RCC Framed Buildings

By Umesh Dhargalkar

Most of the multistoried buildings found in the urban landscape of Mumbai are *RCC Framed Structures*. RCC stands for "Reinforced Cement Concrete", wherein reinforcement in the form of steel bars is embedded in concrete for required strength. RCC enables construction of tall buildings, buildings with complex shapes and building with stilts. Such a building consists of various structural elements connected to one another as a framework so that it behaves as one unit. Walls in such structures are constructed after the frame is ready and are not meant to support any load.

Structural Elements:
RCC frame consists of the following elements:

- Flat ceiling of a room called a '**Slab**'.
- Horizontal members supporting a slab called '**Beams**'.
- Vertical members supporting the beams called '**Columns**'. A specially designed long column is called a '**Shear Wall**'.
- The underground system transferring the load of the building to the soil called '**Foundation**'.

Also, there are other RCC elements such as chajjas, lofts, staircase, lift wall, water tanks, features provided for general aesthetics etc.

Loads on Buildings:
There are basically two types of loads, which a structure must support.

- **Gravity load:** These act vertically downward and can be further divided into 'Dead Load' and 'Live Load'. Dead load consists of the weight of the structure itself including the frame, walls, plaster, flooring, waterproofing, fixed furniture etc. Live load constitutes the transient loads such as the weight of people, movable furniture, furnishings, domestic equipment etc.
- **Lateral loads:** These act horizontally on the building. The most common lateral loads are wind load and earthquake load. These are occasional loads and may act in any direction. They may also cause a building to move back and forth or even to vibrate.

Load Transfer:
Load transfer means to support the loads acting on the building and to safely carry them down to the soil below. In a framed building, the loads are transferred by 'Frame Action'. First the loads are transferred from slabs to beams. Beams then transfer them to columns immediately below them. These columns transfer the loads to lower columns. While a beam carries the load for that floor only, a column carries the load for all the floors above it. The lowermost columns transfer the loads to the foundation, which, in turn, transfers them to the soil.

Common Types of Foundations:
The common types of foundations adopted for RCC framed buildings are:

- **Footings:** In these, sufficient area of contact with soil is provided around each column when good soil is available at a shallow depth.
- **Raft foundation:** This is used when basement is to be provided and good soil is not available at a shallow depth. In this case the entire base slab of the basement transfers the load to the soil.

- **Pile foundation:** This type is used when the loads to be supported are large and firm soil is not available at a shallow depth. In this case, loads are transferred to the deep rock by using vertical piles.
