Details of Construction

Floors, Roofs
&
Stairs

Floors

Definition and Meaning

- Flat supporting elements which divide the building into different levels thus increases accommodation on a given plot of land.
- Basic purpose is to provide a firm and dry platform for people and other items like furniture, stores, equipment etc.
- Floor is generally referred to by its location.

Types of Floors

There are Three types of Floors:

1. **Basement Floor -** A floor provided for accommodation below the natural ground level is termed as basement floor.

2. **Ground Floor -** A floor immediately above the ground is termed as ground floor.

3. **Upper Floor -** All other floors such as first floor, second floor etc are termed as upper floors.

Basement Floor



Upper floors



Components of Floors

A floor basically consists of two parts: sub floor and flooring.

1. **Sub Floor** - Structural component of the floor which supports all the loads (dead and superimposed).

2. **Flooring** - Covering layer of desired specification (cement concrete, terrazzo, tiles etc) provided over the sub-floor to serve as a finishing layer.

Types of Ground Floors

The different types of floors which are commonly used for ground floor construction are:

1. Mud Flooring - Used in low cost housing, specially in villages.
2. Muram Flooring - Muram is a form of disintegrated rock with binding material. This flooring has practically the same properties as that of mud flooring.
3. Brick Flooring- Well burnt bricks of uniform shape and color are laid either flat or on edge or set at right angles to the wall.
4. Flag Stone Flooring - Any laminated sandstone available in uniform thickness (2 cm to 4 cm) is called flag stone. Stone slab may be square (30cm x 30cm, 40cm x40 cm,60cm x 60cm) or rectangular (45cm x 60cm).
5. Tiled Flooring - Tiled flooring is constructed from square, hexagonal or other shapes, made of clay (pottery), cement concrete or terrazzo. These are available in different sizes and thicknesses.

Mud flooring

- They are cheap, hard, fairly impervious, easy in construction and easy in maintenance.



Muram Flooring



Brick Flooring





Flag Stone Flooring





Types of Ground Floors



Chequered Tiles



Terrazo Tiles



Glazed Tiles

Types of Ground Floors (contd)

6. Cement Concrete Flooring
7. Granolithic Flooring - Finished coat provided over the concrete surface to form a hard, resistant to abrasion and durable flooring. Granolithic concrete is composed of cement, FA and specially selected aggregates.
8. Terrazzo flooring
9. Marble Flooring
10. Timber Flooring

Cement Concrete Flooring

- Commonly used for residential commercial and even industrial building.
- Moderately cheap, quite durable and easy to construct.



Granolithic Flooring

- It has a similar appearance to concrete, and is used to provide a durable surface where texture and appearance are usually not important (such as outdoor pathways or factory floors).



Terrazzo flooring

- Terrazzo flooring offers high durability and deep beauty.
- Terrazzo is a concrete surface with special aggregate of marble chips mixed with white or other colored cement in proportion of 3:1.



marble, granite

Marble & Timber Flooring





Types of Ground Floors (contd)

12. Asphalt Flooring - Dustless, elastic, durable, waterproof, acid proof and attractive in appearance. Non-slippery and noiseless. Used in factories, loading platforms, swimming pools etc.
13. Rubber Flooring
14. Linoleum Flooring - Linoleum is a covering laid over wooden or concrete floors in order to hide the defects of flooring or to enhance its appearance. It is manufactured by mixing oxidized linseed oil with powered cork, wood flour, various types of gums and suitable coloring pigments.
15. Acid proof Flooring

Asphalt & Rubber Flooring





Linoleum & Acid Proofing Flooring





Selection of Type of Flooring

The selection of the type of floor often poses a problem and as such the following points are carefully considered before making the final choice.

1. It should be durable.
2. It should be easy to clean.
3. As far as possible it should be noiseless.
4. It should have a good appearance.
5. It should be free from dampness.
6. It should be fire resistant.
7. It should have low maintenance cost.
8. It should not be very costly.

Types of Upper Floors

The upper floors may be broadly classified into the following different types:

1. Timber floors.
2. Timber floors supported on rolled steel joists.
3. Flag stone floors resting on steel joists.
4. Jack arch floors. Jack arch is an arch of either brick or concrete, supported on lower flange of mild steel joists (RSJ).
5. Reinforced cement concrete floors.
6. Ribbed floors or hollow tiled flooring.
7. Pre-cast concrete floors.

Reinforced cement concrete floor



Ribbed Floor

- It is a form of RCC floor construction in which, the portion of concrete below the NA of slab is removed.
- Used when live loads are comparatively small and spans are comparatively longer.



Roofs

Definition and Meaning

Roof may be defined as a covering provided over the top of a building with a view to keep out rain, snow , sun, and wind and to protect the building from the adverse effects of these elements.

Components of Roof

A roof basically consists of two components: Roof Decking and Roof Covering.

Roofs (contd)

The Roof Decking

The roof decking is the structural component which supports the roof covering e.g. trusses, portals, flat slab, shell, dome or space frame etc.

The Roof Covering

Materials supported on the structural elements installed on the building top e.g. thatch, wooden shingles, tiles, AC Sheets, GI Sheets, Slates etc.

Asbestos fibre cement

Roof Decking & Covering





Requirements of Roof

A well planned roof should satisfy the following requirements:

1. It should be structurally sound and strong enough to carry the anticipated dead and live loads safely.
2. The roof should be durable against adverse effects of elements like rain, snow, sun, wind etc.
3. It should have efficient water-proofing and drainage provisions.
4. The roof should provide desired insulation against heat.
5. It should provide desired insulation against sound.

Type of Roofs

1. Flat roof
2. Pitched or Slopped roof
3. Curved roof

Choice of a Particular Type Depends on:

1. Location of building
2. Weather conditions
3. Funds available
4. Functional and aesthetic requirement

Flat Roofs

- Structural element is flat slab.
- A roof laid at an angle of less than 10^{o} to the horizontal is known as flat roof.
- Flat roof may be of RCC, precast concrete, flag stones supported on RSJ, or jack arch type.
- Flat roofs are constructed in a similar manner as the upper floors except that the roof surface is properly treated to protect it from the adverse effect of rain, snow and heat etc.
- Water proofing and roof drainage are considered to be the two very important requirements of flat roofs.
- Flat roofs are considered for buildings in plains or in hot regions where rainfall is scanty.

Flat Roofs

- **Terracing**

An additional layer of insulating material (mud, lime concrete etc) is laid over the roof surface to provide adequate thermal insulation to the space below. This layer is known as terracing or grading.

- **Purposes of Terracing**

1. It provides suitable slopes on the roof top for drainage of rainwater.
2. It acts as insulation layer for providing thermal comfort to the users of the space below.

Flat Roofs

- Advantages of Flat Roof
  1. The roof can be conveniently used as terrace for playing, gardening or sleeping purposes.
  2. It is easy to render flat roof fire resistant.
  3. It avoids the enclosure of the triangular space.
  4. It has good insulating properties.
  5. In this age of steel and reinforced concrete structures, the construction of flat roof is considered more simpler and architecturally suitable.
  6. In a multi- storied building, flat roof is considered to be the best choice.
  7. Flat roof require lesser area of roofing material than sloped roof.

Flat Roofs

- Disadvantages of Flat Roof
  1. Span is restricted. Can not be used for larger spans.
  2. Exposed to sun. Subjected to violent temperature changes which may lead to cracks in the roof surface.
  3. Leak in roof is difficult to trace and rectify.
  4. Considerable self weight makes the construction expensive.
  5. Initial cost much more than pitched roof.
  6. Progress of construction is slow as compared with that of pitched roof

Pitched or Sloped Roof

- Structural element is truss(wood or steel).
- Most common form of roof.
- Generally regarded as the cheapest alternative for covering a structure.
- Suitable for buildings in coastal regions or in areas where rainfall is very heavy.
- Slope less than 1 in 3 is not satisfactory from the drainage point of view. In areas of heavy snow fall steeper slopes (1 to 1 1/2 or 1 to 1 are provided to reduce the incidence of snow load on the roof.

Curved Roof

- Structural element is shell or dome.
- Roof having curved shape provided to meet the functional as well as aesthetical requirements of the building.
- For examples, domes for large circular halls used for assembly, gymnasiums etc. Shell or folded plate for libraries, theatres, recreation centers, factories, workshops etc.

Curved Roof





Stair

- A stair may be defined as series of steps suitably arranged for the purpose of connecting different floors of a building.

Types of Stair

- Different types of stairs may be classified under the following main head.

1) Straight stair.
2) Dog-legged stairs.
3) Open-newel stairs.
4) Geometrical stairs.
5) Circular stairs.
6) Bifurcated stairs.

Straight Stair.

- Straight stair:

➢ Runs straight between the two floors.

➢ All the steps rise in the same direction.

➢ In case of steep ascending straight flight may be broken at an intermediate landing.



Dog-Legged Stairs

- Dog-Legged Stairs- **Dog-leg** is a term used to describe a configuration of stairs between two floors of a building, often a domestic building, in which a flight of stairs ascends to a half-landing before turning 180 degrees and continuing upwards.
- Flights do not have to be equal and frequently are not.
- These stairs are useful, where total width of space available for stair case in equal to twice the width of the steps.

Dog-Legged Stairs





Open-Newel Stairs

- Open well or open newel half turn stair has a space or well between the outer string.
- These stairs are useful, where available for stair case has a width greater than twice the width of the step



Open-Newel Stairs



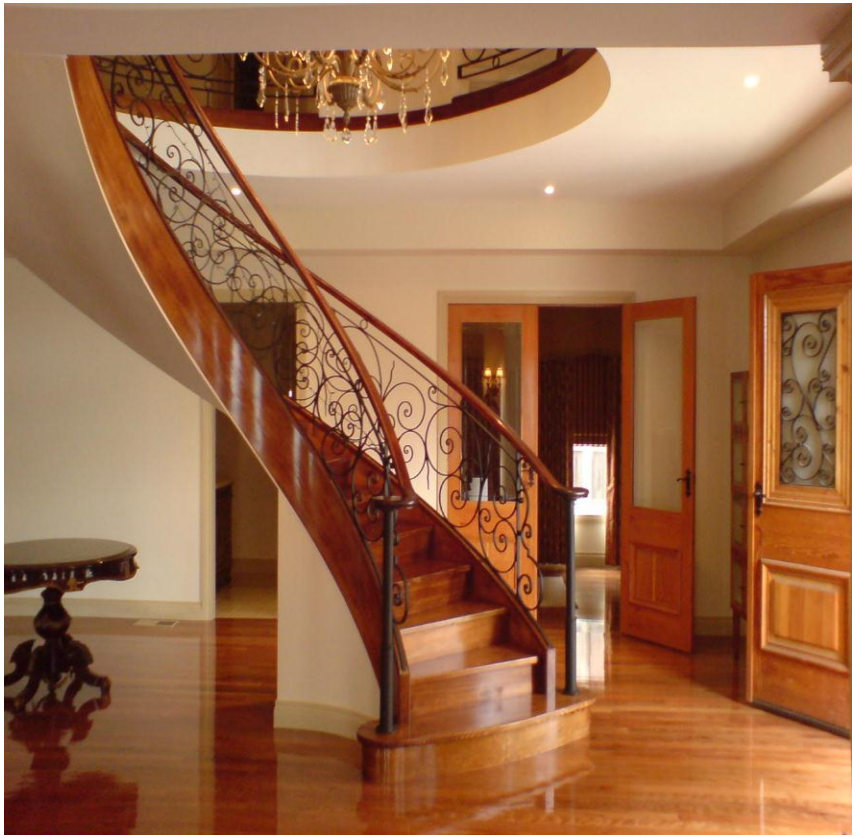


Geometrical Stairs

- Geometrical Stairs- Similar to open well stairs, with the difference that the open well between the forward and the backward flight is curved.
- Circular Stairs- Commonly provided at the backside of a building for easy access to its various floors for service purpose.

Geometrical Stairs





Circular Stairs





Spiral stairs

- ✓ It is just circular stair having central vertical post.
- ✓ All the steps radiate from this central vertical post

Spiral stairs



Bifurcated Stairs

- Commonly used at public building at their entrance.
- A wider flight at the bottom is divided into narrower flights, one turning to the left and the other to the right, at the landing.



Stair of Different Materials

1) Wooden stairs.
2) Stone Stairs.
3) Metal stairs.
4) Reinforced Concrete stairs.

Wooden Stair

- Fire resistance is not considered much.
- Easy and cheap in construction.
- Light in weight.



Stone Stair

- Stone stairs are quite strong and rigid, though they are very heavy.
- Constructed in workshops, warehouse and public buildings.
- Due to its heavy weight stone stairs require stable support.



Metal Stair

- Stairs of mild steels or cast iron are used only as emergency stairs.
- As they make lots of noise, commonly used in factories and godowns.



Reinforced Concrete Stair

- Widely used for residential, public and industrial buildings.
- They are strong, hard wearing and fire resisting.



Conclusion