

## UNIT -2

### 3.STONE AND BRICK MASONRY

Masonry may be constructed using bricks or stones. The walls can be divided into 2 types.

1. **Load bearing wall**

2. **Non load bearing wall**

- In a frame structure there is a system of **columns** and **beams**. The gap between columns and beams are filled by non load bearing walls.
- In the case of load bearing walls the wall will support the **roof slab or beam or any live load**.

### Classification of masonries

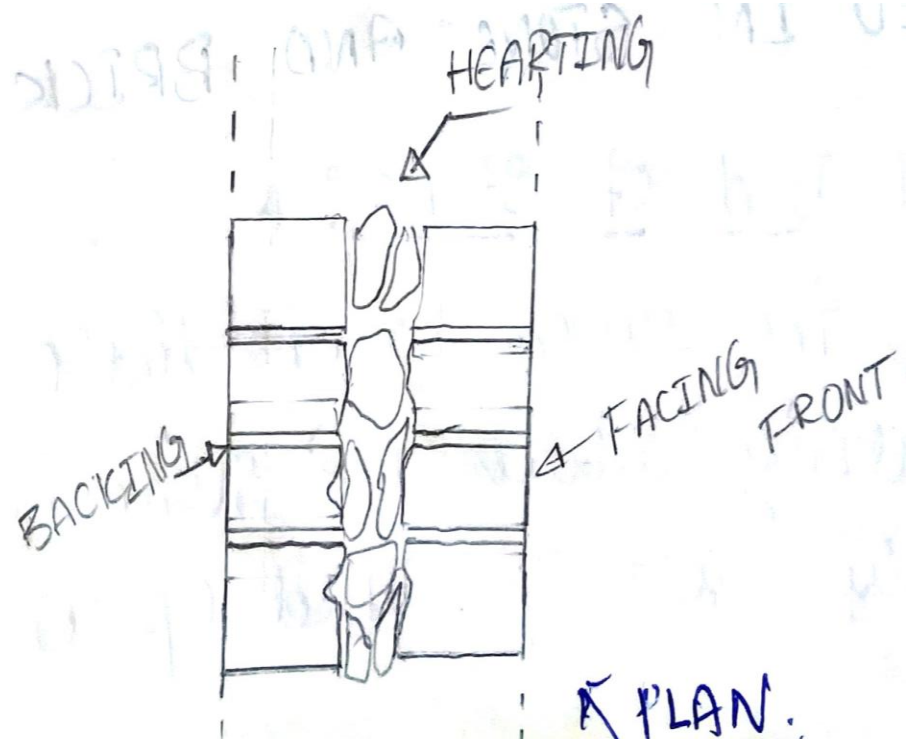
Masonry can be classified into following categories

1. Stone masonry
2. Brick masonry
3. Hollow block concrete masonry
4. Solid concrete block masonry
5. Composite masonry

# Terms used in stone and brick masonry

1. **Natural bed of stone:** The rocks have distinct plane of divisions along which the stone can be split easily. This plane is called as natural bed. The direction of natural bed should be parallel to the direction of the pressure.
2. **Course:** A course is horizontal layer of bricks or stones.
3. **Bed:** It is the lower surface of the brick/stone on which it rest in a course.
4. **Joint:** The place where 2 or more bricks or stones meet is called as joint. The joint between successive course are called horizontal joint. The joint between 2 bricks/stones in a course is called vertical joint.

5. **Backing**: The internal face of the wall is known as backing.
6. **Facing**: It is the external face of the wall.
7. **Hearting**: The internal portion of the wall between face & back is called hearting & the material used is called as filling materials.



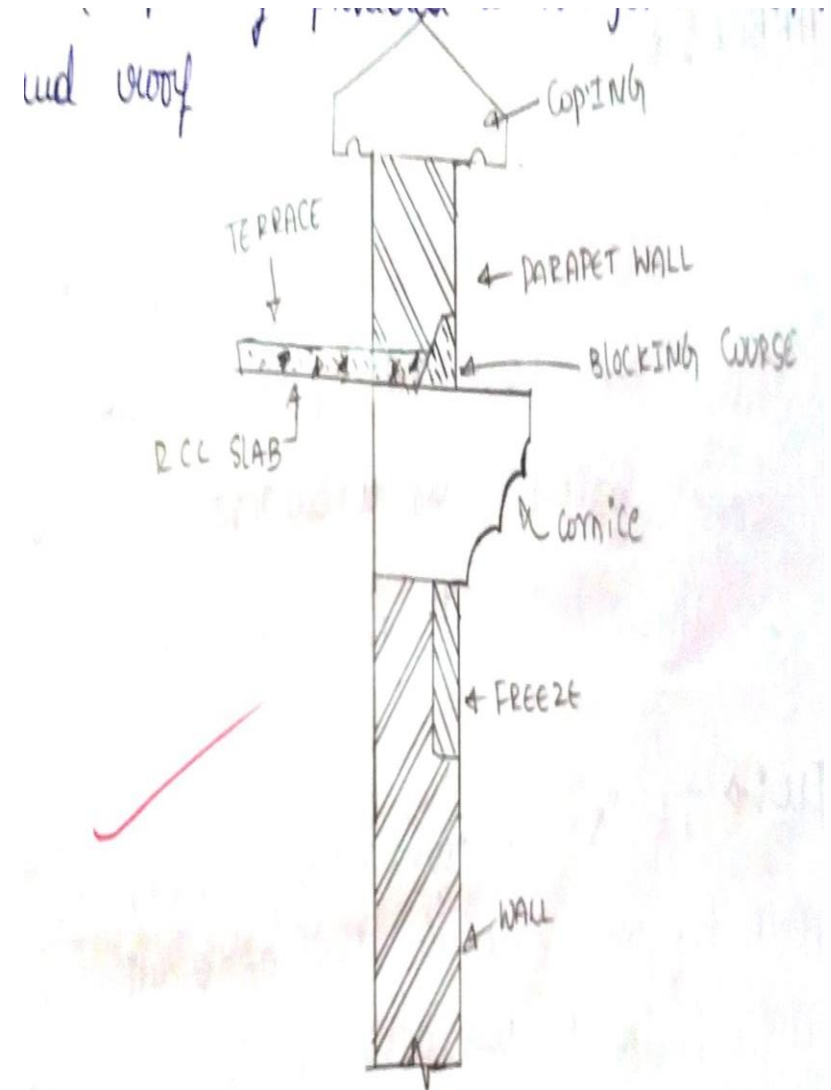
8. **Plinth and plinth course**: It is the horizontal projection course. It forms the base of the superstructure. Plinth course is the top most course of the masonry in basement.
9. **Cornice**: It is a projecting ornamental course; it gives good appearance to the wall. It is generally provided at the junction of wall & roof.

**10.Parapet:** It is a low wall built around the terrace to protect the person on the terrace.

**11.Coping:** It is a course placed on the exposed top of an external wall to prevent seepage of water it may be of concrete, stone or brick.

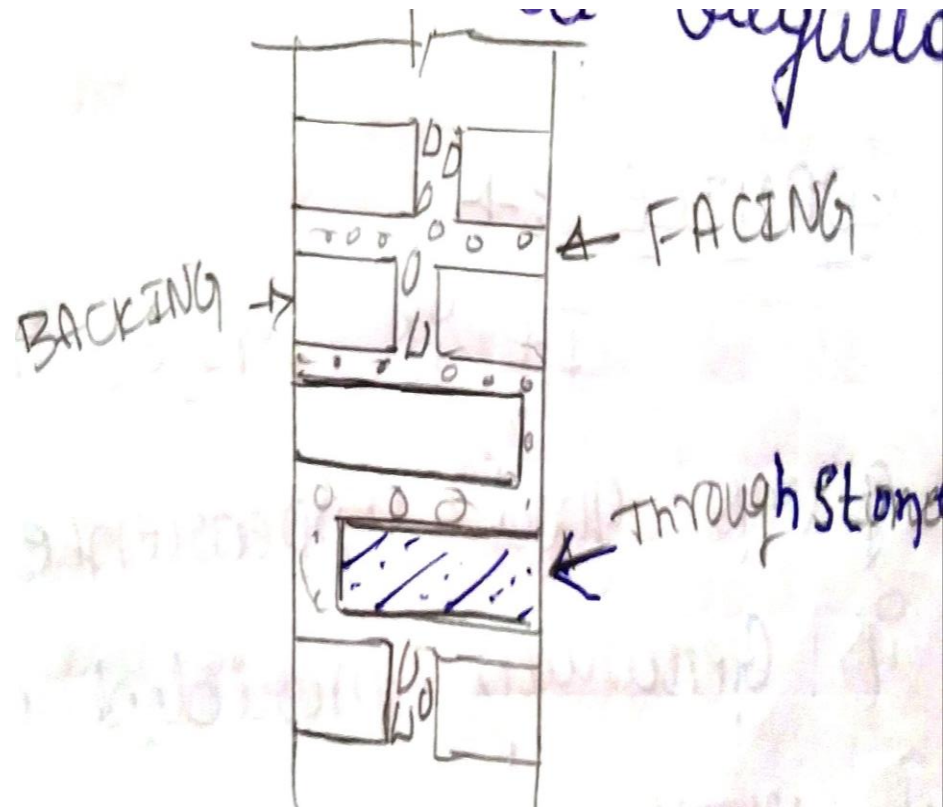
**12.Frieze:** It is a slab below the cornice stone.

**13.Lintel:** It is a horizontal member of stone brick or RCC. It is used to support the masonry above an opening.



PARAPET:- It is a low wall built around

**14.Through stone:** It is a projecting ornamental course; it gives good appearance to the wall. It is generally provided at the junction of wall & roof.

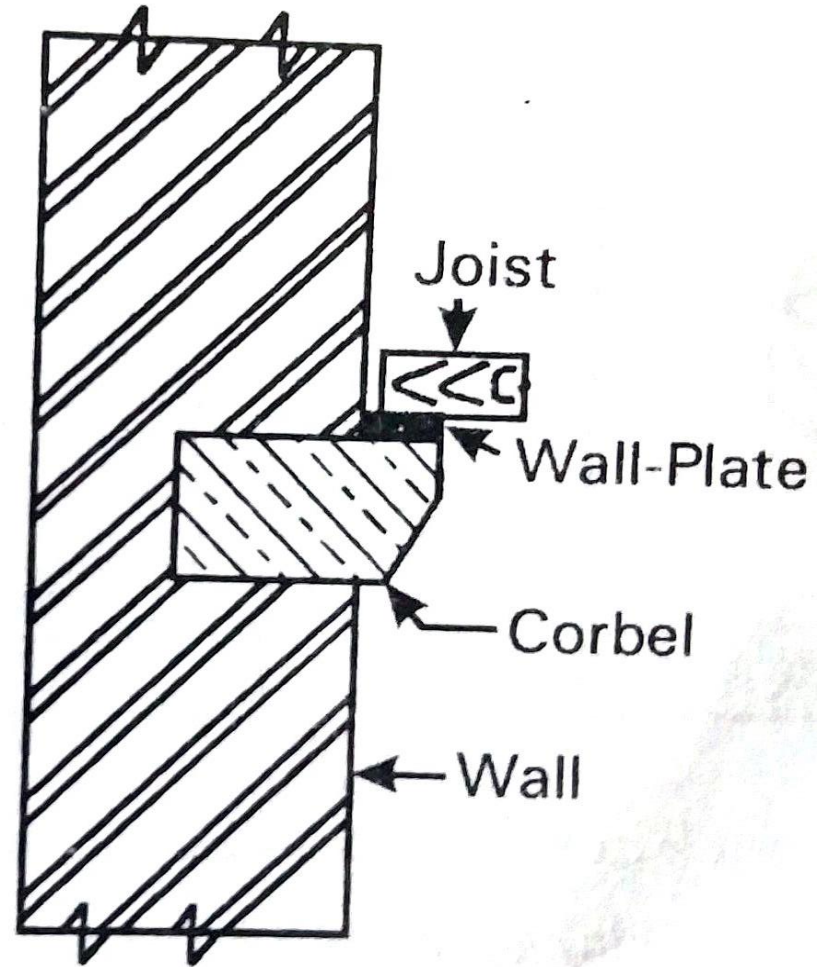


## 15. Corbel:

Corbel is a projecting stone provided to serve as a support for roof, beam etc

## 16. Sill:

It is the horizontal member to support the vertical member of a window or door, it is usually provided with main doors, and windows.



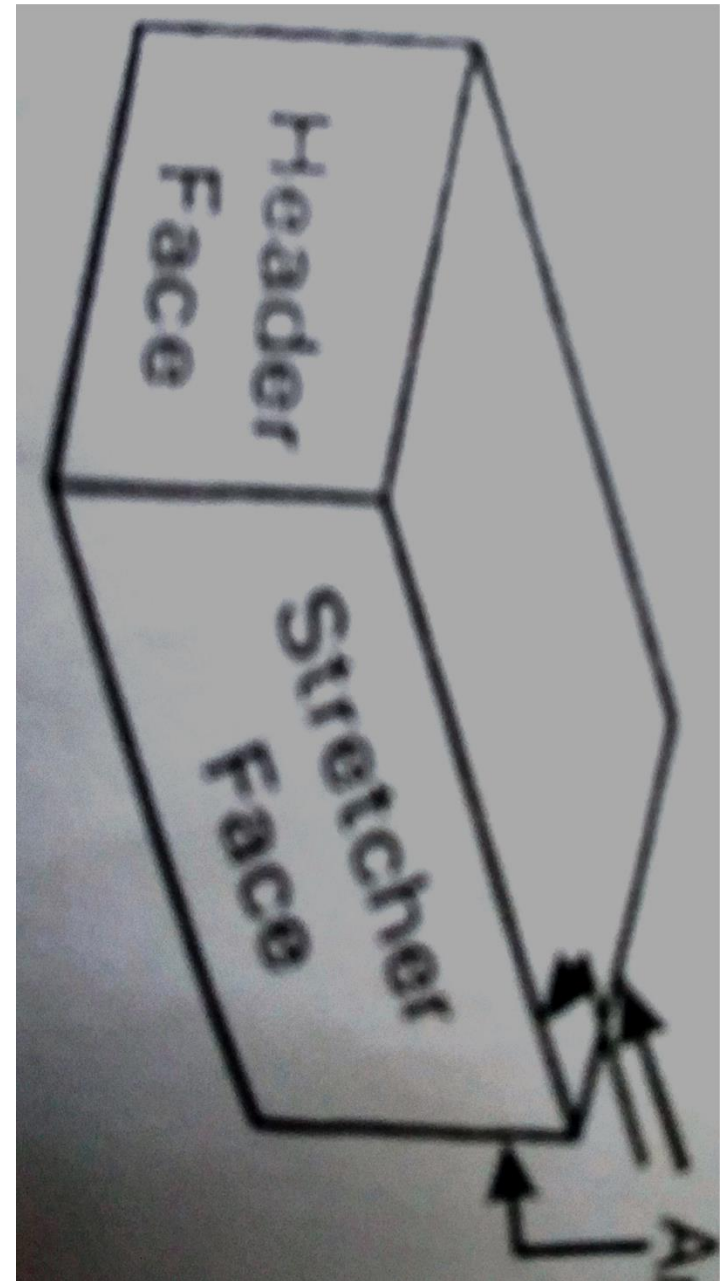
**17.Jambs:** It is the vertical sites of finished opening of doors, windows etc.

**18.Reveal:** These are exposed surface of walls of an opening of a door or window.

**19.Header:** It is a full brick which is laid which its length parallel to the face of the wall.

**20.Stretcher:** It is a full brick which laid its length parallel to the face of the wall.

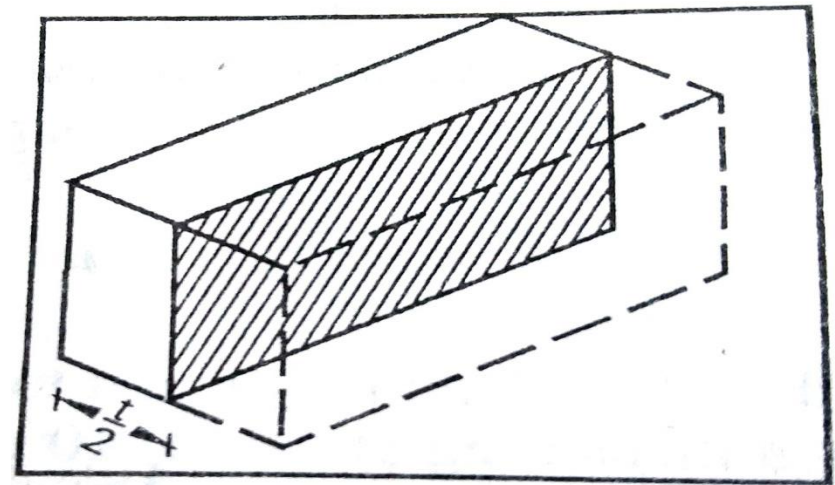
**21. Frog:** It is a depression on the top face of the brick. It prevents displacement of brick placed above it.





## 22. Queen Closer:

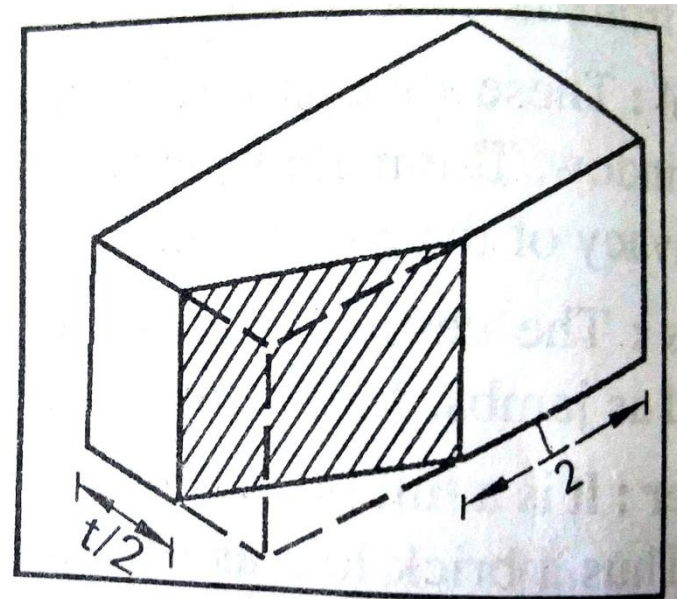
This are half bricks cut length wise



Queen closer

## 23. King Closer:

They are the portion of bricks obtain by cutting the triangular piece between centre of one side and center of one end.



King closer

## **24.Bull Nose:**

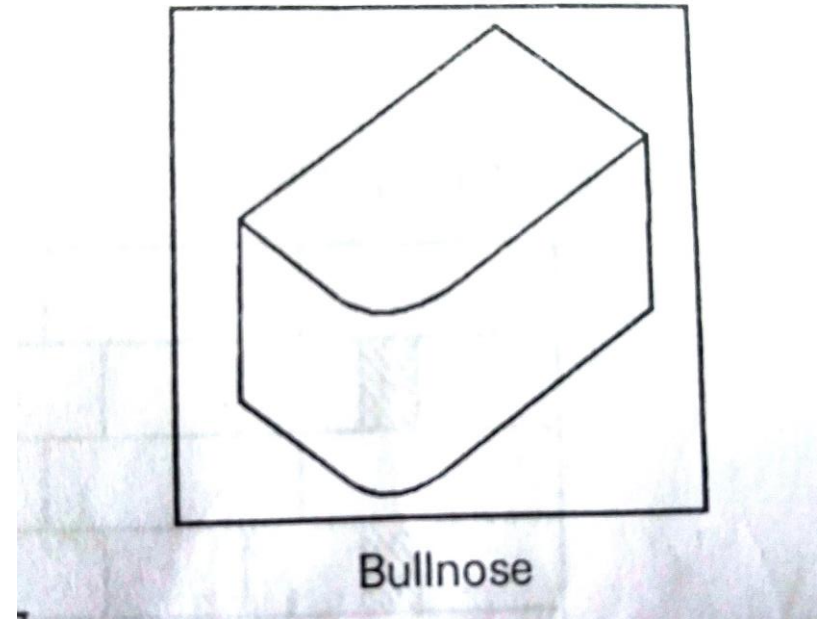
The brick is moulded with rounded angle is known as bull nose

## **25.Bat:**

It is a portion of a brick cut across its width or length fraction.

## **26.Bond:**

It is over lapping of bricks or stones in a wall in alternative courses. It is essential to eliminate to continuous vertical joint.



## 27. Racking Back:

It is the process of stopping the unfinished end of a wall in stepped fashion.

Fig. 3.9

38. Racking back : The process of stopping the unfinished end of a wall in stepped

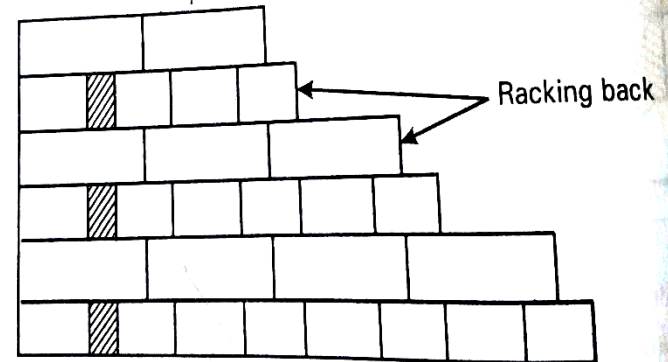


Fig. 3.10 : Racking back

39. Tothing : The termination of a wall in such a fashion that it can be

## 28. Tothing:

Each alternative course at the end projects which is known as tothing. It is provided to have adequate bond when the wall is to be constructed further.

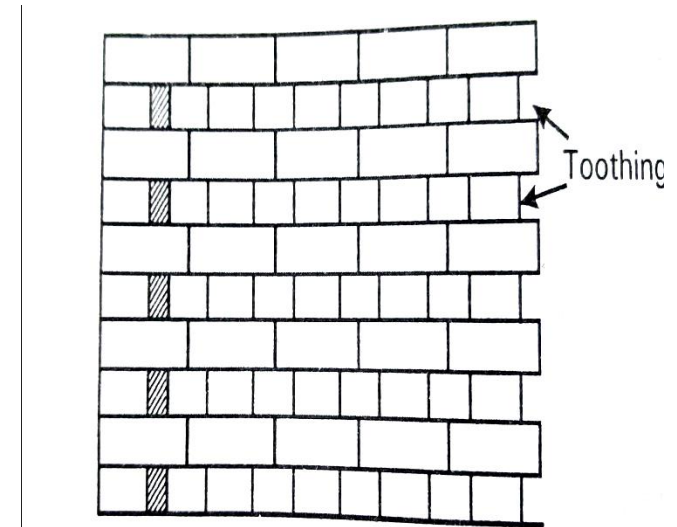


Fig. 3.11 : Tothing

# USES OF STONE MASONRY

1. For building foundation of Dams and other structures.
2. Building walls, piers, columns etc
3. Arches, domes, lintels and beams etc
4. Roof, floor, paving jobs.etc

## CLASSIFICATION OF STONE MASONRY

Based on the arrangement of stones and finishing the surface of construction. Stone masonry can be classified into two types.

1. Rubble masonry
2. Ashlar masonry

**1.Rubble masonry:** Rubble masonry in which undressed or roughly dressed stone are used.

- **Following are the types**

- A. Uncoursed random rubble masonry

- B. Coursed random masonry

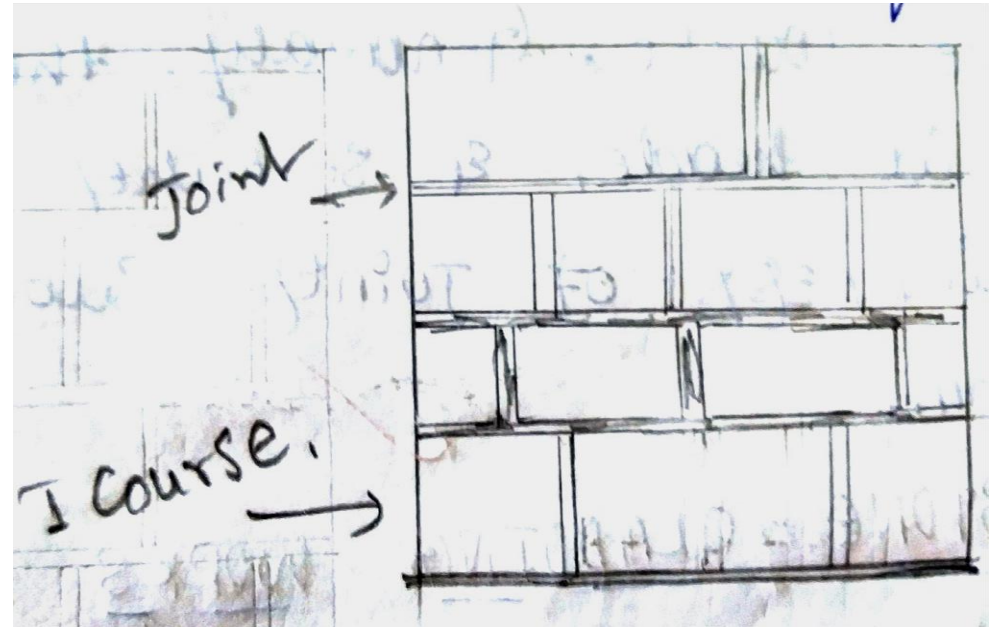
- C. Square rubble masonry

- D. Dry rubble masonry

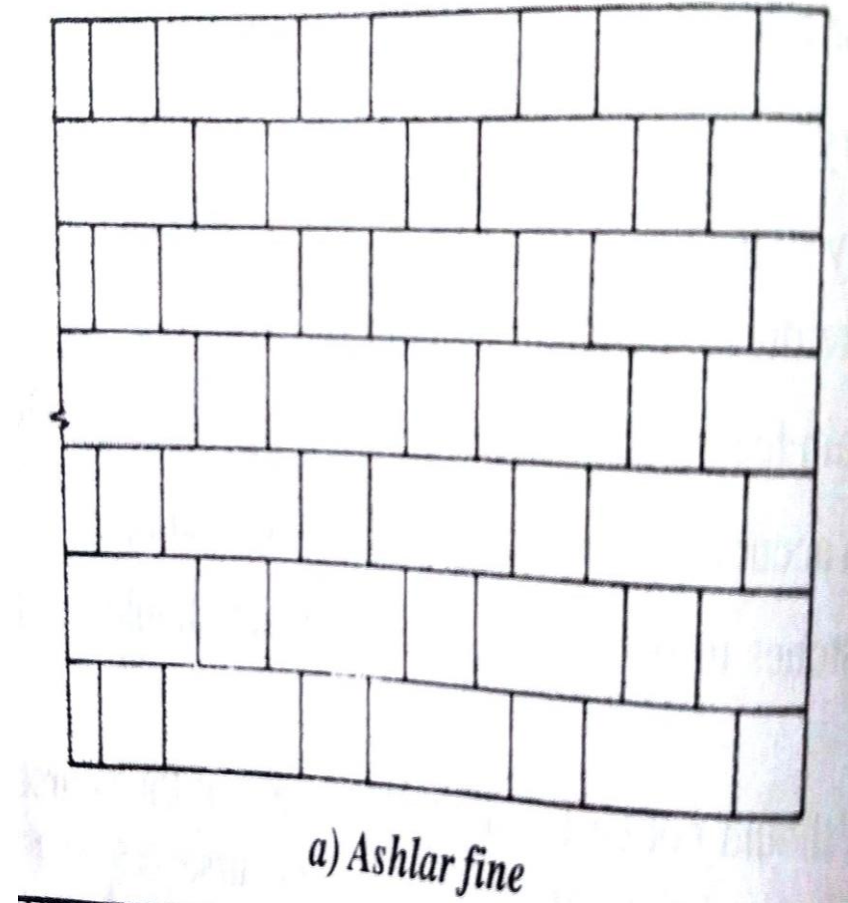
**B. Coursed random rubble masonry:** this type of rubble masonry, the stones vary from 50mm to 200mm. Each course is of equal height. It is used in the construction of residential building, public building depending upon dressing and finishing of the stone.

- Coursed rubble masonry is divided into first class, second class and third class masonry.

- **In first class masonry** all the courses are the same height and minimum height is 15cm. The face of the stone are hammer dressed and the projection of the face stone for chisel dressed and it will be true and square.



2. **Ashlar masonry:** In this type of construction, the square or rectangular blocks of stone are used. The beds, sides and faces are finely chisel-dressed. (Ashlar means dressed). This type of construction gives smooth appearance, but it is costly.
- The backing of ashlar masonry may be built of ashlar masonry or rubble masonry.

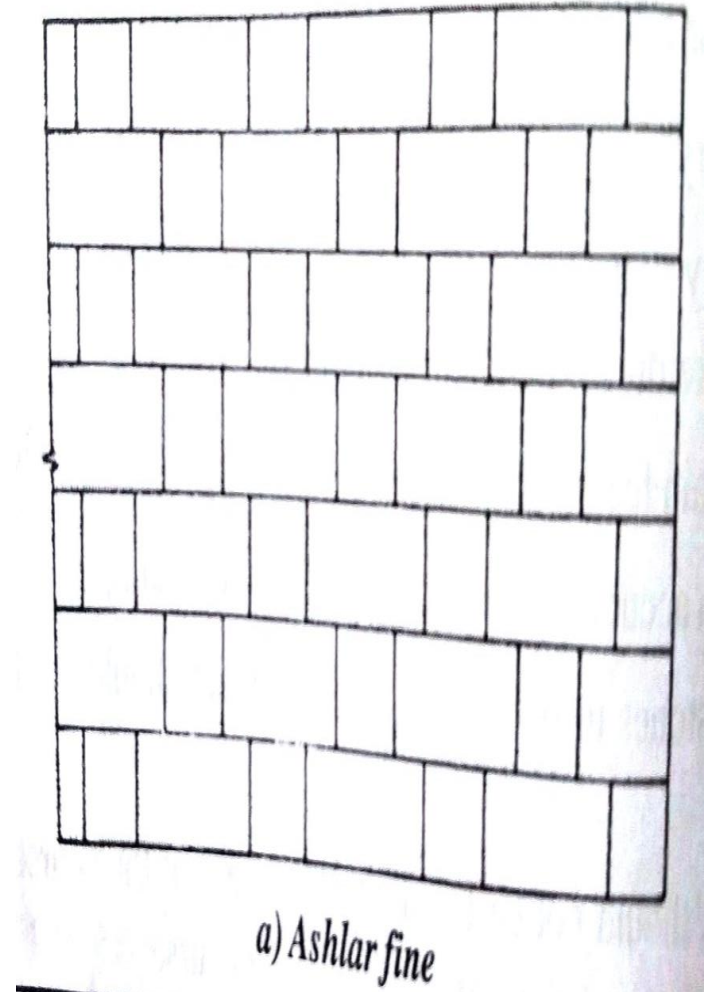




# Types of Ashlar masonry

- I. Ashlar fine
- II. Ashlar rough tooled masonry
- III. Ashlar rock
- IV. Ashlar chamfered masonry
- V. Ashlar facing

- **Ashlar fine masonry:**
- This is costlier, high grade and superior quality.
- All the 6 faces of stones are cut by chisel. The width of the stone should not be less than the height of the course. Generally the face stones are laid header & stretches alternatively. The thickness of joints should not be more than 3mm.





# STONE CLADDING WORKS FOR FACING WORKS

Stone cladding used as a **protective and decorative covering** for interior or exterior vertical walls and surfaces. It is the one of the most expensive element to thin tiles without the mechanical anchors.

To have stone **cladding of higher thickness mechanical anchor** is necessary. The following procedure is adopted for laying exterior cladding.

- The stone should be cut into slabs to the required thickness and should be wetted before laying.
- The stone should be fixed with mortar, the adjoining stones are secured by means of a copper pin 75mm long & 6mm dia wherever necessary.
- The backing of the stone is secured by means of cramps.
- Cramps should be made out 25mm X 6mm & 30cm long.
- The cramp may be of copper alloyed with zinc or stainless steel.
- The zinc or stainless steel.
- The pin cramps should be layed in cement mortar 1:2
- The joint should be done with cement mortar 1:3
- If any hollow is detected in laying of stone should be relayed
- The thickness of joint should be as small as possible.
- Masonry work in cement mortar should be kept wet for a period of 7 days.

# **General principle in the stone masonry construction.**

While supervising the construction of a stone masonry wall, the following point should be kept in mind.

1. The stones to be used for stone masonry should be hard, tough and durable.
2. The pressure acting on the stone should be vertical.
3. The stone should be properly dressed as per the requirement
4. Stone should be well wetted before use.
5. Proper bond should be maintained throughout the masonry.
6. Toothing should not be allowed in stone masonry.
7. Mortar to used should be of good quality and as per specification.
8. The construction work of stone masonry should be raised uniformly.
9. Plumb bob should be used to check the verticality
10. The hearting of the masonry should be properly packed.
11. Bed and vertical joints of masonry should be as thin as possible
12. The exposed joints in the stone masonry should be properly pointed.
13. The facing and backing of wall should be well bond by through stones.
14. The entire work should be kept wet for a period of 2week.

# BRICK MASONRY.

It is the masonry constructed using Bricks .The strength of brick work depends on the quality of brick and the type of mortar and the method of Bonding adopted in the structure.

There are two types.

1. Modular bricks.
2. Traditional bricks.

The dimensions of traditional brick is (230 x 114 x 76mm)

## TYPES OF BRICK MASONRY

- Following are types based on the *mortar*
- 1. Brick work in mud
- 2. Brick work in cement mortar
- a. First class                      b. Second class                      c. Third class

# Bonds in Brick masonry

- Bond is defined as **Geometrical arrangement of bricks or blocks of stone in masonry**. So that the vertical joint should not be in a straight line in the two successive layer.

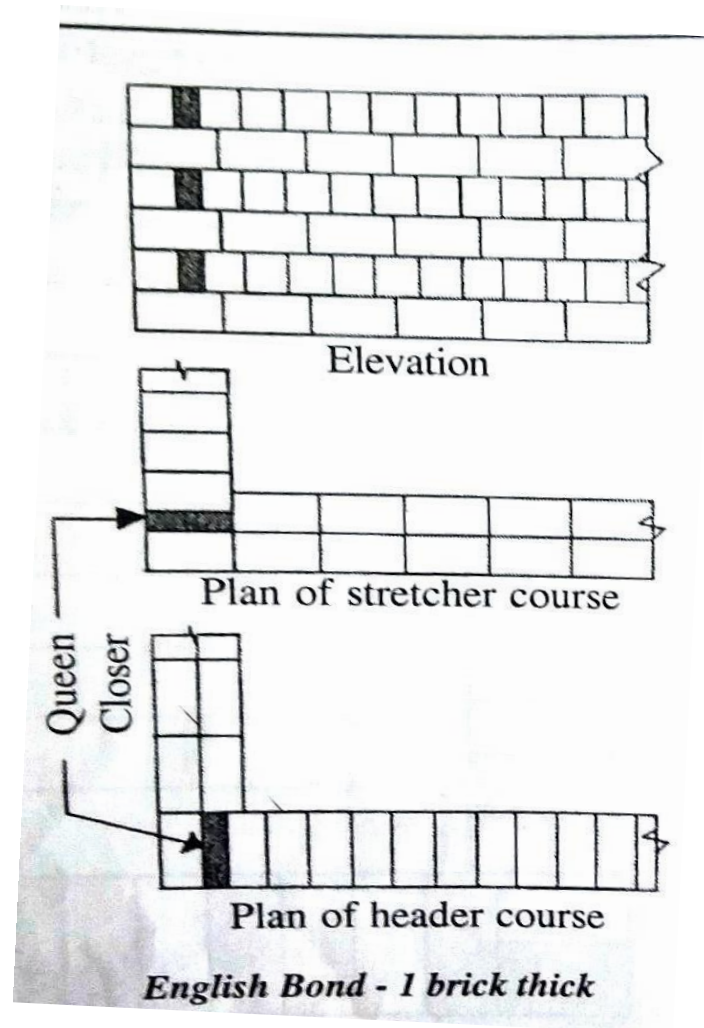
Following are types of bonds

1. **Stretcher bond**
2. **Header bond**
3. **English bond**
4. **Flemish bond**
5. **Garden wall bond**
6. **Facing bond**
7. **Dutch bond**
8. **Zig-zag bond**
9. **Brick on edge bond**
10. **English cross bond**

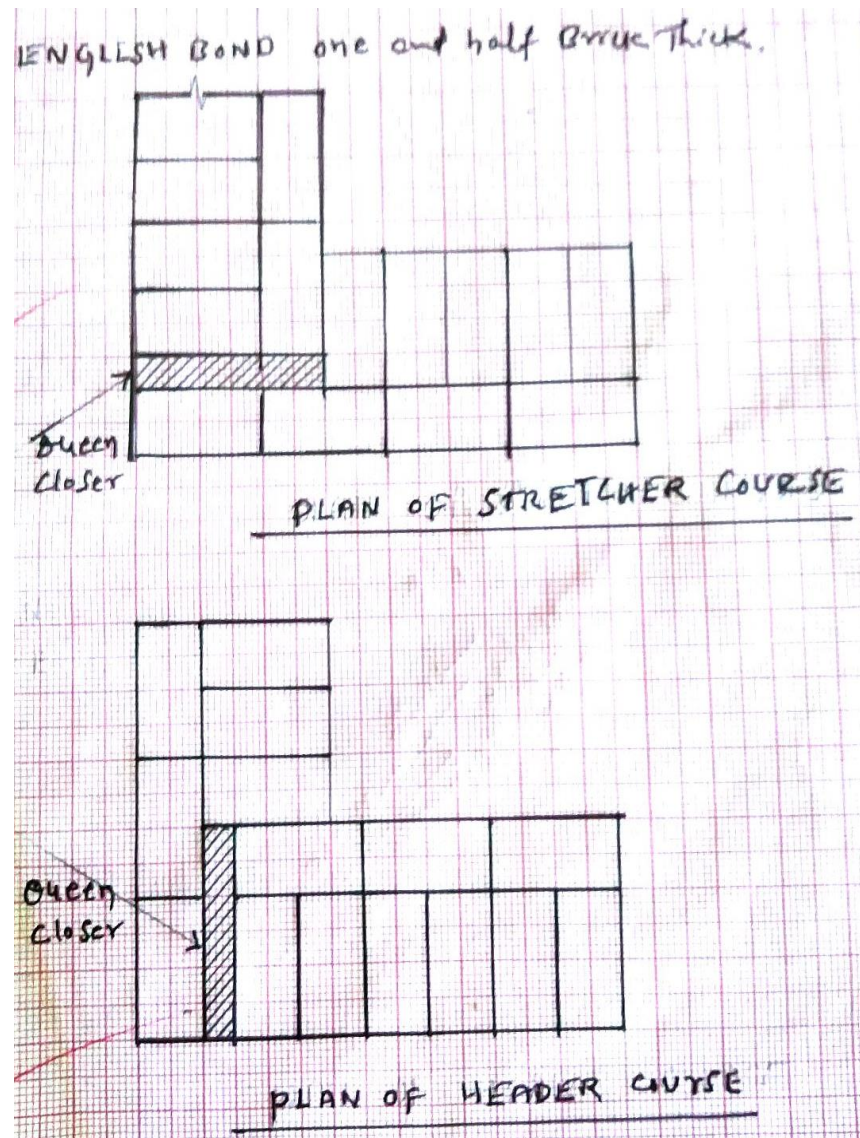
# English Bond

- ❖ It is the most common and popular bond, In this type of bond the alternate courses of header and structures are laid.
  - ❖ It is necessary to a place queen closer after the 1<sup>st</sup> header in the header course to break the joint.
- 
- Following are the features of English bond.
    1. The header course never start with a **queen closer**
    2. Each alternate **header** should be **centrally placed** over the stretcher.
    3. Continuous **vertical joint** should not be allowed.
    4. In stretcher course the stretcher should have **minimum** lap of one fourth of **its length** over the headers.
    5. Only header should be used **for hearting** of the thicker wall.
    6. Since the **number of vertical joints in header course** is **twice** the no of joints in the stretcher course. **The joints in the header course are made thinner than joints in stretcher course.**

# One brick thick and one half brick thick English bond



# One and half brick thick English bond



# Flemish bond

- In this arrangement of bonding each course consist of alternate headers and structure , the alternate header is center over the structures in course below.

The following are the main features of Flemish bond

- 1) In each course headers and structures are alternatively placed.
- 2) Every header is centrally supported over a structure below it .
- 3) Large no. of brick bats are used in Flemish bond.
- 4) Skilled works are required for the construction of this bond.

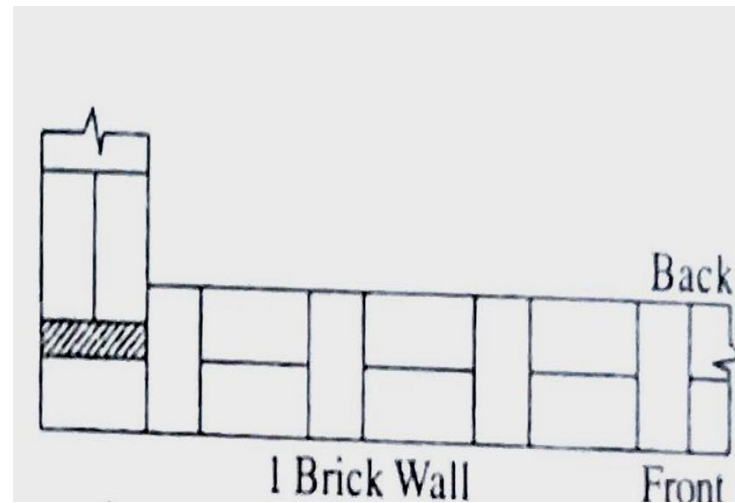
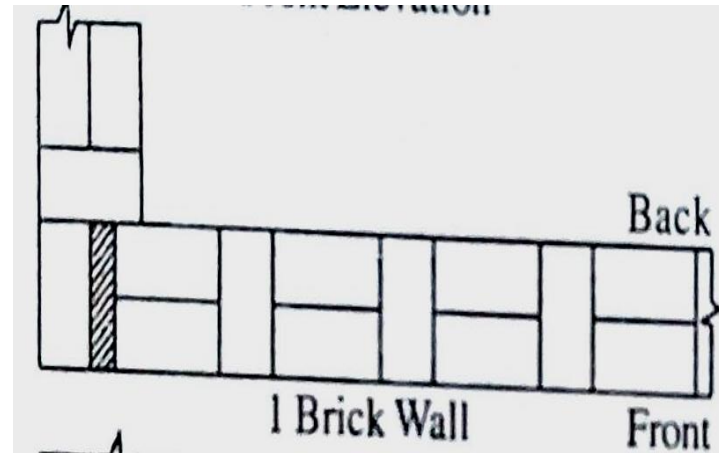


- Flemish bond is divided into 2 types
- a) Double Flemish bond
- b) Single Flemish bond

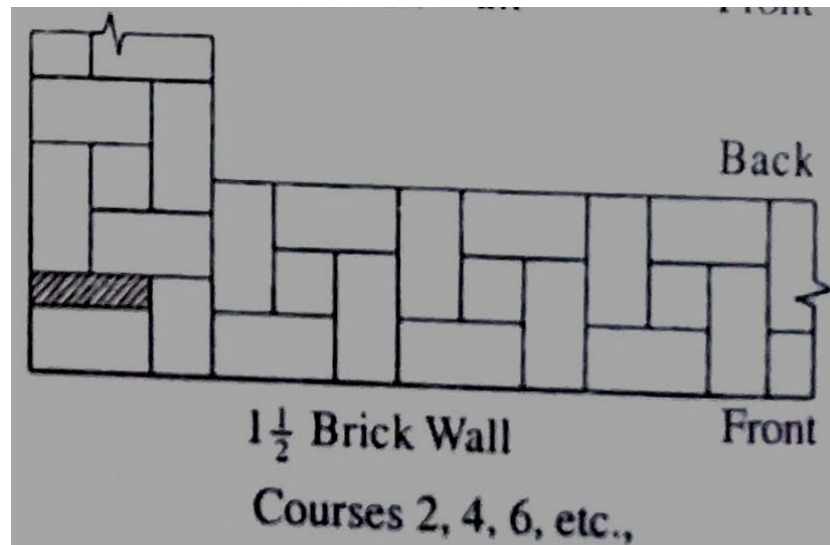
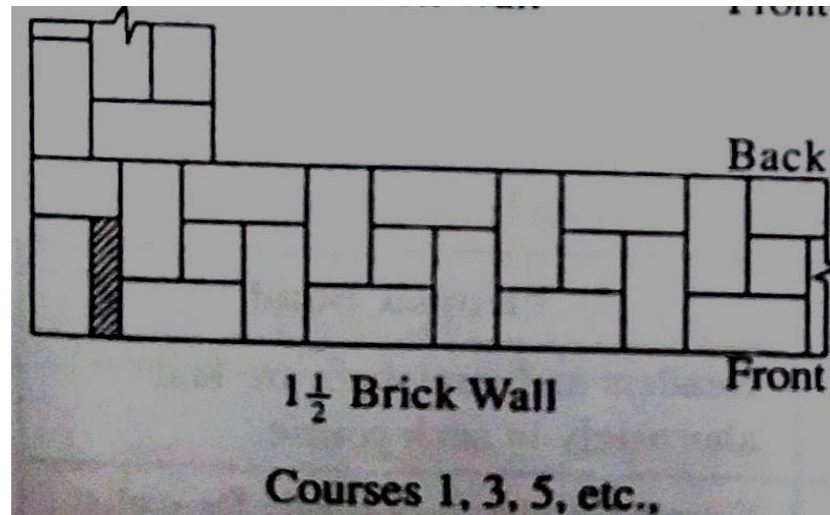
- a) Double Flemish Bond

- In this bond alternate headers and structures are laid in each course. Facing and backing of the wall of the same appearance. The queen closer is placed next to the queen header. This type of bond is economical and has good appearance.

# Flemish bond One Brick Thick



## Flemish Bond One and Half Brick Thick



# Comparison between English Bond and Flemish Bond

## English Bond

1. Headers and structures are laid in alternate course
2. It is strongest of all types of bond
3. It provides rough appearance.
4. There are no continuous joints
5. Special attention is not required
6. Progress of work is more
7. It is costly because no brick bats are used

## Flemish Bonds

1. Header & Structures are laid in alternate in each course.
2. Comparatively less strong
3. It provides good appearance.
4. Partly continuous joints appear in the structures.
5. Special attention is required.
6. Progress of work is less
7. It is economical because brick bats are used

# Types of bonds and their uses

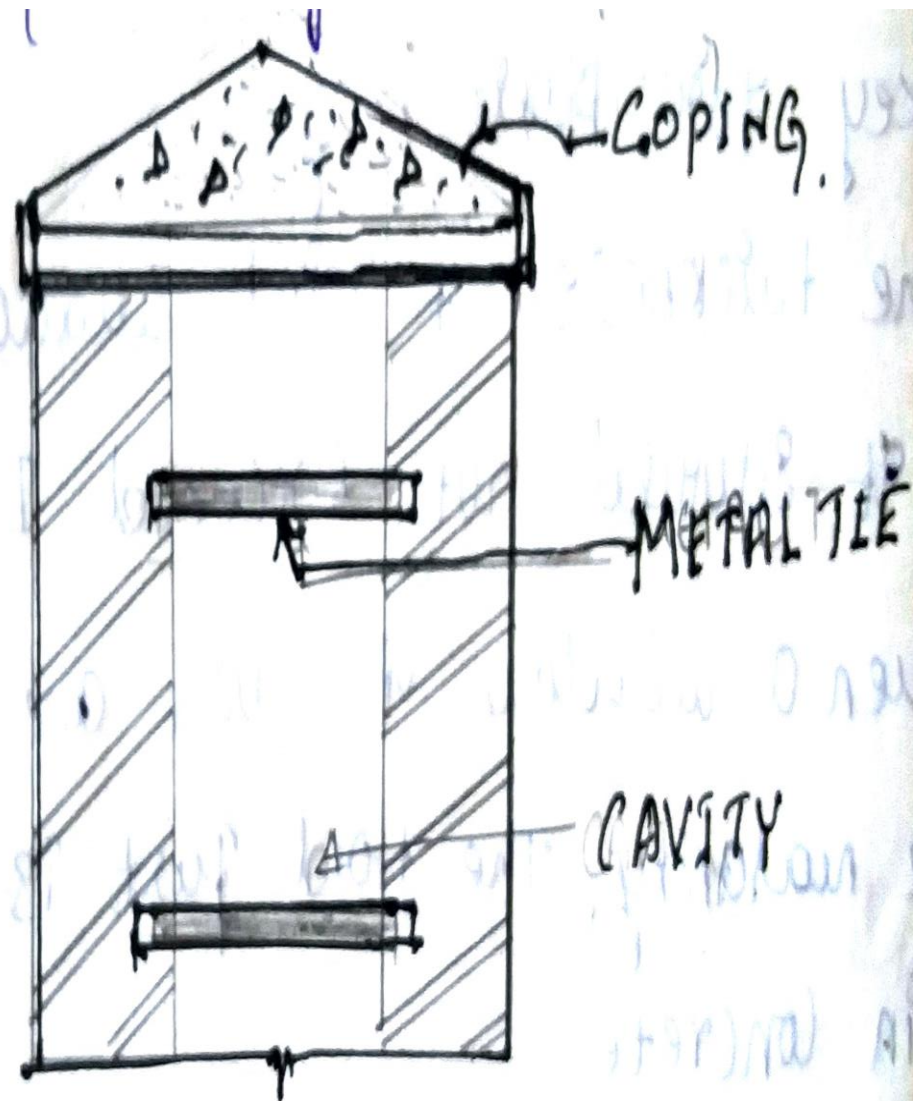
Bond	Uses
Structure bond	Suitable for half brick wall
Header bond	It is suitable for curved wall
English bond	Suitable for all types
Flemish bond	It is economical bond
Garden wall bond	Suitable for boundary wall
Zig zag bond	Suitable for floor paving

# General Principle in brick masonry

1. In good brick masonry the brick should be hard, well burnt, and tough with uniform colour, shape and size should be used.
2. The brick should be saturated with water so has to prevent absorption of moisture in the mortar.
3. The brick should be laid on their bed with frog pointing upward.
4. The face of the wall should be constructed vertically.
5. Bond should be maintaining through the construction work.
6. The brick work should be raised uniformly.
7. The mortar to be used should be of good quality and specified proportion.
8. When the mortar is green the joints should be raked to a depth of 10 to 15 mm to provide key for plastering.
9. The thickness of joint should be uniform and it should not exceed 1cm
10. When a window or door are to be fixed to the masonry. The hold part is to be embedded in concrete.
11. Plastering should be done after 28 days of completion of brick work should be well water for period 1 to 2 weeks.

# CAVITY WALL

- It is a wall comprising of two leaves. They are separated by cavity. To provide an air space within the wall. This to leaves or tied together with a metal rod.
- The width of the cavity should not be less than 50mm and not more than 1150mm
- The space between may be left as cavity or filled with water proof in material.



SECTION OF CAVITY WALL



# Advantage of cavity wall

1. The moisture cannot enter from outer wall to inner wall.
2. It provides good insulation against sound.
3. Protection against effloresce.
4. It proves economical during construction
5. Load on the foundation is reduced.
6. There is a reduction of heat transfer since there is a layer of air.

# Partition wall

- This partition wall is a non load bearing wall. It is used to divide rooms, corridor, hall etc... for the purpose of privacy, this partition is resting on flooring concrete or on beams they are designed to take self weight only.
- Following are the types of partition walls
  1. Brick partitions
  2. Concrete block partition
  3. Glass partition
  4. Ply wood partition
  5. Hard board partition
  6. AC sheet partition
  7. Metal partitions
  8. Wood wool slab partitions

- 1) Brick partitions: These are half brick thick wall constructed in stretcher bond with cement mortar. The length of partition wall is more than 2m intermediate pillar are to be constructed.
- The partition wall may be **plane brick partition** or **Reinforced brick partition wall**.
- a) Plane brick partition wall: This wall is generally 10cm thick plastered on both the places the brick work is constructed with cement mortar.
- b) Rein forced brick partition wall: This type of wall is similar to plane brick partition wall except that at every 3<sup>rd</sup> or 4<sup>th</sup> course, steel reinforcement of steel bars (2nos) are provided.
- Reinforced brick partition wall is are more durable and possess more strength.

## 2) Concrete block partitions

- Cement concrete blocks may be hollowed or plain concrete and they are pre cast. These materials are extensively used in the construction of multi storied building and other framed structures.
- Solid blocks are used external walls; hollow concrete blocks are used for internal walls. Hollow blocks reduce the weight of the wall and cost of construction.
- Following are the **advantages of concrete block partitions over brick partition wall.**
- In hollow concrete block there is a savings of material
- The no. of joints are considerably reduced. i.e there is less consumption of mortar
- Less skilled labour can work.
- Hollow concrete block gives good insulation against **heat, cold, sound etc.**

### 3) Glass partitions.

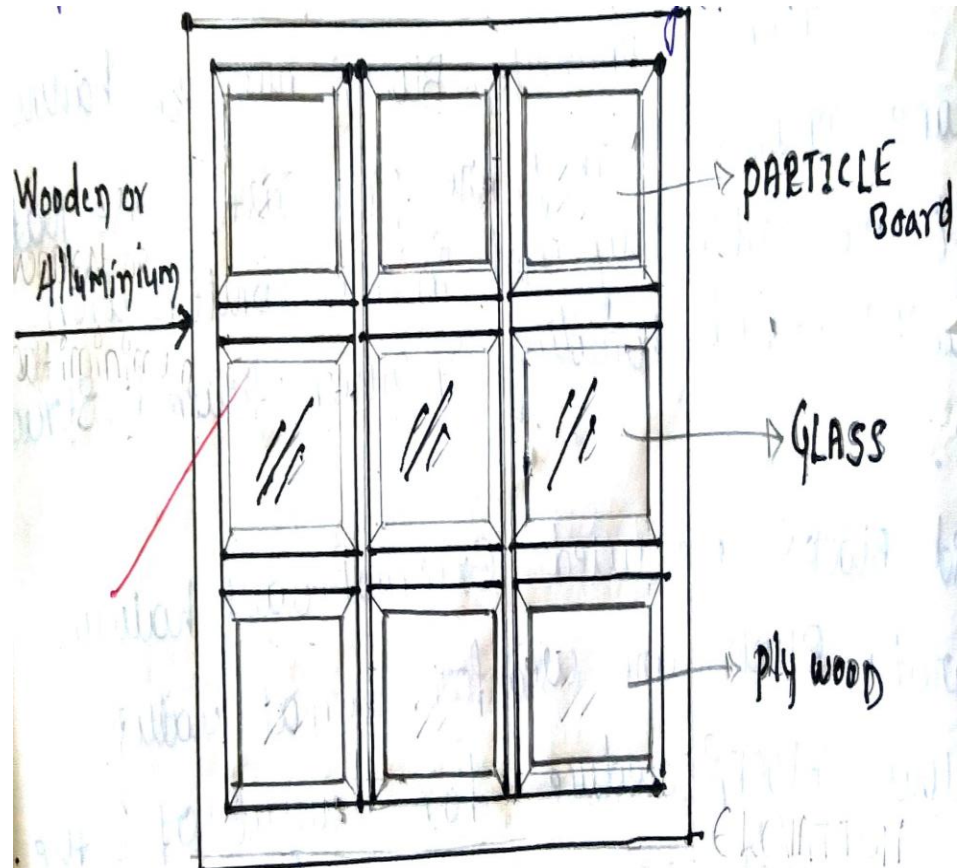
Glass partitions provide good aesthetic and it allow light. These partitions are damp proof, sound proof and heat proof. They are easy to clean in the form of sheet are in the form of hollow block.

#### a) Sheet glass partition

For this a timber or aluminium frame work is prepared and thin sheet of glass are inserted in the panels and they are fixed use in beadings.

Following are the advantages of glass partition

1. It gives decorative effect
2. They are light in weight sound proof and damp proof.



## **b) Hollow glass block partition**

They are made from structural glass they do not require timber frame work and these blocks are translated. They can used for staircase area and external walls to the see weight.

Following are **advantages**

- 1) The surface is smooth
- 2) The blocks do not required timber frame work.
- 3) They are impervious to moisture
- 4) They are sound proof, fire proof and good appearance.

#### 4) Plywood partitions

- Plywood is a commercial wood prepared by several layers of thin wood. Plywood sheets are inserted into the panel and joints are finished. The partitions are light in weight, economical and easy to construct.

Following are the **advantages**.

1. Better appearance
2. Easily workable
3. It has uniform tensile strength in all directions
4. It is available in large size (4 by 8)

## 5) Hard Board Partition

In this type of partitions slabs straw board are used they are prepared by mixing and compressing straw and a glue.

Following are **the advantages**

1. They are more compact strong and durable
2. They are least effected by usage in temperature
3. They give good appearance and finish

## 6) Aluminium Partitions

1. The frame work is prepared by using aluminium section. It was excellent strength to its weight.
2. The gap between the frames is filled with glass or partical board as required.
3. Aluminium partition wall in industries is largest segment of construction market. It has low maintenance and good appearance.