

UNIT – VI

Finishing Works and Special Materials

By

P SWATHI

Assistant Professor

Department of Civil Engineering

Contents

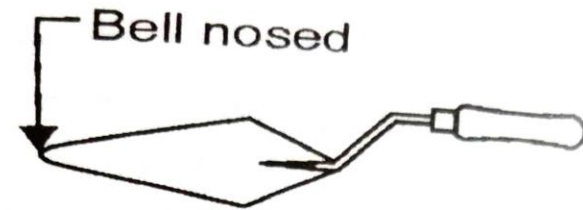
- Plastering & Pointing
- Damp proof Course
- Paints
- Distempers
- Varnishes
- Thermal & Sound insulating materials
- Scaffolding
- Centering and form work for concrete structures

Plastering & Pointing

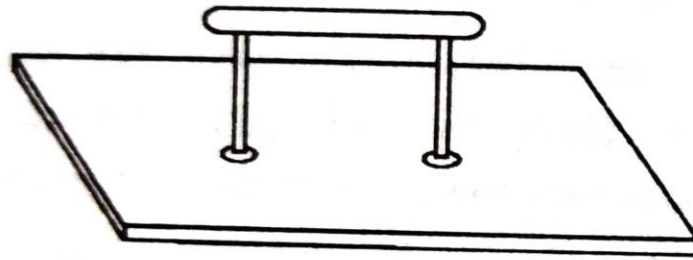
- **PLASTERING :**
- It is the process of covering rough surfaces of walls, columns, ceilings and other building components with thin coat of *plastic mortars* to form a smooth durable surfaces.
- The coating of plastic material (i.e., mortar) is termed as *plaster*.
- Plastering on external exposed surfaces is known as *rendering*.
- **Objects of Plastering :** Plastering is done to achieve
 - 1) To protect the external surfaces against penetration of rain water and other atmospheric agencies.
 - 2) To give smooth surface in which dust and dirt cannot lodge.
 - 3) To give decorative effect
 - 4) To conceal inferior materials or defective workmanship.

- **Requirements of good plaster :** The plaster material should fulfill the following requirements :
 - 1) It should adhere to the background, and should remain adhered during all variations in seasons and other atmospheric conditions.
 - 2) It should be hard and durable.
 - 3) It should possess good workability.
 - 4) It should be possible to apply it during all weather conditions.
 - 5) It should be cheap.
 - 6) It should effectively check penetration of moisture.
- Various types of mortars commonly used for plastering are (i) Lime mortar, (ii) Cement mortar, and (iii) Lime cement mortar.
- Tools used for plastering are Gauging tools, Metal float, Wooden float, Floating rule, plumb bob, spirit level, set square, straight edges brushes, scratchers etc.,

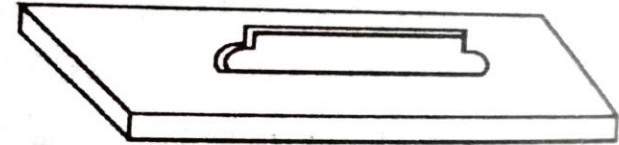




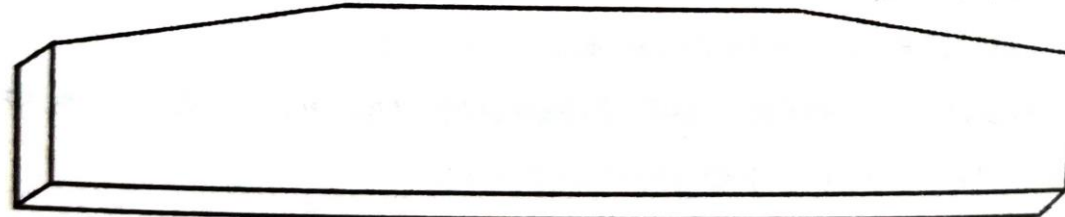
(a) Gauging tools



(b) Metal float (Laying float)



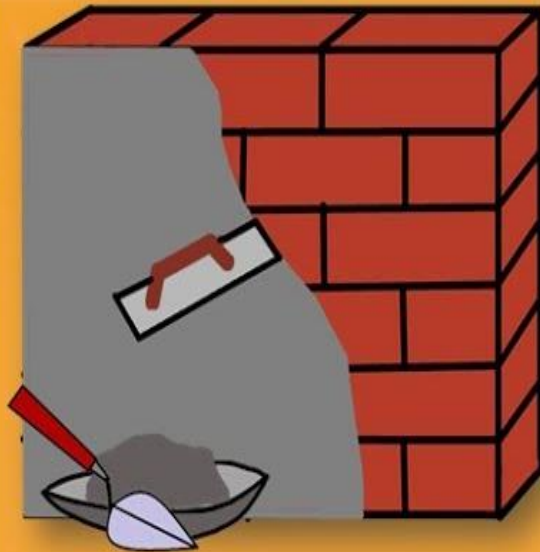
(c) Wooden float
(Skimming float)



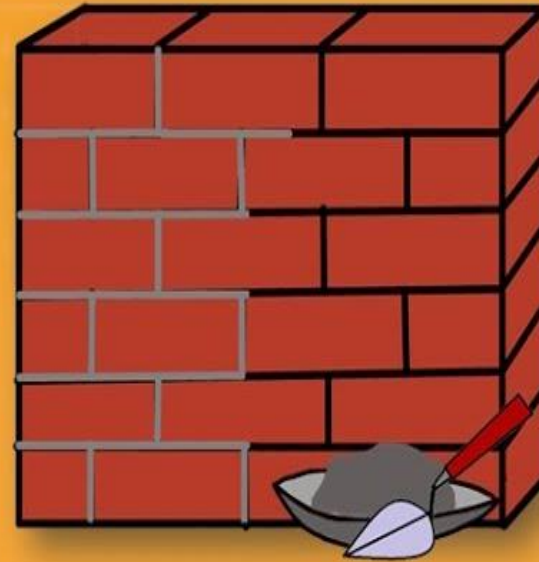
(d) Floating rule

FIG. 19.1. TOOLS USED FOR PLASTERING.

Plastering



Pointing



VS

Differences between **PLASTERING & POINTING**



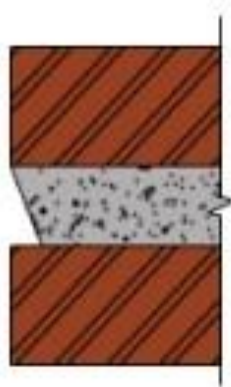
- **POINTING :**

- The term pointing is applied to the finishing of mortar joints in masonry.
- In exposed masonry, joints are considered to be the weakest and most vulnerable spots from which rain water or dampness can enter.
- Pointing consists of raking the joints to a depth of 10 to 20 mm and filling it with better quality mortar in desired shape.
- Mortar : Pointing is done with the following mortar mixes :
 - 1. Lime mortar 1: 2 mix (1 Lime : 2 sand or surkhi)
 - 2. Cement mortar 1 : 3 mix (1 cement : 3 sand)

Types of Pointing



Weathered
Pointing



Struck
Pointing



Flush
Pointing



V-grooved
Pointing



Keyed
Pointing



Recessed
Pointing



Tuck
Pointing



Beaded
Pointing

DAMP PROOF COURSE

- One of the basic requirement of a building is that it should remain dry or free from moisture travelling through walls, roofs or floors.
- Dampness is the presence of hygroscopic or gravitational moisture.
- Dampness gives rise to unhygienic conditions, apart from reduction in strength of structural components of the building.
- Damp prevention is therefore one of the important items of building design.
- Every building should be damp proof. Provision of damp proof courses prevent the entry of moisture in the building.

Causes of dampness in buildings :

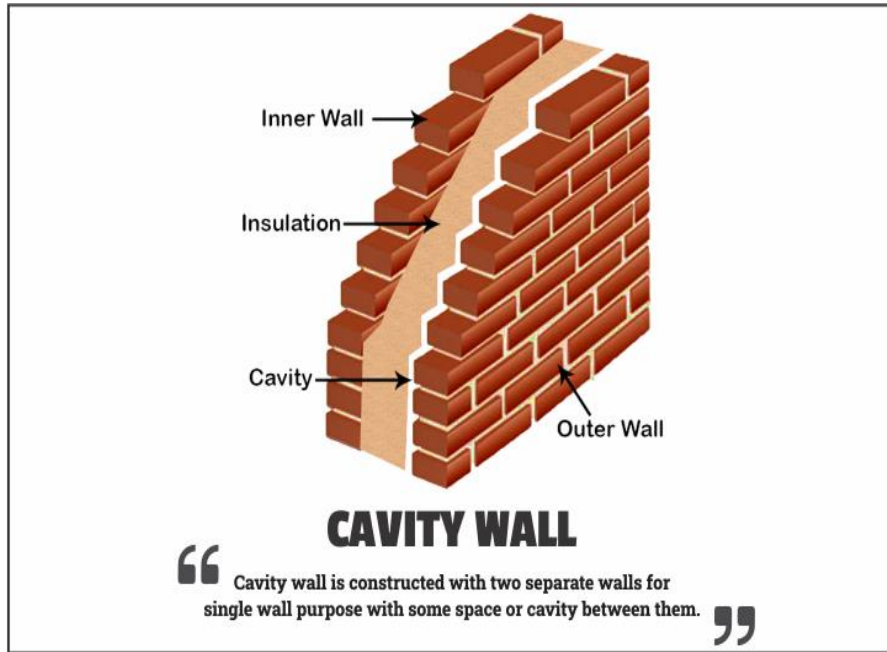
1. Moisture rising up the walls from ground
2. Rain travel from wall tops
3. Condensation
4. Poor drainage at the building site
5. Defective construction : Imperfect wall joints, joints in roofs, etc.,
6. Absorption of water from defective rain water pipes

Effects of Dampness :

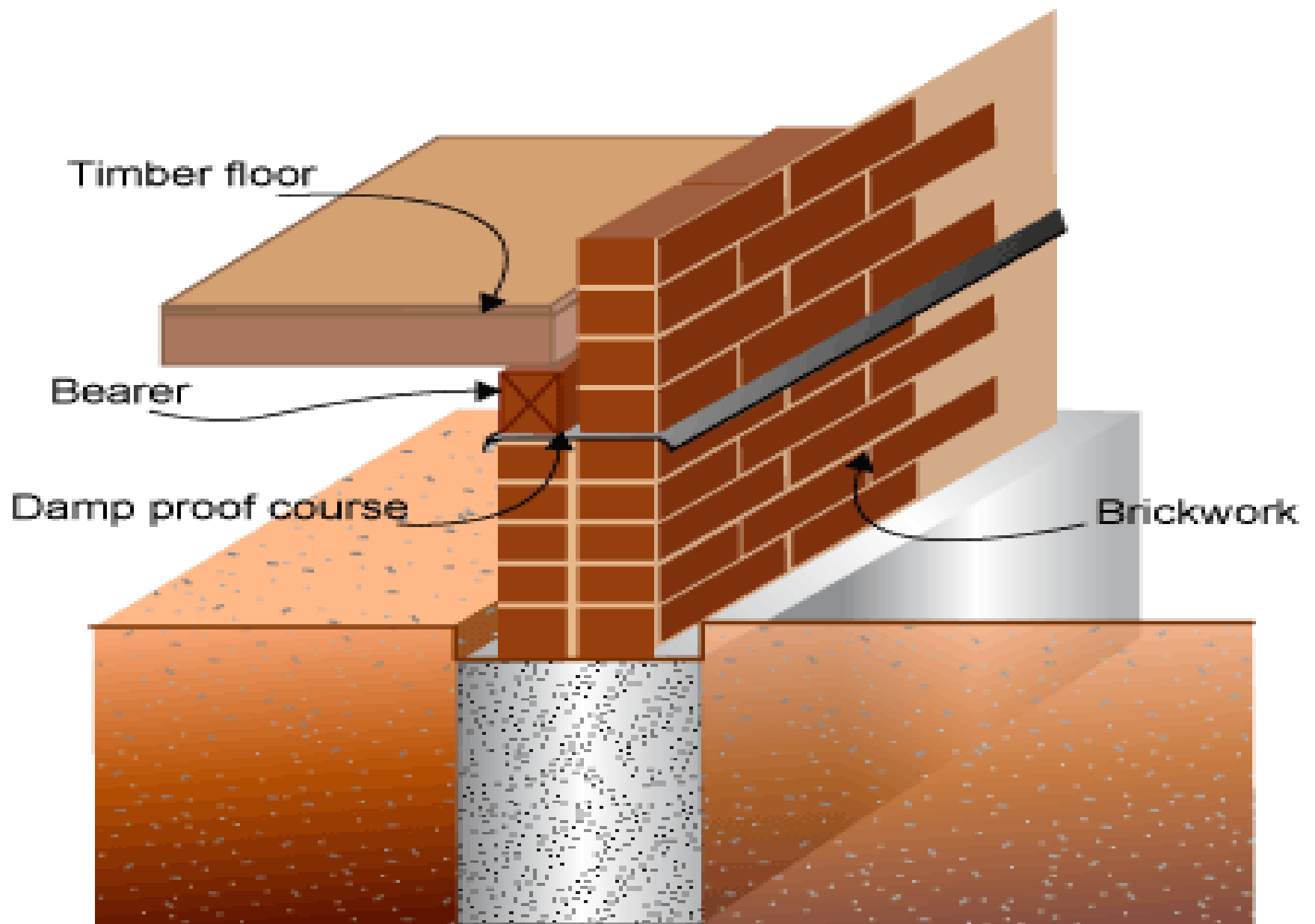
1. Dampness gives rise to breeding of mosquitoes and create unhealthy living conditions.
2. Travel of moisture through walls and ceiling may cause unsightly patches.
3. The wall decoration (i.e., painting etc.,) is damaged, which is very difficult and costly to repair.
4. Continuous presence of moisture in the walls may cause efflorescence resulting in disintegration of bricks, stones, tiles, etc., and consequent reduction in strength.
5. The flooring gets loosened because of reduction in the adhesion when moisture enters through the floor.
6. Electrical fittings get deteriorated, giving rise to leakage of electricity and consequent danger of short circuiting.
7. Dampness causes rusting and corrosion of metal fittings attached to walls, floors and ceilings.
8. Dampness promotes and accelerates growth of termites.

Methods of Damp Proofing :

1. Use of membrane damp proofing
2. Integral damp proofing
3. Surface treatment
4. Cavity wall construction
5. Guniting
6. Pressure grouting



GUNITING - The process of spraying a mix or mortar or concrete to a surface of application with the help of a spray gun



PAINTS

- Paints are liquid compositions of pigments and binders which when applied to the surface in thin coats dry to form a solid film to impart the surface a decorative finish, apart from giving protection to the base material (i.e., concrete, masonry and plaster surfaces) from weathering, corrosion and other chemical and biological attacks.
- Paints preserve timber structures against warping and decay.
- Most of the metals corrode if not painted at suitable interval.
- Painting on surfaces impart decoration and improved illumination.

Constituents of a Paint :

- A paint generally is made up of the following constituents :
 1. *A base* : Solid substance in a form of fine powder, forming the bulk of paint.
 2. *A vehicle or carrier* : Liquid substances which hold the different ingredients of a paint in liquid suspension & makes it possible to spread evenly on surface.
 3. *A drier* : Used to accelerate the process of drying and hardening, by extracting oxygen from the atmosphere and transferring it to the vehicle.
 4. *A colouring pigment* : These are added to the base to have different desired colours. The desired shade or tint of the paint may be obtained by using single or combination of different colouring pigments.
 5. *A solvent or thinner* : Solvents are added to the paint to make it thin so that it can be easily applied on surfaces. It also helps the paint in penetrating through the porous surface of the background.

Characteristics of an Ideal Paint :

An ideal paint should possess the following characteristics :

1. Paint should form hard and durable surface.
2. It should give attractive appearance.
3. It should be cheap and readily available.
4. It should be such that it can be applied easily to the surfaces.
5. It should have good spreading quality, so as to cover maximum area in minimum quantity.
6. It should dry in reasonable time.
7. It should not show hair cracks on drying.
8. It should form film of uniform colour, on drying.
9. It should be stable for a longer period.
10. It should not be affected by atmospheric agencies.

VARNISHING

- Varnish is a solution of resins or resinous substances (such as common resin, amber, copal, shellac etc.) in alcohol, turpentine or oil. It is applied on wood surfaces with the following objects :
 1. To intensify or brighten the appearance of natural grains in wood.
 2. To render brilliancy to the painted surface.
 3. To protect painted surface from atmospheric action.
 4. To protect unpainted wooden surfaces of doors, windows, floors, roof trusses etc. From atmospheric action.

Characteristics of a good varnish :

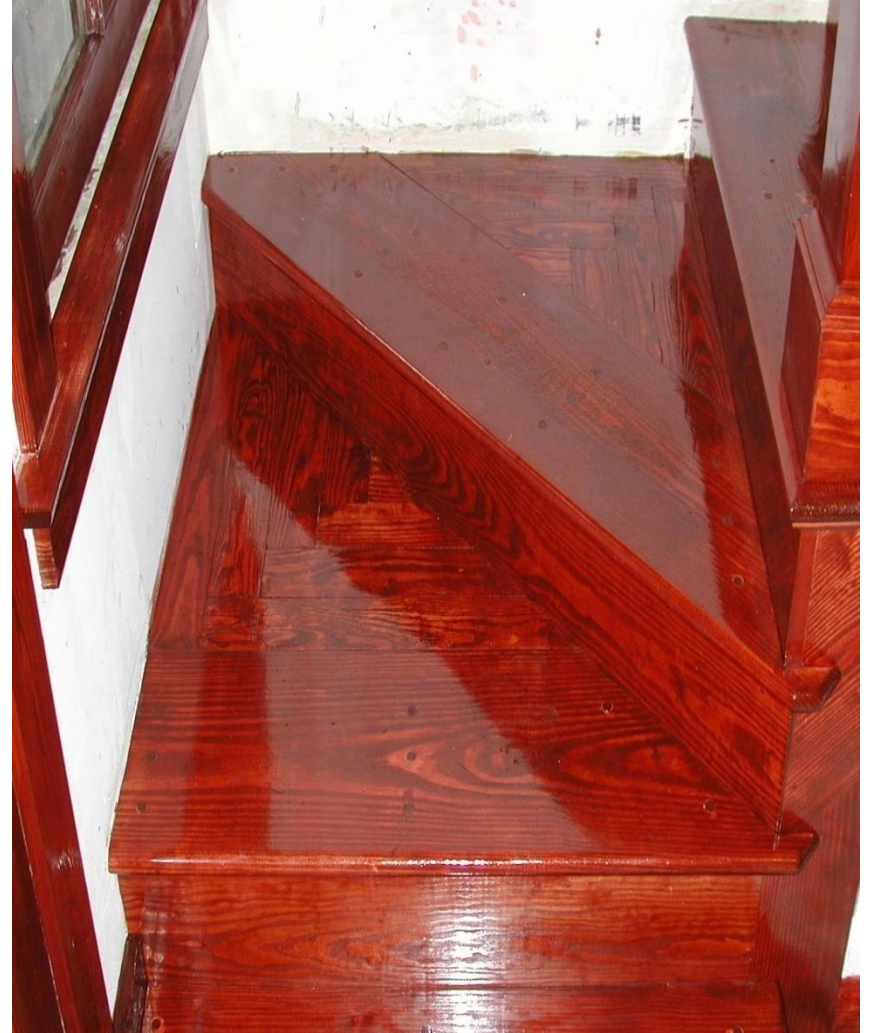
A good varnish should possess the following characteristics :

1. It should dry quickly.
2. The protective film obtained on drying should be hard, tough, durable and resistant to wear.
3. The finished surface should be uniform in nature and pleasing in appearance.
4. It should exhibit a glossy surface.
5. It should not shrink or show cracks on drying. It should have sufficient elasticity.
6. The colour of varnish should not fade away with time.

DISTEMPERING

- Distempers are considered to be *water – paints*. A distemper is composed of the following :
 1. A base, such as whiting or chalk
 2. A carrier (water)
 3. A binder, such as glue or casein
 4. Colouring pigments
- Water – bound distempers are available in powder or paste form, and they are mixed with hot water before use.
- Oil bound distempers are a variety of oil paint, in which the drying oil is so treated that it mixes with water.
- Glue or casein is the emulsifying agent. Oil bound distempers are washable.
- Distempers are cheaper than oil paints.
- They are generally light in colour and they provide good reflective coating, however they are less durable than oil paints.

VARNISH



THERMAL INSULATION

- When there is difference in temperature of inside of a building and outside atmosphere, heat transfer takes place from areas of higher temperature to those of lower temperature.
- In colder regions, when the buildings are internally heated where outside atmosphere is very cool, it is necessary to check this heat loss from the building.
- Similarly, in very hot regions, when the buildings are internally cooled and the outside atmosphere is unbearably warm, it is essential to check the entry of heat from outside atmosphere building.
- *The term thermal insulation is used to indicate the construction or provisions by way of which transmission of heat from or in the room is retarded.*
- The aim of thermal insulation is to minimise the transfer of heat between outside and inside of the buildings.

Advantages of thermal insulation :

1. *Comfort.* Thermal insulation keeps the room cool in summer and hot in winter. This results in comfortable living.
2. *Fuel saving.* Since heat transfer is minimised due to thermal insulation, less fuel is required to maintain the desired temperature in the room.
3. *Prevention of condensation.* Use of thermal insulating materials inside a room results in prevention of condensation (or moisture deposition) on interior walls and ceilings etc.
4. Use of thermal insulating materials prevents the freezing of water taps in extreme winter, and heat loss in case of hot water system.

THERMAL INSULATING MATERIALS

- Thermal insulating materials may be in the following forms :
 1. ***Slab or block insulation*** : These may be made of cork board, mineral wool, vermiculite, cellular glass, cellular rubber, saw dust, asbestos cement etc., These are fixed to walls or roofs.
 2. ***Blanket insulation*** : These are flexible fibrous rolls made from mineral wool, processes wood fibres, cotton, animal hair etc., available in thickness of 12 to 80 mm. These are directly spread on the wall or ceiling surfaces.
 3. ***Loose fill insulation*** : These may consist of fibrous materials like rock wool, slag wool, cellulose or wood fibre wool, etc. Filled loosely in the studding space.
 4. ***Bat insulating materials*** : These are similar to blanket insulations except that these are small in size but of greater thickness. These are also spread on surface of walls and ceilings.

SOUND INSULATION

- Sound insulation is the measure by which transmission of sound/noise from inside to outside or from one room to the other is prevented.
- Unwanted sound reaching the ears is called *noise*.
- It may be due to frequency of sound or intensity of sound or both.
- Noise due to high frequency sound is more unpleasant than the noise due to low frequency sounds.
- Noisy conditions not only result in uncomfortable living conditions, fatigue, inefficiency and mental strain, but prolonged exposure to such conditions may cause temporary deafness or nervous breakdown.

Following are the effects of noise :

1. It creates discomfort.
 2. It has adverse effect on blood pressure, muscular strain and on sleep.
 3. It leads to fatigue, and decreases the efficiency of persons.
 4. It takes away essence of music and speech.
 5. It disturbs concentration.
 6. Prolonged exposure to noise may result in temporary deafness or even nervous breakdown.
 7. Reduction in noise increases output of labour.
- From the origin point of view, noises may be of two type : (a) Outdoor noises & (b) Indoor noises
 - Outdoor noises are caused by road traffic, railways, aeroplanes, lifts, moving machinery, machines in nearby factory or building etc.,
 - Indoor noises are those which are caused either in the same room or in the adjacent room. These are due to conversation of people, moving of people or furniture, crying of babies, playing of radios or other musical instruments, etc.,

SOUND INSULATING MATERIALS

- (1) **Non – porous rigid partitions** : The sound insulation of non – porous, homogeneous rigid constructions, such as plastered solid brick masonry walls.
- (2) **Porous rigid materials** : Porous rigid materials such as porous concrete masonry, cinder concrete etc., because of their sound absorptive properties which provide about 10 % higher insulation than the non – porous variety of the same weight. In order to secure the best insulation from such porous materials, it is recommended that porous partitions should be plastered at least on one side, and if possible on both sides.

SCAFFOLDING

- When the height of wall or column or other structural member of a building exceeds about 1.5 m, temporary structures are needed to support the platform over which the workmen can sit and carry on the constructions.
- These temporary structures, constructed very close to the wall, is in the form of timber or steel framework, commonly called scaffolding.
- Such scaffolding is also needed for the repairs or even demolition of a building.
- The scaffolding should be stable and should be strong enough to support workmen and other construction material placed on the platform supported by the scaffolding.
- The height of the scaffolding goes on increasing as the height of construction increases.



Scaffolding

Form Work

- The *form work* or *shuttering* is a temporary construction used as a mould for the structure, in which concrete is placed and in which it hardens and matures.
- The construction of form work involves considerable expenditure of time and material.
- The cost of form work may be up to 20 to 25 % of the cost of structure in building work, and even higher in bridges.
- When the concrete has reached a certain required strength, the form is no longer needed and is removed.
- The operation of removing the form work is commonly known as *stripping*.
- When stripping takes place, the components of formwork are removed and then reused for the forms of another part of the structure.
- Such forms, whose components can be reused several times are known as *panel forms*.
- Forms are classified as wooden, plywood, steel, combined wood – steel, reinforced concrete and plain concrete.
- Timber is the most common material used for form work.

Requirements of a good form work :

- ✓ The material of the form work should be cheap and it should be suitable for re – use several times.
- ✓ It should be practically water proof so that it does not absorb water from concrete. Also, its shrinkage and swelling should be minimum.
- ✓ It should be strong enough to withstand all loads coming on it, such as dead load of concrete and live load during its pouring, compaction and curing.
- ✓ It should be stiff enough so that deflection is minimum.
- ✓ It should be as light as possible.
- ✓ The surface of the form work should be smooth, and it should afford easy stripping.
- ✓ All joints of the form work should be stiff so that lateral deformation under loads is minimum. Also, these joints should be leak proof.
- ✓ The form work should rest on non – yielding supports.





Aluminium Formwork



Centering & Shuttering

- Centering is a part of form work. It is used to support horizontal members like slabs.
- Form work for slabs and floor beams is known as centering.
- Shuttering is the formwork which supports the vertical surface is known as shuttering.



Asphalt as a Building Material

- The *asphalt* is a mechanical mixture of inert mineral matter like alumina, lime, silica, etc., and the asphaltic bitumen.
- It is black or brownish – black in color.
- It remains in solid state at low temperature and becomes liquid at a temperature of about 50 C to 100 C.
- There are two types of asphalt – Natural asphalt and Residual asphalt.
- Natural asphalt – Obtained from nature.[Lake asphalt & Rock asphalt]
- Residual asphalt/Artificial asphalt – Obtained by the fractional distillation of crude petroleum oils.

Properties :

- Tough and durable
- Water proof material and easily cleaned
- Good insulator of electricity, heat and sound
- Non – inflammable and non – absorbent.
- Not attacked by acids and safe against vermin.

Uses :

1. As damp proof courses
2. As water proof layer for tanks, basements, swimming pools, etc.,
3. For preparing paints and roofing felts
4. For constructing roads and pavements, etc

Bitumen as a Building Material

- The bitumen is the binding material which is present in asphalt.
- It is also sometimes called the mineral tar.
- It is obtained by partial distillation of crude petroleum.
- It is chemically a hydro – carbon.
- It is insoluble in water, but it completely dissolves in carbon bisulphate, chloroform, benzol, coal tar, alkalies etc.,
- It is composed of 87% of carbon, 11% of hydrogen and 2% of oxygen by weight.
- It is black or brown in color and it is obtained in solid or semi solid state.
- There are several forms of Bitumen. They are
 1. **Bitumen emulsion** - liquid bitumen
 2. **Blown bitumen** – Used as Roofing, damp – proofing belts and as heat insulating material
 3. **Cut – back bitumen** – Can be applied as bitumen paint
 4. **Plastic Bitumen** – Used for filling cracks in masonry structures, stopping leakages, etc.,
 5. **Straight run bitumen** – distilled bitumen

Tar as a Building Material

- The tar is a dark black liquid with high viscosity.
 - According to its source, there are three types of Tar
1. **Coal Tar** – Heavy, black and strong smelling liquid
 - This is used for making macadam roads, preserving timber, etc.,
 2. **Mineral Tar** – Obtained by distilling the bituminous shales. It contains less volatile matter.
 3. **Wood Tar** – It contains creosote oil hence possesses strong preservative property.

TABLE 17-8
COMPARISON BETWEEN ASPHALT, BITUMEN AND TAR

No.	Item	Asphalt	Bitumen	Tar
1.	Adhesive power	Less	More	Most
2.	Carbon content	Low	Moderate	High
3.	Colour	Blackish brown	Dark colour with slight reddish tinge	Deep black
4.	Effect on heating	Burns with a smoke flame at about 250°C and becomes plastic	Melts on heating	Becomes more fluid when heated
5.	Resistance to acid and water	More	More	Less
6.	Setting time	Less	Less	More
7.	State	Usually solid or semi-solid in state	Usually solid in state	Viscous liquid state

Tar, Bitumen and Asphalt



THANK YOU