

## Chapter -5

### Floors

#### Introduction

Floors are provided to divide a building into different levels for creating more accommodation one above the other within certain limited space. One of the major purposes of floor is to provide a level surface capable of supporting the inmate/occupants of a building together with their belongings, furniture, equipment, stored materials. In the traditional floor constructions, the floor is needed to have a clean, smooth, impervious level and durable surface. They are designed to be dust free and easy to clean so that they will have good aesthetic appealing. Exclusion of dampness, sound and thermal insulation, fire resistance and adequate strength and stability are among the purposes of the floor. The bottom floor near the ground level is known as ground floor and other floors above it are termed as upper floors or 1st floor, 2nd floor, etc. If there is any accommodation constructed below the natural ground level, it is known as basement and the floor provided in it is known as basement floor.

A floor may consist of two main components:

- (i) A sub-floor, which provides proper support to floor covering and the superimposed loads are carried by it.
- (ii) Floor covering, which provides a smooth, clean, impervious and durable surface.

#### Classification of Floors

If the building has only one storey, it is possible to support the floor upon the ground. However, if a basement is required or if the building has more than one storey, some other means must be found for supporting the floors. Floors may, therefore, be classified as: *ground floors and upper floors*. Ground floors have some kind of contact with the ground surface while upper floors are situated above the ground level. Ground floors are further subdivided into suspended floors, solid floors and basement floors.

Suspended floors are floors supported above the ground level. Where a floor has to be especially resilient, for instance, in a dance hall, suspended construction may be desirable. Solid floors are floors resting directly on the surface. Basement floors are floors resting at the lowest/basement level. Resistance to moisture ingress is one of the main criteria in the design of basement floors. Generally, the main purpose of a hard core in floor system is to prevent the dampness from penetrating the soil and affecting the floor through capillary action.

#### Ground Floors

Ground floor or basement floors which rest directly on the ground do not require the construction of a strong sub-floor. Floor covering may be directly placed on a well compacted base. But it is essential to make suitable arrangements for proper drainage for the floor. A porous layer of inert material like sand is provided to check the rise of subsoil water into the floor. Special types of treatments are given to the base for using various types of floor coverings.

For good performance of a ground floor, it should be able to perform the following conditions:

## Building Construction :Floors

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1. Support without failure the loads imposed on it by people and furniture in the case of residential buildings, factories, warehouses, etc. Floors should be strong enough to carry all incidental loads including wares and machinery,
2. Prevent dampness inside the building by providing a damp proof membrane in or below the floor. Suspended floors should be properly ventilated to avoid the accumulation of moist air underneath.
3. Prevent the growth of vegetable matter and other living organisms inside the building,
4. be reasonably durable so as to require minimum maintenance or replacement work,
5. provide a surface finish with a standard of appearance, comfort, cleanliness and heat retention suitable to the needs of the inhabitants of the building

### **UPPER FLOORS**

In top floors, the construction of properly designed sub-floors is essential for the structural safety of the floors. Suitable types of floor construction for upper floors of buildings are selected on the following considerations:

(1) Building Plan. If a building is such in plan that it can be divided into rectangular panels which are nearly square in size, flat slab construction may be adopted. For small spans, ordinary slabs are economical and for long spans ribbed slabs will be more suitable.

(2) Floor Loads. The floor load is dependent directly on the activities that will go on the floor. Light loads can be carried by any type of floor construction but larger loads need very strong floors, e.g. steel joists with thin slabs of stone over them are suitable to carry light loads whereas for heavy loads thick reinforced concrete slab and beam construction becomes essential. The construction of flat slab will, not be economical for carrying light loads.

(3) Type of General Construction. The type of floor construction must be in complete harmony with the type of general construction adopted for that particular building. If beams, girders and columns are made of timber, the floor will be also constructed with timber, whereas for steel framed building, the floor may be constructed with steel or timber. Concrete framed structures must have RC.C. floors. In case, brick walls are adopted to carry the loads, flat slab construction is not possible.

(4) Initial Cost. Selection of a particular type of floor is directly linked with initial cost of construction. According to the cost of construction, the various types floors may be put in the following order:

- (a) Wooden single floors or RC.C. battened floors.
- (b) Light steel joist with timber planks.
- (c) Double and framed timber floors.
- (d) Steel joist with RC.C slab or jack arches.
- (e) RC.C. slab and beams.
- (f) Flat slab construction or RC.C. ribbed slabs.
- (g) RC.C. ribbed slabs with clay tiles.
- (h) Hollow clay tile arches and steel beams.

Upper floor should:

1. Sustain its own weight and other weights imposed on it
2. Offer fire resistance especially in very tall buildings , in buildings where there are many occupants and in buildings where large combustible goods are stored,

## Building Construction :Floors

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3. Minimize noise transfer from the upper floor to the lower floor,
4. Be reasonably durable,
5. Provide an acceptable surface finish which is safe, comfortable, clean and of good appearance.

The following factors govern the selection of suitable type of floor construction in general :

1. **Initial Cost.** The cost of construction widely varies for different types of floors and floor coverings. Marble floors and special clay tile floors are most expensive type whereas terrazo flooring, linoleum flooring, etc. are moderately expensive. Concrete floor is the cheapest type of floor construction. Hence the selection of the suitable floor will be restricted by the fund available for its construction.
2. **Appearance.** Decorative value and architectural appearance of the floor in conformity with building needs proper attention while selecting suitable type of floor covering.
3. **Cleanliness.** A good floor must easily be cleaned. It should be non-absorbent and joints should be water-tight. Marble, terrazo and tiled floors are easily cleaned and useful for the floor construction of hospital, public buildings, etc.
4. **Noiselessness.** Sometimes it is required that any movement on the top floors should not disturb the persons working on the other floors. The suitable flooring is provided which is some-what noiseless when travelled over. Rubber flooring, cork flooring, asphalt flooring, etc. are such types of floor coverings.
5. **Durability.** Resistance to temperature changes, wear, humidity, disintegration and decay should be carefully considered while selecting suitable type of floor covering as the life of the floor is dependent on these factors.
6. **Damp Proofing.** Dampness and damp-proofing are the important factors which require careful consideration, especially in the construction of ground floors. A damp floor creates very un-healthy environment in the building.
7. **Indentation.** In superior types of floor coverings, no indentation mark should be formed on it by the movement of loads on it.
8. **Maintenance.** Certain types of floors require regular and careful maintenance and hence the maintenance cost is high. Tile, marble, terrazo and concrete floors require less maintenance cost than wooden, cork, mastic floors.

The basic materials used for the making of floors are stone, brick, timber, concrete and metal, among which timber and concrete/RCC are the most widely used floor making material.

### 1. Timber Floors

One of the first materials used by man in the construction of shelter was wood. About 40 years ago not less than 40% of the land of Ethiopia was covered with dense forests and it was easy to get suitable indigenous trees for almost all kinds of engineering works. Unfortunately, this is not true nowadays and is increasingly becoming difficult to get suitable locally grown wood for structural members. Wood used for engineering purposes is generally termed as timber.

The fact that wood can be glued laminated or bonded to metal or plates make it versatile construction materials. The resistance of wood to fire and insects can be improved by coatings. Care should be taken

## Building Construction :Floors

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however, to avoid the rise of moisture through the wall plates and the hollow space between the flooring and the concrete is kept dry and ventilated.

Timber floors essentially consist of boarding supported on timber joints called floor joists. The structural element of timber floors is the joist. The joists are designed to carry the necessary load across the span, and the floor planking adds to the rigidity of the floor. Where a timber surface is required on the ground floor, therefore, suspended floor may be found to be an economical solution.

Types of timber floors

1. Basement or ground timber floor.
2. Single joist timber floor.
3. Double joist timber floor.
4. Framed timber floor.
5. Filler joist floor.

**1. Basement or ground timber floor.** Timber floors (Fig. 13.1) are constructed on ground floors, generally in the theatres where dance and drama performances are held. Several sleeper walls or dwarf walls of half-brick thickness or full brick thickness are constructed at an interval of 1.5 metres to support the timber floor. Wall plates are placed on walls and sleeper walls to support the joists supporting the floors. The joists are provided at a distance of about 300 mm and the timber planks are closely fitted over the joists to provide the floor. The arrangement for proper air circulation is made in the floor, otherwise timber will be attacked by dry rot. The following precautions are recommended:

- (a) Well seasoned timber should be used in the construction of such floors.
- (b) 100 mm thick plain cement concrete (1 : 2 : 4) is provided over the soil beneath the timber floor.
- (c) The empty space between the floor and the concrete base is filled up with sand.
- (d) The damp-proofing courses are placed in the external walls and at the top of the sleeper walls.

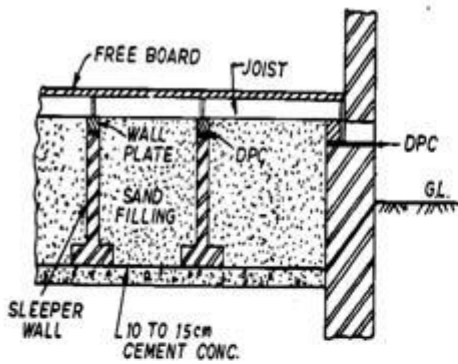
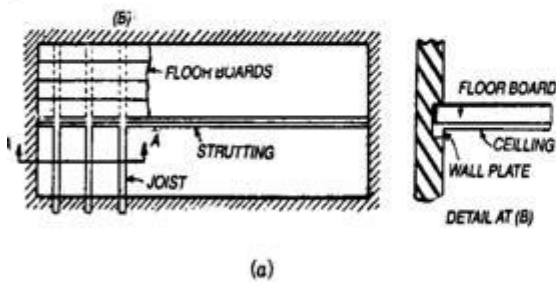
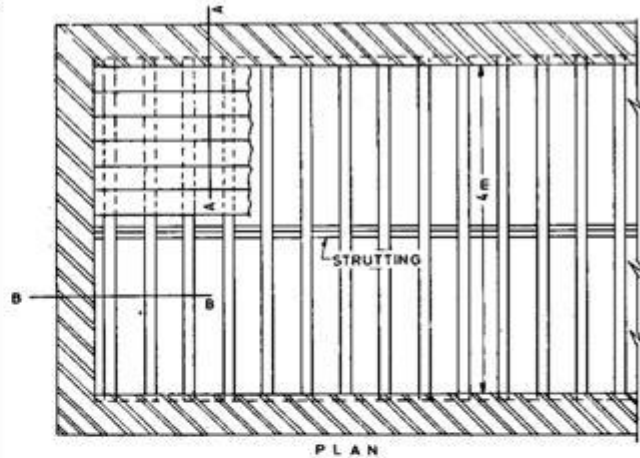


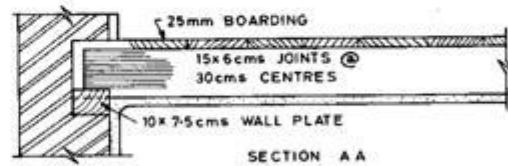
Fig. 13.1



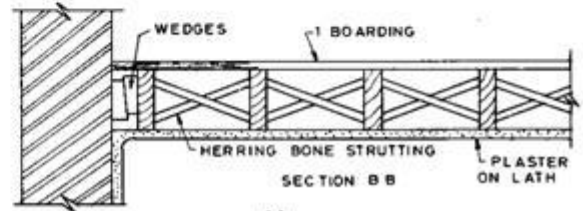
(a)



PLAN



SECTION AA



(c)

Fig. 13.2

**2. Single joist timber floor.** This type of floor is used for residential buildings where spans are comparatively small and the loads are lighter. The wooden joists are placed at about 300 mm centre to centre spanning the rooms in the shorter direction. Wooden planks are laid over these joists. The timber joists are supported on wall plates of 100 mm x 70 mm to 120 mm x 70 mm. Corbels may be required to support the joists if the width of the wall is not sufficient. Joists must be strong enough to withstand the loads and at the same time they are fixed in position. Finally they are rubbed with sand paper and then waxed or polished (Fig. 13.2)

### Advantages

- (a) Single joist timber floors are simple to construct.
- (b) They require less initial cost.
- (c) Distribution of loads on the wall is more uniform as the joists are spaced closely.

### Disadvantages

- (a) The joists may sag and hence cracks will develop in the ceilings.
- (b) They are not sound-proof.
- (c) Deep joists are required for larger spans which increase the weight and construction cost of the floor.
- (d) The loads are transmitted on the openings such as window or door lintel because of evenly spaced joists.
- (e) They require wall plates for supporting the joists.

**3. Double joist timber floor.** Double joist timber floor (Fig. 13.3) is stronger than the single joist timber floor. They are used for longer spans of 3.60 to 7.50 metres and prevent the travel of sound waves to a great

## Building Construction :Floors

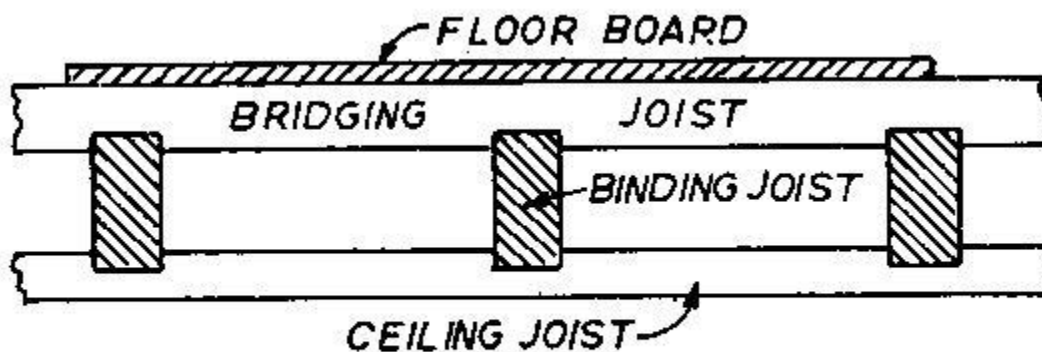
extent. Intermediate supports, called as binders, are for bridging the joists. Binders are spaced at a centre to centre distance of about 2 metres. The ends of binders are kept on wooden or stone block and they should not be embedded in the masonry wall. Ceilings may be fixed to the bottom of the binders by fixing ceiling joist to the binders. Lathing is fixed to the ceiling joist. The following are the advantages and disadvantages of this type of construction.

### *Advantages*

- (a) The loads are transmitted to the wall at certain specified points and hence door and window opening may be avoided.
- (b) This is more rigid type of flooring and hence there is less chance of developing cracks in the plastering ceiling.
- (c) It is more Sound-proof.
- (d) The use of additional binder near the walls can eliminate the need of walls plates.

### *Disadvantages*

- (a) More labour is required.
- (b) The depth of floor is considerably increased and thus the head room is reduced.



**Fig. 13.3**

**4. Framed timber floor.** This type of timber floor is used for spans more than 7.5 metres. Girders are placed between the walls and the binders are put on the girders and the bridging joists rest on the binders. The spacing between girders depends on the type and size of the girder and the size of the binders. Binders are staggered and connected to girder by tusk and tenon joints, The ends of girders are put on stone or concrete templates in the wall. Ceilings are fixed directly to the binders or ceiling joists may be employed (Fig. 13.4).

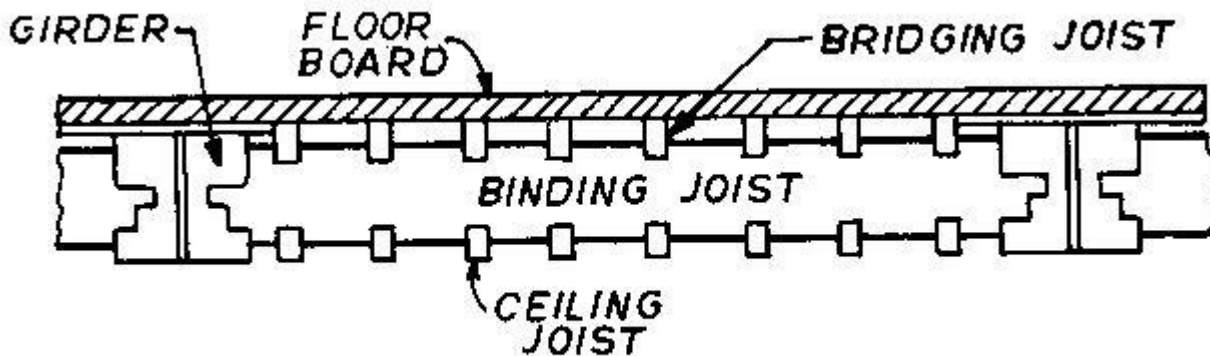


Fig. 13.4.

Steel is a very strong material that is capable of supporting large imposed load. Mostly it is used as joists. **Filler joist floor.** Small sections of rolled steel joists are encased in the concrete. The joists are supported on walls or on steel beams as illustrated in Fig. 13.5. The joists are placed at a centre to centre distance 600 to 900 mm and act as reinforcement in the concrete. The rolled steel joists and beams should be completely encased in the concrete.

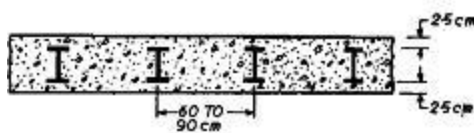
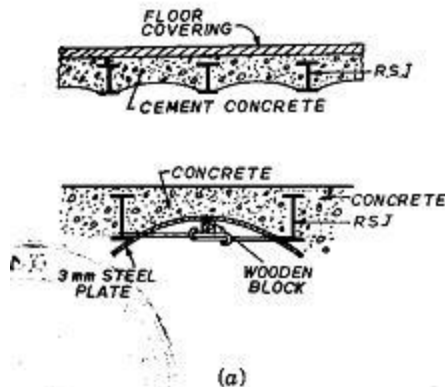
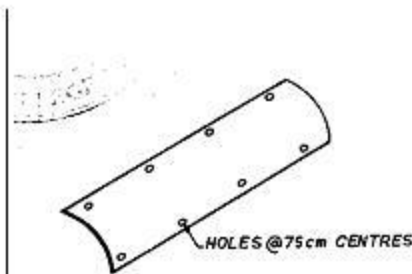


Fig. 13.5



(a)



(b)

Fig. 13.6

concrete floor is commonly used for residential, commercial, industrial buildings etc due to the fact that it is moderately cheap, quite durable and easy to construct. Concrete floors can be cast in situ or prefabricated.

3.

a. *In situ concrete Floors*

Cast in situ concrete floors give the maximum freedom in design since they can take up any shape dictated by the plan. They can be thicker or thinner from place to place in the building, as required by variations in

## Building Construction :Floors

the load or span. The objections to in situ concrete are that it requires complete shuttering for the whole of its area that it has to be placed wet, and that it cannot carry loads until the concrete has set.

Cast in situ concrete floors can be solid, or ribbed based on the design requirements.

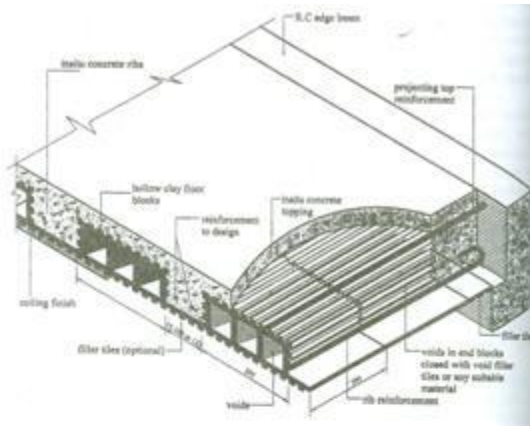


Fig. Floors formed with hollow clay blocks

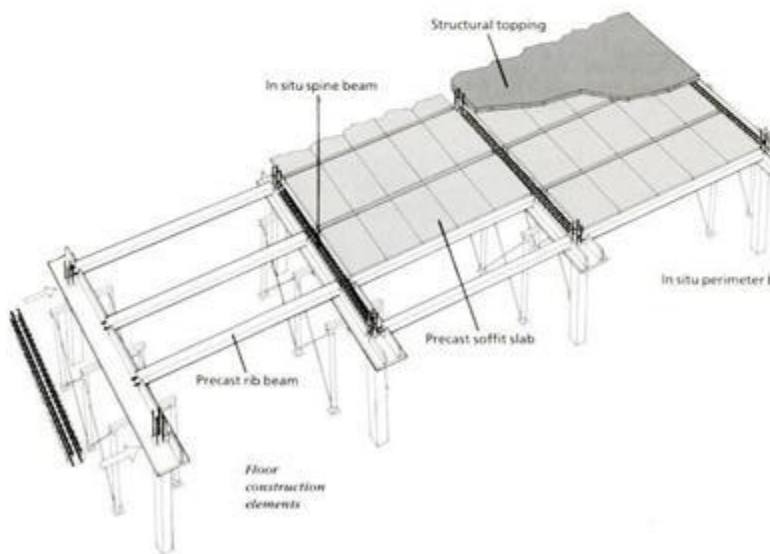


Fig. Ribbed slab floor system before casting concrete

3.

### a. *Precast Concrete Floors*

Precast concrete floor are designed primarily with the object of eliminating shuttering and wet poring, which make the installation of an in situ floor rather a slow process. Precast concrete floors can be erected rapidly and immediately provide a platform on which further work on the building can proceed they are lighter in weight. The main disadvantage of precast concrete floors is that it is less easy to provide a rigid connection between a precast unit and a supporting beam or wall. Hence, wholly precast floors are not so well adapted to designs employing the principle of continuity or monolithic construction.



## Building Construction :Floors

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Precast concrete floors are available in either reinforced or pre stressed concrete.

Both can be solid or contain internal cores of polyethylene or equivalent to reduce weight. Prestressed concrete floors are usually shallower, hence lighter than reinforced concrete; but by virtue of their pre stress, they have an upward camber that is not always consistent between units. Prestressed concrete floors have their own inherent problems when later modifications are required with the building to suit user's needs.

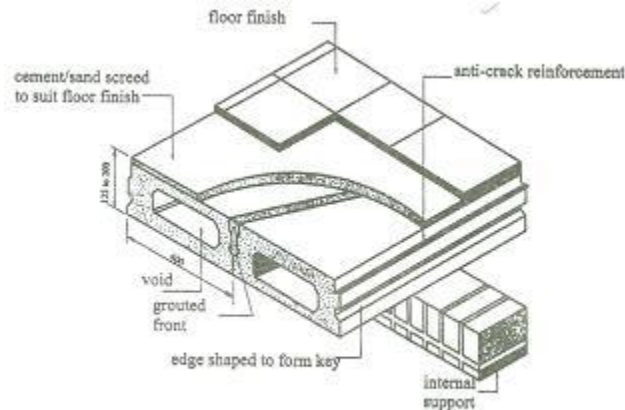


Fig. Typical details of precast hollow concrete floor

### R.C.C. Floor

Reinforced cement concrete slab is being more commonly used in the construction of modern buildings. For small spans and comparatively lighter loads, a simple RC. slab is suitable. If the ratio of the length and width of room is more than 1.5 metre the slab is designed to span along the shorter direction. The main reinforcement is provided along this shorter dimension of the room. The thickness of the slab is guided by the superimposed loads, span and type of concrete used. The end of the slab rests on the wall. When the building is constructed in reinforced concrete frames, it is essential to construct the slab monolithic with the supporting beams.

For larger spans and greater loads, R.C.C. beams and slab construction is adopted in the construction of buildings. The slab acts as flange of the beam and is cast monolithic with the beams. In this case the size of the beam is greatly reduced. Over the RC. floor, suitable floor covering is laid to get the desired finish (Fig. 13.8).

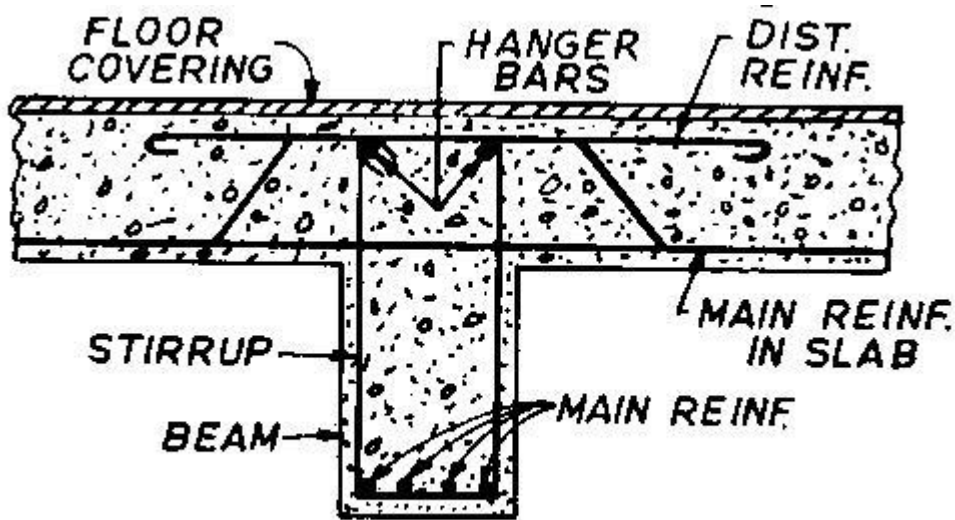


Fig. 13.8

**Flat slab floor.** Flat slab floor is directly supported on the columns without providing any intermediate beams. This type of construction is adopted when the use of beams is forbidden.

The following advantages are claimed by such type of construction:

- (a) More clear head room is available for use.
- (b) Even for quite heavy loads, thinner slabs are required.
- (c) No projections of beams are to be seen and, therefore, the need of false ceiling is eliminated.
- (d) It is convenient to make lighting arrangements.
- (e) The frame-work and construction of flat slab is simpler.

Flat slabs are commonly used in commercial buildings, factories, warehouse, etc. But it is not economical for lighter loads.

**Hollow tiled ribbed floor.** To reduce the weight of solid floor structure, a hollow tiled ribbed floor is constructed. In this type of construction hollow blocks of clay or concrete are used. These hollow blocks or tiles are placed at about 100 mm apart. In this space of 100 mm mild steel rods of 8 to 12 mm diameter are placed. The surfaces of the hollow tiles are kept rough to develop a better bond with the surrounding concrete. A minimum cover of 80 mm is provided at the top of the tile. The empty spaces are filled up with the concrete as illustrated in Fig. 13.,9. These floors are fire-proof. Sound-proof, damp proof, light and economical.

# Building Construction :Floors

Floor coverings are provided to improve the appearance, cleanliness noiselessness and damp-proofing of the floors. Various types of materials are used and different treatments are done.

The choice of floor finishes depends on the use to which the floor is likely to be employed. In varying degree, floors may have to meet a very wide range of requirements which include: initial cost, appearance, durability, availability, fire resistance, resistance to water or chemicals, sound insulation for the upper floors and resistance to wear or impact. The following types of floor coverings are generally employed:

## 1. Brick Flooring

Brick flooring is used in cheap constructions, especially where good bricks are available. This flooring is specially suited to warehouses, stores, pedestrian walkways, etc. Good quality bricks of various colours and shapes can be used. The method of preparing the base course for brick flooring varies from place to place and is based on the intended use.

In pedestrian walkways where there is a possible frost attack, the sub- grade is compacted properly to the desired level and about 5cm thick fine sand is spread over this, a course of bricks is laid flat in the desired pattern without the use of mortar as this will enable the stress to be relieved through the joints. For other types of floors, over well compacted and levelled ground a layer of lean cement concrete mix (1 : 6 : 18) in laid in 100 thickness. Over this bedding, bricks are placed in proper bonds on their edges. They are joined in cement or lime mortar. sometimes the joints are pointed to obtain a better appearance. The only draw-back of brick floor covering is that it absorbs water (Fig. 13.10).

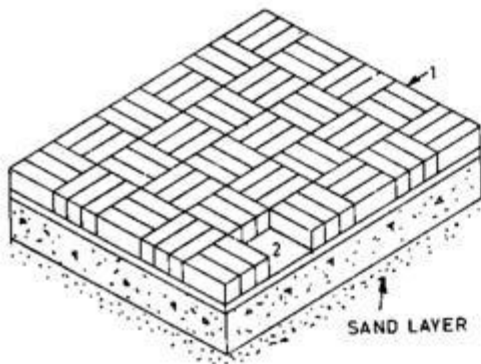
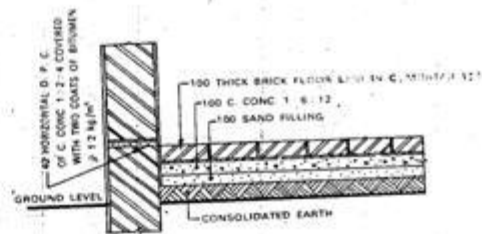


Fig. 13.10



BRICK FLOOR  
Fig. 5-1

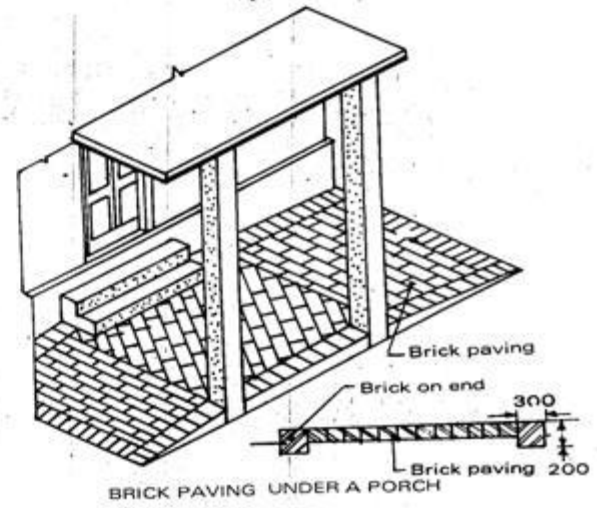


FIG 5-2

## 2. Stone Flooring

Dressed stones having rectangular or square sizes are used for making floors. The stone slabs can be laid over properly compacted ground or concrete base. The joints are the pointed with cement mortar and cured. Proper slope should be given to the surface for drainage. Stone flooring can be used for garages, entrance corridors of institutional buildings, pedestrian walkways, etc.

Square or rectangular slabs of stones are used as floor covering. Generally 20 to 40 mm thick stone slabs of sizes 300 x 300 mm, 450 x 450 mm, 600 x 600mm, 450 x 600 mm, etc. are used. The stone should be hard, durable, tough and of good quality. The earthen base is levelled, compacted and watered. On this surface a layer of 100 to 150 mm thick concrete is laid and properly rammed. Over this concrete bed the stone slabs are fixed with thin layer of mortar. Before fixing the stone slabs in position, they are dressed on all the edges and the joints are finished with cement. The stone surfaces may be rough or polished. Rough surface is provided in rough works like sheds, stores, etc. and polished surface is provided in superior type of works.

A slope of 1 : 40 should be provided in such type of floor coverings for proper drainage (Fig. 13.11).

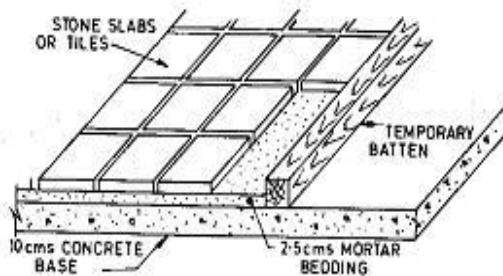
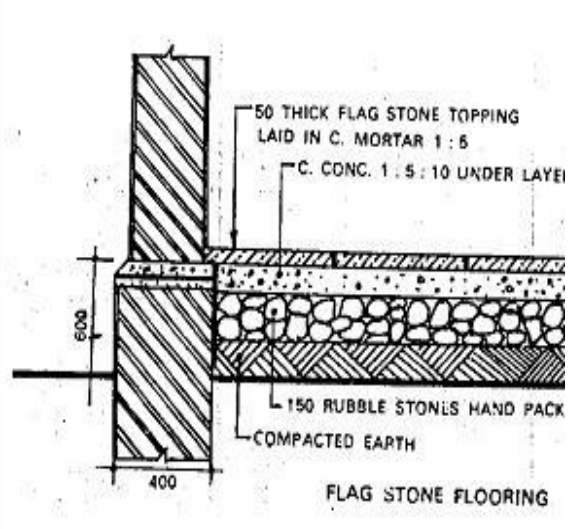


Fig. 13.11



## 3. Concrete Flooring

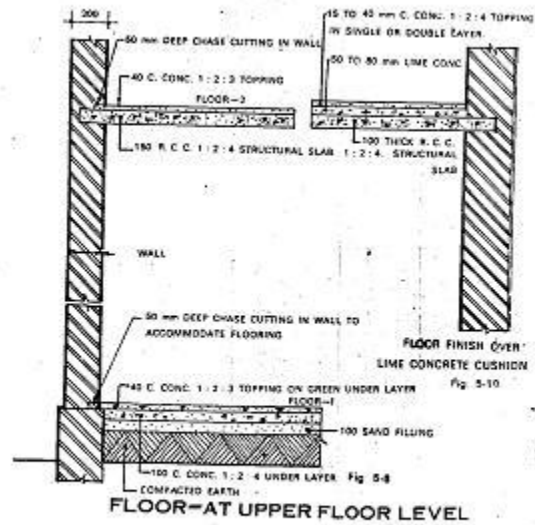
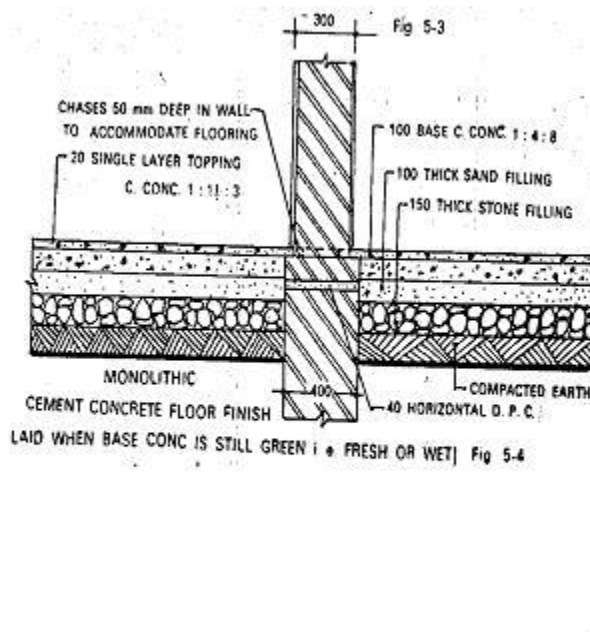
Concrete floorings are used for residential, commercial and even industrial buildings, since it is moderately cheap, durable and easy to construct. Concrete floor consists of two components: the base concrete and the topping of wearing surface. The two components of the floor can be constructed either monolithically or independently. When the floor is laid monolithically, good bond between the two components is obtained resulting in smaller overall thickness. In this case the concrete slab should be roughened with wire brushes so as to ensure good bond between the base and the flooring layer.

This is the most common type of floor covering and it is also known as Indian Patent Stone flooring. On the earthen surface sand cushion of 150 mm is provided. It is watered and rammed thoroughly. Over this sand cushion about 100 mm thick concrete base is laid to receive the topping. The top surface of the concrete base is roughly finished to develop good bond between the base and the topping. Lime concrete or lean cement concrete is used for the construction of concrete base.

## Building Construction :Floors

The surface of the base concrete is cleaned with a stiff wire brush and it is moistened with the water. Square or rectangular panels are made on the base with wooden battens laid on mortar beds in the desired level and slope.

The cement grout is applied to the base and before laying the topping concrete is poured into the alternate bays at a time. After 3 days, the rest of the bays are concreted. The top layer is beaten and made in a uniform line and level, and finally it is smoothed by trowelling. Dry cement should not be sprinkled on the surface to facilitate trowelling. The newly constructed floor is protected from sunlight, wind and rain for at least 12 hours. This is cured for at least one week. Sometimes coloured cement is used in the topping to get the desired tint in the floor covering.



## 4. Granolithic Flooring

Granolithic finish consists of rich concrete made with very hard and tough quality coarse aggregates, such as granite and basalt. The concrete mix proportion varies depending on the requirements. For instance, a proportion of 1:1:2 to 1:1:3 are to be used for heavy-duty floors, while different proportions have to be used for residential buildings. This type of floor finish is important where hard, resistant to wearing and durable flooring surface is required.

## 5. Tiled Flooring (cement, clay tiles)

Tiled flooring is constructed from square, hexagonal or other shapes, made of cement, clay, concrete or terrazzo and is available in different sizes, colours and thickness. It is commonly used in residential houses, offices, school and other public buildings. The method of laying is similar to laying stone or brick flooring. It is essential, however, to spread cement slurry over the floor so that the joints are filled. They are placed in position on a concrete base with a thin layer of mortar. Grinding and polishing is done after the floor is sufficiently cured.

## 6. Wooden/ Timber Flooring (parquet)

Timber is probably one of the oldest materials for floor finishing. It can be used for the construction of ground as well as upper floors, Wood used for flooring must have hard and dense surface to withstand wear and abrasion. Both hardwoods and soft woods can be used for flooring purposes.

Wooden floor covering may be carried out in one of the following three types:

(a) *Strip floor covering.* This is made up of narrow and thin strips of timber which are joined to each other by tongue and groove joints.

(b) *Planned floor covering.* In this type of construction, wider planks are employed and these are joined by tongue and groove joints (Fig.13.12).

(c) *Wood block floor covering.* It consists of wooden blocks which are laid in suitable designs over a concrete base. The thickness of block is 20 to 40 mm and its size varies from 200 x 80 mm to 300 x 80 mm. The blocks are properly joined together with the ends of the grains exposed (Fig. 13.13).

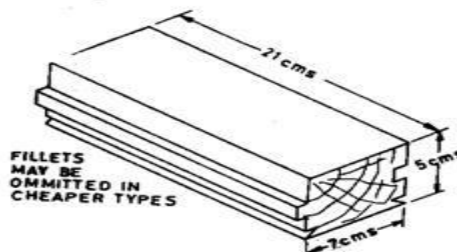


Fig. 13.12

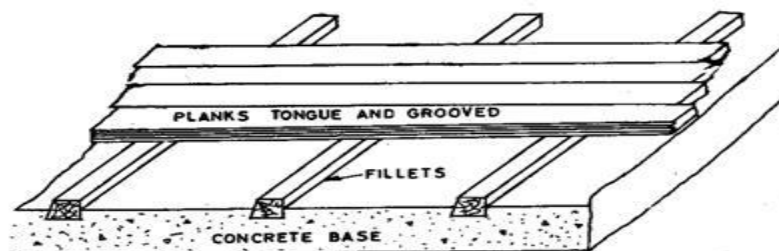
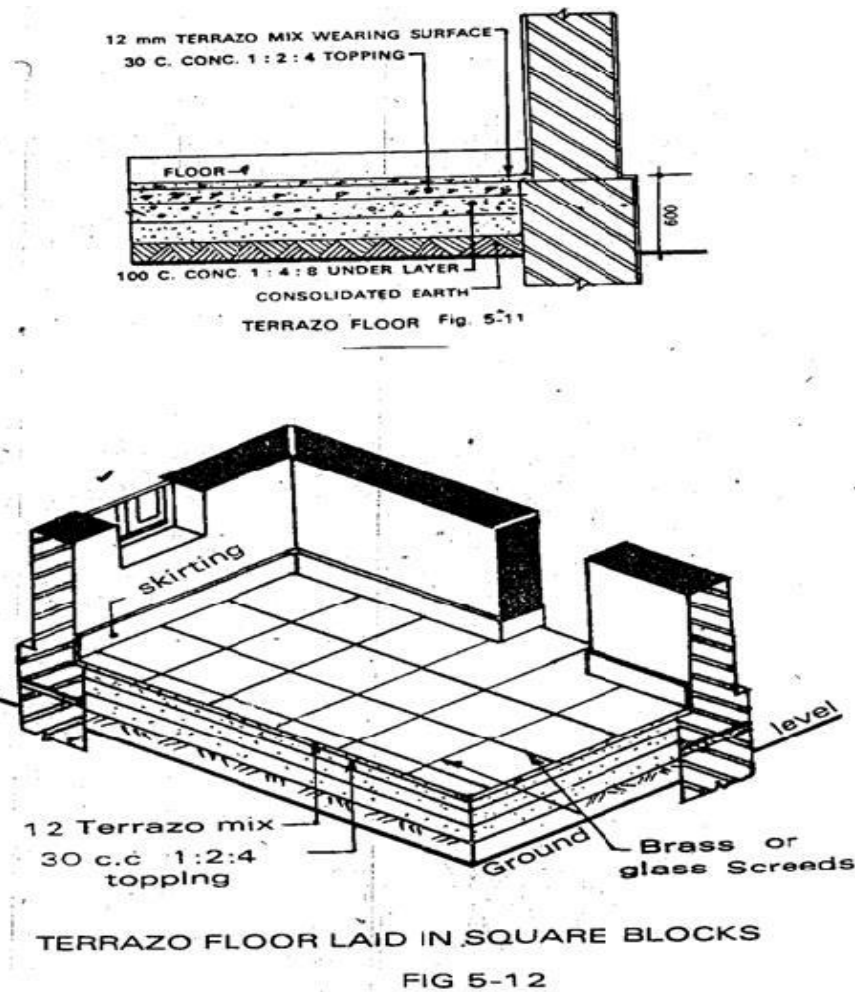


Fig. 13.13

## 7 Terrazzo Flooring

Terrazzo is a mixture of cement and marble chips and the surface polished with carborandum stone to obtain a smooth finish at top. It is a concrete containing white and/ or colored cement and marble chips as an aggregate in proportion of 1:2 to 1:3. The size of marble chips (powder) may vary from 3mm to 6mm and may have various colours.

Terrazzo flooring is another type of floor finish that is laid in thin layer over the concrete topping. It is decorative and has high wearing resistance. Due to this, it is widely used in residential buildings, offices and other public buildings. Terrazzo flooring can be found in the market as precast terrazzo in the form of tiles usually 20-30cm in width and 2-3cm in thickness. In case of stair cases, precast terrazzo (treads and risers), steps of different width and rise are also available.



## 8 Mosaic Flooring

Mosaic flooring is made of small pieces of broken tiles of china glazed or of cement or of marble arranged in different pattern. These pieces are cut to desired shapes and sizes. They may be glazed or unglazed. Mosaics are impervious to water and have a dense structure. There are two distinct types of ceramic mosaic tiles: porcelain or natural clay type. Porcelain types are made by the dust-press method from a carefully proportioned blend of ceramic materials with a vitreous (glass like) body, which is resistant to freezing and thawing and to abrasive wear. A wide range of colors is obtained by adding mineral pigments to the mix.

## Building Construction :Floors

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A concrete base is constructed for laying the floor covering. Over this base mortar is placed to a depth of about 60 mm and it is levelled up. A layer of cementing material about 3 mm in thickness is spread. After spreading this cementing material, the tiles are laid in the desired fashion. This surface is left 24 hours and then it is rubbed with pumice stone to get a smooth and polished surface.

### **9 Plastic or PVC Flooring**

It is made of plastic material, called poly- Vinyl-Chloride (PVC) fabricated in the form of tiles or rolls of different sizes and colors. PVC tiles are widely used in all residential as well as non- residential buildings. These tiles are laid on specially prepared concrete base and specific type of adhesive is applied both on the back of the PVC and on the smoothly finished cement screed After the adhesive has set, the tiles are then pressed gently using lightweight roller so as to avoid air voids and the oozing out adhesive is wiped out. The floor is washed with warm soap water before use, PVC tile flooring is resilient, smooth, good looking and can be easily cleaned.

### **10 Marble Flooring**

Marble flooring is one of the most expensive floor finishes and is commonly used in places of worship and in public buildings having rich specifications. In view of high cost of material, use of marble flooring in residential buildings is normally restricted in areas like kitchen, staircase, bathroom, corridor, etc. The quality of marble floor depends on the quality of marble type. Marble is available in different colors and sizes. The procedure of marble laying is similar to stone flooring. The properly laid marble has to be cured and cleaned before use.

### **11 Asphalt Flooring**

Asphalt floorings are of many types and are used where wear resistance and durability is the main design factor. Asphalt flooring is mainly used in garages, stores, etc. They can be made in different types; such as asphalt mastic, asphalt tiles and asphalt mosaic, Asphalt mastic is the most widely used floor finish in Ethiopia. It consists of sand and asphalt in different ratio, mixed hot and laid in continuous sheets.

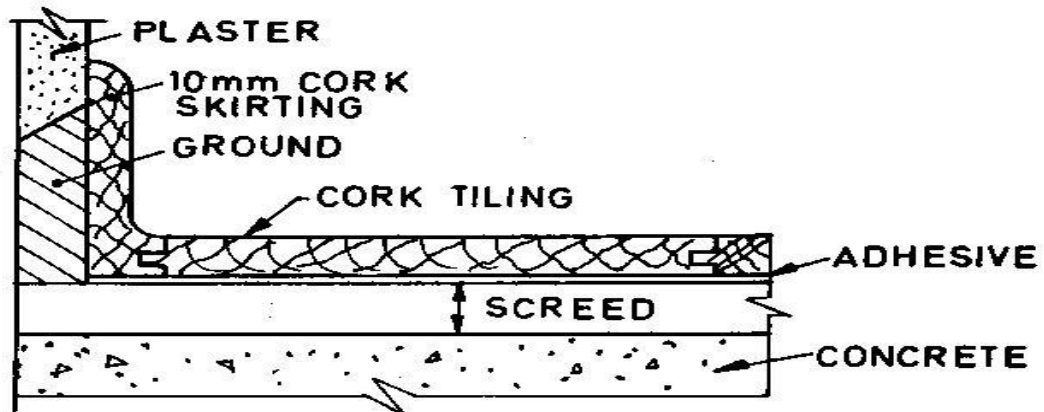
### **12 Rubber Flooring**

Rubber flooring consists of sheets or tiles of rubber, in variety of patterns and colors, with thickness varying from 3 to 10mm. The sheet or tile is manufactured by mixing pure rubber, reclaimed or synthetic rubber with fillers such as cotton fibre, and granulated cork or asbestos fibre. The sheets or tiles are fixed to concrete base or wood by means of appropriate adhesives. Rubber floorings are resilient and noise proof. However, they are expensive and are used mainly in offices or public buildings such as in hospitals and schools. Rubber provides a durable, quiet, flexible generally non-slippery and dustless floor covering which is obtainable in a wide range of attractive colours. There are two types of rubber floor coverings, i.e. (a) Sheet and (b) tiles.

### **13 Cork Flooring**

Cork flooring is perfectly noiseless, and is used in libraries, theatres, art galleries, broadcasting stations, etc. Cork which is the outer bark of cork oak tree, is available in the form of cork carpet and cork tiles. Cork carpet is manufactured by heating granules of cork with linseed oil and compressing it by rolling on canvas. Cork tiles are manufactured from high-grade cork bar compressed in moulds to a thickness of 12mm and baked subsequently. They are available in various sizes, thickness and shades.





**Fig. 13.14**

### **14 Glass Flooring**

This is a special purpose flooring used in circumstances where it is desired to transmit light from upper floor to lower floor(s) and specially to admit light to the basement from the upper floor(s). structural glass is available in the form of tiles or slabs, in thickness varying from 12 to 30mm. Glass floorings are fixed in closely spaced frames so that the glass and the frame can sustain anticipated loads. This type of floor covering is not used commonly.

### **15 Linoleum Flooring**

Linoleum was developed in England over 100 years ago and it was the only type of resilient flooring material available for many years. Linoleum flooring is a large covering which is available in rolls and spread directly on concrete or wooden flooring, Linoleum sheets are manufactured by mixing oxidized linseed oil in gum, resins, pigments, wood flour, cork dust and other filler materials. It is available in the market in rolls of width about 2 to 4 metres. The thickness varies from 2 to 6 mm. Linoleum tiles are also manufactured in various sizes, shapes and patterns. Linoleum floor covering is laid over an effective damp proof course. It is cheap, durable, attractive, comfortable and moderately warm. It can be cleaned easily. Linoleum is not used for basement.

## **Assignment-5**

1. What is the difference between precast concrete floor and insitu concrete floor?
2. Describe type of floors briefly