BUILDING MATERIALS AND CONSTRUCTION

S5

TUTOR :Ar. SHABNA .K

MODULE II

MODULE II

FLOOR FINISHES (12 hrs)

•Types of flooring, methods of laying, furnishing of floors with different floor finishes like cement, colored cement, mosaic, terrazzo, tiles,wood,parquet flooring, stone, brick etc.

•Classification & properties of tiles used in flooring. Selection criteria & Methods of fixing various types of tiles.

•Different type of resilient and vibration resistive floor like rubber, Linoleum and PVC flooring.

•Sketches : Tile flooring, wooden flooring

Factors to Consider

- Durability and wear factors
- Cleaning and maintenance
- Acoustics
- Static electricity
- Moisture in slab
- Price
- Appearance
- Safety

Types of Flooring

- **Soft Flooring** – *(warm, quite, difficult to maintain, allergens)*
  - Rugs and Carpets
- **Hard Flooring** *(durable, noisy, more expensive)*
  - Tile
  - Cement Concrete
  - Stone (Slate, marble, flagstone, terazzo, granite)
  - Brick
  - Wood and Bamboo (strips, planks, parquet)
- **Resilient Flooring** *(durable, good acoustics, easy to maintain)*
  - Sheet Vinyl
  - VCT (vinyl composition tile)- requires waxing which is not easy to maintain
  - Cork
  - Rubber
  - Linoleum

Properties of flooring material : Selection criteria

- Damp resistance:– flooring should offer the resistance against dampness so that healthy environment is obtained in the building.
- Sound insulation:– the flooring should insulate the noise. Also, it should not be such that the noise is produced when users walk on it.
- Thermal insulation:– the flooring should offer reasonably good thermal insulation so that comfort is imparted to the residents of the building.
- Smoothness:– the flooring material should be smooth and should have even surface. However, it should not be slippery.
- Fire resistance:– this is more important for upper floors. Flooring material should offer sufficient fire resistance so that fire barriers are obtained between different levels of the building.
- Hardness:– it should be sufficiently hard so as to have resistance to indentation marks, imprints etc.Likely to be caused by shifting of furniture, equipment etc.
- Maintenance:– the flooring material should require least maintenance.

Tile flooring

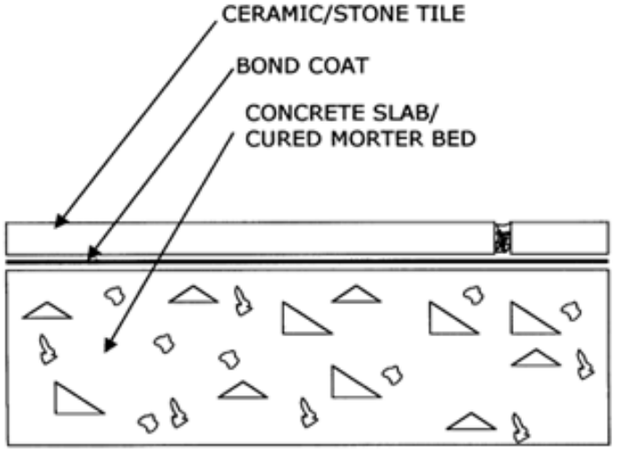


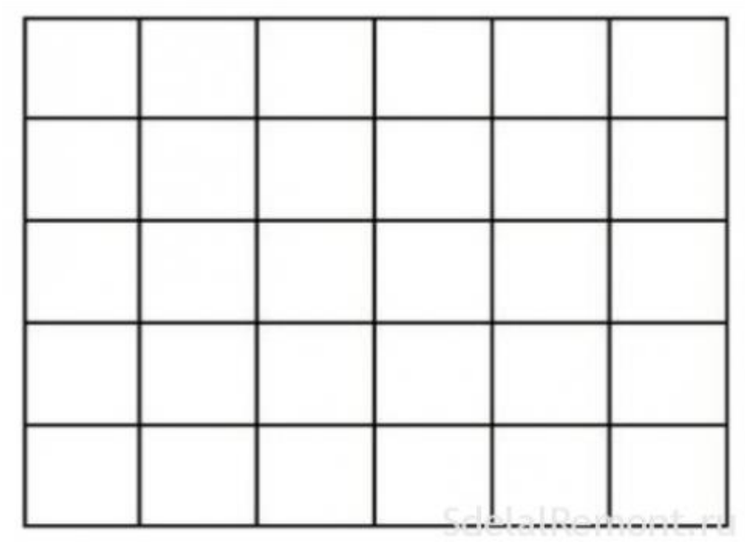
FIGURE A

- commonly used in residential flooring, offices, hospitals, schools and other public buildings.
- Over the concrete base, a 25 to 30 mm thick layer of lime mortar 1:3 is spread to serve as a bedding.
- Before laying the tiles neat cement slurry is spread over the bedding mortar and the tiles are laid flat over it, gently pressing them into the bedding mortar with the help of wooden mal let till level surface

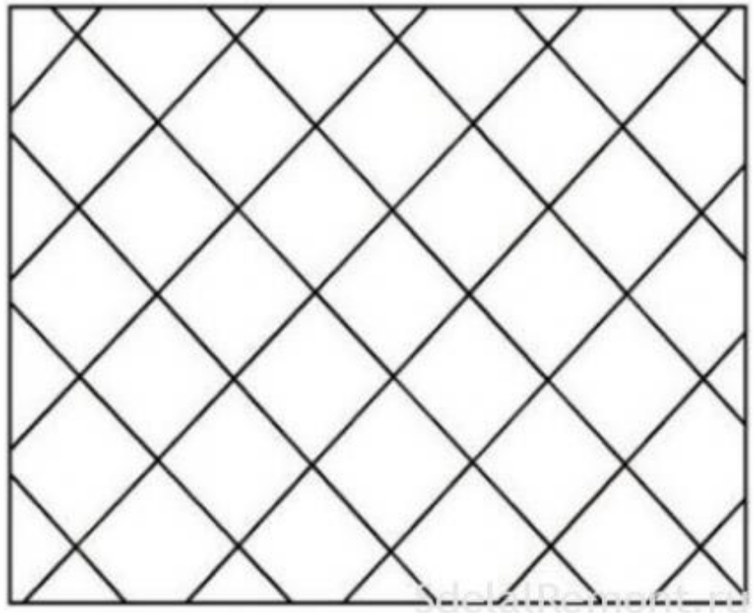
- Tile flooring
- https://goodguyflooring.com/blogs/home-improvement-blog/how-to-properly-prep-your-floor-for-tile-installation
- https://www.realsimple.com/home-organizing/decorating/types-of-tiles

Methods of laying

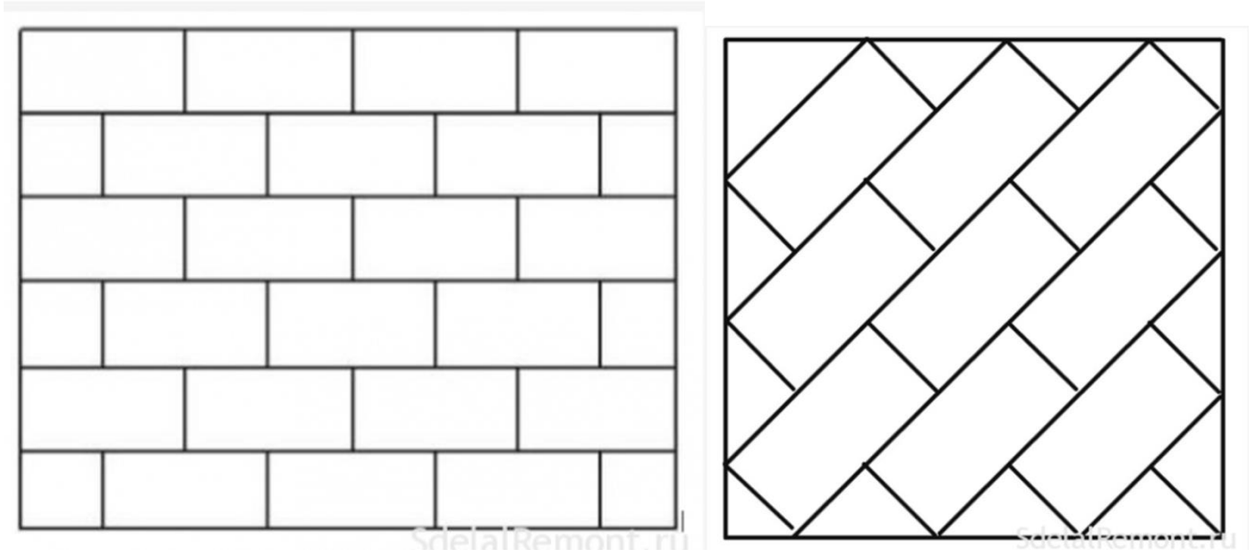
- Normal/grid



- diagonal



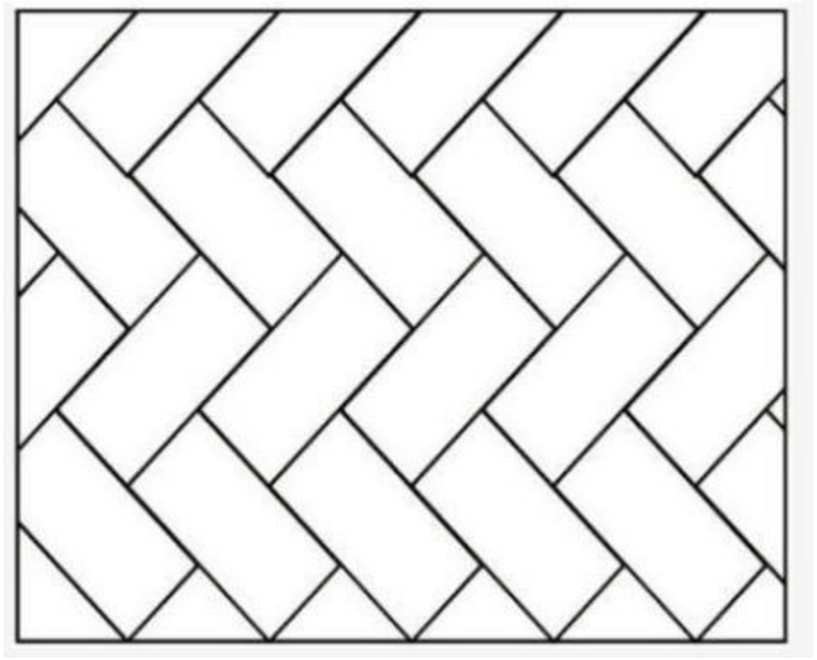
- Offset



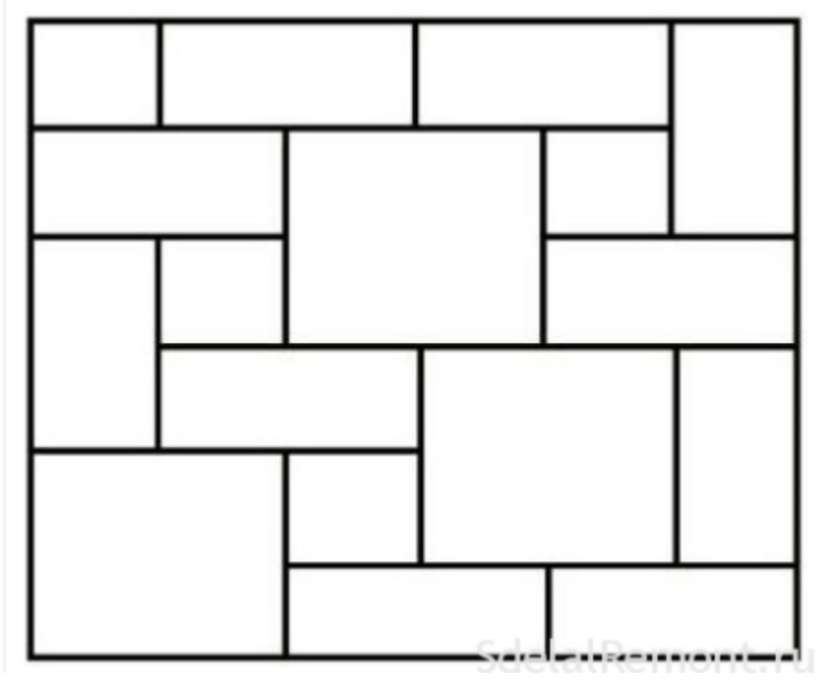

SdelalRemont.ru


SdelalRemont.ru

- Herringbone



- Modular



Different types

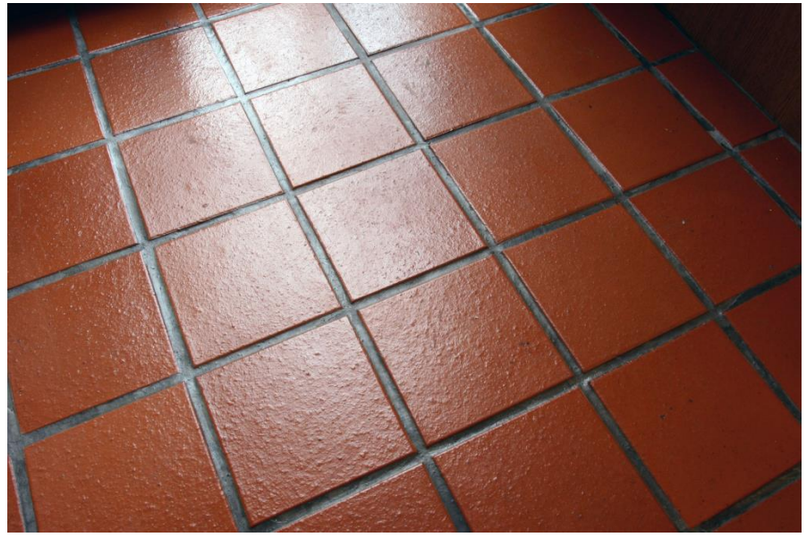
- Ceramic tiles These are made from fired clay and finished with a glaze. They are hard-wearing, waterproof and fireproof. They are available in a wide range of designs, colours, sizes and finishes, and at a range of different prices.

- Porcelain tiles are made from hard, finer clays. They used to be made using a different manufacturing method which resulted in the design running all the way through the tile - but these days they are usually glazed and fired in the same way as ceramic tiles. They tend to be harder and denser than ceramic tiles.

	CERAMIC	PORCELAIN
MOISTURE	Absorbs more moisture	Absorbs less moisture
HARDNESS	Softer	Harder
COST	Cheaper	More expensive
USAGE	Only for use indoors	Can be used both outdoors and indoors
CUTTING	Easier to cut	Harder to cut

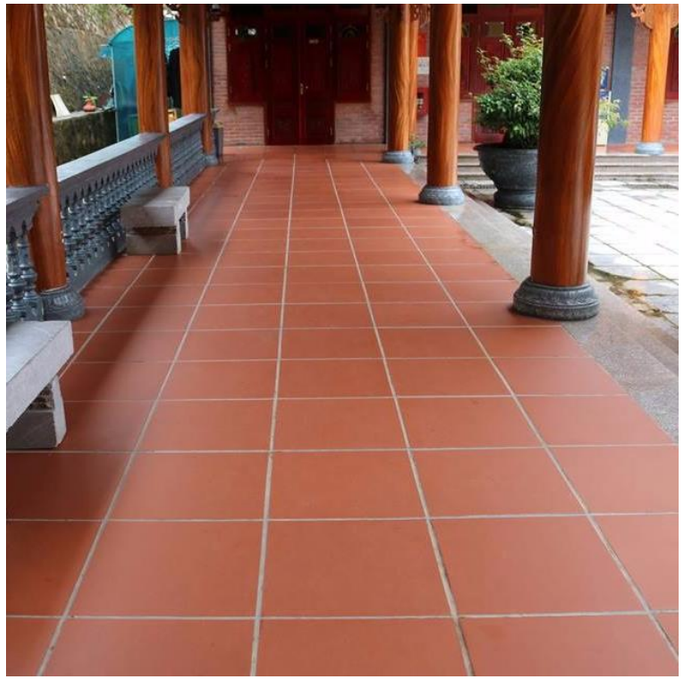
https://www.warmup.com/blog/porcelain-vs-ceramic-tile

Different types



- Quarry tiles are extruded (that is, squeezed out) rather than pressed, as most ceramic tiles are. This gives a slightly rougher finish and greater variability in shape. Traditionally a reddish brown colour, they are now available in various shades of grey and black, too.

  https://www.thespruce.com/uses-for-quarry-tile-1822628



- Terracotta tiles are traditionally fired at lower temperatures and have more natural variation in the individual tiles. Modern terracotta tiles can be finished with a glaze, or can require a surface treatment to seal them once installed. They tend to give a more rustic, less formal effect.

Cement flooring

- This is commonly used for residential, commercial & even industrial building.
- It is moderately cheap, quite durable and easy to construct.
- The floor consists of two components:-

a) Base concrete b) Topping or wearing surface.

- They are constructed either monolithically or non monolithically.
- When the floor is laid monolithically, good bond between the two components is obtained resulting in smaller overall thickness.

Method of application

- The base course may be 7.5 to 10 cm thick, eiher in lean cement concrete (1:3:6 to 1:5:10) or lime concrete containing 40% mortar of 1:2 lime-sand & 60% coarse aggregate of 40mm nominal size.
- When base concrete has hardened, its surface is brushed with stiff broom & cleaned thoroughly.
- It is wetted the previous night and excess water is drained.
- The topping consists of 1:2:4 cement concrete, laid in desired thickness (usually 4cm) in one single operation.
- Other alternate layers are then laid after 72 hrs, so that initial shrinkage of already laid panels takes place, thus eliminating the cracks.
- The prepared surface is protected from sunlight, rain, other damages for a period 12 to 20 hrs.
- The surface is then properly cured for a period of 7 to 14 days.

- Merits
- non-absorbent and hence offers sufficient resistance to dampness, This is used for water retaining floors as well as stores.
- provide smooth, hard even and pleasing surface.
- possesses high durability.
- offers fire resistant surface.
- easily cleaned and has proved overall economical due to less maintenance cost.
- Demerits
- Work progress is slow because to wait till the initial setting of base course.
- The defects, once developed, in concrete floors whether due to poor workmanship or materials, can not be easily rectified.
- cannot be satisfactorily repaired by patchwork
- does not possess very satisfactory insulation properties against heat and sound.

•Corridors of IIM Ahmedabad, Louis Kahn

Cement flooring :variants(colored concrete, cement tiles)

https://www.archdaily.com/910825/the-possibilities-of-pigmented-concrete-18-buildings-infused-with-color

Colored cement flooring

- However, compounds that add pigment to the mixture are becoming increasingly prevalent and popular, as they infuse the concrete with hues more stable than paint. T
- these shades result from the addition of oxides: yellow, red and their derivations (eg. brown) are obtained with the addition of iron oxide; chromium and cobalt oxide create the greens and blues, respectively. For black concrete, it is common to use black iron oxide and carbon oxide combined with pozzolanic cement.

- Pigmenting the concrete can go beyond the aesthetic function. It can work to enhance the impression of a volume, contextualize a building in its surroundings, or even refer to the design concept.

Stone flooring

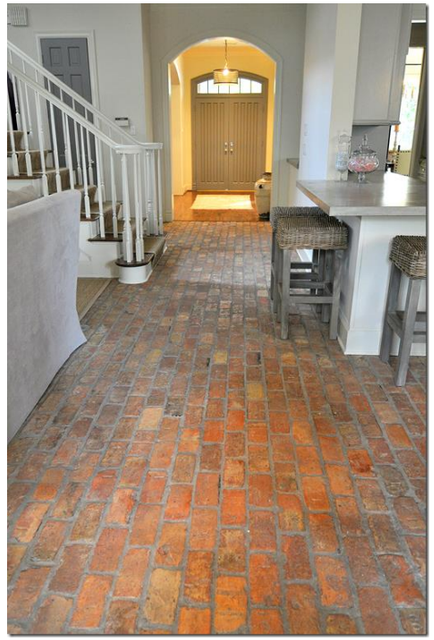
- Merits
- It provides a hard, durable and wear resisting floor surface and as such can be used for godowns , stones, workshops.
- It is easy in construction.
- It is easily repairable and maintainable.
- It is used in place Tamilnadu , Andhra Pradesh, where slab stones are available.
- Demerits
- Its usage is not comfortable for living purpose due to not offering perfect even surface.
- It does not give a pleasing appearance, so can not be used in residential building or important public building.



- Natural stone tiles are just that - slabs of natural stone that have been cut to size and shape. Stone tends to be heavier than ceramics, and has a natural variability in colour and surface finish.eg;flagstone,granite
- Travertine tiles are natural limestone, laid down in layers over millions of years as a sedimentary rock. Although technically incorrect, their appearance means they are often counted as a marble tile,. They are usually a lighter colour, varying from pale to darker pinks and creams.

- Marble is similar to travertine, but is a metamorphic rather than a sedimentary rock. This means that it has been compressed, heated and cooled during its time in the ground, so that it is actually a mass of little crystals. It is harder, denser and less porous than travertine, and has a different colour palette. Marble tiles give a very classical appearance, with a natural variation in the colour inclusions.
- Slate was formed in layers at the bottom of the ancient seas, then compressed and heated. It comes in a range of colours, including greys, greens, pinks and purples. Slate is notable in having more natural variability than almost any other flooring material, both in surface finish and in thickness.

Brick flooring



- It is used in cheap construction, specially where good bricks are available.
- This flooring is specially suited to ware-house, stores, godowns etc.
- 10 to 15 cm thick layer of lean cement concrete (1:8:16) or lime concrete is laid over the prepared sub grade.
- This forms the base course, over which bricks are laid flat on 12 mm thick mortar bed in such waythat all the joints are full with mortar.

- Merits
- hard and durable.
- non-slippery and fire resistant surface.
- cheaper iinitial cost than cement concrete, mosaic, terrazzo flooring.
- Low maintenance cost.
- Demerits
- It is absorbent.

Terrazzo flooring

- It is very decorative
- It is widely used **in residential buildings hospitals, offices, schools and other public buildings.**
- prepared concrete surface with cement and marble chips in proportion to 1:2.
- When surface has set, the chips are exposed by grinding operation. The sub base preparation and concrete base laying is done in the similar manner of cement concrete flooring.

Process

- The top layer may have 40 mm thickness consisting of:-
- a) 34 mm thick cement concrete layer (1:2:4) laid over the base concrete.
- b) About 6 mm thick terrazzo topping.
- Concrete of the grade 1:2:4 is then laid in alternate panels leveled and finished to rough surface.
- When the surface is hardened, the terrazzo mix is laid and finished to the level surface.
- Additional marble chips may be added during the temping and rolling operations.
- So that , at least 80% of the finished surface show exposed marble chips
- The surface is cured for 4 to 6 days and final grinding is done with carborundum stone of 320 grit size.
- The surface is thoroughly scrabbed and cleaned using plenty of water.
- Wax polish is applied with the help of polishing machine to get final glossy surface.

- Merits
- It is then ground waxed and polished. It has a mosaic look.
- It can also be premade and is available in slabs or tiles.
- It is very hard wearing.
- It is very useful in commercial situations i.e. malls and shopping cen ters as it is very durable and easy to clean.
- Demerits
- They are slippery when polished

https://www.vogue.com/article/how-terrazzo-moved-out-from-under-our-feet-to-absolutely-everywhere

Mosaic flooring

- It is made of small pieces of broken tiles of china glazed or of cement or of marble arranged in different pat tern.
- A concrete base is prepared as in the case of concrete flooring and over it 5 to 8 cm thick lime surkhi (Powder of bricks) mortar is spread and leveled.
- On this, a 3 mm thick cementing material in the form of paste of 2 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 are arranged in definite pat terns and hammered into cementing layer.
- The surface is gently rolled by a stone roller of 30 cm diameter and 40 to 60 cm long, sprinkling water over the surface, so that cementing materials comes up through the joints and an even surface is obtained.

- Merits
- They are laid in different sizes usually in rectangular and square shapes.
- They are long lasting.
- This is a superior type of flooring used in bathrooms and kitchens of residential buildings and in hospitals, sanatoriums and temples
- Demerits
- They are slippery when polished

https://www.livspace.com/in/magazine/materials101-mosaic-vs-terrazzo

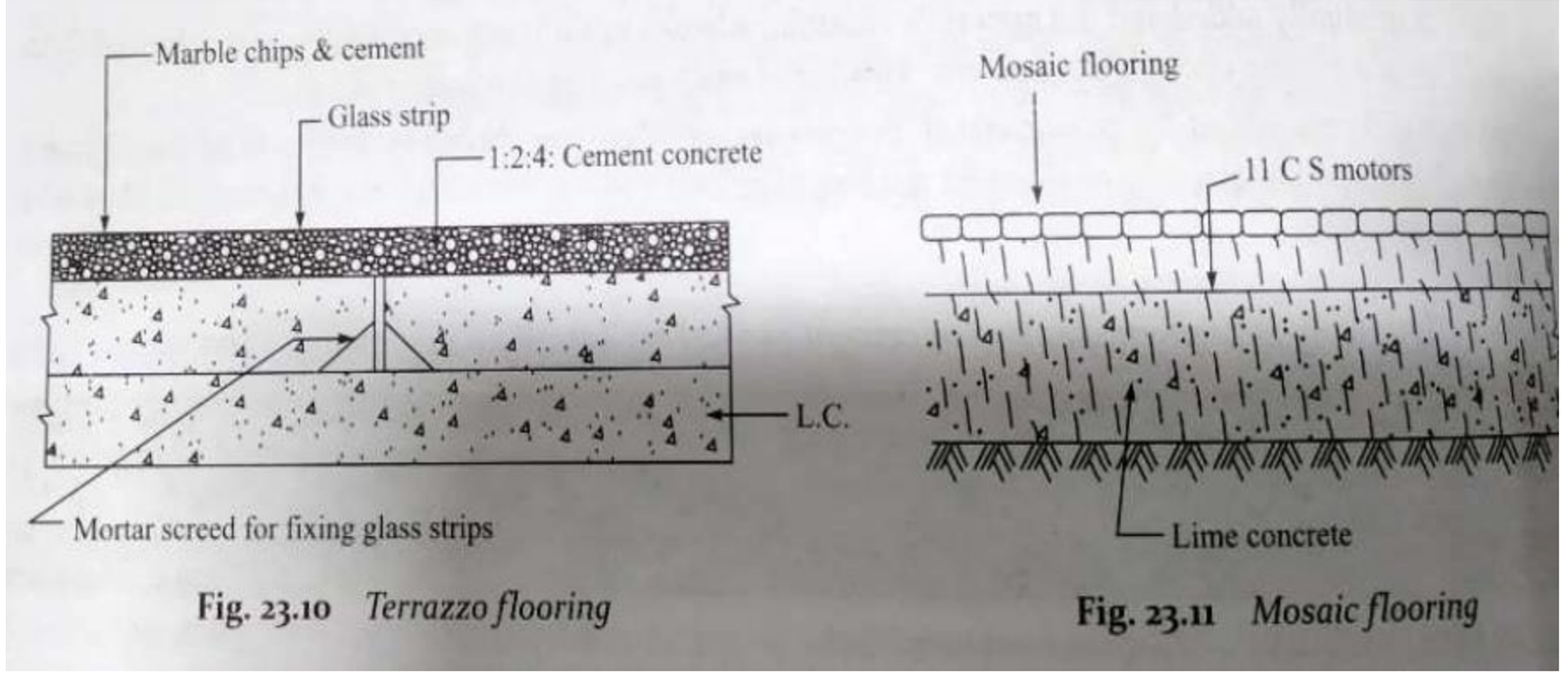


Fig. 23.10 *Terrazzo flooring*

Fig. 23.11 *Mosaic flooring*

Wooden flooring

- It is used for carpentry halls, dancing halls, auditorium etc.
- They were not commonly used in residential building s in humid climates of India because timber flooring is quiet costlier.
- In hilly areas, where timber is cheaply & readily available, and where temperature drops very low, timber flooring is quite common.
- One of the major problems in timber flooring is the damp prevention.
- This can be done by introducing D.P.C. layer below the flooring.
- Many resistant varieties are available in the market making it a favorite option for architects/consultants

Wooden flooring

- Now extensively available in many styles, colours, cuts and species

Common types:

- Laminated wooden flooring
- Engineering wooden flooring
- Solid wooden flooring

- Laminated wooden flooring is a compressed fibre board planks covered by a photographic image of wood, stone or tile with a protective overlay

Advantages

- It is cheap
- Resistance to abrasion
- Easy and fast to lay

Disadvantages

- It is easily swollen by moisture and damage can be prepared
- The joints wear over time, and once the surface is damaged it is had to fix

- Engineering wooden flooring is composed of two or more layers of wood in the form of a plank.
- The top layers is the wood that is visible and the flooring is installed and is adhered to the core
- Engineer wood is the most common type of wood flooring used globally
- Each floor board consist of three or four layers of wood, glued together at right angle to create a plank around 40mm thick
- It can be laid anywhere, if its not exposed to water or humid atmosphere ;cheaper than solid wood and stable than laminate; Tongue and groove is harder to install than clicklock

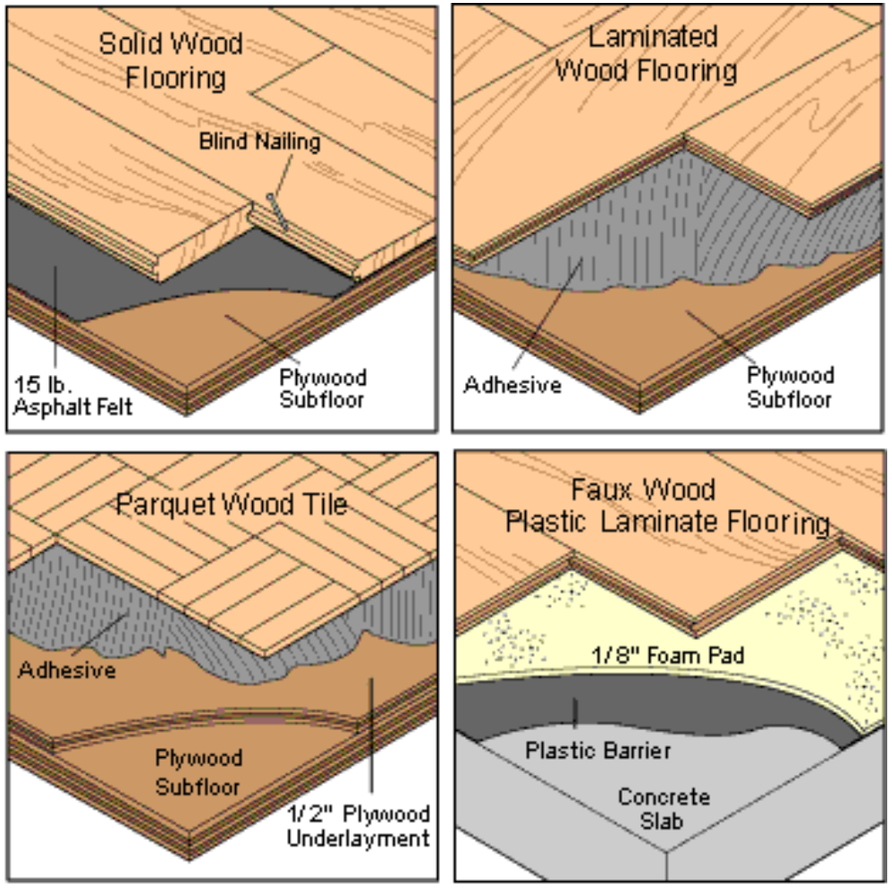
https://hardwoodfloorstore.co.uk/blogs/blog/engineered-wood-flooring-vs-different-types

- Solid wooden flooring Each board is made from a single piece of wood typically 18 to 20mm thick
- It is usually fitted using tongue and groove
- All types of wood have a hardness score which indicates how easily they can be damaged
- It is laid anywhere with a relatively constant atmosphere particularly in hallways and living areas where you can show it off

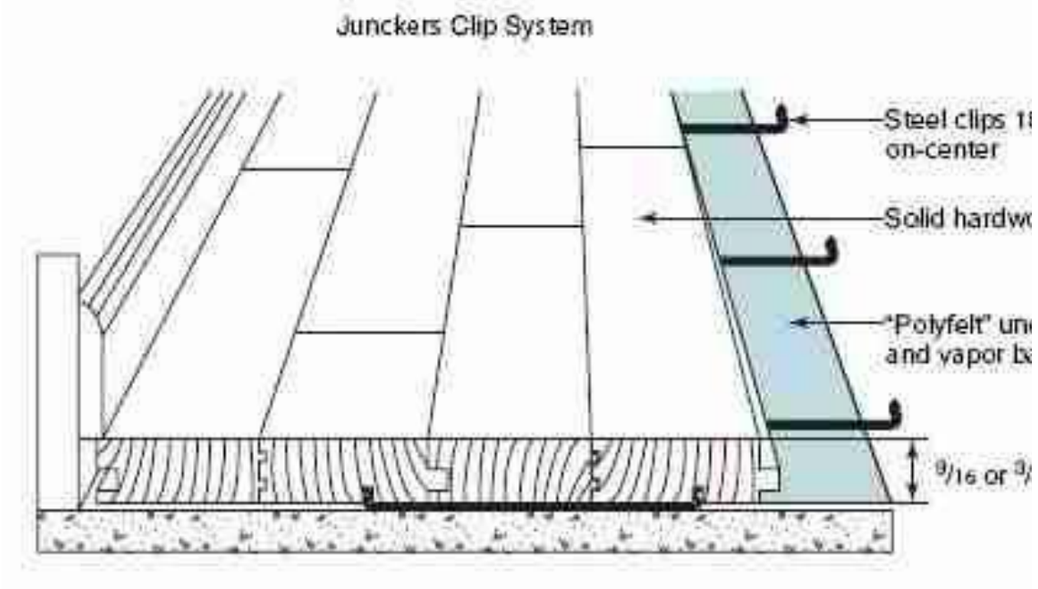
- Parquet is a type of wood flooring made by arranging small slats of wood in distinct, repeating patterns. While traditional parquet floors were installed one piece at a time, most modern parquet comes in tile form in which the wood slats are bonded to a backing material. Parquet tile flooring is installed by gluing, nailing, or stapling the tiles to the subfloor. Because the parquet strips are hardwood, parquet flooring is similar in look and performance to traditional solid-hardwood strip flooring.

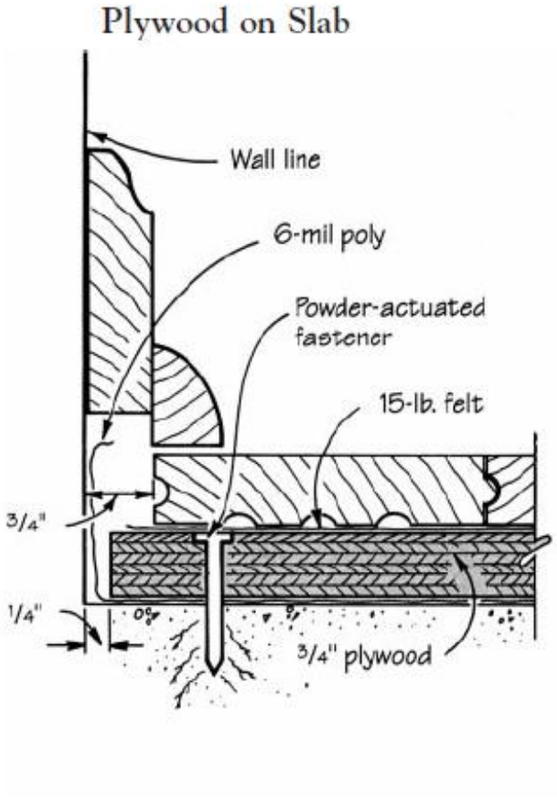
https://www.thespruce.com/wood-parquet-flooring-comeback-1821879

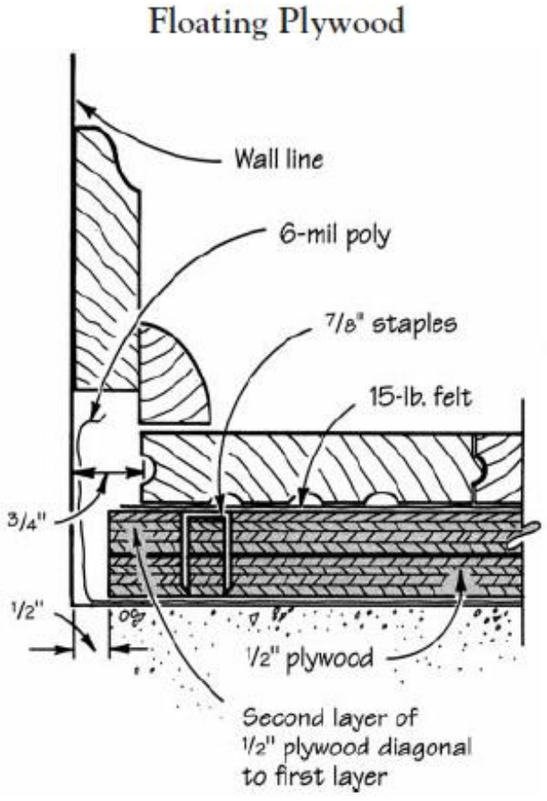
Adhesive based installation



Other systems







Types of Flooring

Soft Flooring – *(warm, quite, difficult to maintain, allergens)*

- Rugs and Carpets

Hard Flooring *(durable, noisy, more expensive)*

- Tile
- Cement Concrete
- Stone (Slate, marble, flagstone, terazzo, granite)
- Brick
- Wood

Resilient Flooring *(durable, good acoustics, easy to maintain)*

- Sheet Vinyl
- VCT (vinyl composition tile)- requires waxing which is not easy to maintain
- Cork
- Rubber
- Linoleum
- PVC

Rubber flooring

- It consists of sheets or tiles of rubber in variety of patterns and colors with thickness varying from 3 to 10mm.
- The sheets or tiles are fixed to concrete base or wood by means of appropriate adhesives (epoxy polyurethane).
- Rubber flooring are resilient and sound proof, however they are costly.
- Used in heavy equipment spaces, where live load is heavy and active such as gyms.

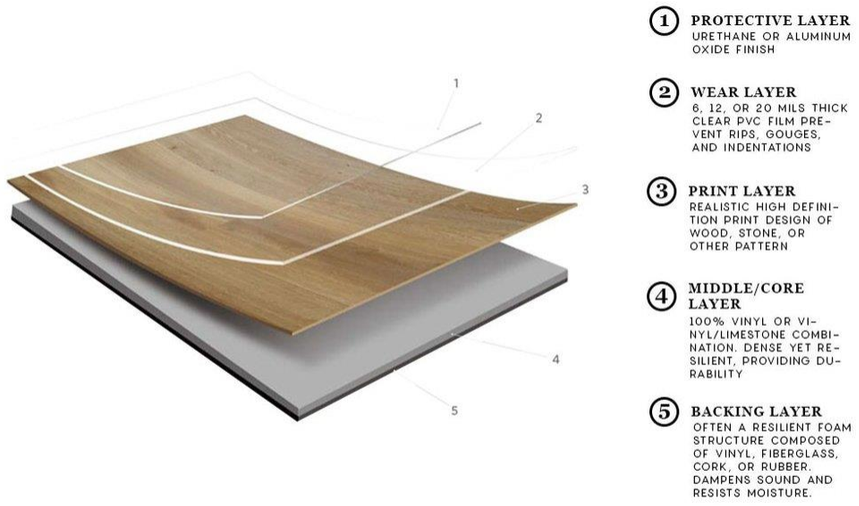
Linoleum flooring

- Linoleum, is a floor covering made from materials such as solidified linseed oil (linoxyn), pine resin, ground cork dust, sawdust, and mineral fillers such as calcium carbonate, most commonly on a burlap or canvas backing
- It is covering which is available in rolls and which is spread directly on concrete or wooden flooring.
- The sheets are either plane or printed and are available in 2 to 6 mm thickness and 2 to 4 m wide rolls.
- Linoleum tiles are also available which can be fixed to concrete base in different pat tern.
- Therefore it cannot be used for bathrooms, kitchens etc,I deal for offices and public buildings,also for deck coverings in ships

- Merits
- It provides attractive, resilient, durable and cheap floor surface.
- It offers surface which can easily washed and clean.
- It offers adequate against insulation noise and heat.
- Demerits
- It is subject to rotting when kept wet for sufficient time and not recommended for basements.
- It does not offer resistance against fire, being combustible nature

Plastic or P.V.C. Flooring

- Linoleum has largely been replaced as a floor covering by polyvinyl chloride (PVC), has similar flexibility and durability to linoleum, but also has greater brightness and translucency, and is relatively less flammable.
- The fire-retardant properties of PVC are due to chlorine-containing combustion products, some of which are highly toxic, such as dioxin
- The floor is washed with warm soap water before used.
- It is resilient , smooth, good looking and can be easily cleaned.
- PVC flooring is inexpensive and used in a variety of buildings, including homes, hospitals, offices, and schools. Complex and 3D designs are possible, which are then protected by a clear wear layer.
- A middle vinyl foam layer also gives a comfortable and safe feel. The smooth, tough surface of the upper wear layer prevents the buildup of dirt, which prevents microbes from breeding in areas that need to be kept sterile, such as hospitals and clinics



RESILIENT VINYL LAYERS

- (PVC) fabricated in the form of tiles of different sizes and different color shades.
- laid on concrete base.
- The tile is laid when the adhesive has set sufficiently; it is gently pressed with the help of wooden roller and the oozing out adhesive is wiped off.

Types of Flooring

- **Soft Flooring** – *(warm, quite, difficult to maintain, allergens)*
  - Rugs and Carpets
- **Hard Flooring** *(durable, noisy, more expensive)*
  - Tile
  - Cement Concrete
  - Stone (Slate, marble, flagstone, terazzo, granite)
  - Brick
  - Wood (parquet)
- **Resilient Flooring** *(durable, good acoustics, easy to maintain)*
  - PVC
  - Rubber
  - Linoleum