Architecture for Civil Engineering

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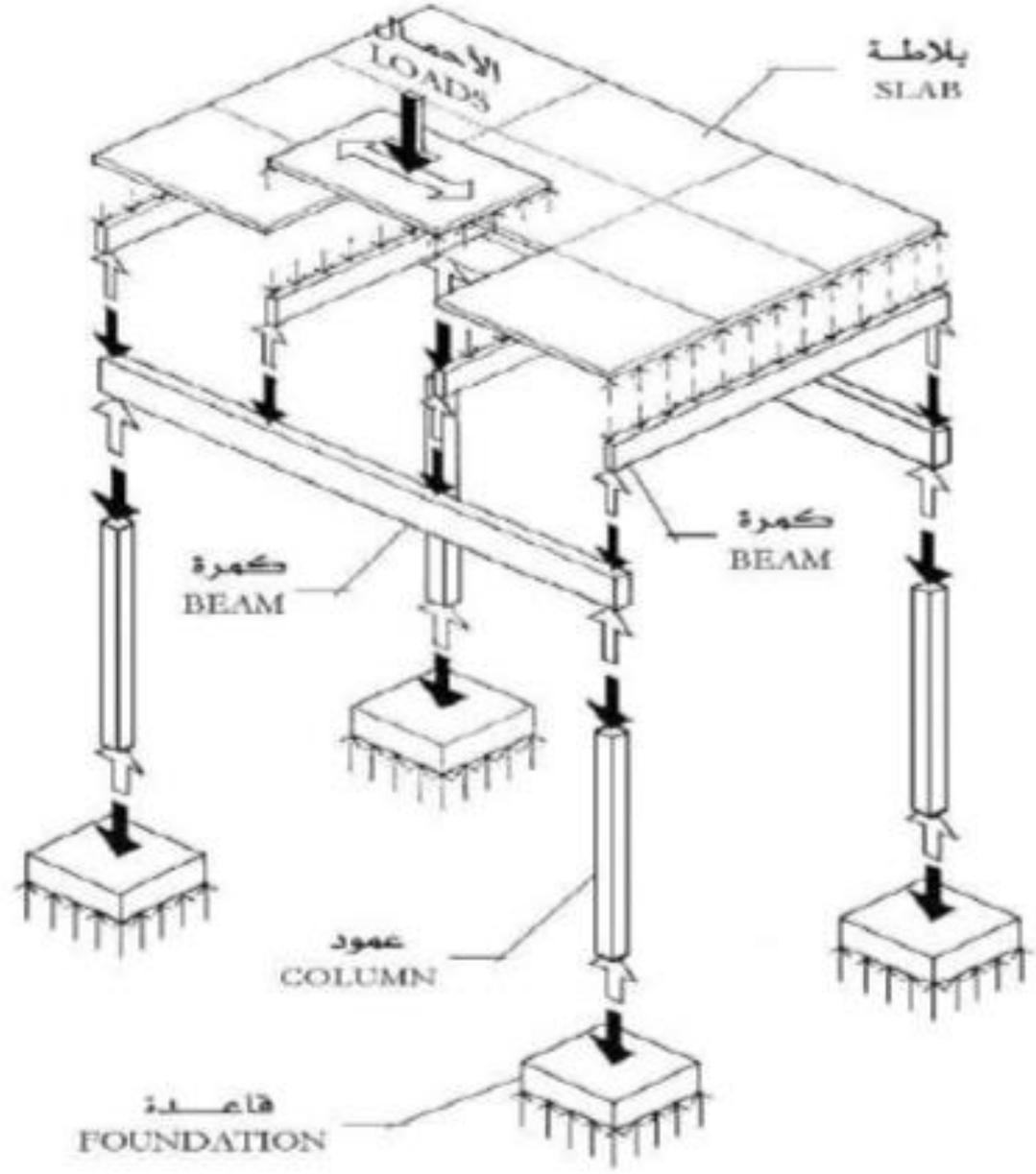
2-Skeleton Structure System

- **Beam and column System**
- Frames
- Trusses
- Arches

The load of the slab is transferring to the columns or walls through the beams ,down to the foundation ,and then to the supporting soil beneath.

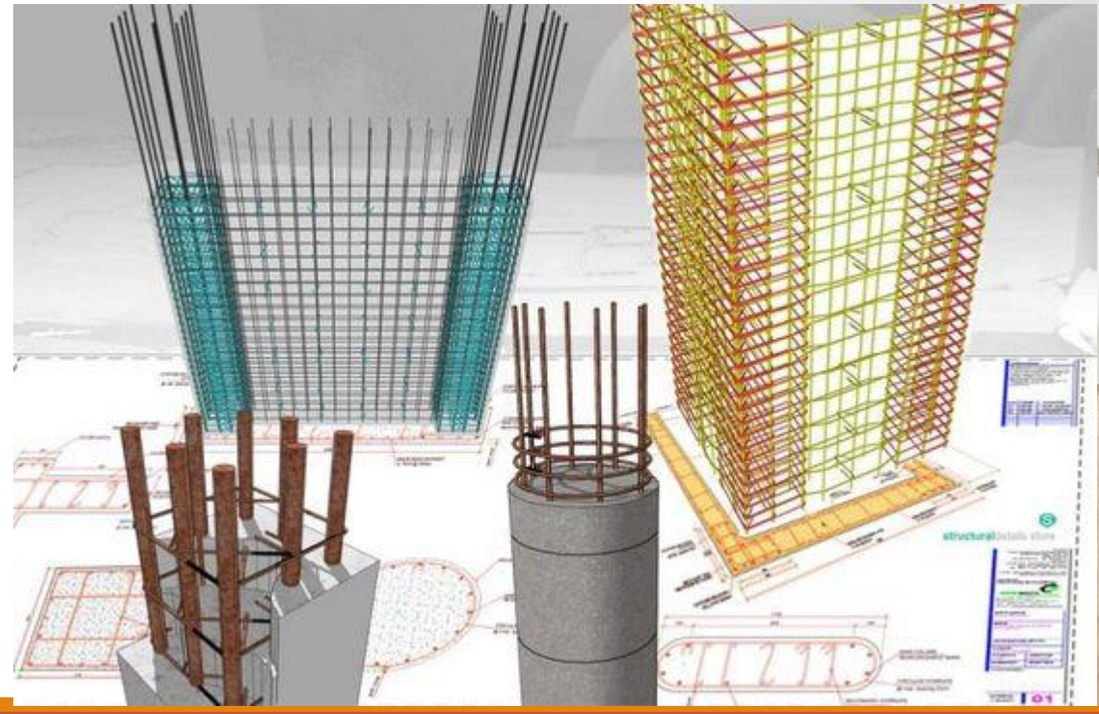
2-Skeleton Structure System

Beam and column System



Column

- RCC (Reinforced Cement Concrete) column is a structural member of RCC frame structured building. It's a vertical member which transfers loads from slab and beam directly to subsequent soil.
- Material used in columns
  - Cement
  - Coarse aggregate
  - Fine aggregate
  - Steel bar
  - Water
  - Shuttering



Column Construction process

- Constructing RCC (Reinforced Cement Concrete) Column involves following four stages of works.

1. Column Layout work.
2. Column Reinforcement work.
3. Column Formwork.
4. Pouring Concrete into column.

1. Column layout work

In this stage of works the location of columns are determined practically in field. It is done by laying rope according to grids shown in the drawing and then mark the location of columns related to rope.

2. Column reinforcement work.

After marking the column locations, they then start to place reinforcement as instructed in the structural drawing .

3. Column formwork

Column formwork is a term used for structures that are used to support forms or molds for poured concrete columns. It can be as simple as a reinforced cardboard tube for small cylindrical columns or very complex forms constructed from many pieces of wood and metal

4. Pouring concrete into column

For small quantity of concrete volume they normally depend on machine-mix concrete and for large concrete quantity they order ready-mix concrete. Because, if you use moving pump with ready-mix concrete and if you want not to exceed 5 feet height range for dropping concrete that would be difficult

Curing

Concrete which is moist cured for 7 days is about 50% stronger than uncured concrete

Slab

- In building construction the roof or slab for roof is very important constituents.
- Material used in slab.
  - Cement.
  - Coarse aggregate.
  - Fine aggregate.
  - Steel bar.
  - Binding wire.
  - Water .
  - Shuttering materials (wooden Planks, and Iron Plates).

Slab laying process

- According to work arrangement laying of RCC slab can be done in 4 stages such as formwork or centering and shuttering, bending and binding MS steel bars and laying of concrete

1. Formwork
2. Bending And Binding Steel bars
3. Spacing of steel bars
4. Laying of Cement Concrete

1. Form work

- The formwork should be as per (I S : 14687-1999).
  To retain concrete, formwork or centering and shuttering is required, which provides the support to the wet concrete until it has gained sufficient strength to be self supporting.

2. Bending And Binding Steel bars

- At the time of designing the slab, it is consider that concrete is strong in compressive strength but weak in tensile strength, so make the structure safe against the tensile stress, steel bars are provided.

3. Spacing of steel bars

- Steel bars diameter and its spacing in the RCC slab is calculated by designing the slab according to load and span of the slab. In general 12mm, 10mm and 8mm diameter steel bars are used in RCC slab according to the length of span of the slab and similarly spacing is from 4.5” to 6” in the main bars and 6” to 8” in distribution bars.

4. Laying of Cement Concrete

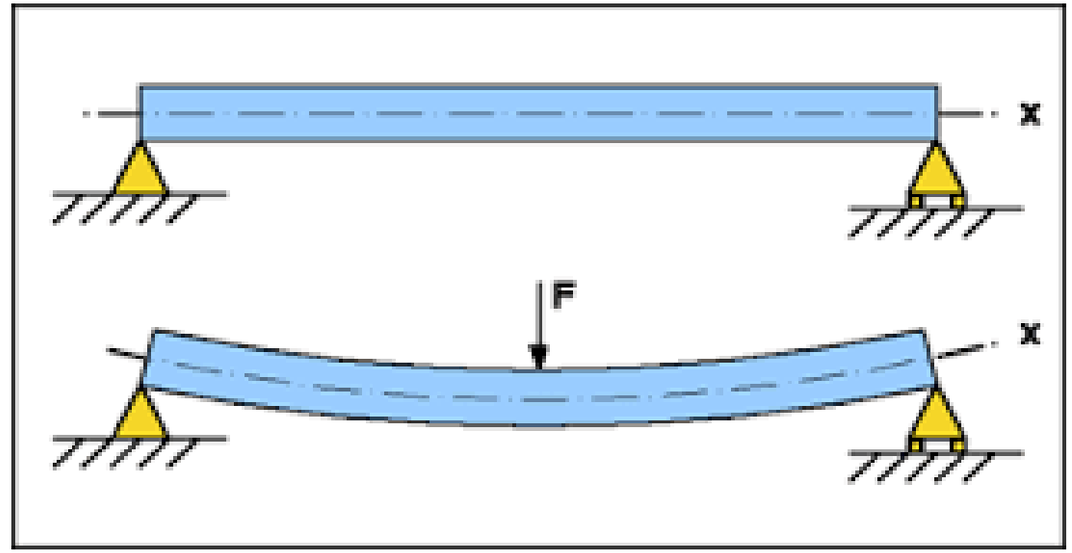
- Make walking way on steel bars by placing wooden plates to avoid disturbance in steel bars. Now start to lay the cement concrete mix as per design but not below the 1; 2; 4 ratio. The mix should be mechanically mixed and vibrated after laying on the slab

Curing

- After laying the RCC slab it should be cure for 28 days for getting full strength.

Beam

- A **beam** is a structural element that is capable of withstanding load primarily by resisting against bending. The bending force induced into the material of the **beam** as a result of the external loads, own weight, span and external reactions to these loads is called a bending moment.



Beam construction process

- According to work arrangement laying of RCC Beam can be done in 4 stages

1. Formwork.
2. Bending And Binding Steel bars.
3. Laying of Cement Concrete.
4. Curing .

Form work

The formwork should be To retain concrete, formwork or centering and shuttering is required

Bending And Binding Steel bars.

- At the time of designing the slab, it is consider that concrete is strong in compressive strength but weak in tensile strength, so make the structure safe against the tensile stress, steel bars are provided.

Laying of Cement Concrete.

- For small quantity of concrete volume they normally depend on machine-mix concrete and filling the beam.