTE: 1. In the designation of Cct mix 'M' refers to the mix and number to be specified. characteristic compressive strength of 150 mm cube at 28 days expressed in N/mm^2 .

2. for Cct. of grade above M60, design parameter of IS 456 are not valid and for this Cct, further specialised literature or experimental result is to be concerned

3. Ordinary Cct is used for general RCC continued, standard Cct is used for prestressed Cct structure and high strength Cct is used for high strength RCC structure.

Minimum grade of concrete to be used depends upon the exposure conditions in the anticipated life of the Cct, which governs its durability as follows.

| Exposure | Min grade of Cct (PCC) | Min grade of Cct (RCC) |
|-------------|------------------------|------------------------|
| Mild | — | M20 |
| Moderate | M15 | M25 |
| Severe | M20 | M30 |
| Very severe | M20 | M35 |
| Extreme | M25 | M40 |

NOTE: Minimum grade of plain cct for mild exposure condition is not specified.

REMARK: Minimum grade of Cct (IS 456).
RCC M20
PCC M15

Min grade of cct (structural) shall be M20 but M25 for building (IS 13920).
a) More than 15 m in height in seismic