

8. R.C.C. structure can be designed to take any load.

## 6.2 Uses of R.C.C.

It is a widely used building material. It is used in almost each and every part of building right from foundation to constructing roof. It is used in almost all type of structure irrespective of its loading conditions. Widely used in residential and commercial building, dams, retaining wall etc.

### B) Building Component

A building consists of three parts

1. Foundation
2. Plinth
3. Super Structure

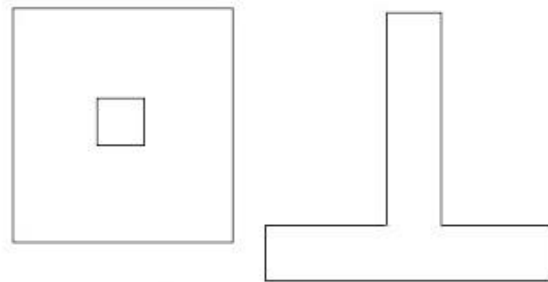
#### 1. Foundation

A foundation is the lowest part of a building structure. It connects upper part of building to the ground, and transfers loads from the structure to the ground. Foundations are classified into two types

- a) Shallow Foundation
- b) Deep Foundation

#### a) Shallow Foundation:

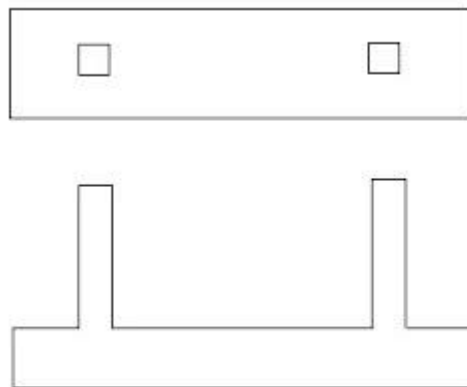
- When Depth to width ratio of the foundation is less than or equal to 1 then foundation is called as shallow foundation.
- These foundations are placed near the surface of the earth or transfers the loads at a shallow depth.
- Type:
  - **Isolated Footing**
    - These are most economical. They are usually in square or rectangle size with the column sitting in the middle of the square. It's a kind of pad footing.



Isolated Footing

○ **Combined Footing**

- A footing, either rectangular or trapezoidal, that supports two columns. It's also a pad footing.



Combined Footing

○ **Strap Footing**

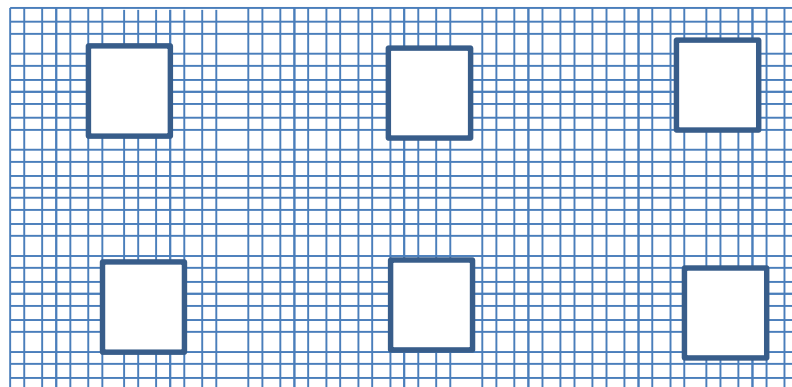
- Consist of two single footings connected with a beam or a strap and support two single columns.
- Used when distance between columns is large and load taken by structure is smaller than construction of combined footing become uneconomical. In such cases Strap footing is provided.



Strap Footing

○ **Raft Footing or Mat Foundation**

- Consist of one footing usually placed under the entire building area. They are used when soil bearing capacity is low, column loads are heavy, single footing can't be used, piles are not used and differential settlement must be reduced.



**b) Deep Foundation**

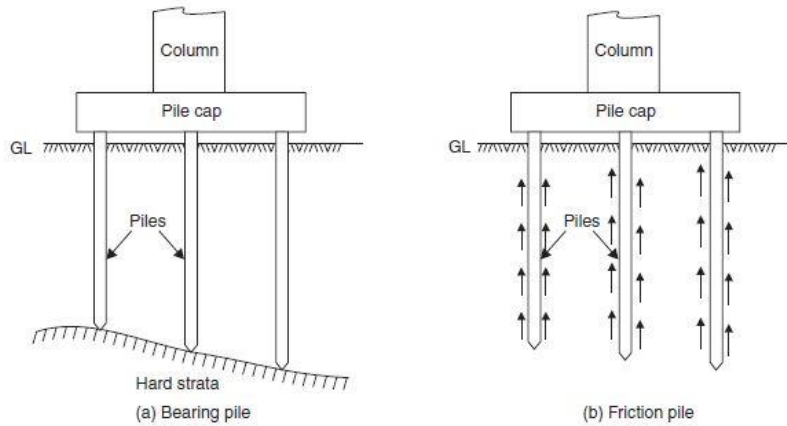
When depth to width ratio is greater than 1 than such foundation are called as Deep Foundation.

These type of foundations transfers building loads to the earth farther down from the surface than a shallow foundation does to a subsurface layer or a range of depths.

**Type :**

- a) **Pile foundations:** are a common type of deep foundation. These are relatively long, slender members that transmit foundation loads through soil strata of low bearing capacity to deeper soil or rock strata having a high bearing capacity. They are used when for economic, constructional or soil condition considerations it is desirable to transmit loads to strata beyond the practical reach of shallow foundations.

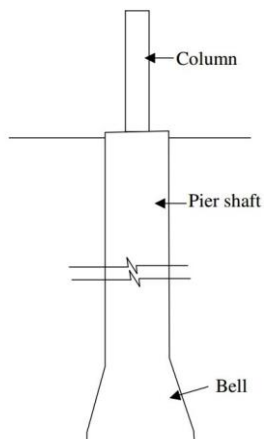
In addition to supporting structures, piles are also used to anchor structures against uplift forces and to assist structures in resisting lateral and overturning forces.



### b) Pier Foundation

is a collection of large diameter cylindrical columns to support the superstructure and transfer large super-imposed loads to the firm strata below.

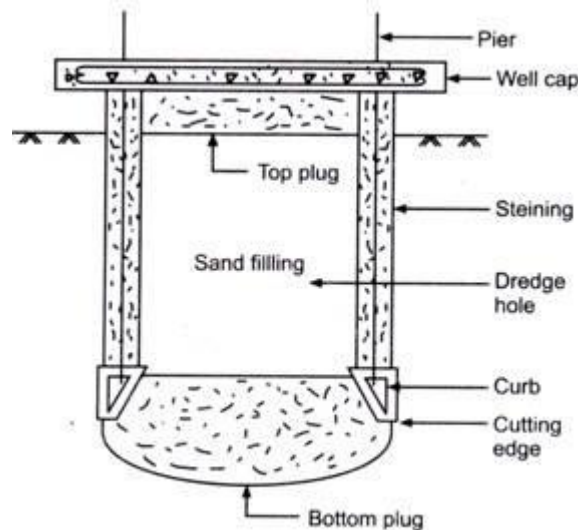
Load here is transferred via bearing action.



Pier Foundation (Caisson)

### c) Well Foundation or (Caisson Foundation)

Well foundation is a type of deep foundation which is generally provided below the water level for bridges. Caissons or “well” have been in use for foundations of bridges and other structures since Roman and Mughal periods.



## 2. Plinth

This is the portion of the structure between the surfaces of the surrounding ground and surface of the floor, immediately above the ground. Role of plinth is to transmit the load of superstructure to the foundation. Protect the building from damp or moisture penetration into it which increase the stability and durability of structure

**3) Super Structure:** Part above the plinth is called superstructure. A superstructure consist of following parts:

- Beams, Colum, Slabs:** Are load taking and load transferring structure of buildings.
- Walls:** Wall is used for partition in a building. In some super structures it may also be designed as load bearing structure. A wall should be fire resistant, provide sound insulation and must provide protection against weather conditions like sun, wind rain etc.
- Doors and Window:** Primary function of door is to provide access to other parts and outside building. Doors allow free movement into and out side building. The main aim of window is to provide proper ventilation and lighting of a building. Both door and window should be placed such a way that they offer sufficient privacy, security and easy access.
- Sills, Lintel and Shades:** Window sills are provided between bottom of window frames and wall below it. The function of window sill is to protect wall from wear and tear. A lintel is

beam like rectangular structure constructed over door and windows to take up weight of the wall. Shades are installed in combination with lintel to protect them from weather elements.

- e. *Staircase*: A stair case is used to move from one floor to another. The placement of staircase should be such that its accesses easy and quick. The stair case should be designed to bear intended load. The material should be of good quality, fire resistant and durable.
- f. *Roof*: The uppermost part of building is called roof, and its function is to protect the building and persons from weather conditions like rain, sun, snow etc. Since it bears weathering actions the quality of material should be excellent.

### **BUILDING BY-LAWS**

Building By Laws are set of standards and regulations related to construction of a building set by concerned government authorities. The aim of setting such laws are:

1. Ensure quality construction: As per building by laws, a contractor should adhere to standard suggested by respective codes. For example minimum grade of concrete used for construction shall be M20.
2. Health and safety of the people using the building. This is ensured by directing builders to construct mandatory emergency related provisions like fire exist, alarms etc.
3. Easy access for the disable people.: This is done by providing lifts and ramp in every building.
4. Providing physical and physiological comfort not only to building users but also to the neighbors. By specifying the necessary provisions like setback distance, building orientations etc. building bye laws helps in avoiding unnecessary confrontation between neighbors.

Example of few prominent building bye-laws are:

- a. No provision for parking area for structure having area less than 500m<sup>2</sup>
- b. Width x height of lift shall be 1.1m x 2 m, with entry width of 0.9m.
- c. Minimum Set back distance with respect to height:

Height (m)	Set back distance (m)
40-45	13
45-50	14
50-60	15
60 and above	17

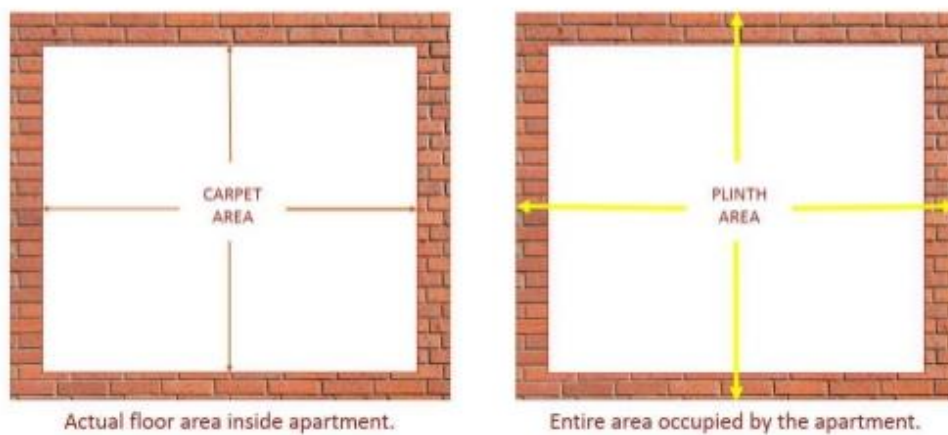
- d. A completion certificate certifying quality standard.

### **Few technical Terms:**

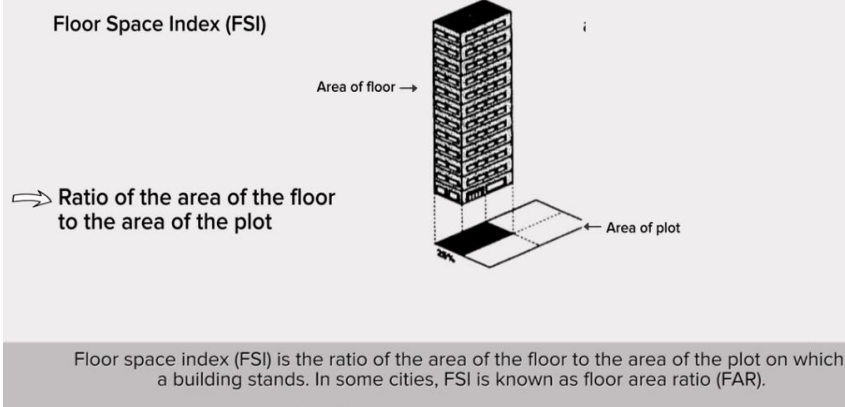
- a) **Plinth Area**: It is the difference of plot area and setback distance.  
Where, plot area is area surrounded by boundary, and setback distance is the empty space provided as per building by laws.

- b) **Carpet Area:** It is the difference between plinth area and area covered by wall. It is the area enclosed within the walls. It is measured from wall to wall within the apartment and translate into actual floor area.
- c) **Floor space Index/ Floor area ratio:** It is the ratio of floor space covered in all floors to the actual area of plot.

### Difference between Carpet Area and Plinth Area



### Floor Space Index (FSI)



### Type of Buildings :

The purpose of constructing buildings is to live and work comfortably by ensuring following terms  
Shelter people, goods or animal from weathering effect.

Providing privacy

Providing safety.

Types of Buildings

To fulfill various purposes, buildings are divided as following types by international building code:



1. Assembly Buildings
2. Business Buildings
3. Educational Buildings
4. Factory Buildings
5. Hazardous Building
6. Institutional Buildings
7. Mercantile Buildings
8. Residential Buildings
9. Storage Buildings
10. Utility & Miscellaneous

### **1. Assembly Buildings**

In this type of buildings people gather for some reason. These reasons can be any types. Such as social purpose, religious purpose, patriotic purpose or simply recreation purpose. This types of buildings are – Restaurant, Cinema hall, Theater, Gymnasium, Swimming pool, Prayer hall, etc.

### **2. Business Building**

This type of buildings are used for providing various types of services. Below are this type of buildings – Bank, Dispensaries and clinic, Libraries, Insurance agencies, Fire station, Police station, etc.

### **3. Educational Buildings**

This type of buildings constructed for various activities in primary, secondary or college level educational system. Example of this type of buildings are –School, College, Training institute, Day care centre, etc.

### **4. Factory Buildings**

In this type of buildings, products are assembled or processed or fabricated or repaired. For example –Gas plant, Power plant, Refineries, Dairies, and Laundries etc.

### **5. Hazardous Buildings**

This type of buildings are used to produce or storage high flammable or toxic materials (Don't be confused with factory building). Such as fireworks, hydrogen peroxide, cyanide, etc.

### **6. Institutional Buildings**

Although this type of buildings provide facility of sleeping accommodation these are not included in residential buildings. Institutional buildings are those where people are physically unable to leave without assistance.

Followings are the institutional buildings –Hospitals, Infants care homes, Old homes, Nursing homes Prisons, etc.

### **7. Mercantile Buildings**

In this type of buildings goods or materials are displayed or sold. Following are this type of buildings – Shopping mall, Grocery Store, Departmental store

### **8. Residential buildings**

All those buildings with sleeping accommodation facility are called residential buildings. Following are example of residential buildings –Apartments, Flats, Hotels, Hostels, Private Houses, Cottage, bungalows, Duplex

### **9. Storage Buildings**

This type of buildings are used for storing goods, animals or vehicles. The storage materials should not be hazardous. Such types of buildings are – Garage, Warehouse, Cold storage, Transit sheds, Parking, etc.

### **10. Utility and miscellaneous**

Good example of this type of buildings are Water tower, Barns, etc.



**Concept of Sunlight and Ventilation**

Good sunlight and proper ventilation is very important to create pleasing and healthy environment. This is achieved by following ways

- a) A given room must have a window or glass door that is sized to equal at least ten percent of the floor area of the room. So, if a room is 10 feet wide x 12 feet long, then the room area would be 120 square feet and the minimum size of the window in that room would have to be 12 square feet. A three foot by four foot window would provide 12 square feet of natural light to the room – again, the required minimum.
- b) For Ventilation natural ventilation must equal 5 percent of the floor area – or exactly half the requirement for that of natural light. In our natural light example above the window also would qualify for minimum natural ventilation if half of it was operable.