JECRC Foundation

JAIPUR ENGINEERING COLLEGE AND RESEARCH CENTRE

JAIPUR ENGINEERING COLLEGE AND RESEARCH CENTRE
DEPARTMENT OF CIVIL ENGINEERING

Class – III Semester /II Year
Subject –Building Materials And Construction
Chapter – 6(Floors)
Presented by – Teekam Singh (Assistant Professor)

VISION AND MISSION OF INSTITUTE

VISION

To become a renowned center of outcome based learning, and work towards academic, professional, cultural and social enrichment of the lives of individuals and communities.

MISSION

Focus on evaluation of learning outcomes and motivate students to inculcate research Aptitude by project based learning. Identify, based on informed perception of Indian, Regional and global needs, areas of focus and provide platform to gain knowledge and solutions. Offer opportunities for interaction between academia and industry. Develop human potential to its fullest extent so that intellectually capable and imaginatively gifted leaders can emerge in a range of professions.

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VISION

To become a role model in the field of Civil engineering for the sustainable development of the society.

MISSION

To provide outcome base education
To create a learning environment conducive for achieving academic excellence
To prepare civil engineers for the society with high ethical values.

CONTENTS

- Floors
- Essential Requirements of a Floor
- Selection of Flooring Material
- Materials used for Floors
- Types of Ground Floors
- Types of Upper Floor

Floors

Floors are the horizontal elements of a building structure which divide the building into different levels for the purpose of creating more accommodation within a restricted space one above the other and provide support for the occupants, furniture and equipment of a building.

Types of floors

- Basement floor
- Ground floor
- Upper floor

Basement Floor

The construction of floor below the ground surface is known as basement floor.

Basement ceiling height shall not be less than 7 feet above the finished floor.

A smoke alarm shall be installed in the basement.

All basement stairs shall have a light source to illuminate all treads and landings. Lights shall be operated by a switch located at the top and bottom of the stairs.

If adding a bedroom and the house is equipped with a gas-fired appliance, a carbon monoxide alarm shall be installed in the basement.

Ground floor

The floor resting directly on the ground surface are known as Ground floor.

Upper floor

The upper floors have the major problem of strength and stability since they are supported only at their ends, on walls, beams etc.

Upper floors do not have problem of damp resistance.

Essential Requirements of a Floor

- To provide this function, a floor must satisfy the following requirements.
  1. Adequate strength and stability
  2. Adequate fire resistance
  3. Sound insulation
  4. Thermal insulation
  5. Damp resistance
  6. Durability i.e. resistance to wear and decay

SELECTION OF FLOORING MATERIAL

Following are the factors that affect the choice of a flooring material :

1.Initial cost: Selection of flooring material mainly depends on cost of the material. Flo or coverings of marble etc. are very costly and may be used only for residential building s.

2.Appearance: Covering should give pleasing appearance, i.e. it should produce a desire d color effect and architectural beauty. Floorings of terrazzo, mosaic, tile and marble giv e good appearance.

3.Cleanliness: The flooring should be capable of being cleaned easily, and it should be n on-absorbent. It should have effective resistance against absorption of oil, grease etc.

4.Durability: The flooring should have sufficient resistance to wear, temperature change s, disintegration with time and decay, so that long life is obtained. From this point of vie w, flooring of marble, terrazzo, tiles, concrete, mosaic etc. are considered to be of best t ype.

5.Damp resistance: Flooring should offer sufficient resistance against dampness, so that healthy environment is obtained in the building. Flooring of concrete, terrazzo, mosaic e tc. are preferred for this purpose, while flooring of wood, rubber, brick etc. are not suita ble for damp conditions.

SELECTION OF FLOORING MATERIAL

6) **Sound Insulation:** Flooring should insulate the noise. Also, it should not be such tha t noise is produced when users walk on it. Cork flooring, rubber flooring and timber f looring are good from this point of view.

7) **Thermal Insulation:** The flooring should offer reasonably good thermal insulation so that comfort is imparted to the residents of the building. Floor covering of wood, rubb er, cork, P.V.C. tiles are better for this purpose.

8) **Fire resistance:** This is more important for upper floors. Flooring material should off er sufficient fire resistance so that fire barriers are obtained between different levels of a building. Concrete, tiles, terrazzo, mosaic, marble have good fire resistance..

9) Smoothness: The flooring material should be smooth, and should have even surface. However, it should not be slippery.

10) **Hardness:** It should be sufficiently hard so as to have resistance to indentation or mar k caused by shifting of furniture, equipment etc.

11) **Maintenance:** The flooring material should require least maintenance.

Materials used for Floors

- Ceramic tiles,
- Plain tiles,
- Mosaic tiles,
- Glazed tiles,
- Mud and Murum,
- Bricks,
- Flag stone,
- Concrete,
- Terrazzo,
- Marble,
- Wood or timber,
- Asphalt,
- Rubber,
- Cork,
- Glass,
- Plastic or PVC

Types of Ground Floors

- Mud flooring and Muram flooring
- Brick flooring
- Flag-stone flooring
- Concrete flooring
- Granolithic flooring
- Terrazzo flooring
- Mosaic flooring
- Tiled flooring
- Marble flooring
- Timber flooring
- Linoleum flooring
- Rubber flooring
- Plastic flooring

Types of Floors

Mud flooring

Over a well-prepared ground, a 25 cm thick selected moist earth is spread and is then rammed well to get a compacted thickness of 15 cm.

➢The floor is maintained by giving a thin cement cow-dung wash (1 : 2 to 1 : 3) twice a week.

Murum flooring

Muram is a form of disintegrated rock with binding material.

•To construct such a floor, a hard bed or sub grade is prepared by lying abou t 25 cm thick layer of hand picked rubble boulders, a 15 cm thick layer of muram is laid over prepared sub grade. Over it, a 2.5 cm thick layer of pow der muram (fine muram) is spread and water is sprinkled over it.

•The surface is then rammed well. After ramming, the surface is saturated wi th a 6 mm thin film of water.

Mud Flooring

Murum Flooring

Mud and Murum flooring

Merits

- Mud flooring and murum flooring are used only in low cost housing special ly in villages.
- Such flooring is cheap, hard, fairly impervious, easy to construct and easy t o maintain.
- It has good thermal insulation property due to which it remains cool in sum mer and fairly warm in winter.
- It is easy in construction, repair and maintenance.

Demerits

- Proper maintenance, the floors are required to be given a wash of cement a nd cow dung once in a week.

FLAG STONE FLOORING

•Flag stone is any laminated sand stone available in 2 cm to 4 cm thickness, in th e form of stone slabs of square (30 cm x 30 cm, 45 cm x 45 cm or 60 cm x 60 cm) or rectangular size (45 x 60 cm).

•This type of work is also called paving. The stone slabs are laid on concrete base.

•The sub-soil is properly compacted, over which 10 to 15 cm thick lime concret e or lean cement concrete is laid.

•The flag stones (stone slabs) are then laid over 20 to 25 mm thick layer of bed mortar.

•In laying the slabs, work is started from two diagonally opposite corners and br ought up from both sides.

•A string is stretched between two corner slabs laid first to correct level. Other sl abs are then so laid that their tops touch the string.

•When the stoneslabs are properly set, mortar in the joints is raked out to a depth of about 15 to 20 mm and then flush pointed with 1 : 3 cement mortar. Pro per slope is given to the surface for drainage. The work is properly cured.

FLAG STONE FLOORING

Merits

1.It provides a hard, durable and wear resisting floor surface and as such can be used for godowns, stones, workshops.

2.It is easy in construction.

3.It is easily repairable and maintainable.

4.It is used in place Tamil nadu , Andhra Pradesh, where slab stones are available.

Demerits

1.Its usage is not comfortable for living purpose due to not offeri ng perfect even surface.

2.It does not give a pleasing appearance, so can not be used in r esidential building or important public building.


Flagstone

BRICK FLOORING

- Such flooring is used in cheap construction, specially where good bricks ar e available.
- This flooring is specially suited to ware- houses, stores, godowns etc.
- Well-burnt bricks of good color and uniform shapes are used.
- Bricks are laid either flat or on edge, arranged in herring bone fashion or se t at right angles to the walls, or set any other good looking pattern.
- The method of preparing the base course for brick flooring varies from pla ce to place.
- In one method, the sub grade is compacted properly, to the desired level, an d a 7.5 cm thick layer of sand is spread. Over this, a course of bricks laid fl at in mortar is built.
- In the second method, 10 to 15 cm thick layer of lean cement concrete (1:8: 16) or lime concrete is laid over the prepared sub grade.

BRICK FLOORING

Merits

1.It is hard and durable.

2.It is non-slippery and fire resistant surface.

3.It is cheaper in initial cost than cement concrete, mosaic, terrazzo fl ooring.

4.It is easy in maintenance cost.

Demerits

1. It is absorbent.

CEMENT CONCRETE FLOORING

- This is commonly used for residential, commercial and even industrial building, sin ce it is moderately cheap, quite durable and easy to construct.

The floor consists of two components:

(i) base concrete, and (ii) topping or wearing surface.

- The two components of the floor can be constructed either monolithically (i.e. toppi ng laid immediately after the base course is laid) or non-monolithically.
- When the floor is laid monolithically, good bond between the two components is ob tained.

Such a construction has three disadvantages :

(i) The topping is damaged during subsequent operations,

(ii) Hair cracks are developed because of the settlement freshly laid base course which has not set, and

(iii)work progress is slow because the workman has to Wait at least till the initial setti ng of the base course.

CEMENT CONCRETE FLOORING

- Concrete flooring consists of the following operation.

1. Ground preparation,
2. Formation of base course (1:2:4 about 15 cm thick) on sub gr ade (15 cm thick broken stone) and lying lime concrete,
3. Lying of the toping concrete (1:2:4 about 2.5 cm-4 cm),
4. Lying of wearing coat or floor finish (by Mosaic, Terrazzo, Gr anolithic, cement paints etc)
5. Grinding and polishing and
6. Curing

CEMENT CONCRETE FLOORING

Merits

1. It is non-absorbent and hence offers sufficient resistance to dampnes s. This is used for water retaining floors as well asstores.
2. It is provide smooth, hard even and pleasing surface.
3. It possesses high durability.
4. It offers fire resistant surface.
5. It is easily cleaned and has proved overall economical due to less maintenance cost.

Demerits

1. The defects, once developed, in concrete floors whether due to poor workmanship or materials, can not be easily rectified.
2. The concrete flooring cannot be satisfactorily repaired by patch work
3. It does not possess very satisfactory insulation properties against heat and sound.

MOSAIC FLOORING

- Mosaic flooring is made of small pieces of broken tiles of china glaz
ed or of cement, or of marble, arranged in different pattern.
- These pieces are cut to desired shapes and sizes.
- A concrete base is prepared as in the case of concrete flooring, and o
ver it 5 to 8 cm thick lime mortar is spread and leveled.
- 3 mm thick cementing material, in the form of paste of two parts of slaked lime, one part of powdered marble and one part of puzzolana material, is spread and is left to dry for about 4 hours.
- Thereafter, small pieces of broken tiles or marble pieces of different colors are arranged in definite patterns and hammered into the ceme nting layer.
- The surface is gently rolled by a stone roller of 30 cm dia. and 40 to
60 cm long.
- Sprinkling water over the surface, so that cementing material comes
up through the joints, and an even surface is obtained.

MOSAIC FLOORING

Merits

1. They are laid in different sizes usually in rectangular and square shapes.
2. They are long lasting.
3. This is a superior type of flooring used in bathrooms and kitchens of residential buildings and in hospitals, sanatoriums and temples

Demerits

1. They are slippery when polished

TERRAZZO FLOORING

- Terrazzo flooring is another type of floor finish that is laid in t hin layer over concrete topping.
- It is very decorative and has good wearing properties. Due to t his, it is widely used in residential buildings, hospitals, offices, schools and other public buildings.
- Terrazzo is a specially prepared concrete surface containing ce ment and marble chips of different colors, in proportion to 1:2 to 1:3. When the surface has set, the chips are exposed by grin ding operation.
- The sub base preparation and concrete base laying is done in a similar manner.
- The top layer may have about 40 mm thickness consisting of 34mm thick cement concrete layer (1:2:4) laid over the base c oncrete and about 6 mm thick terrazzo topping.

TERRAZZO FLOORING

Merits

1. It is then ground waxed and polished. It has a mosaic look.
2. It can also be premade and is available in slabs or tiles.
3. It is very hard wearing.
4. It is very useful in commercial situations i.e. malls and shopping cen ters as it is very durable and easy to clean.

Demerits

1. They are slippery when polished

TILED FLOORING

- Tiled flooring is constructed from square, hexagonal or other s hapes made of clay cement concrete or terrazzo.
- These are available in different sizes and thicknesses (In India, tiles are in size of 20cm×20cm, 25cm×25cm, 30cm×30cm).
- The method of laying tiled flooring is similar to that for flag st one flooring except that greater care is required.
- Over the concrete base a 25mm to 30 mm thick layer of lime mortar 1:3 is spread.

MARBLE FLOORING

- It is a superior type of flooring, used in residential buildings, and in hospital s, temples etc. where extra cleanliness is an essential requirement.
- Marble slabs may be laid in different sizes, usually in rectangular or square s hapes.
- The base concrete is prepared in the same manner as that for concrete floori ng.
- Over the base concrete, 20 mm thick bedding mortar of either 1:4 cement : s and mix is spread under the area of each individual slab.
- The marble slab is then laid over it, gently pressed with wooden mallet and l eveled.
- The marble slab is then again lifted up, and fresh mortar is added to the hollo ws of the bedding mortar. The mortar is allowed to harden slightly, cement sl urry is spread and then the marble slab is placed in position.
- It is gently pushed with wooden mallet.

TIMBER FLOORING

- Timber flooring is used for dancing halls, auditoriums, etc.
- They are not commonly used in residential buildings in India,
- because timber is quite costlier.
- However, in hilly areas, where timber is cheaply and readily av ailable timber flooring can used.
- Where temperature drops very low, timber flooring is quite co mmon.
- The major problems in timber flooring is the damp prevention.
- This can be done by introducing D.P.C. layer below the flooring.


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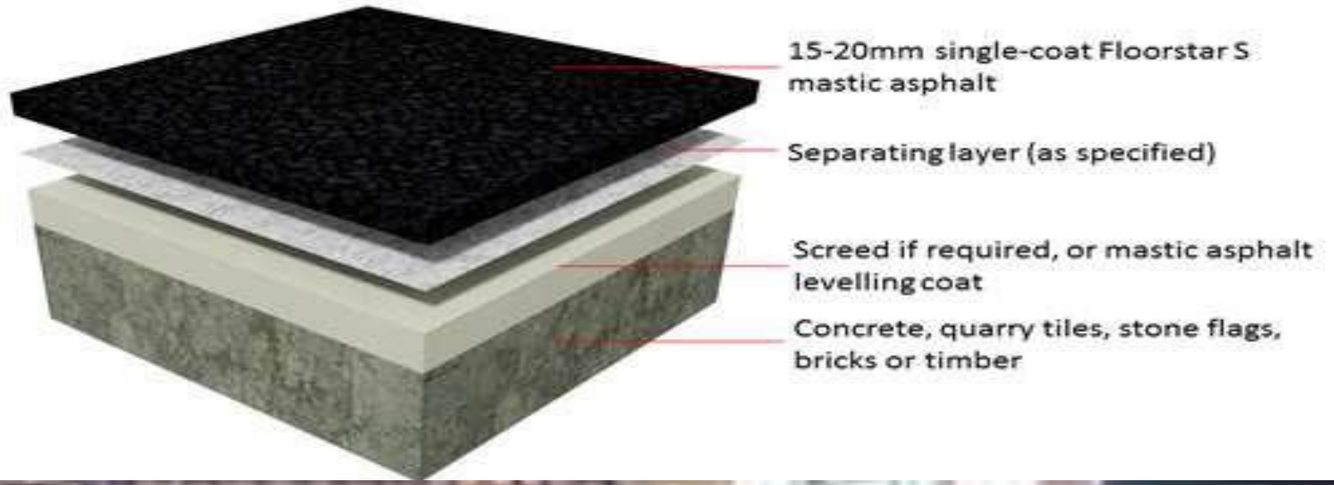
ASPHALT FLOORING

Asphalt flooring are of many types :

- ❑ Asphalt mastic flooring
- ❑ Asphalt tiles flooring (20 cm-45 cm square with 3-6 mm thickness)
- ❑ Asphaltic terrazzo flooring
- ❑ Acid proof mastic flooring.

- All grades of mastic asphalt for flooring are available colored red or black.
- A complete range of colored surface finishes is available using special compatible paints.
- The total thickness of the mastic asphalt flooring should be appropriate to the types of building and their conditions.
- Usually the mastic asphalt should be laid in one coat, but multi-coat work should be used where a waterproofing membrane is specified.
- Asphalt flooring are cheap, resilient, sound proof , acid proof and moisture proof.


15-20mm single-coat Floorstar S mastic asphalt
Separating layer (as specified)
Screed if required, or mastic asphalt levelling coat
Concrete, quarry tiles, stone flags, bricks or timber

RUBBER FLOORING

- It consists of sheets or tiles of rubber, in variety of patterns and colors with thickness varying from 3 to 10 mm.
- The sheet or tile is manufactured by mixing Pure rubber with fillers such as cotton fiber, granulated cork or asbestos fiber.
- The sheets or tiles are fixed to concrete base or wood by means of appropriate adhesives.
- Rubber floorings are resilient and noise proof.
- They are costly.
- They are used in office or public buildings.
- The size of rubber sheets are 500cm×90cm, 350cm×90cm, and 250cm×90cm.
- The size of rubber tiles are 20cm×20cm, 30cm×30cm, and 45cm×45cm.

LINOLEUM FLOORING

- Linoleum is a floor covering made from materials such as soli dified linseed oil (linoxyn), pine resin, ground cork dust, and mineral fillers such as calcium carbonate.
- Linoleum is known for its durability. Through evaluation of ac tual lifetime data, is has been determined that linoleum has a u seful life of 30 years.
- For optimal adhesion, an acrylate copolymer adhesive is applie d to a subfloor or other surface at a thickness of 0.29 mm and mass of 290 g/m².
- Linoleum covering are attractive resilient, durable and cheap a nd can cleaned very easily.

LINOLEUM FLOORING

Merits

1. It provides attractive, resilient, durable and cheap floor surface.
2. It offers surface which can easily washed and clean.
3. It offers adequate against insulation noise and heat.

Demerits

1. It is subject to rotting when kept wet for sufficient time and not recommended for basements.
2. It does not offer resistance against fire, being combustible nature

CORK FLOORING

- Such type of flooring is perfectly noiseless, and is used in libra ries, theatres, art galleries etc.
- Cork, which is the outer bark of cork oak tree.
- Cork is available in cork carpet and cork tiles.
- It is fixed to concrete base by inserting a layer of saturated ad hesive.
- Cork carpet is manufactured by heating granules of cork with l inseed oil and compressing.
- Cork tiles are manufactured from high grade cork bark compre ssed in moulds to a thickness of 12 mm.
- They are available in various sizes (10 cm x 10 cm to 30 cm x 90 cm), various thicknesses (5 to 15 mm) and various shades.

GLASS FLOORING

- This is a special purpose flooring, used in circumstances where it is desired to transmit light from upper floor to lower floor, a nd specially to admit light at the basement from the upper floor

.

- Structural glass is available in the form of tiles or slabs, in thic knesses varying from 12 to 30 mm.
- Glass flooring is very costly, and is not commonly used.

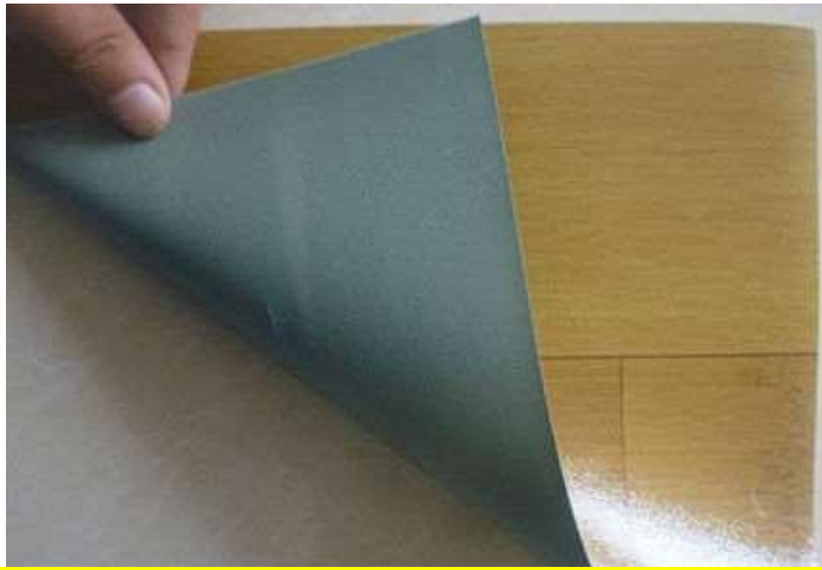

MODERN
CONTEMPO

PLASTIC OR P.V.C. FLOORING

- It is made of plastic material, called Poly-Vinyl-Chloride.
- The form of tiles of different sizes and different color shades. These tiles are now widely used in all residential as well as residential buil ding.
- The tiles are laid on concrete base.
- Adhesive of specified make is applied on the base as well as the bac

k of P.V.C. tile with the help of a notched trowel.

- The tile is laid when adhesive has set sufficiently (say within 30 min utes).
- It is gently pressed with the help of a 5 kg weight wooden roller.
- The floor is washed with warm soap water before use.
- P.V.C. tiles flooring is resilient, smooth, good looking and can be easily cleaned.
- It is costly and slippery.
- It can be damaged very easily when in contact with burning objects.



Plastic Flooring

Choice of construction for upper Floor

➢To provide this function, a floor must satisfy the following requirements.

1. General type of building construction,
2. Amount and type of floor loading or flooring load,
3. Plan of building,
4. Sound insulation
5. Initial cost
6. Fire resistance
7. Types of ceiling
8. Weight and position of floor
9. Wearing surface

Types of Upper Floor

Depending upon the materials used for construction and arrange ment of beam , girder etc. upper floor may be classified in to the f ollowing types:

1.Steel joist and stone or precast concrete flooring

2.Jack arch floor

3.Reinforced cement concrete floor

4.Ribbed or hollow tiled flooring

5.Filler joists floor

6.Precast concrete floor

Steel joist and stone or precast concrete flooring

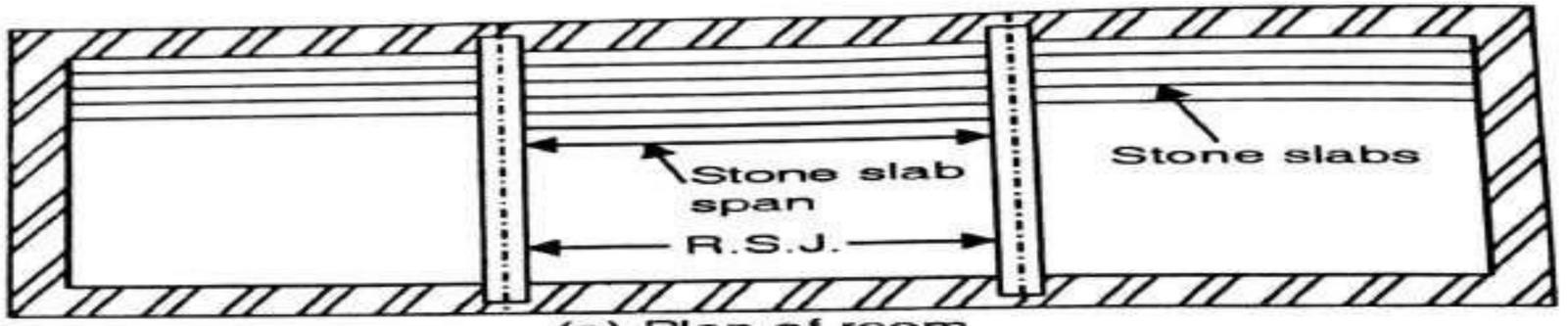
- This types of floor is quite common in location where stone sla b are easily available in span of 1 to 3 meters and widths 30 to 60 cm.
- Where stone slabs are not available precast concrete slab can b

e used.

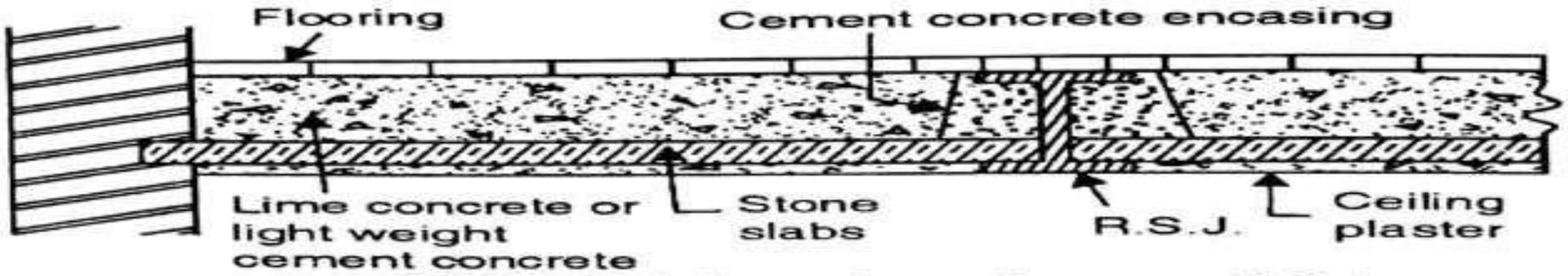
- The slabs are place at lower flange of rolled steel joists.
- The spacing of steel joists depend upon the length of available

stone slab.

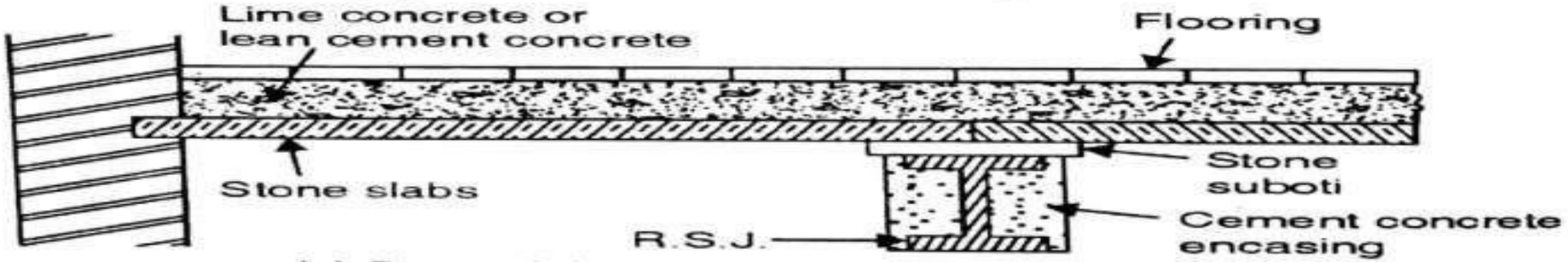
- The joist have the clear span equal to the width of the room.
- The space between the top of the slab and top of steel joist(RSJ) is filled with lime concrete.



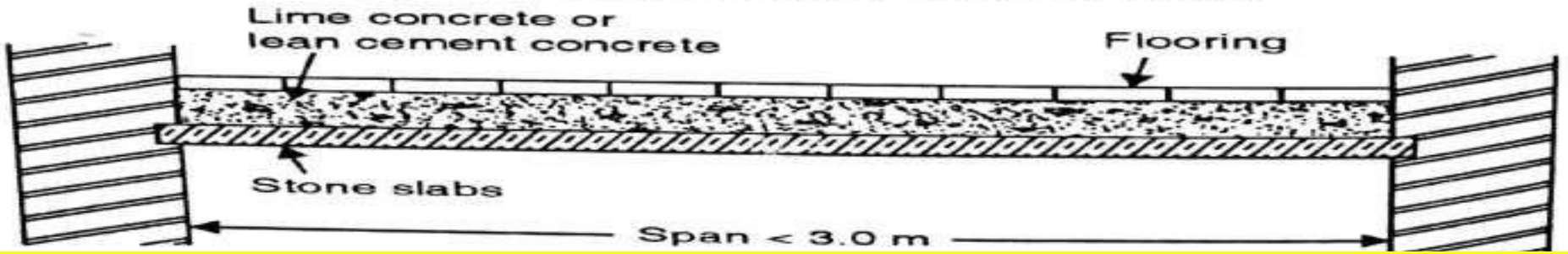
(a) Plan of room



(b) Stone slabs on lower flange or R.S.J.



(c) Stone slabs on upper flange or R.S.J.



Jack arch floors

- Jack arch is an arch of either brick or concrete, supported on lower flange of mi

ld steel joists (R.S.J.).

- The joists are spaced 1 to 1.5 m centre to centre, and are supported at their ends either on the walls or on longitudinal girders.
- The rise of the arch is kept equal to 1/12th of the span.
- The bottom of the floor is not plane; this is the only disadvantage of this floor.

Brick Jack Arch Flooring

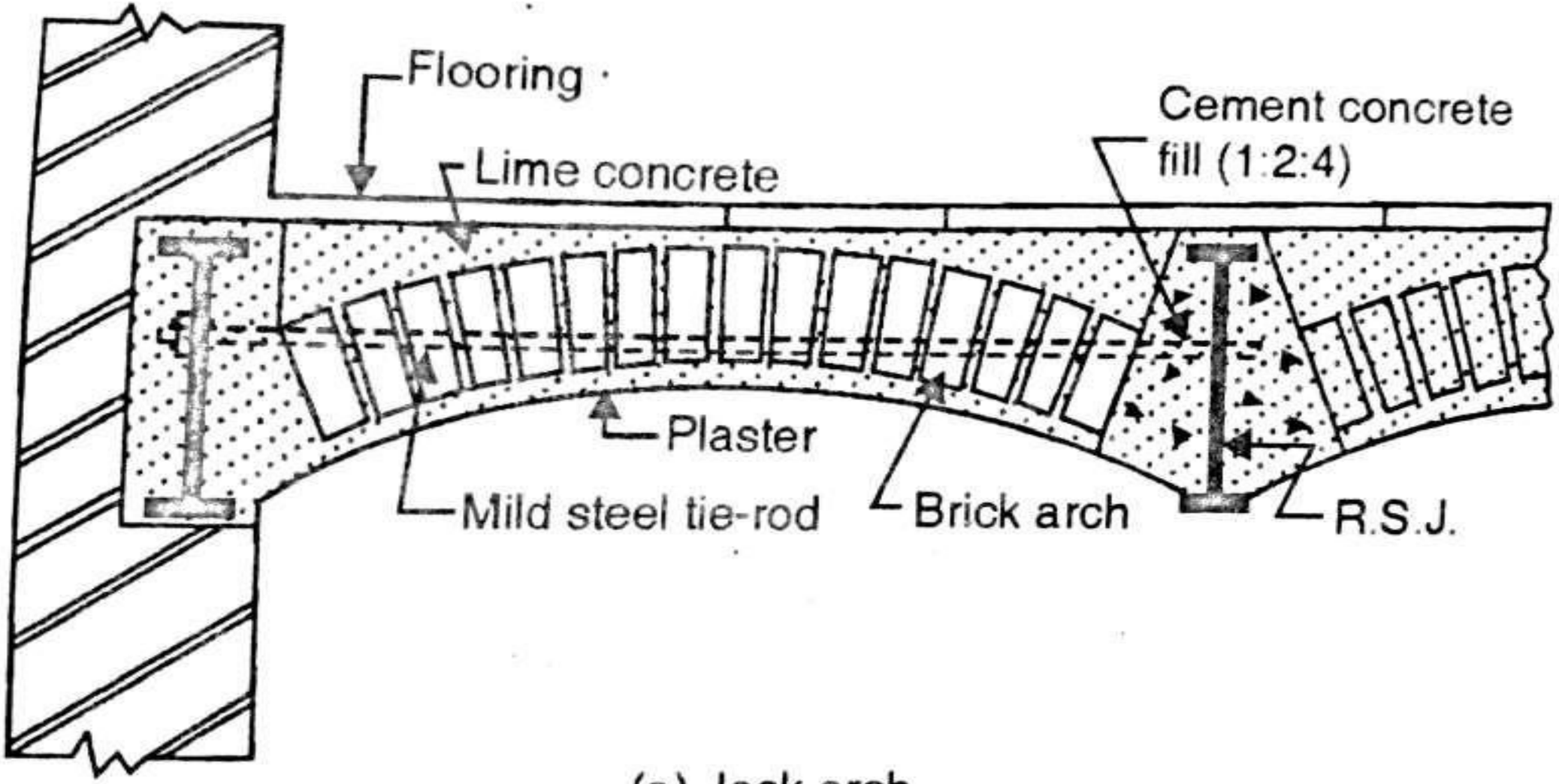
- Before starting the work, the RSJ should be properly secured in position.
- Only first class bricks should be used.

  Successive rings should be properly interlocked.

  Key brick should be properly and tightly secured in rich mortar.

  If lime mortar is used, RSJ should encased in cement mortar.

  Top concrete and flooring should not be laid unless the brickwork is properly cured.

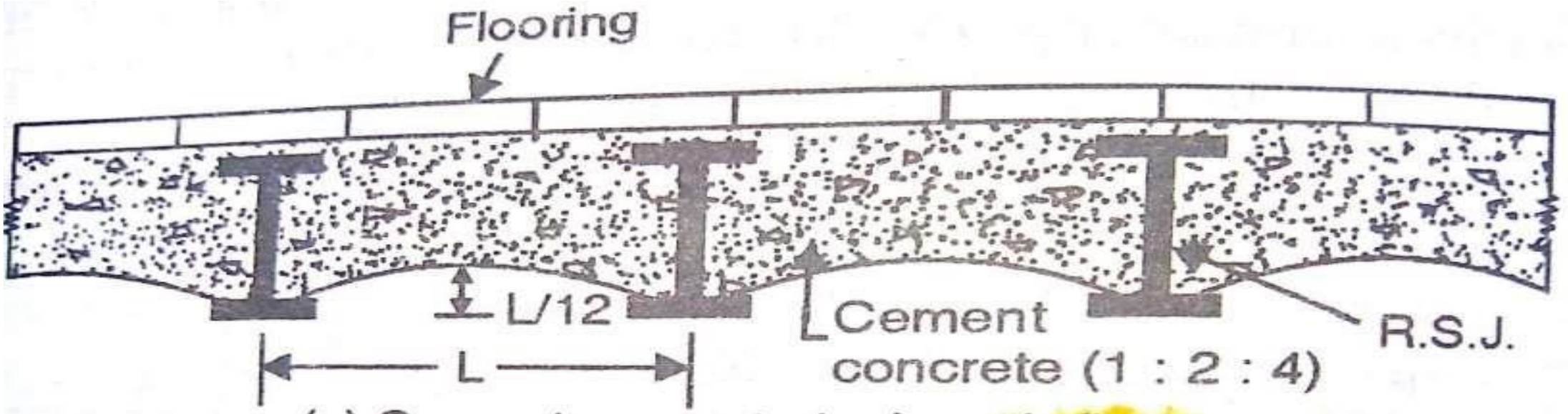

Flooring
Lime concrete
Cement concrete
fill (1:2:4)
Plaster
Mild steel tie-rod
Brick arch
R.S.J.

(a) Jack arch

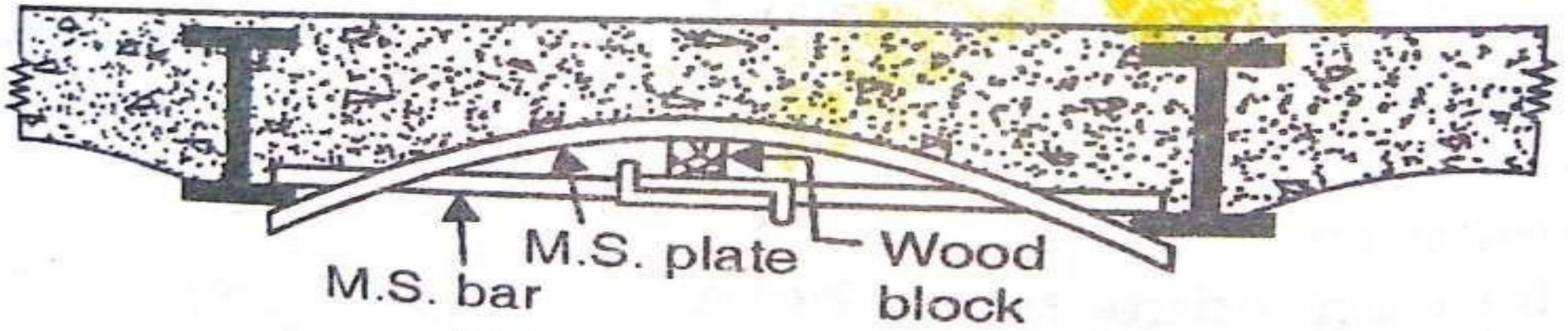
Cement concrete Jack Arch Flooring

- Cement concrete Jack Arch Flooring are made of 1 : 2 : 4 cement concrete, supported on the lower flanges of M.S. joists.
- The construction of concrete jack arches is relatively simple. The centering consists of a 3 mm thick mild steel plate, bent to the sha pe of arch, and having pair of holes at ends, spaced at 75 cm c/c.
- The centering plate is supported on the lower flange of joists thro ugh a pair of 12 mm dia. Rods.
- The ends of the rods pass through symmetrical holes of the center ing plate and finally rest on the lower flange of R.S.J.

  In order to check the deflection of the centering plate, a wooden packing block is tightly inserted between M.S. plate and Rod.



(a) Cement concrete jack arch flooring



(b) Centering details

REINFORCED CEMENT CONCRETE FLOORS

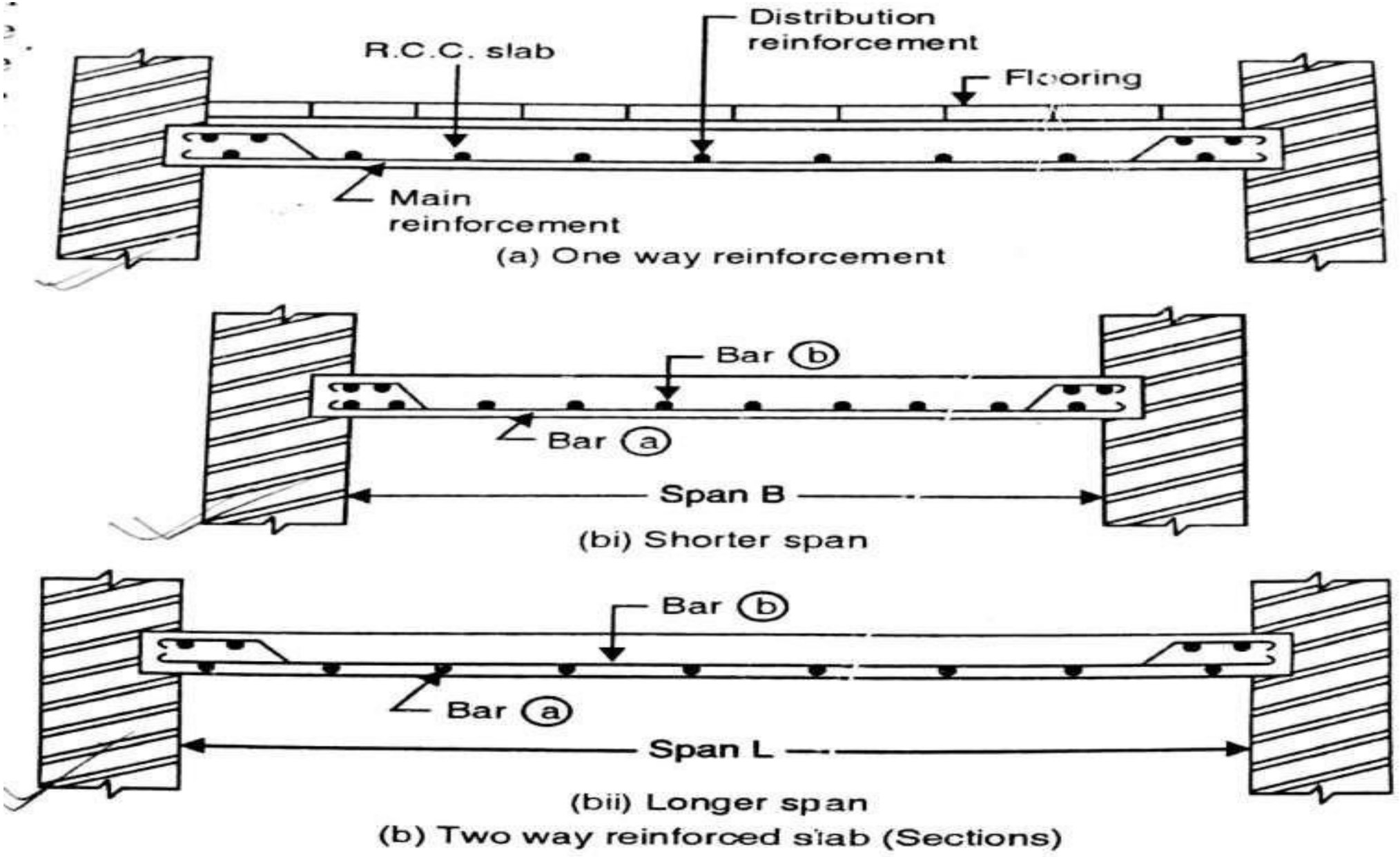
- Floors of modern buildings are invariably made of reinforced cement concrete (R.C.C.), because of the inherent advantages of this type o f construction.
- Concrete, which is strong in compression but is weak in tension . Ho wever, it is suitably reinforced with the help of steel bars which take the entire bending tension.
- Due to this, the overall thickness of R.C.C. floors is comparatively small, thereby reducing the self weight of floor itself.
- R.C.C. floors are also comparatively fire proof and damp proof, The method of construction is also easy except that centering is required.
- These floors can also be used on large spans, and therefore, more suitable for big size rooms, halls etc.

R.C.C. floors can be classified into the following types

- Simple slab flooring
- Reinforced brick flooring
- Beam-slab flooring
- Flat slab flooring.

Simple R.C.C. slab Flooring

- In simple R.C.C flooring, the R.C.C. slab bends downwards, causing tension at the bottom.
- Due to this mild steel bars reinforcement is placed at the bottom of the slab, keeping a minimum clear cover of 15 mm.
- Half these bars are bent up near end to take up negative bending moment caused due to partial fixidity at the ends.
- This main reinforcement is placed in the direction of the span of the slab, which is equal to the width of the room, specially when the length of the room is more than 1.5 times the width of the room.
- Such a slab is known as one way reinforced slab.
- Such slabs are quite suitable and economical for spans up to 5m.When the length of room is less than 1.5 times the width of room,the slab bends in both direction.Such slab is known as two way reinforcement slab.



(a) One way reinforcement

(bi) Shorter span

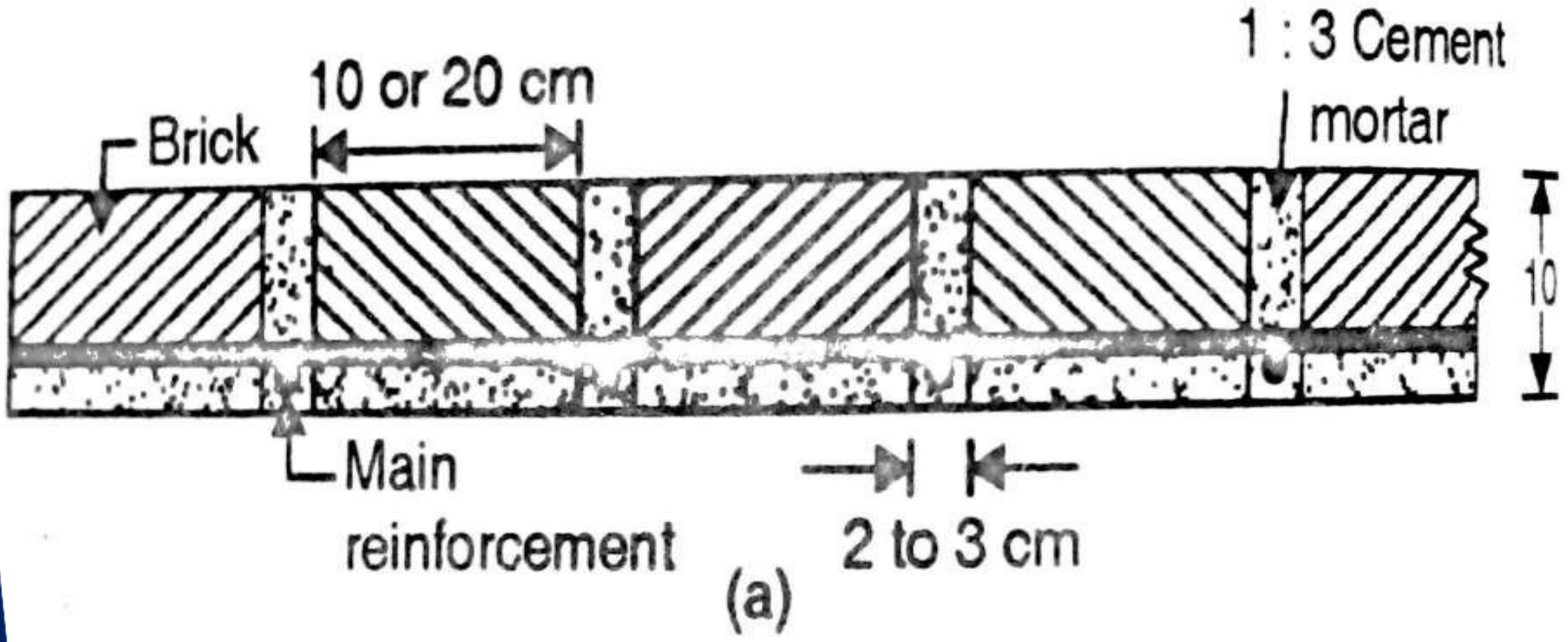
(bii) Longer span

(b) Two way reinforced slab (Sections)

Reinforced Brick Flooring

- Reinforced brick work is a typical type of construction in which the compressive strength of bricks is utilized to bear the compressive stress a nd steel bars are used to bear the tensile stresses in a slab.
- In other words, the usual cement concrete is replaced by the bricks. However, since the size of a brick is limited, continuity in the slab is obt ained by filling the joints between the bricks by cement mortar.
- The reinforcing bars are embedded in the gap between the bricks, whic h is filled with cement mortar. Such type of construction is quite suitab le and cheap for small span floor slabs carrying comparatively lighter l oads.
- The depth of reinforced brick slab is governed by the thickness of the bricks available. Modular bricks are 10 cm thick (nominal). Hence thic kness of slab may be kept as 10 cm.
- First class bricks should be used for such a work. Cement mortar used to fill the joints etc. should be of 1 : 3 ratio, with proper water-cement ratio to make the mortar workable.

  The width of the joint between adjacent bricks is generally kept equal to 2 cm.


1 : 3 Cement
mortar
10 or 20 cm
Brick
10
Main
reinforcement
2 to 3 cm

(a)

Beam-Slab Flooring

- When the width of room becomes more, the span of slab incre ases, and simple R.C.C slab becomes uneconomical.
- In that case, the floor structure consists of R.C.C. beams and sl abs cast monolithically.
- The beams, known as T-beams, act as intermediate supports to the slab which is continuous over these beams.
- When the size of the room {i.e.. hall) is very large, intermediat e T-beams are constructed either supported on R.C.C. columns or end walls.

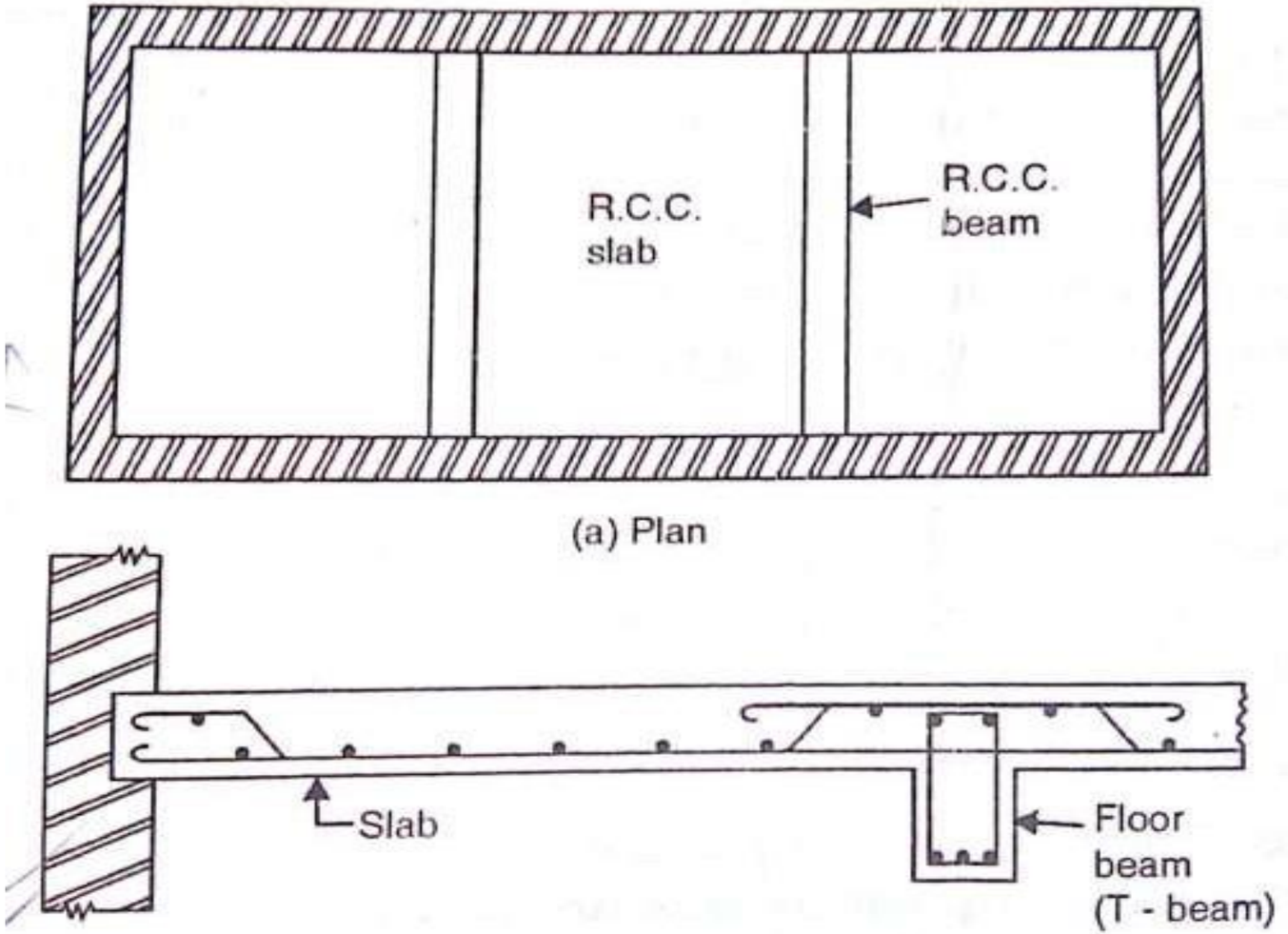


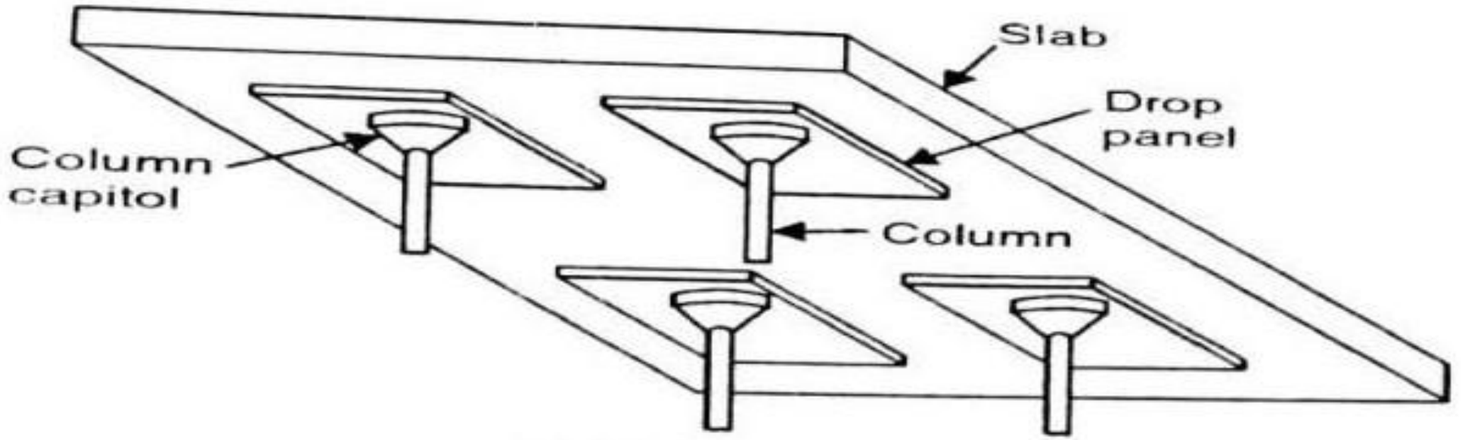
FIG. 12.6. BEAM-SLAB FLOORING.

Flat Slab Flooring

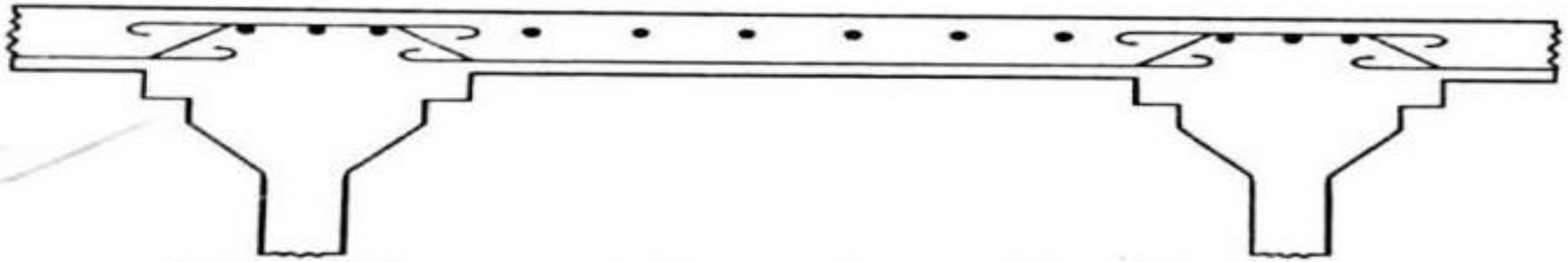
- A flat slab is a typical type of construction in which a reinforced sl ab is built monolithically with the supporting columns and is reinfo rced in two or more directions, without any provision of beams.
- The flat slab thus transfers the load directly to the supporting colu

mns suitably spaced below the slab.

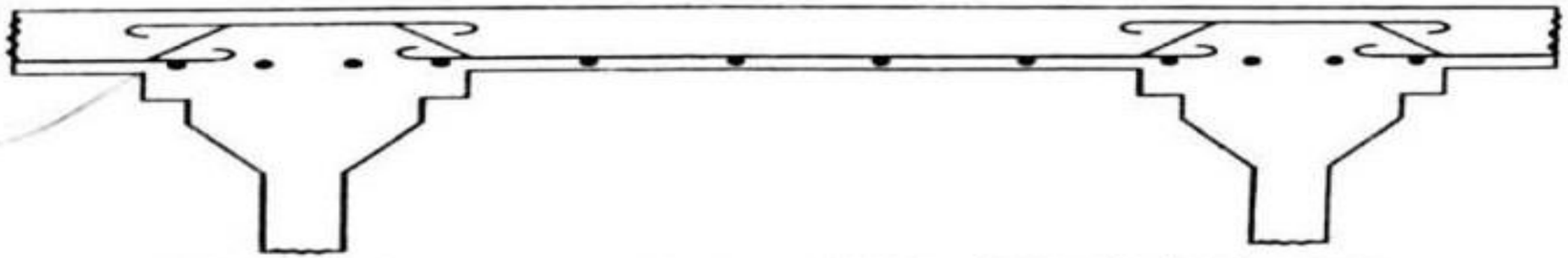
- Because of exclusion of beam system in this type of construction, a plain ceiling is obtained, thus giving attractive appearance from arc hitectural point of view.



(a) The floor system



(b) Reinforcement along column strip of long span



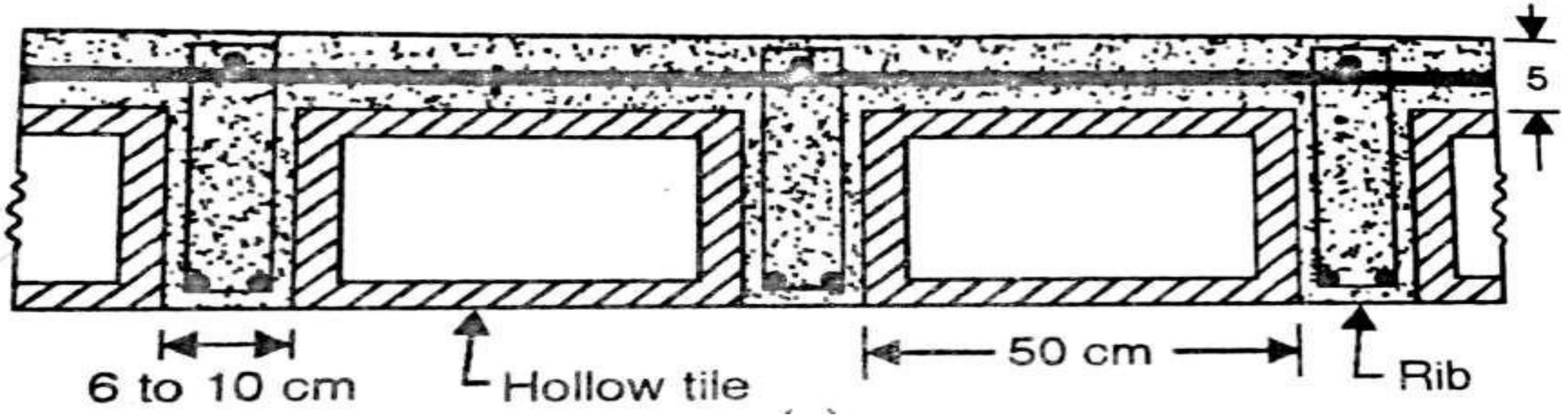
(c) Reinforcement along middle strip of short span

FIG. 12.7. FLAT SLAB CONSTRUCTION.

RIBBED OR HOLLOW TILED FLOORING

- Concrete is incapable of resisting tension which is caused in the lower part of the thickness of the slab. This lower part does not partake in load bearing, and hence part of it can be replaced by hollow tiles so that weight of the slab is reduced.
- The clear spacing of ribs depends upon the size of hollow blocks available,but it should normally not exceed 50 cm.
- The width of ribs may vary between 6 to 10 cm. The span of ribs may be as much as 7 m.
- Main reinforcement is provided at the bottom of the rib. To resist the support moment (negative) an additional bar is placed at the top of rib section.A minimum cover of 2.5 cm is provided. The depth of rib is calculated on the basis of bending moment as well as the cost ratio of steel and concrete.Depth of rib is usually kept as at least L/20 with free support and at least L/25 with fixed support, where Lis the span of the ribs.

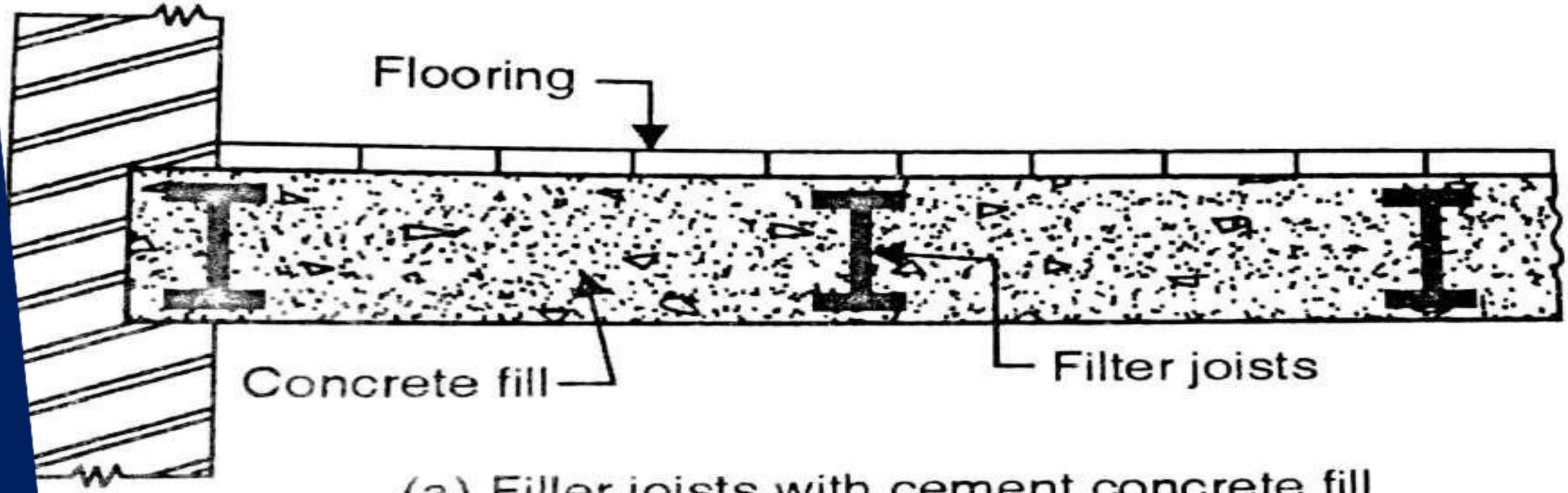
  Hollow tiles are available in different widths and different depths. Sometimes, to suit the requirements of the depth of rib, hollow tiles of required depth may be manufactured at the site.


5
6 to 10 cm
Hollow tile
50 cm
Rib

FILLER JOISTS FLOORS

- This is a typical type of composite construction in which R.S.J of small sections are placed in concrete.
- The spacing of the joists may vary between 40 to 90 cm.
- The filler joists may either rest on walls (if the span is less) or on longitudinal steel beams.
- The joists act as reinforcement, and no separate reinforcement is provided in the concrete filled in between the joists.
- Concrete should completely surround the filler joists and steel

beams, with a minimum cover of 2.5 cm over filler joists.



(a) Filler joists with cement concrete fill

PRE-CAST CONCRETE FLOORS

- With the modern developments in construction technology, precast bea m slab units are now available with the help of which the floors can be constructed easily. without use of any form work.
- These precast units are available in about 25 cm width, various depths,

and various spans.

- Precast units can be supported either on walls or on rolled steel joists. The sides of each unit are provided with grooves to form connecting jo ggles for adjacent units.
- The joints are grouted with cement mortar, using concrete guns.
- Such floors are economical, light weight, sound proof, fire proof.

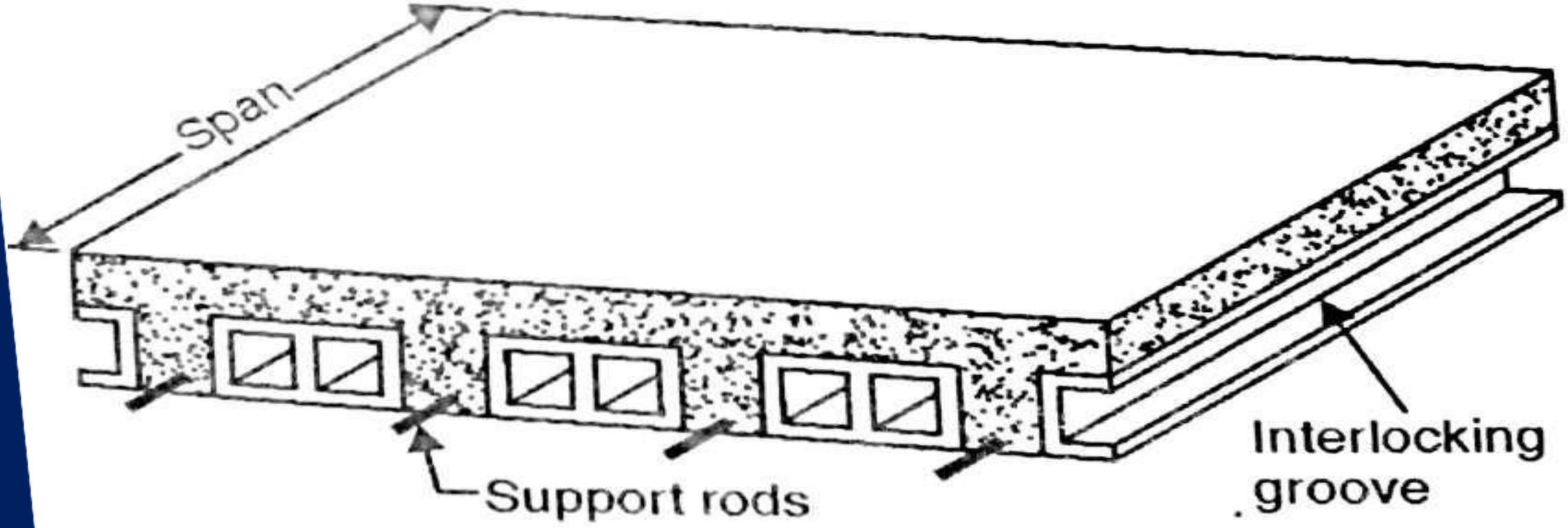


FIG. 12.10. HOLLOW PRECAST FLOOR UNITS.

TIMBER FLOORS

- Timber floors which is quite light in weight, have poor fire resista nce and sound insulation property.
- They are quite costly except at those location where local timber i s cheaply available.
- timber floor are basically three types,
- Single joist timber floors.
- Double joists timber floors

  Framed or triple joists timber floor

JECRC Foundation

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Thank you!

STAY HOME, STAY SAFE