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Module - 3
Building Services

Subject:- BCE **Code:-3110004**	**Prepared by:** **Asst.Prof. Nutan c. Patel** **(Civil Department,ACET)**	AMIRAJ COLLEGE OF ENGINEERING & TECHNOLOGY

Types Of Building Services

1. Plumbing sanitation, Water Supply, Drainage System
2. Electricity
3. Building Finish Like Plastering, Painting
4. HVAC (Heating, Ventilation, Air conditioning)

Water Supply System Plumbing

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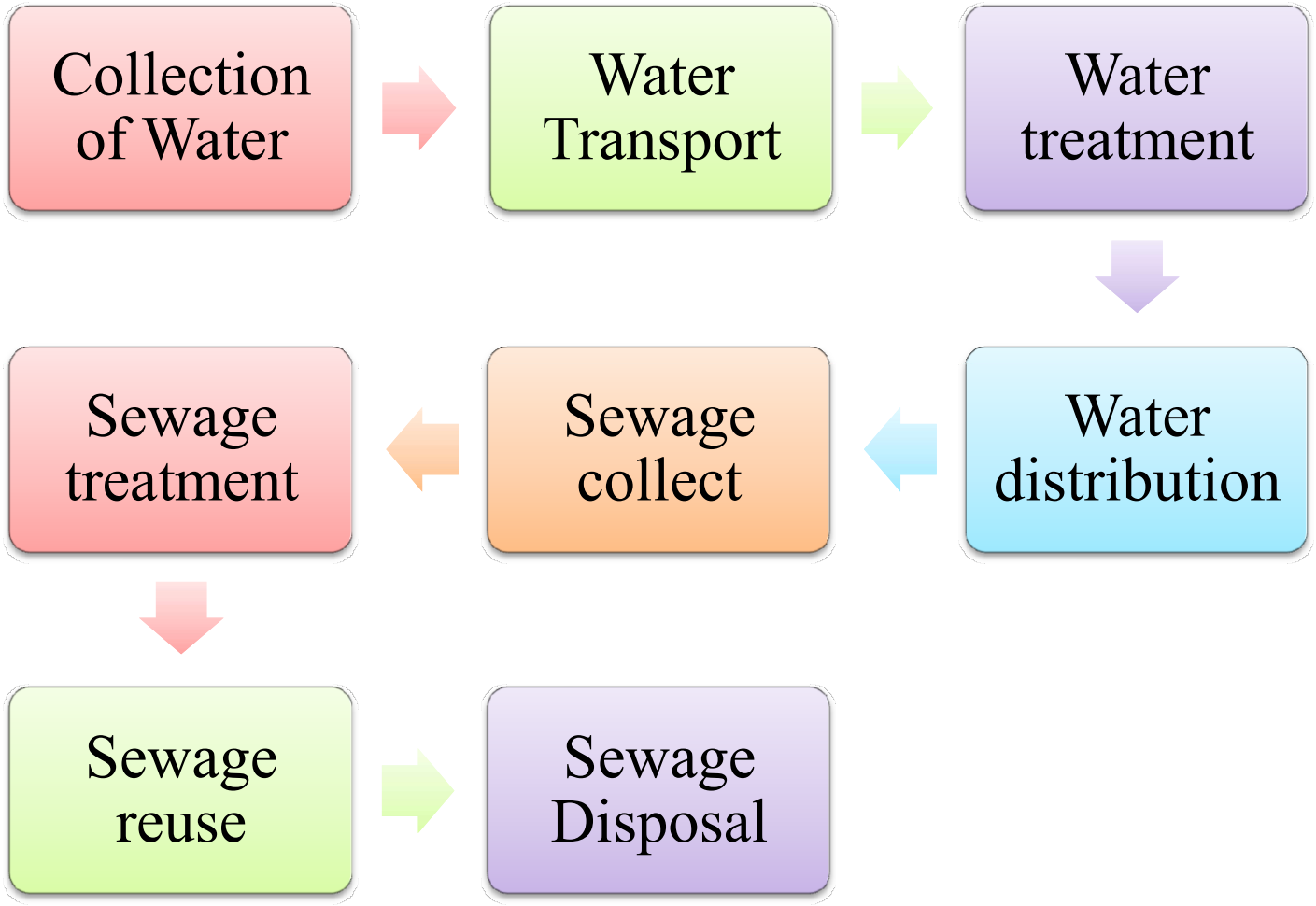
Water Supply system Plumbing

- The services including water supply, drainage and sanitation.
- Plumbing is not a specific but general term consist of installation of materials and maintenance of pipes, different appliance used water supply system, sanitary and drainage system.

Water Distribution System

- Water is collected from reservoir into purification tank and then elevated to municipal water tank from which water is distributed.
- Quality of water supply is safe and potable.

Water Supply system



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Material Used For Service Pipe

1. G.I Pipes
2. Copper Pipes
3. Polythene Pipe
4. Lead Pipe

G.I Pipes

- Galvanized Iron Pipes
- Used for Distribution of Water supply
- Pipes are coated by the process of galvanization.
- Not easily get corrode.
- Corrode in acidic water.

Copper Pipe

- Copper Pipe are non corrosive.
- Costly pipe
- Strong and ductile pile.
- Generally not in use

Polythene Pipes

- These pipes are plastic pipes.
- Non corrosive
- Light in weight
- Low cost
- Easy to installed
- Low maintenance

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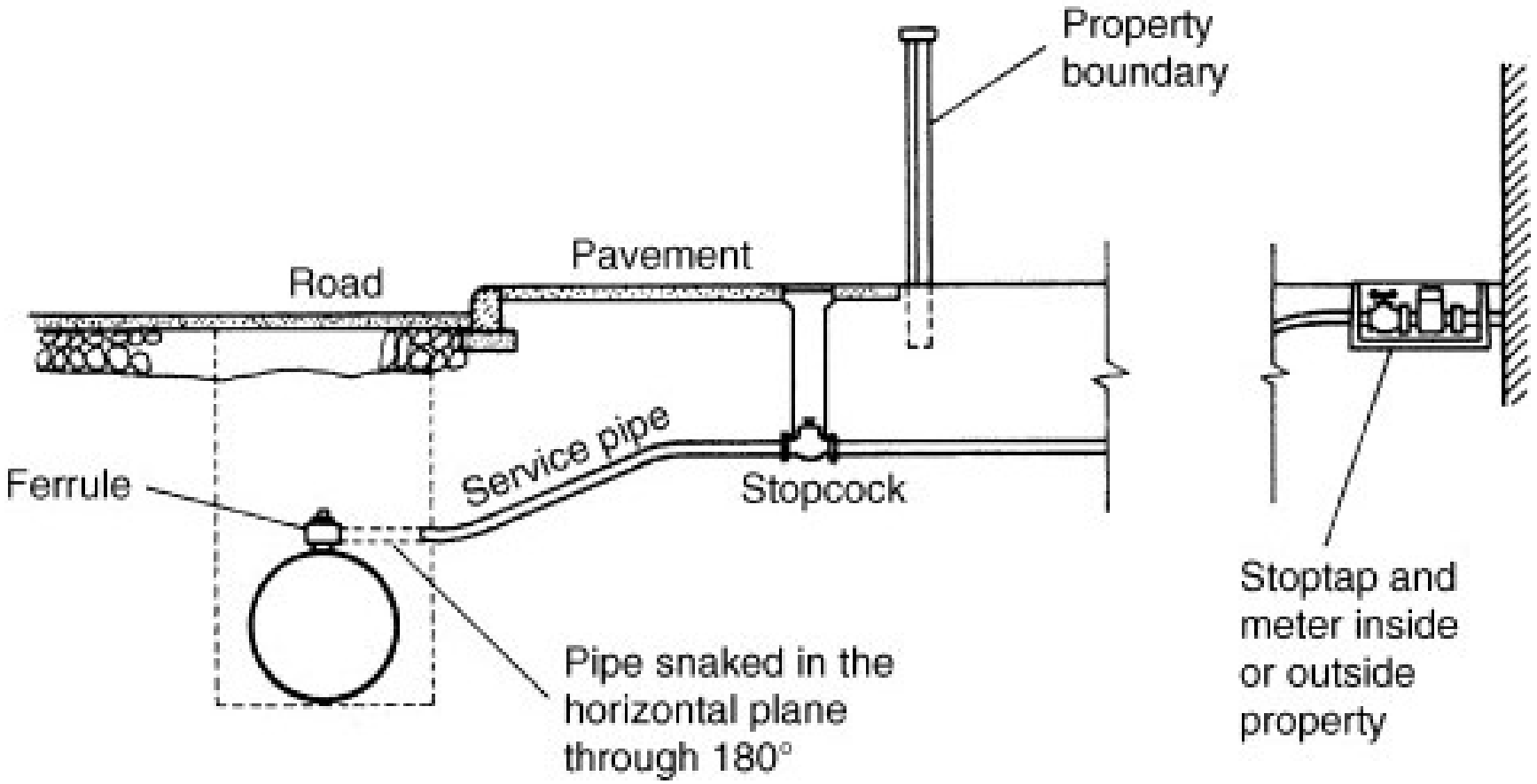
Lead pipes

- Not commonly used
- Lead give poisoning effect
- High resistance to corrosion

Domestic Service Connection



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Valve, Fitting & Taps

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Valve

- Valve which is used in domestic water supply
- Valves are used to control

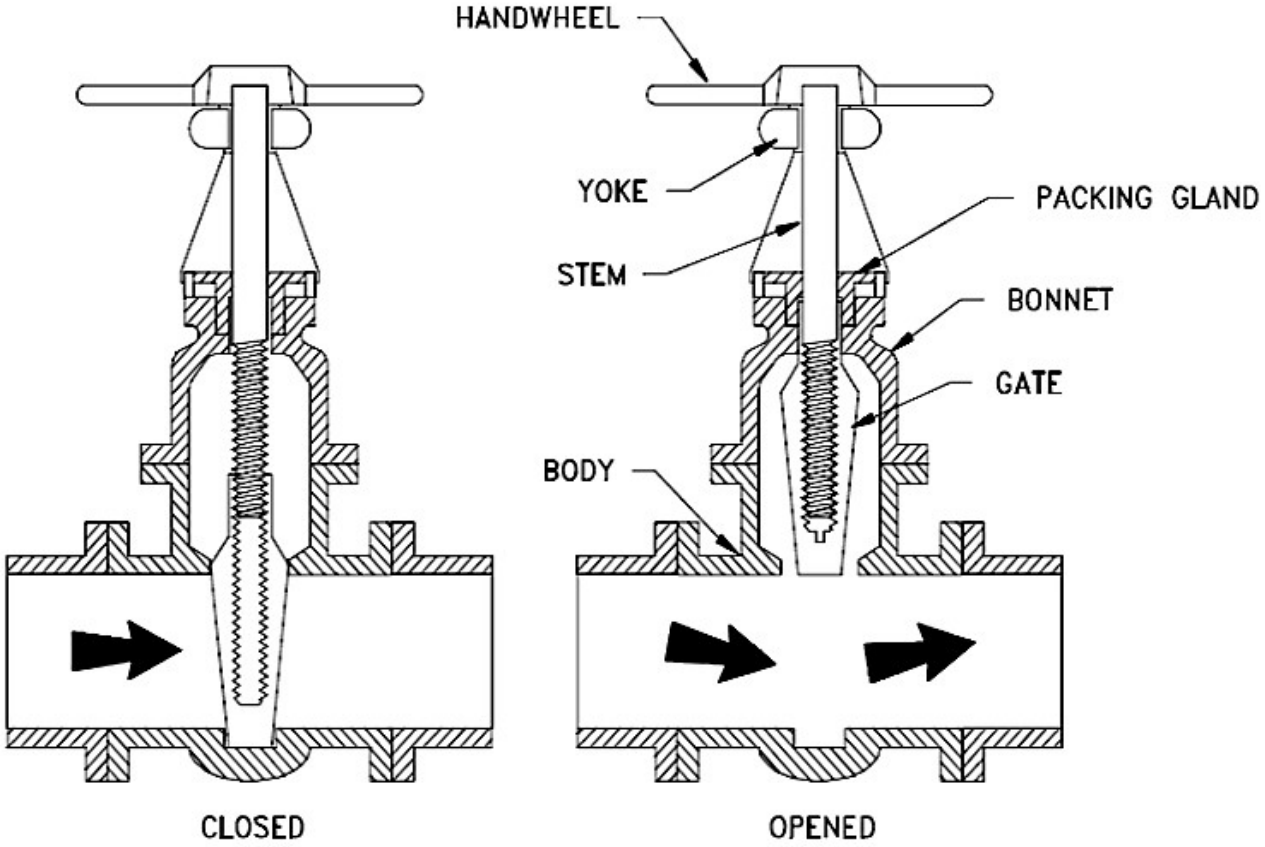
1. Flow of Water
2. Release or Admit the air
3. Regulate pressure

- Types of Valves

1. Sluice Valve
2. Pressure Relief Valve
3. Reflux valve or Check Valve
4. Air valve or Air Relief valve
5. Scour valve
6. Globe valve

Sluice Valve

- Also called gate valve or stop valve
- Valves are located at the intersection of pipelines or at a street corner.

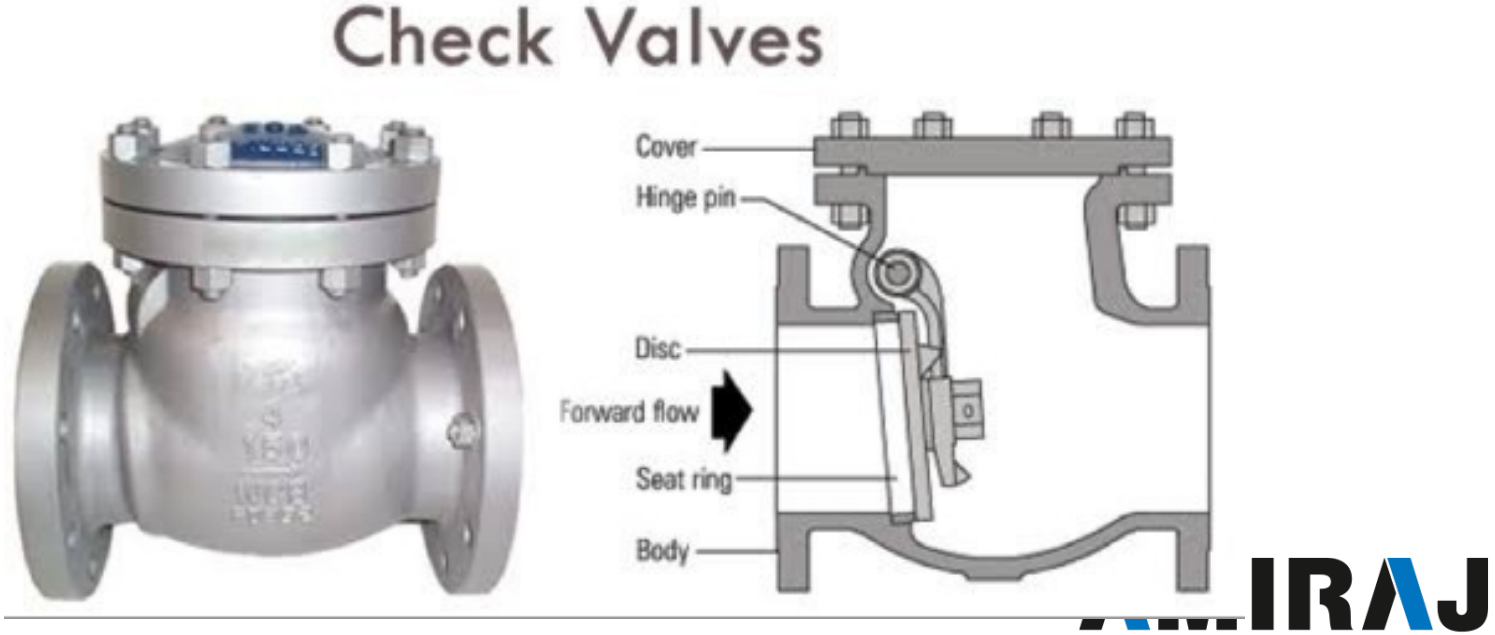


Pressure Relief Valve

- Also called safety valve.
- Fixed at downstream end of long length.

Check Valve

- Also called non-return valve or foot valve.
- Valve is open only in the direction of flow.
- Prevent back running of water.
- Valve are placed about 300m interval
- Generally used in sloppy area

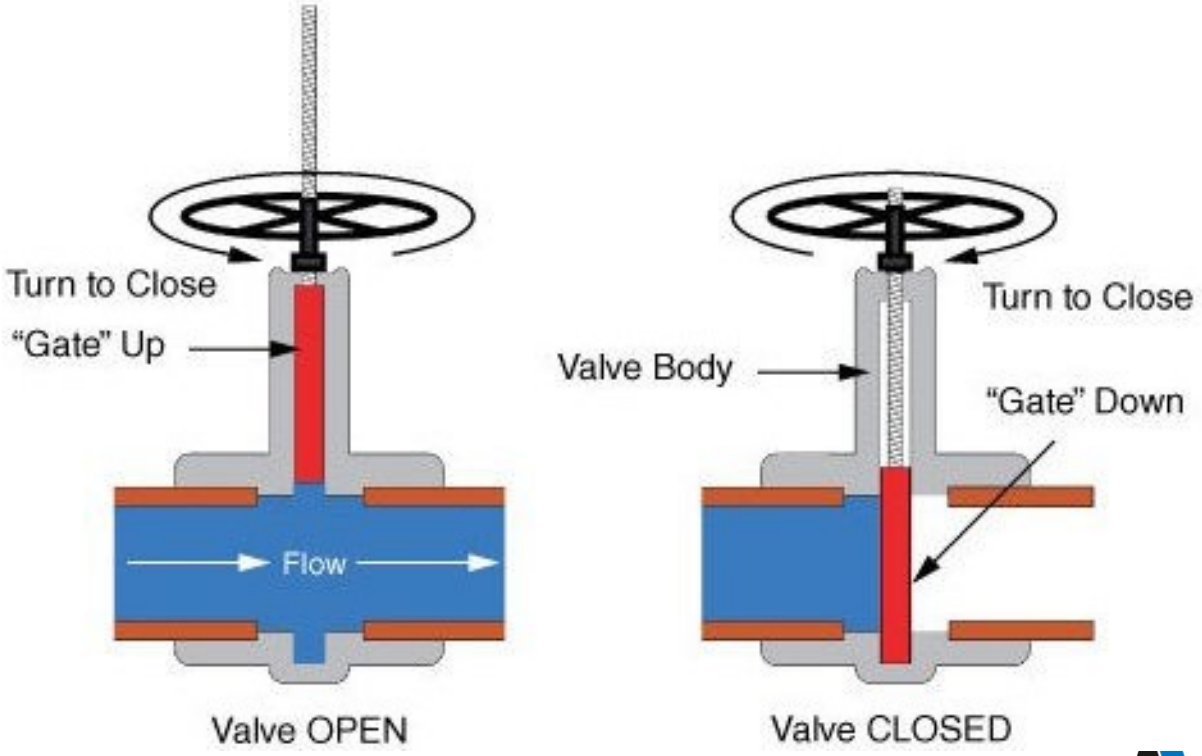


Air Valve

- Also called air relief valve.
- When water is flowing through pipes some air is carried with water and air cause blockage of water.

Scour Valve

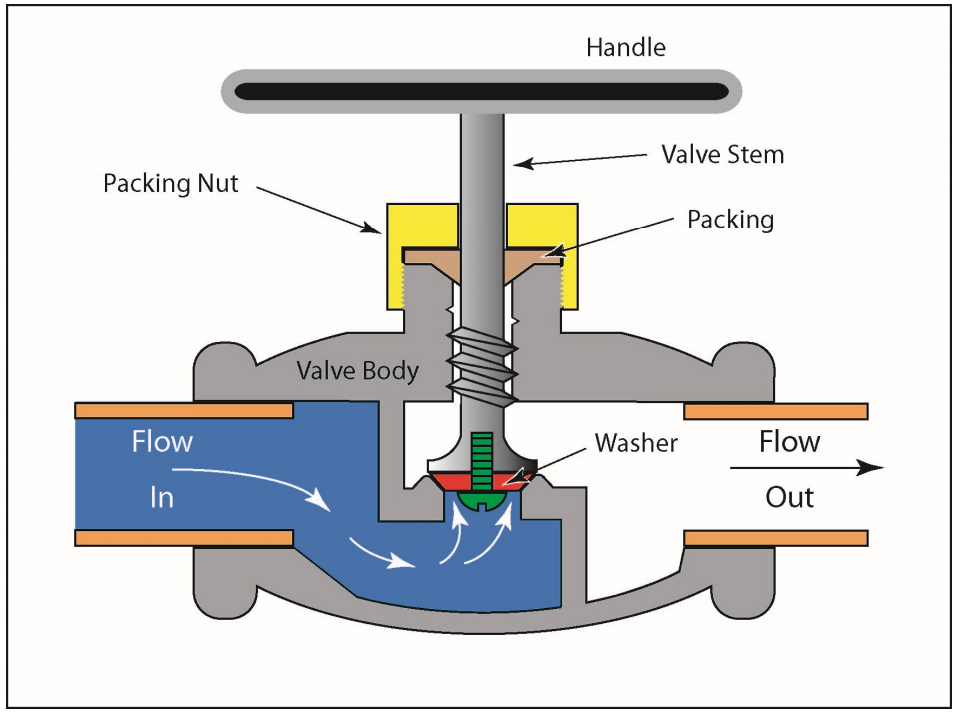
- These valve are also called wash out valve.
- Fixed at every dead end.



Glob Valve

- Provided to control the rate of flow
- Fittings & Taps.

1. Water Taps
2. Stop cock
3. Bends



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Water Taps

- Plastic, Copper, Brass, Steel Material used
- Bib Tap is common used tap
- Push Tap also included in water Tap
- Pillar tap are generally used in wash basin
- The usual size of the water tap are 9.5, 13, 16, 19, 25, 32, 38, 50mm

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Stop Cock

- Common used in water supply line between building and street in mains and in house plumbing.
- Stop the water line

Bends

Tees

Crosses

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Elbow

Union

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Caps

Plugs

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Sockets

Nipples

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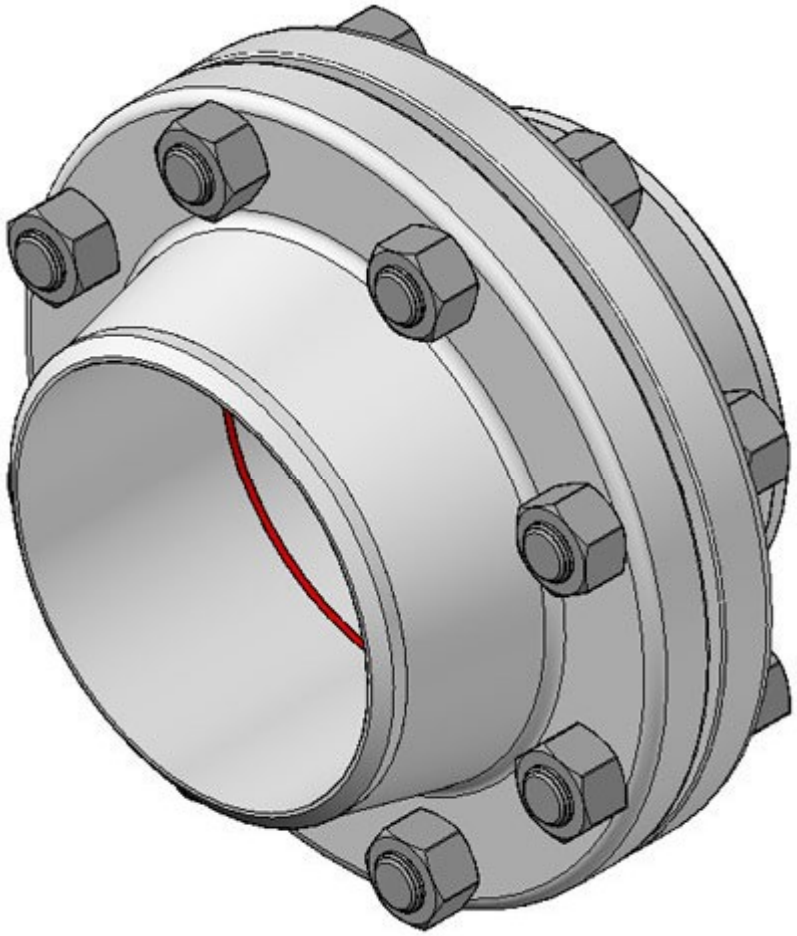

Flange

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Sanitary Fitting

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Sanitary Fitting

- Various ceramic product used for sanitary purposes.

1. Water Closet
   - European Type
   - Indian type
2. Flushing cistern
3. Wash basin
4. Sink
5. Urinals
   - Basin Type or Bowl Type
   - Stall Type or Slab Type
6. Bath tub

Water Closet

- Definition: A sanitary fitting which is designed to received human excreta directly from the person using it is known as water closest.
- Types

1. European type water closest
2. Indian type Water closest

1. European Type Water Closet

- Made of Porcelain
- Pan has a flushing rim to spread water
- Cover is provided at top
- The excreta fall directly in to the trap.

2. Indian type Water Closet

- Made of Porcelain
- Pan and trap are two different part
- Pan has flushing rim to spread the flush water

Flushing cistern

- Necessary for flushing
- Capacity is 5 to 15 litres
- Hand operated or automatic

Wash Basin

- Generally made of Glazed earthware
- May be pedestal or fixed on wall

Sink

- Sink is rectangular basin
- Made up glazed earthware
- Size if sink depend upon use
- Outlet usually of about 40mm diameter
- Sink can also be prepared of cast-in-situ

Urinals

- Urinal are generally provided with manually or automatic flush system.
- Urinals are classified in following two categories

1. Basin Type urinal
2. Slab type urinal

Trap

Trap

- Definition: Trap is bent or depressed sanitary fitting which is always remain full of water.
- The depth of water seal in practice is varies from 25mm to 75mm.
- Functions:

1. The main function of a trap in drainage system is to prevent the passage of foul air.
2. Also it allows the sewage to flow through it.

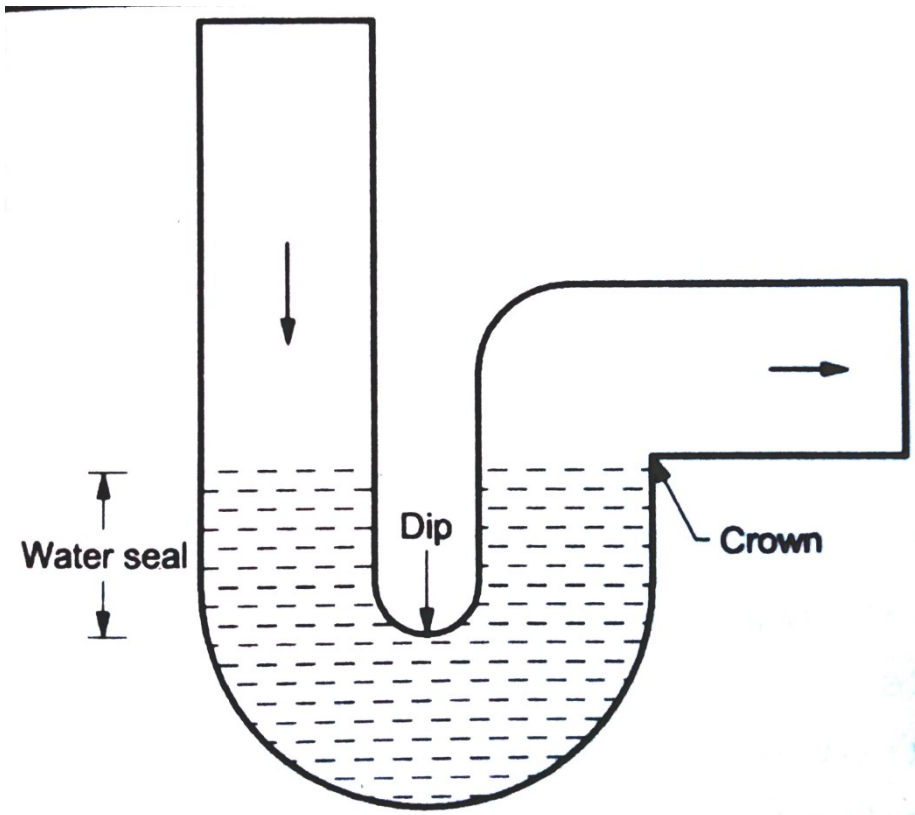
Classification of Traps

- According to shape
  - P – Trap
  - Q – Trap
  - S – Trap

- According to use
  - Floor Trap
  - Gully Trap
  - Intercepting Trap

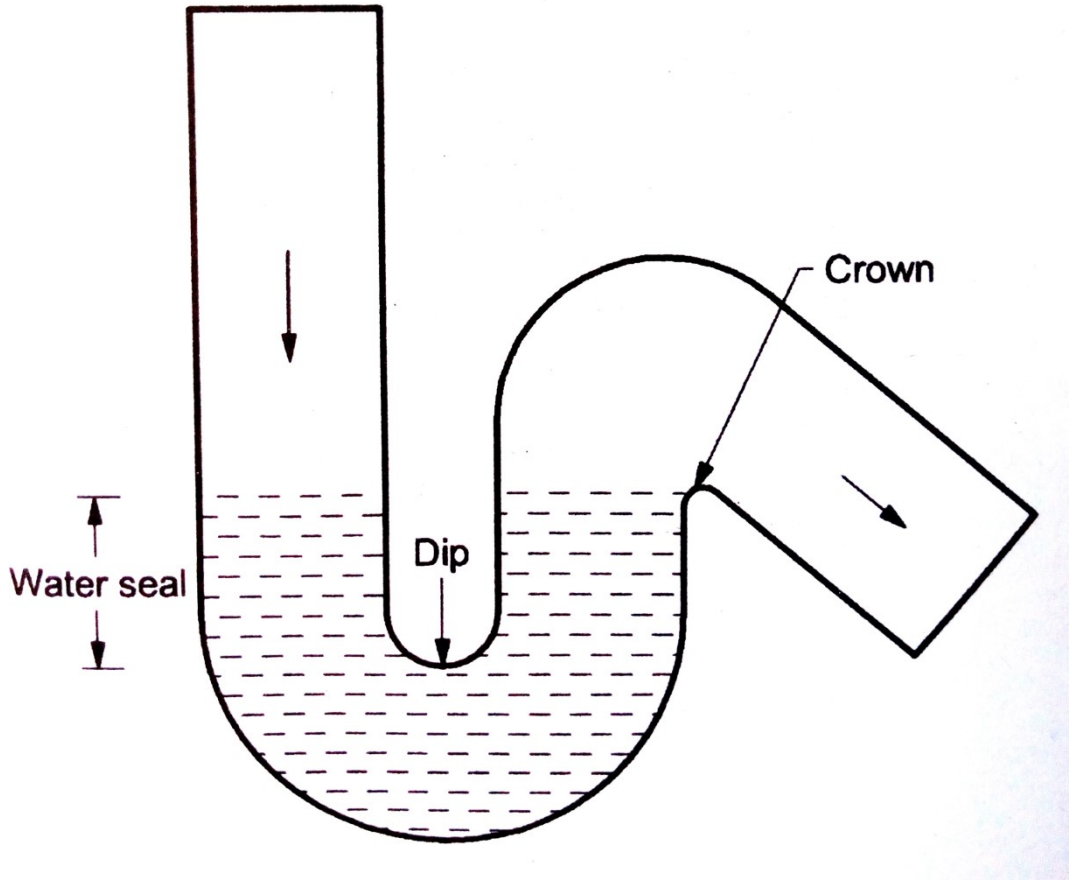
P - Trap

- Trap which has shape of letter P is know as P – Trap



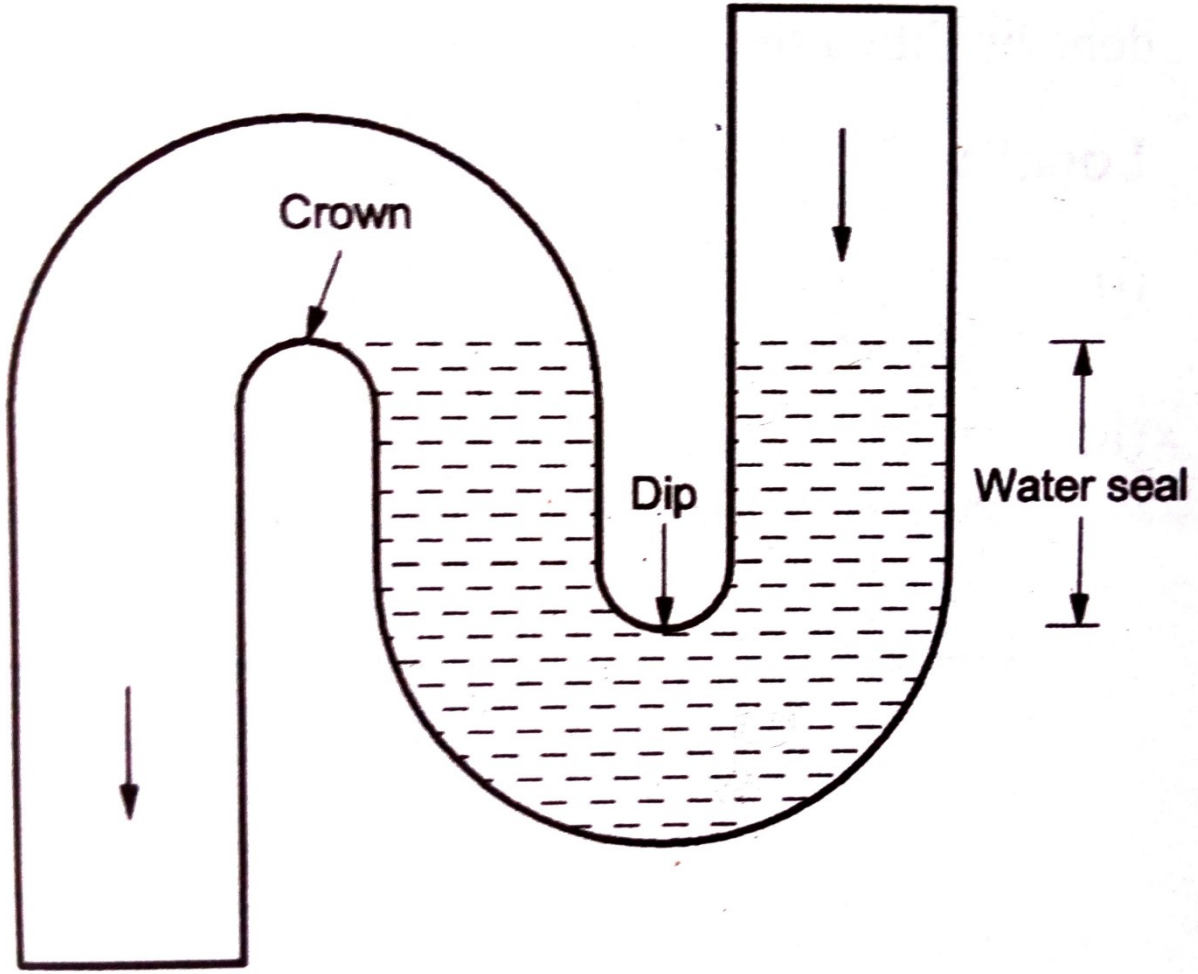
Q – Trap

- Trap which has shape of letter Q is know as Q – Trap



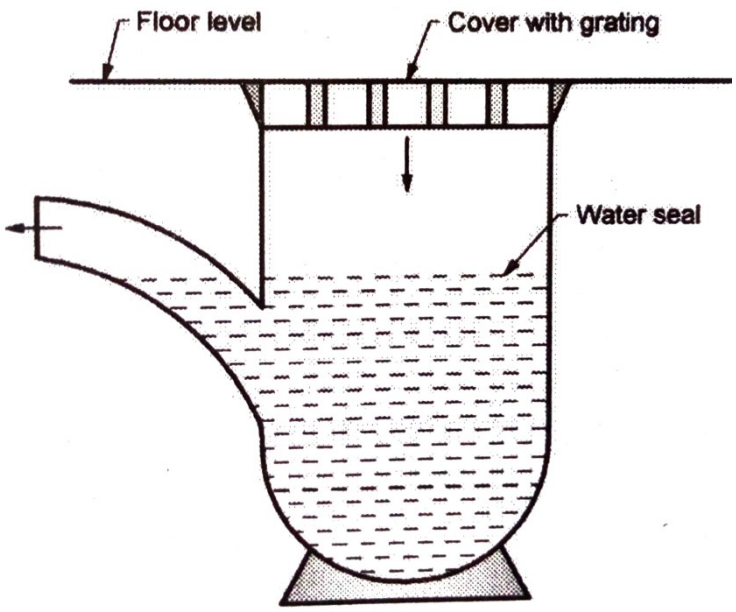
S – Trap

- Trap which has shape of letter S is know as S – Trap



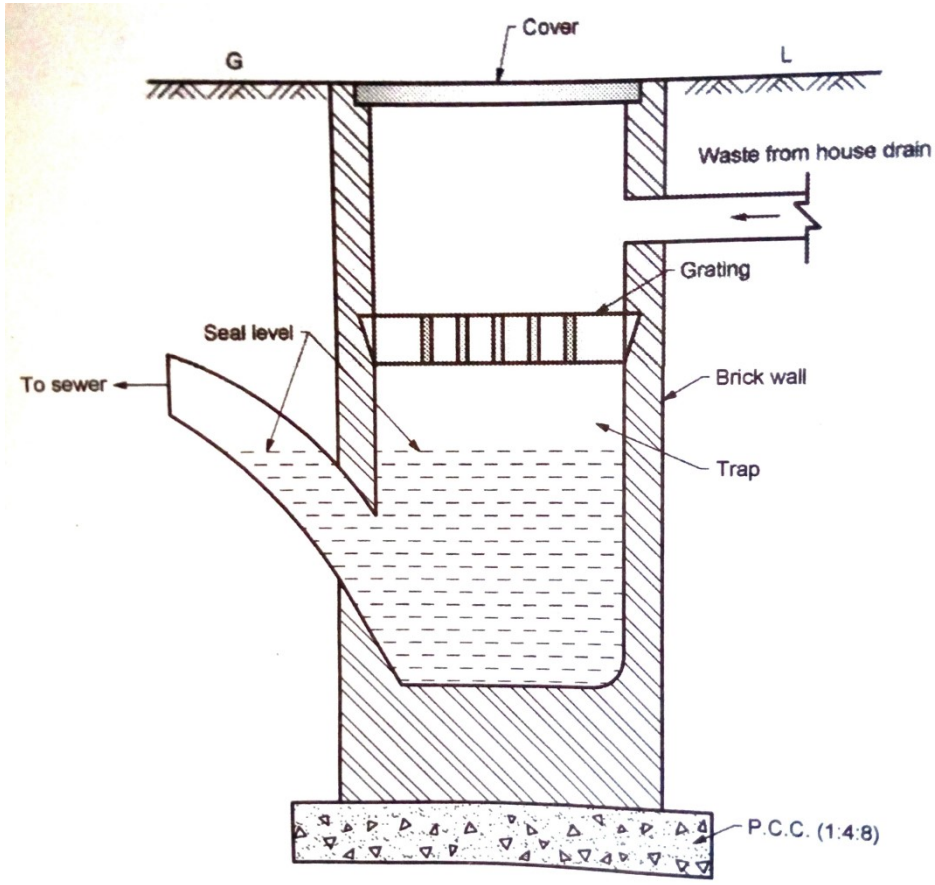
Floor Trap

- Also called Nanhi trap
- A cast iron cover with grating is provided at top, so as to prevent entry of solid matter.
- Cover can be removed for cleaning of the trap.
- Located in bathroom



Gully Trap

- Usually made of stoneware and a cast iron grating is provided at top.
- It is fitted inside a masonry chamber
- Water seal is provided of a height 60 to 70 mm.



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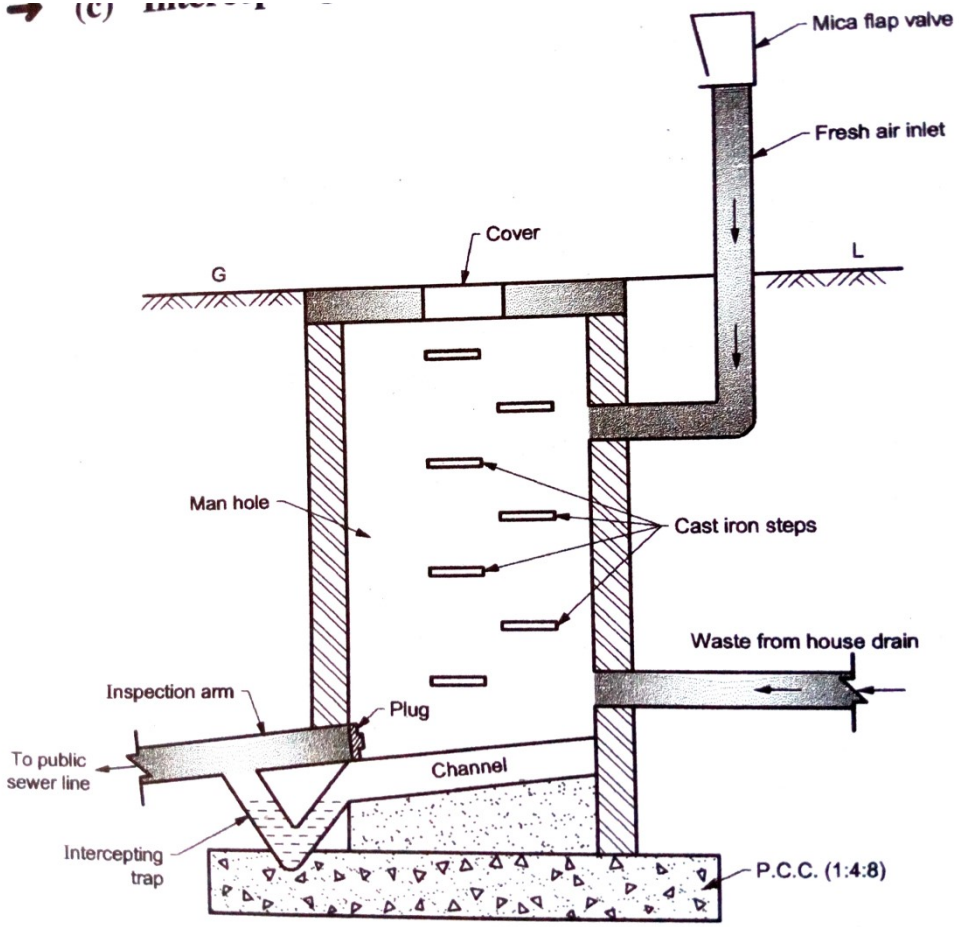
Intercepting Trap

- Intercepting trap is to prevent entry of sewer gas from public sewer line in to house drain.
- The trap has water seal of 100mm
- Fresh air inlet is also provided in manhole.

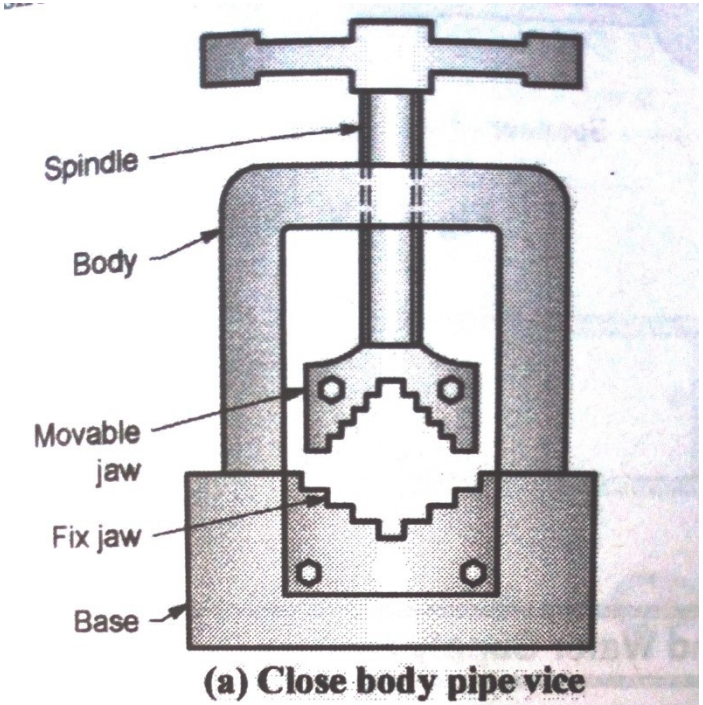


Qualities of Good Trap

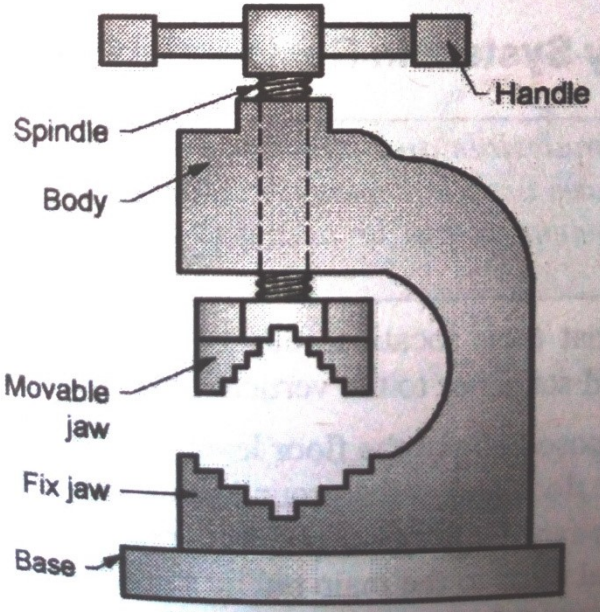
- Simple construction
- Adequate water seal
- Easily cleaned
- Self cleaning property.
- Internal and external surface is smooth

Tools and Plants required for Pipe Fitting in Plumbing work.

- Spanner
- Pipe Vice
- Pipe Cutter
- Pipe wrench
- Threading dies
- Hacksaw
- Adjustable wrench
- Chain wrench
- Pipe bending machine



(a) Close body pipe vice



(b) Open body pipe vice

Fig. 5.2.24 : Pipe vice

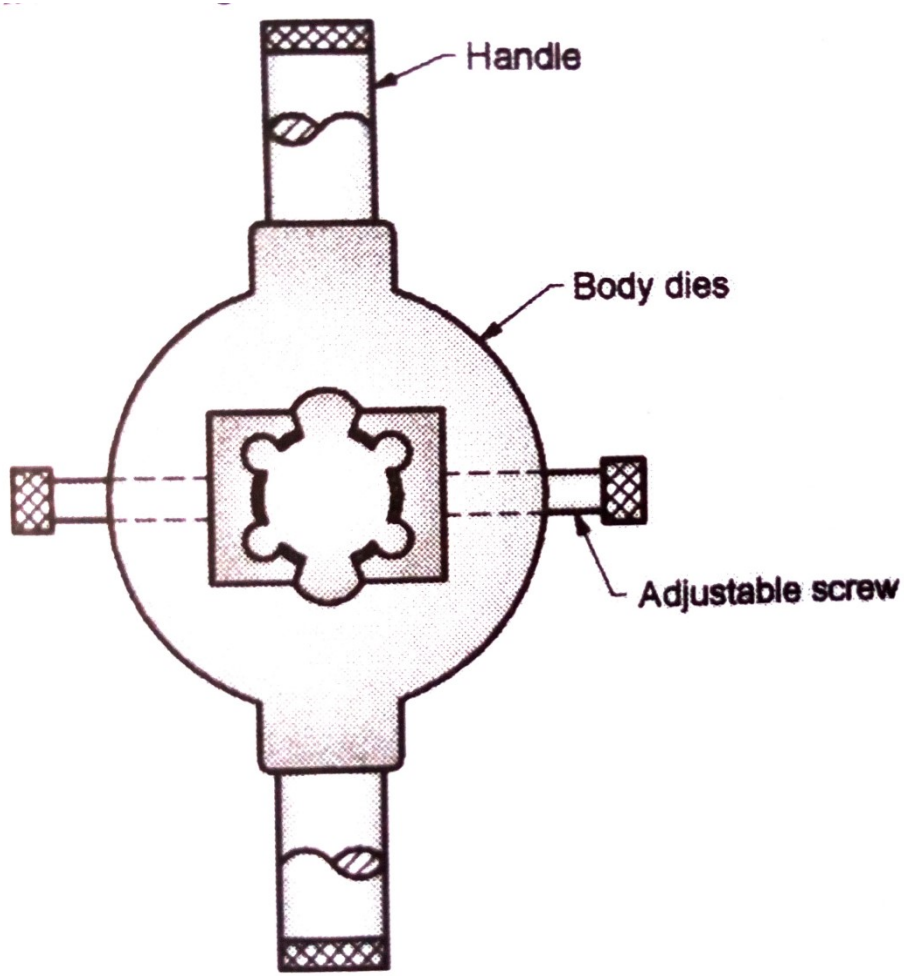
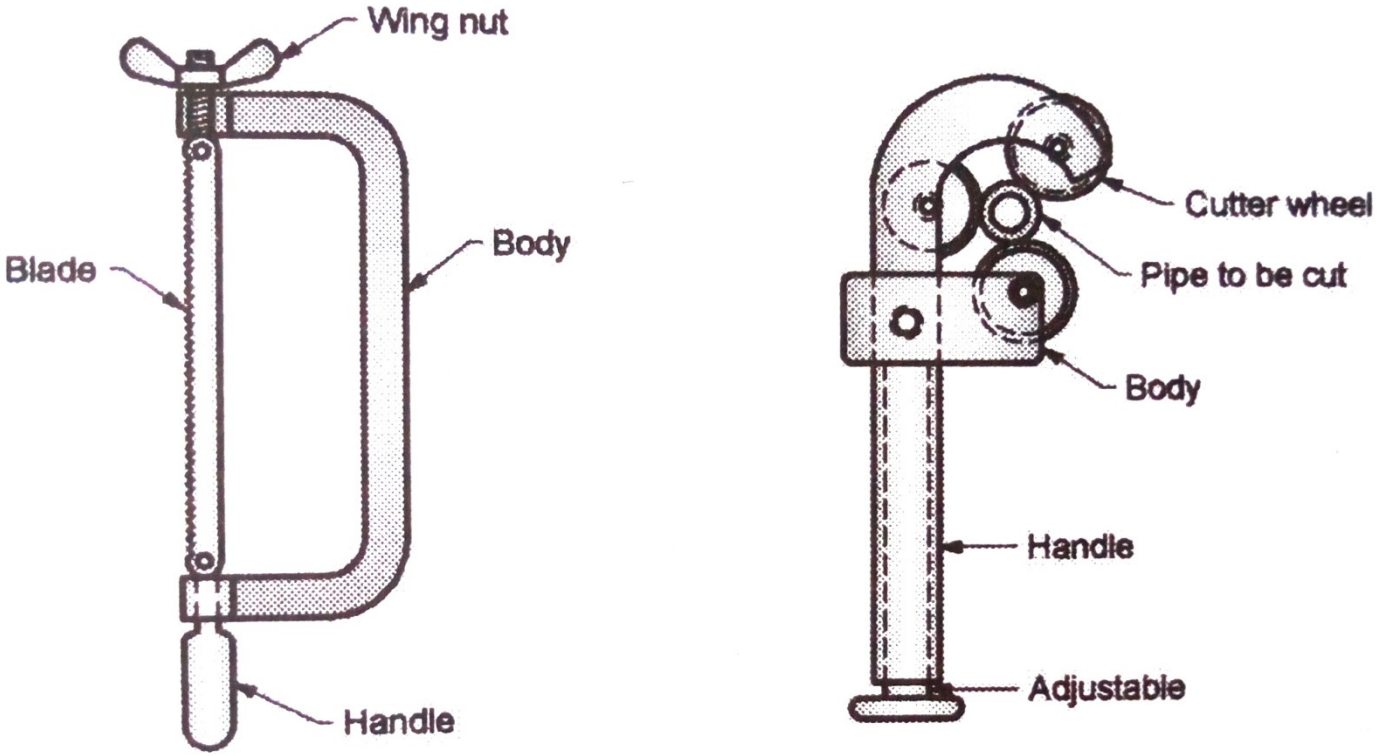
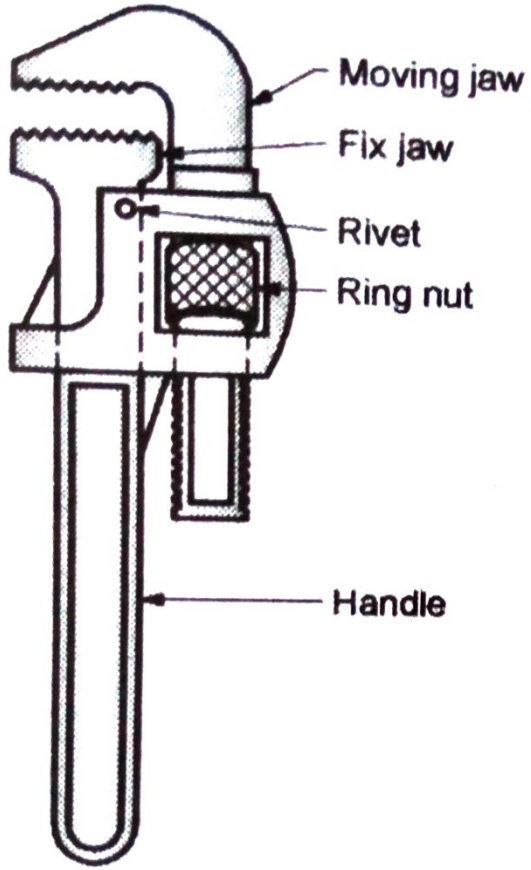


Fig. 5.2.25 : Die-stock

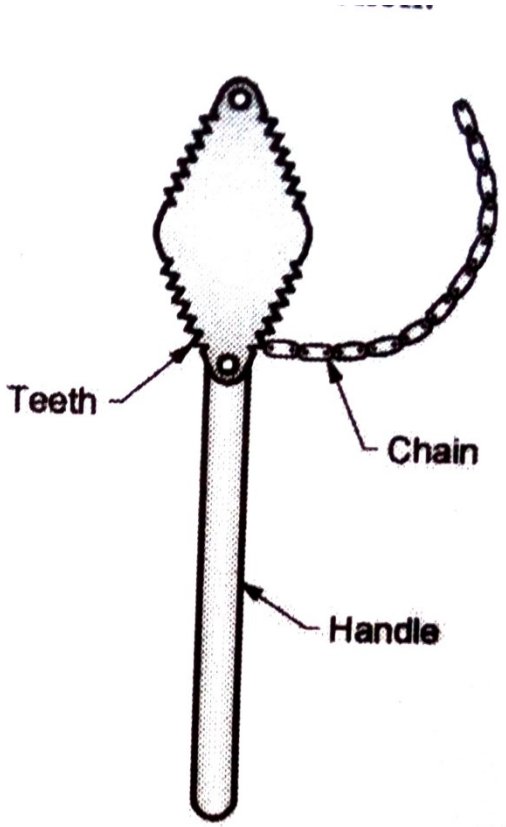


Hacksaw frame **Pipe cutter**

Fig. 5.2.26 : Cutting tools



Pipe wrench



Chain wrecnch

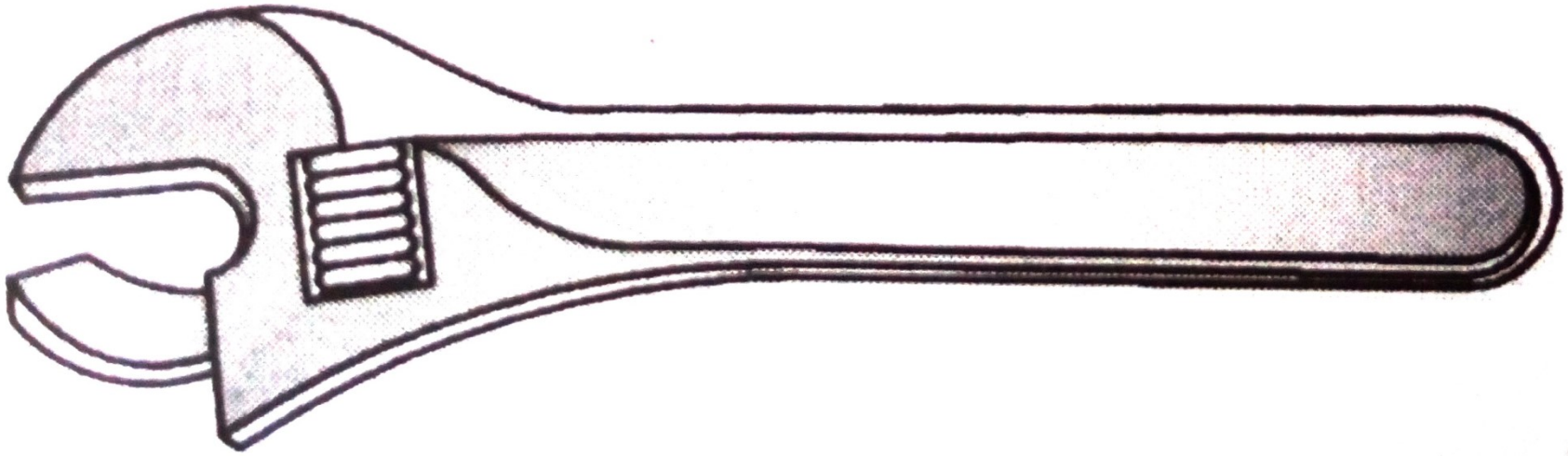


Fig. 5.2.28 : Adjustable wrench

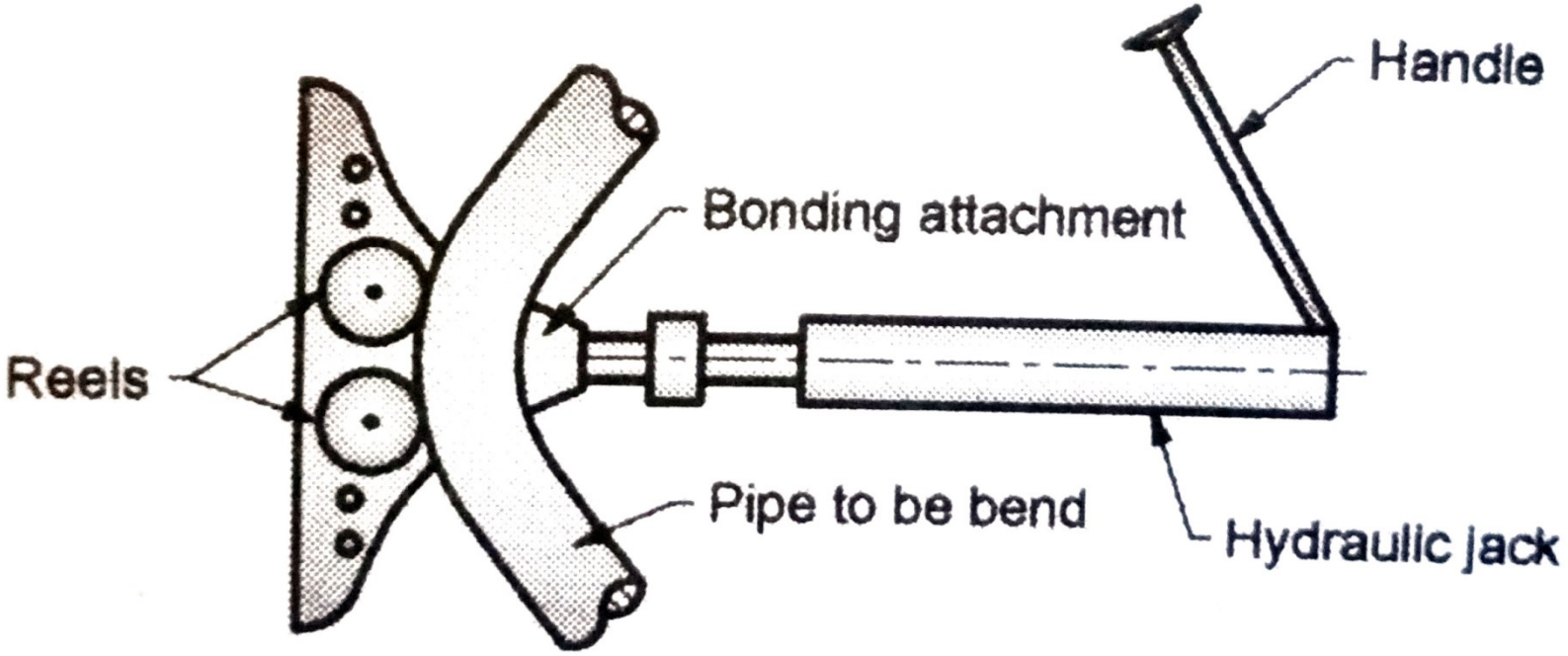


Fig. 5.2.29 : Pipe bending machine

Electricity

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Electrification

- Following points to be consider while selecting installation system

1. Life of installation
2. Alteration in future
3. Construction of Building
4. Possibility of Fire hazards
5. Presence of corrosive fumes
6. Dampness

System used for distribution of Power

- Single Phase – Two wire system (230v)
- Three Phase – Three wire system (440v)
- Three Phase – Four wire system (440v)

Accessories of electrical Installation

- Cables
- Flexible wires
- Switches
- Fuses
- Ceiling rose
- Lamp Holder
- Plugs
- Socket outlet
- Junction Box

Cables

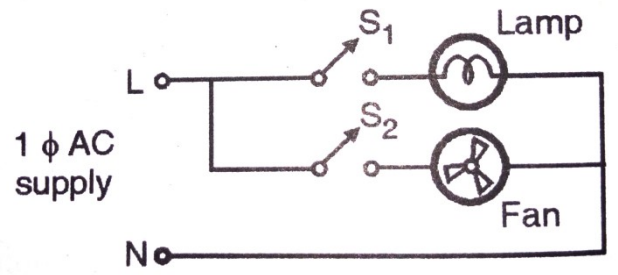
- Copper or aluminium material is used
- Wire is coated with insulating material to minimize risk of fire & shocks
- Types of Cables

1. Vulcanized Indian Rubber Insulated (VIR)
2. Tough Rubber Sheathed Cables (TRS)
3. Cab Tyre Sheathed Cables (CTS)
4. Weather – proof cable
5. Polyvinyl chloride insulated cables (PVC)
6. Lead Sheathed Cables

Flexible Cords

- Large number of fine wire to form the conductor.
- These are insulated by plastic insulation.
- Wire is used to connect domestic appliance.
- These cords are easy to guide and handle.

Switches



- Break of electrical connection to the load is carried out with the help of switch.
- Switch should be connected with Live (L) wire
- Switch connected in neutral wire will make and break circuit but the user can get a shock if he touch live point.
- Switch are available in 5A and 15A
- In certain application such as staircase lighting we use the switch to turn ON and OFF the lamp more than one point.

Fuse

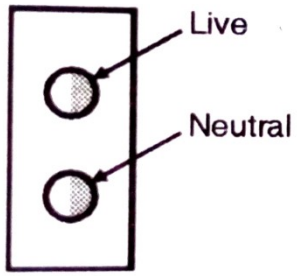
- Used for protecting the appliance against over current.
- A fuse is basically a piece of wire rated for particular current and has a low melting point.
- Copper, Zinc, Lead, Tin, Aluminium etc material used.

Socket Outlet

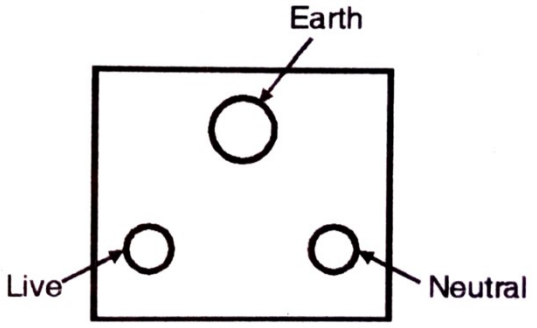
- Socket outlets are provided for temporary electrical connections such as table lamp, table fan, radio, TV etc...
- Socket outlet can be of the following two type

1. Two Point type
2. Three Pin type

- Socket are fixed on wooden block



(a) A two pin socket

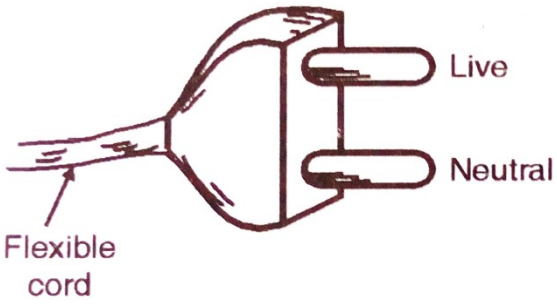


(b) A three pin socket

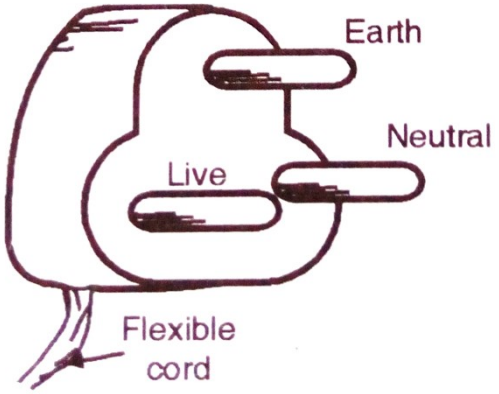
Plug

- The plug along with flexible cord are used for providing the electrical supply to portable appliance like table fan, table lamp, radio, TV etc.....
- Available in 5A and 15A rating
- Two types

1. Two Pin plug
2. Three Pin Plug



(a) Two pin plug



(b) Three pin plug

Lamp Holder

- Used to support and connect Lamp to supply system.
- Possible to remove or replace lamp from lamp holder.
- Classification

1. Batten holder
2. Pendant Holder
3. Bracket holder
4. Angle Holder

Ceiling Rose

- Ceiling rose is used for connecting the ceiling fans, pendent lamp, etc to supply system
- Ceiling rose is made of following two parts

1. Base
2. Cover

Junction Box

- Junction box are used to join some conductor.

Switches

- A switch is a mechanical device used to connect and disconnect a circuit.
- Switch has two piece of metal called contacts that touch to make a circuit and separate to break the circuit.
- Types of Switches

1. Mercury tilt switch
2. Knife Switch
3. Changeover switch

1. Mercury tilt switch

- The mercury switch consist of a drop of mercury inside a glass bulb with 2 contacts.
- The two contacts pass through the glass, and are connected by the mercury when the bulb is tilted to make the mercury rolled on.

2. Knife Switch

- Enclosed circuit and connection are with a rubber or plastic insulated section for the user, the contact and bridge are fully exposed.

3. Changeover Switch

- Switch contact have a spring loaded action which disconnect the load easily.
-

Fuses

- Fuse is simplest device, which break the circuit under abnormal condition
- Types of Fuse

1. Semi enclosed
2. Totally enclosed
3. Dropout fuse
4. Expulsion fuse
5. High Rupturing Capacity Fuse
6. Striker fuse
7. Switch fuse

MCB

- MCB (Miniature Circuit Breaker)
- Circuit break under overloading and short circuit condition.
- Under a normal condition use as a switch.
- Used in low voltage domestic, commercial and industrial.
- Current carrying part are made by copper and other parts are made by non rusting type material.

Electric Shock

- An electric shocks can occur upon contact human's body with any source of voltage.
- The current may causes tissue damage if it is sufficiently higher.
- Death caused by an electric shocks is referred to as electrocution.

Safety Rules

- Use standard pins to supply of power from the plug point.
- Use ISI marked electrical materials.
- Replace the bulb only after switch it off.
- Plug point of heavy appliance like refrigerator, washing machine must be properly earthen and use 3 pin plug.
- Keep a bulb in place in all the lamp holders.

Earthing

- Earthing means connecting neutral point to the earth by a conductor of negligible resistance.
- Three Types of Earthing

1. Pipe Earthing
2. Plate Earthing
3. Earthing for domestic applience

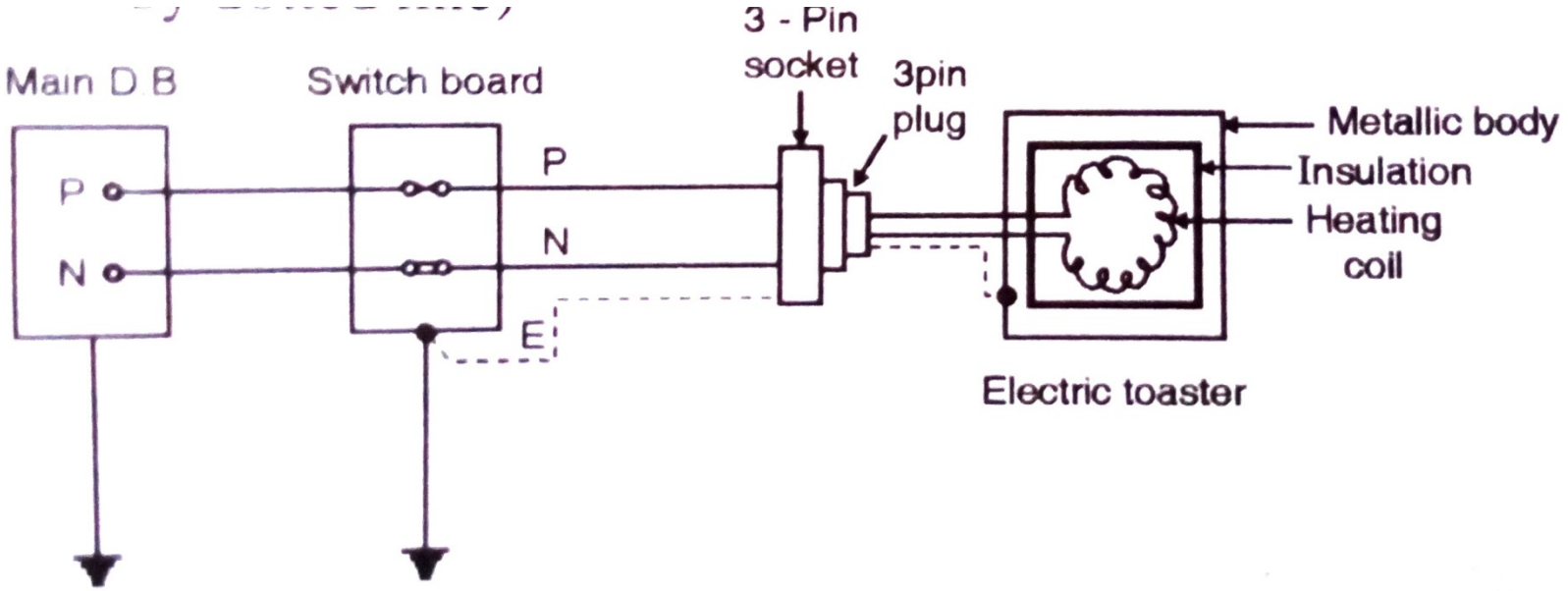


Fig. 5.3.6(a) : Connection of electric toaster to supply using 3 pin plug

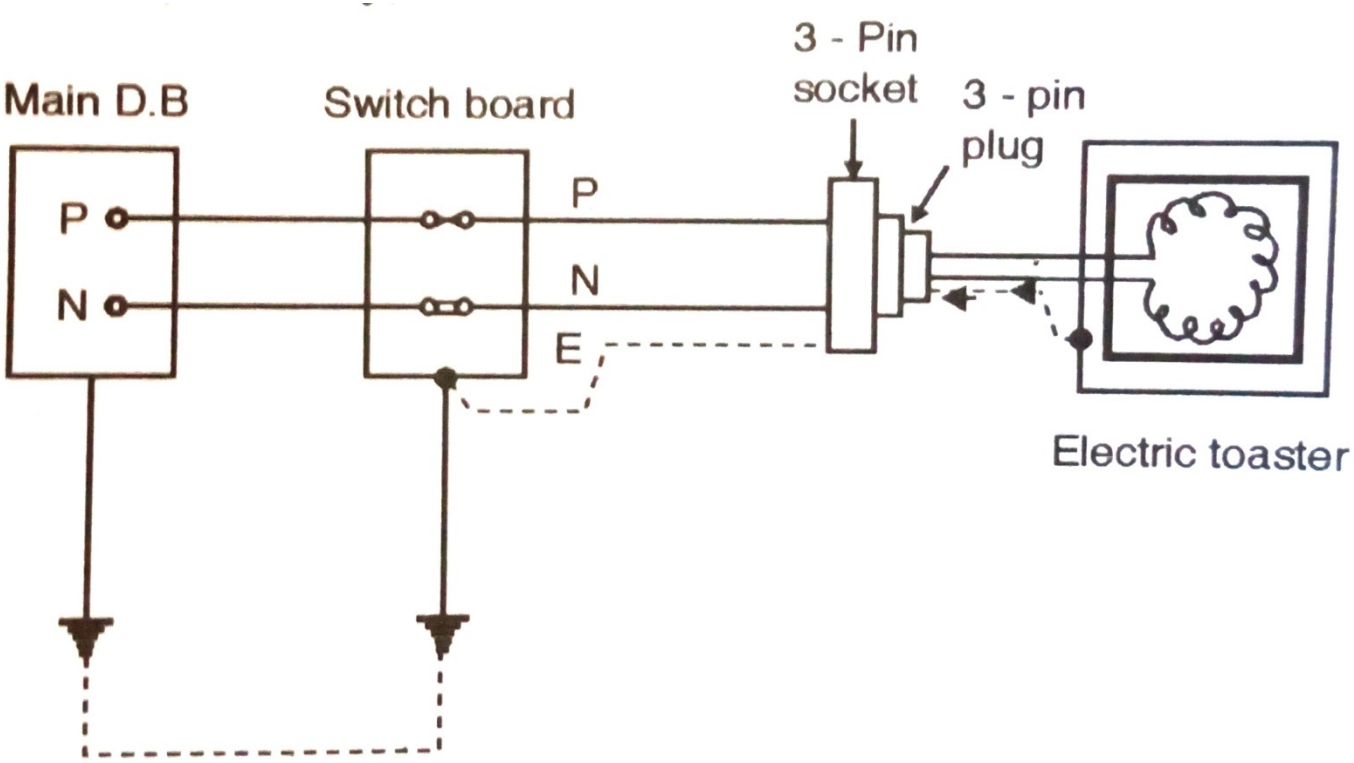


Fig. 5.3.6(b) : Path of fault current through earthing wire

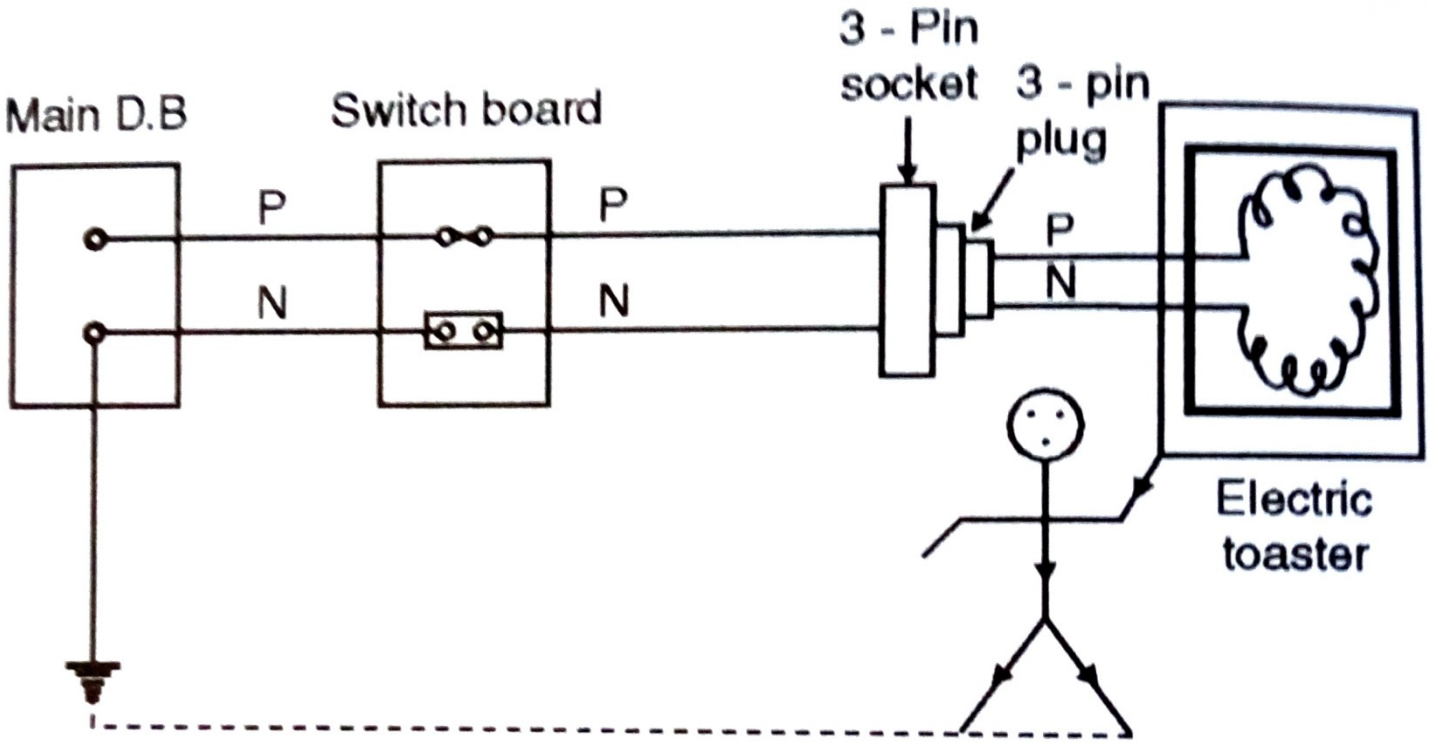


Fig. 5.3.6(c) : Fault current flowing through human body when earthing is not provided

Building Finishes

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Building Finishes

- All Building finishes such as plastering, pointing, painting etc...
- Protect the material used in building from weathering effect
- To give decorative finish to building.

Plastering

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Plastering

- Plastering is covering with material of various composition applied either externally or internally to wall by lime, cement, or mud.

Necessity of Plastering

- To provide smooth, regular, clean, durable and finished surface.
- To conceal defective workmanship.
- To protect surface from atmosphere.
- To fill the joints formed in masonry work.
- To provide satisfactory base of decorative

Preparation of Surface for Plaster

- All the projections which extend by more than 13mm from the general surface of the wall face are knocked off.
- All joints in masonry are valued out for a depth of at least 13mm.
- Surface are brushed and well melted with clean water.
- Surface are free from oil, grease.
- Holes are properly filled in advance.

Ground work for plaster

- In order to obtain uniform thickness of plaster vertical strip called screed or band are formed on the wall surface.
- Dots are applied horizontally and vertically at a distance about 2m covering entire wall.
- After fixing dots the vertical strips of plaster called as screed are formed between dots.
- Screed maintain thickness of plaster.

Procedure of applying internal plaster to brick masonry wall

1. Single coated plaster

- 12 mm thick on brick masonry and 20 mm thick on rubble masonry.
- First coated plaster is applied by clearing surface and sprinkle the water.
- If we apply second coat at least 2 days left for drying of first coat.

2. Double coated plaster

- Second coat is applied after first coat.
- Second coat is uniformly spread with trowels.
- Thickness of second coat of plaster is 6 to 10mm.

3. Neeru – Finishing or Sanla – Plaster

- These coat is applied after 5 dyas of the second coat.
- This coat consist of create white or fat lime and fine white sand the ratio of 1:2 is laid in thickness of 3 mm.
- Some time small quantity of mica powder is also add for shining purpose.

Types of Plaster

- Classification of Plaster depends upon the types of binding material used.
- Types of Plaster

1. Cement Plaster
2. Lime Plaster
3. Gypsum plaster
4. Plaster of Paris
5. Stucco Plaster

Cement Plaster

- Mixture of Cement, Sand and Water
- Usually applied in one coat of thickness 12mm, 15mm, 20mm.
- Usual proportion is 1:4
- Surface is levelled with wooden float, straight edges and trowel.

Lime Plaster

- Lime is used as a building material in making the mortar for plastering purposes then it is called lime plaster.
- Mixture of Lime and sand in equal proportion.
- Making the plaster more effective sand should be free from Pebbles, Garbage and mud.
- Fat Lime generally recommend for plaster work.
- Plain Side 13 mm, For Rough side 16 mm thick, and in stone work 19 mm thick plaster is applied.

Gypsum Plaster

- Gypsum plaster are required small portion of sand and other aggregate is required.
- Plaster is in light in weight.
- Unaffected by bacteria.
- Used in multi storage building.

POP (Plaster of Paris)

- POP Obtained from Gypsum.
- Gypsum is heated to certain temperature, water is removed and we got very fine powder of POP.
- POP sets immediate after adding water in it.
- The dry mix of POP and sand is mixed in small quantities and suitable quantities of water is add and this plaster is applied within in 5 minutes.

Stucco Plaster

- Stucco is the name given to an decorative plaster used on both external and internal.
- Total thickness about 25 mm
- Three coat of plaster
- First coat is rough coat which bond with wall
- Second coat give desire shape to the surface
- Third coat required texture, smoothness, and decorative appearance.

Pointing

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Pointing

- The joints on the face of stone or brick masonry are roughly filled with mortar is called pointing.
- Two types of Mortar

1. Lime Mortar 1:2 mix
2. Cement Mortar 1:3 mix

Methods of Pointing

- All the mortar joints are raked out to a depth of 10 – 15 mm with the help of pointing tool.
- Dust and loose mortar are roughly cleaned.
- Mortar are taken in small pan and by pressing fill up the joints.
- Excess mortar is scraped away.

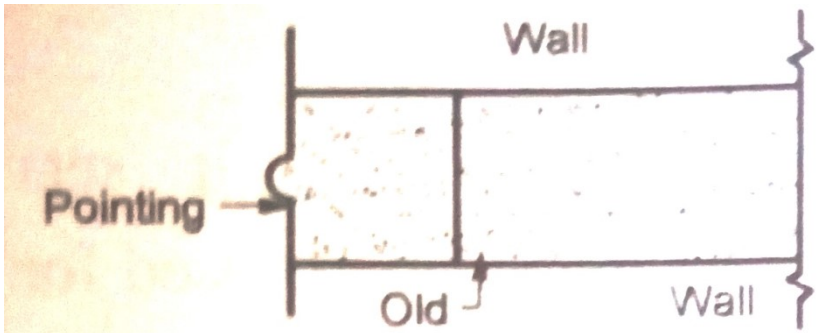
Types of Pointing

- Classification depend on shape of finishing

1. Beaded pointing
2. Flush pointing
3. Recessed pointing
4. Rubbed or grooved pointing
5. Tuck pointing
6. Vee pointing
7. Weathered or struck pointing
8. Struck pointing

1. Beaded pointing

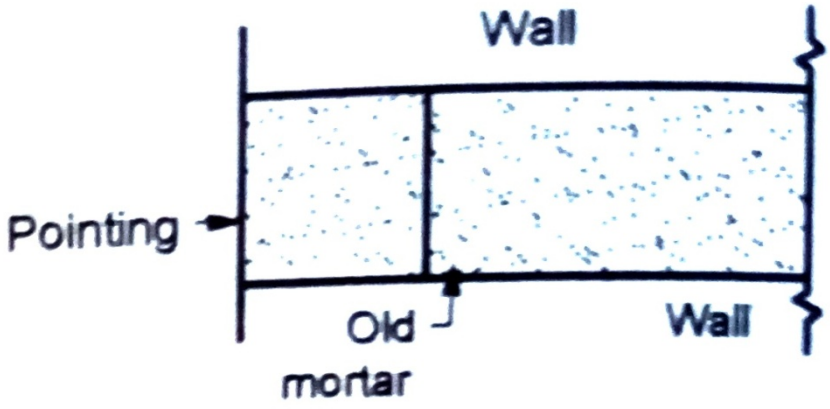
- Gives good appearance
- Difficult to maintain
- The raked joint are filled up with mortar and finished flush with the face of wall and then bead is formed.



(a) Beaded pointing

2. Flush Pointing

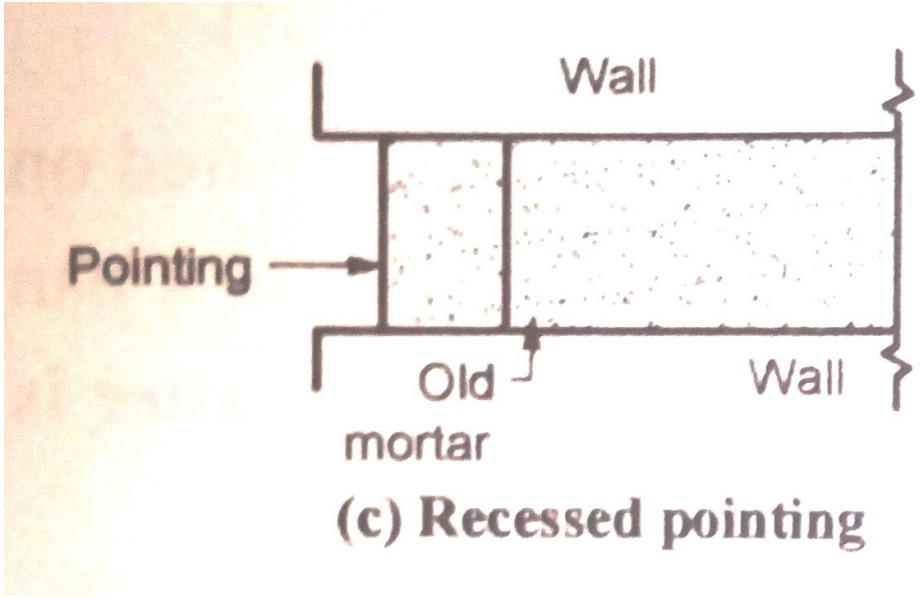
- Joints are raked and they are finished flush with the face of brick masonry.
- Simplest type of pointing.
- Not give good appearance



(b) Flush pointing

3. Recessed pointing

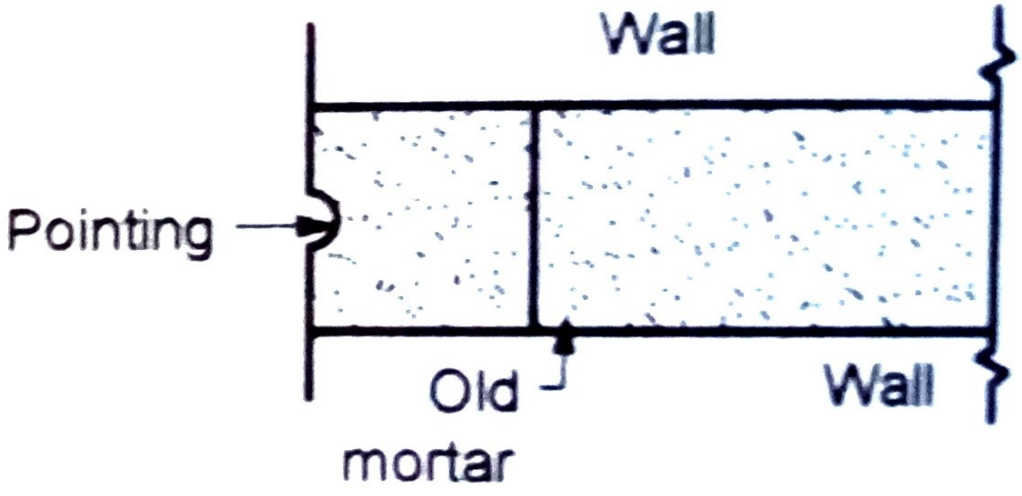
- Mortar is kept vertical but inside the wall surface with the help of suitable tools.
- Suitable for facing work.
- Facing work of good texture of work



(c) Recessed pointing

4. Rubbed or Grooved pointing

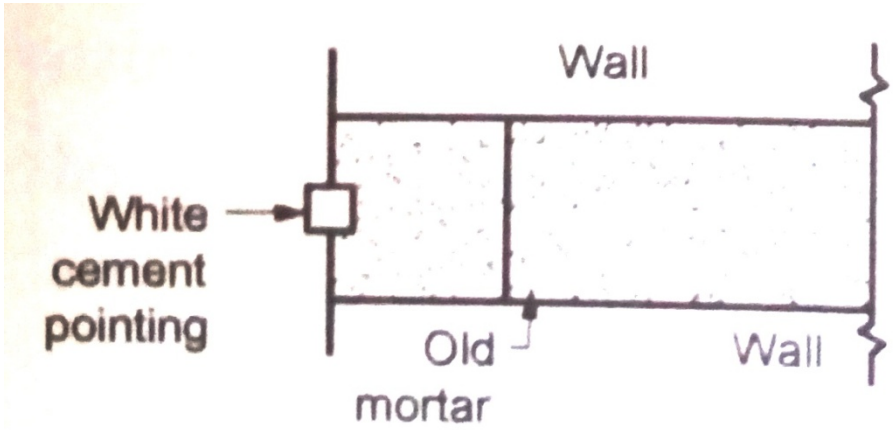
- In this type of pointing the racked joints are filled up flush with face of the wall and semicircular notches are formed by special tools.



(d) Grooved pointing

5. Tuck pointing

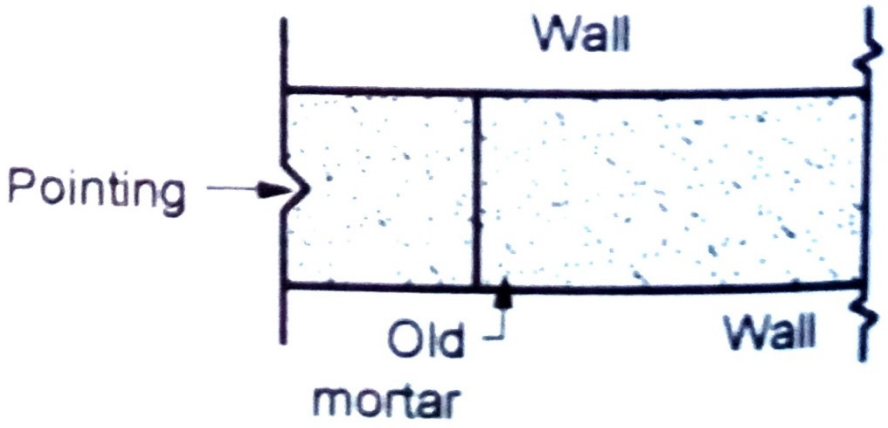
- In this type of mortar is pressed in the joints and finished flush with the face of the wall when the mortar is still wet a rectangular groove is formed at the centre of joints.
- This groove is filled with white lime putty.



(e) Tuck pointing

6. Vee pointing

- In this type of pointing either V shaped grooves are done on finished surface .



(f) Vee pointing

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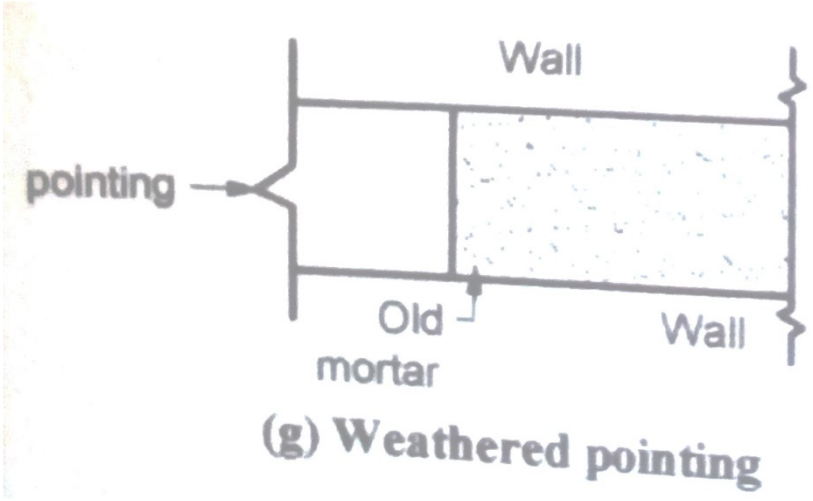
7. Weathered or struck pointing

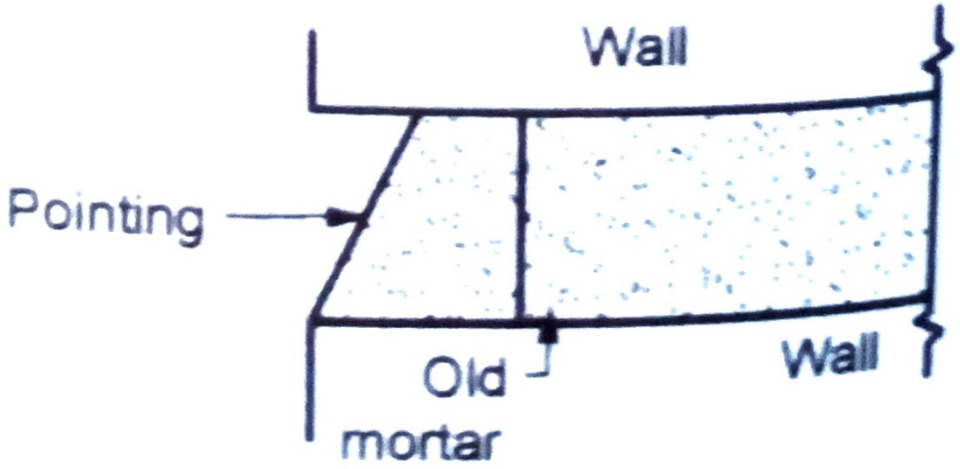
- In this type of pointing either V shaped grooves are done on finished surface on outer side .



(g) Weathered pointing

8. Struck point

- This is a modification of flush pointing in which the face of pointing is kept inclined, with upper edge pressed inside the face by 10mm.



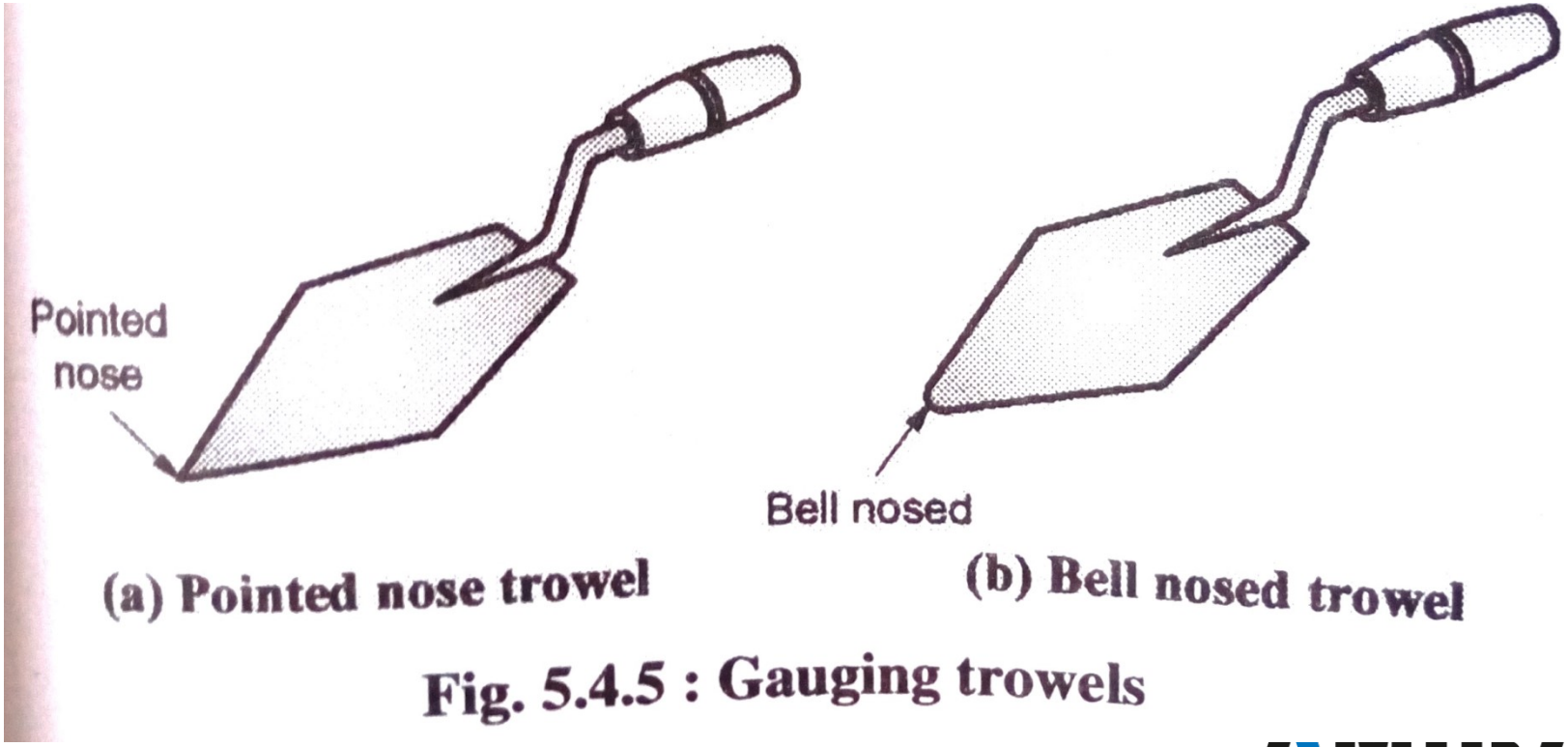
(h) Struck pointing

Tools required for plastering

- Gauging trowel
- Floats
- Floating rule
- Plumb bob
- Steel Ghamelas or steel pot
- Spang
- Spirit level
- Straight edge
- Set square
- Brushes
- Corner edge
- Scratches

Gauging Trowels

- Gauging trowels are commonly used to apply the mortars on the surface to be plastered.



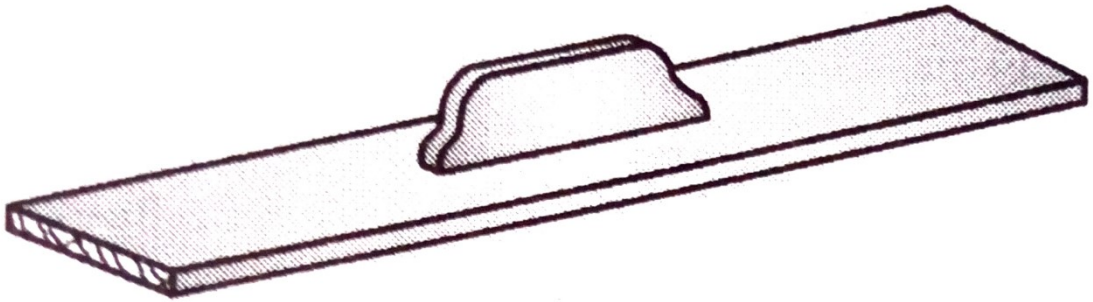
(a) Pointed nose trowel (b) Bell nosed trowel

Fig. 5.4.5 : Gauging trowels

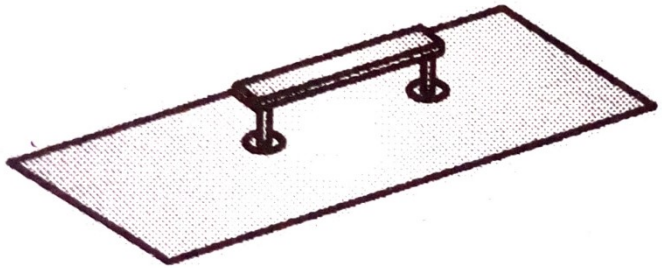
Floats

- Two type of Floats used

1. Wooden Floats
2. Metal floats



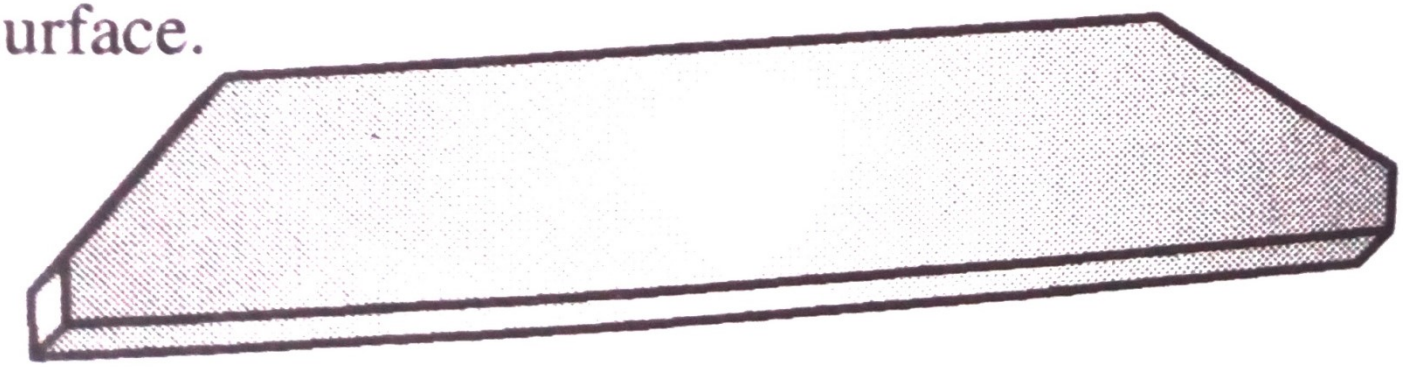
(a) Wooden float or skimming float



(b) Metal float

Floating rule

Floating rule is used to check the level of the plastered surface.



Plum bob

- It is small and handy tool used for making mortar perfectly vertically.

Paints & Painting

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Paints

- Paint is a mechanical dispersion mixture of one or more pigments apply on surface.
- When paint is applied on metal surface primer is compulsory apply.

Necessity of Painting

- Protect iron and wood from wear & tear.
- Protect wood from insects, fungus and moisture.
- Protect iron from corrosion
- Paint surface reflect heat and light.
- Provide smooth and beautiful surface
- To prevent corrosion in metal
- To provide surface hygiene, safe and clean.

Characteristic of Good paint

- It should have good spreading power
- Have good consistency
- Harmless to user
- Paint should be cheap
- Easily apply on surface
- Dry within in 24 hrs
- Paint should be not affected by heat, rain, wind etc...
- Colour of the paint should be retained for long time.

- Paint should be good fire and moisture resistance.
- Its firm it should not cracked on drying.
- Paint should be glossy and stable

Constituents of Paint

1. Pigments
2. Vehicle (drying oil)
3. Thinner
4. Drier
5. Fillers
6. Plasticizer

Classification of Paint

1. Emulsion Paint
2. Exterior house paint
3. Interior wall paint
4. Chemical resistant paint
5. Luminous paint
6. Metal paint
7. Cement paint
8. Distemper (water paint)

1. Emulsion paint

- Dispersion of rubber like resin in water
- Water is used in place of Thinner.
- Constituents of Emulsion paint
  - Rubber Like Resin : such as semi solid polystyrene
  - Oleoresinous material: Linseed oil is used
  - Pigments: Mica and titanium oxide used
  - Extender: Silica and magnesium silicate used

- Emusifying agent: tetra sodium phosephate, sodium sulphate used
- Stabilizer: Dextrin, Starch, Water soluble gum used
- Preservatives: mercuric chloride, chlorothymol are used
- Antifoaming agent: Pine oil and kerosene is used.
- Drier: naphthenates , manganese and zinc
- Volatile material: Water

2. Exterior house Paint

- These paints have following constituents

❑Pigments: Zinc oxide, Titanium oxide, White lead

❑Vehicle: Boiled linseed oil

❑Thinner: Mineral Spirits, Naphthas

❑Extenders: Barytes, talc, clay

3. Interior wall paints

- These paints are prepared by mixture the following constituents:

❑Pigments: White and coloured pigments

❑Vehicle: Varnish or boiled linseed oil

❑Resins: Emulsified phenol formaldehyde resins and casein.

4. Chemical Resistant Paint

- These paint consist of baked oleoresinous varnishes, clorinated rubber composition, bituminous varnishes.used

5. Luminous Paint

- These pain consist of phosphorescent paint composition.

6. Metal Paint

- These paint consist of zinc, alkyds, epoxy, polyamide, chlorinated rubber etc..
- Silicones are added as heat resistant and water resistant

7. Cement Paint

- Cement paint are produced by mixing white cement (70%), hydrated lime, pigment, very fine sand is used.

8. Distempers (water Paint)

- Distemper are water paint
- Ingredient of distemper are

1. Chalk Powder
2. Glue
3. Colouring pigment
4. Water

Types of Exterior paint available in Market

- Latex Paint
- Oil Finish paint
- Velvet finish Paint
- Pearl paint
- Gloss paint
- Acrylic finish paint
- Alkyd finish paint
- Plastic paint
- Exterior emulsion wall paint

Surface preparation for Painting

- Apply sand paper on surface of wall
- Holes, cracks, irregular surface filled by putty.
- Apply white putty
- Apply sand paper for final finish
- Apply white wash as a first coat.
- Apply colour

HVAC
(Heating, Ventilation, Air conditioning)

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Heating

- Heating system mostly used in cold area
- Such system of heating boiler, furnace, heating lamp, steam.
- Heating ventilation Devices

1. Steam coil
2. Hot water coil
3. Electric heater
4. Duct furnace

Ventilation

- Supply of fresh air from out side in to a enclosed space like bungalow, commercial or public building.
- Ventilation can be obtain by natural system, mechanical system, artificial system

Necessity of Ventilation

- Ventilation avoided unwanted accumulation of Carbon dioxide.
- Help to produce air movement
- It prevents dust and bacteria carrying particles.
- It helps to remove smoke, smell and odour.
- It helps to prevents suffocation.

System of Ventilation

1. Natural Ventilation
   - Wind effect for ventilation
   - Stack effect for ventilation

2. Artificial or mechanical ventilation
   - Exhaust system
   - Plenum system
   - Extraction plenum system
   - Air conditioning

Air - conditioning

- Classified in two part

1. Unitary system

- Window Air conditioning
- Split air conditioning system
- Package air conditioner

2. Central System