

Types of Bonds in Brick Masonry Wall Construction and their Uses

Types of bonds in brick masonry wall construction are classified based on laying and bonding style of bricks in walls. The bonds in brick masonry is developed by the mortar filling between layers of bricks and in grooves when bricks are laid adjacent to each other and in layers in walls.

Mostly used material for bonds in brick masonry is cement mortar. Lime mortar and mud mortar are also used.

Types of Bonds in Brick Masonry Wall Construction :

The most commonly used types of bonds in brick masonry are:

1. Stretcher bond
2. Header bond
3. English bond and
4. Flemish bond

Other Types of bonds are:

1. Facing bond
2. Dutch bond
3. English cross bond
4. Brick on edge bond
5. Raking bond
6. Zigzag bond
7. Garden wall bond

1. Stretcher bond

Longer narrow face of the brick is called as stretcher as shown in the elevation of figure below. Stretcher bond, also called as running bond, is created when bricks are laid with only their stretchers showing, overlapping midway with the courses of bricks below and above.

Stretcher bond in the brick is the simplest repeating pattern. But the limitation of stretcher bond is that it cannot make effective bonding with adjacent bricks in full width thick brick walls. They are suitably used only for one-half brick thick walls such as for the construction half brick thick partition wall.

Walls constructed with stretcher bonds are not stable enough to stand alone in case of longer span and height. Thus they Then need supporting structure such as brick masonry columns at regular intervals.

Stretcher bonds are commonly used in the steel or reinforced concrete framed structures as the outer facing. These are also used as the outer facing of cavity walls. Other common applications of such walls are the boundary walls, gardens etc.

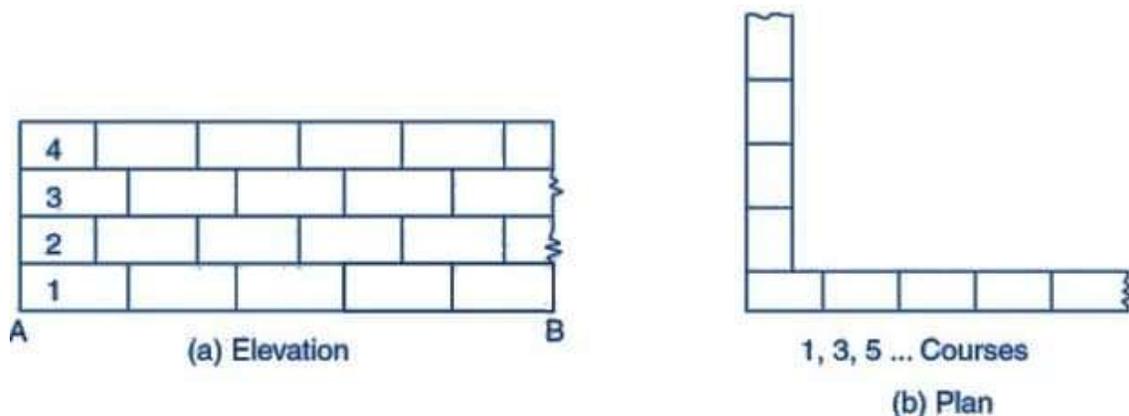


Fig-1: Stretcher Bond

2. Header bond

Header is the shorter square face of the brick which measures 9cm x 9cm. Header bond is also known as heading bond. In header bonds, all bricks in each course are placed as headers on the faces of the walls. While Stretcher bond is used for the construction of walls of half brick thickness whereas header bond is used for the construction of walls with full brick thickness which measures 18cm. In header bonds, the overlap is kept equal to half width of the brick. To achieve this, three quarter brick bats are used in alternate courses as quoins.

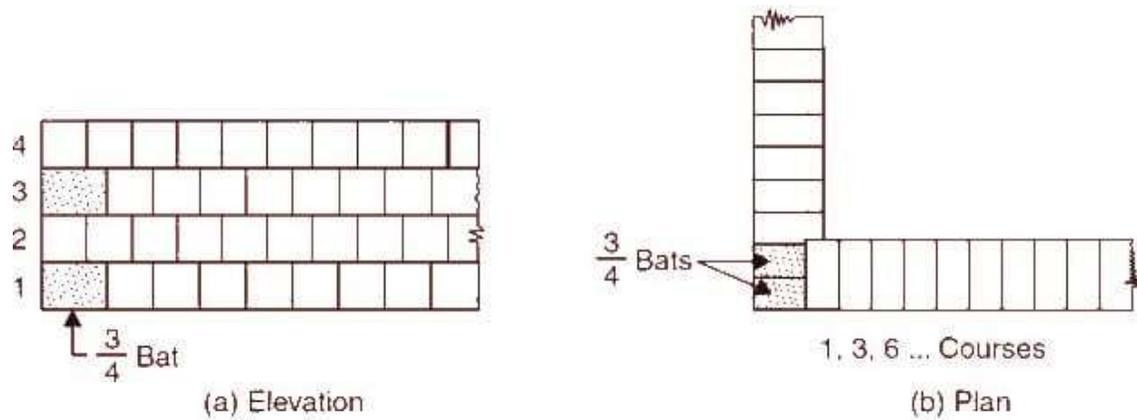


Fig-2: Header Bond

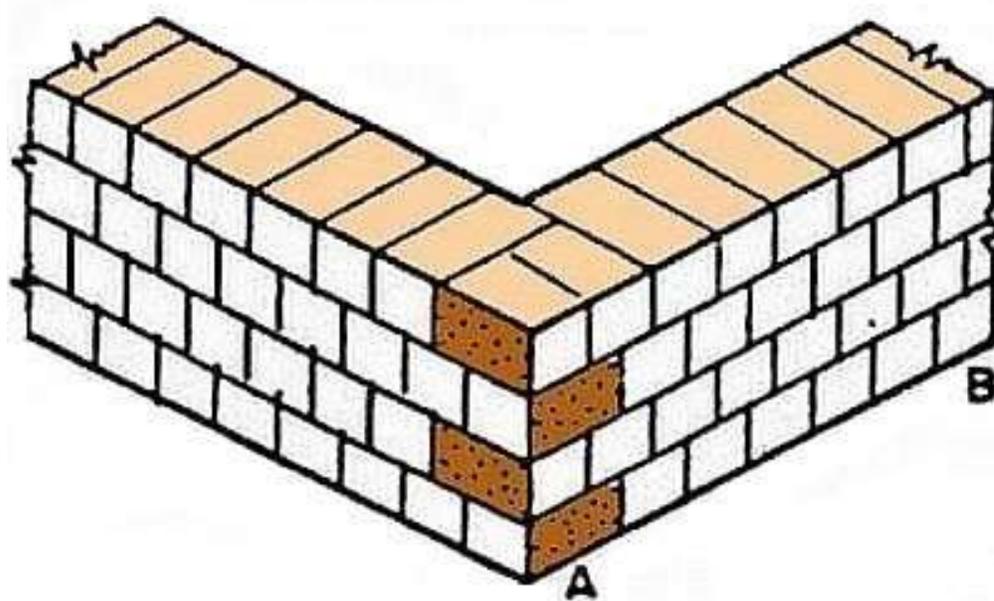


Fig-3: Header Bond Isometric View

3. English Bond

English bond in brick masonry has one course of stretcher only and a course of header above it, i.e. it has two alternating courses of stretchers and headers.

Headers are laid centered on the stretchers in course below and each alternate row is vertically aligned.

To break the continuity of vertical joints, quoin closer is used in the beginning and end of a wall after first header. A quoin close is a brick cut lengthwise into two halves and used at corners in brick walls.

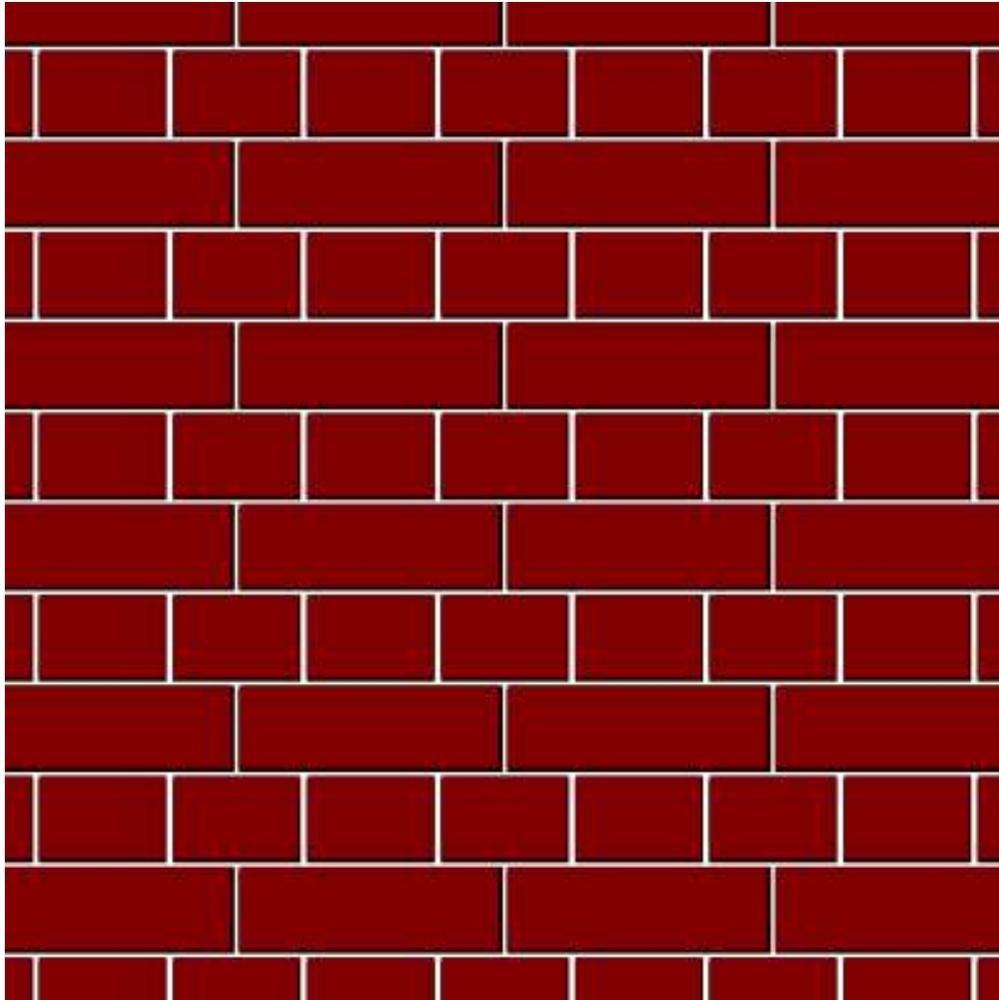


Fig-4: English Bond

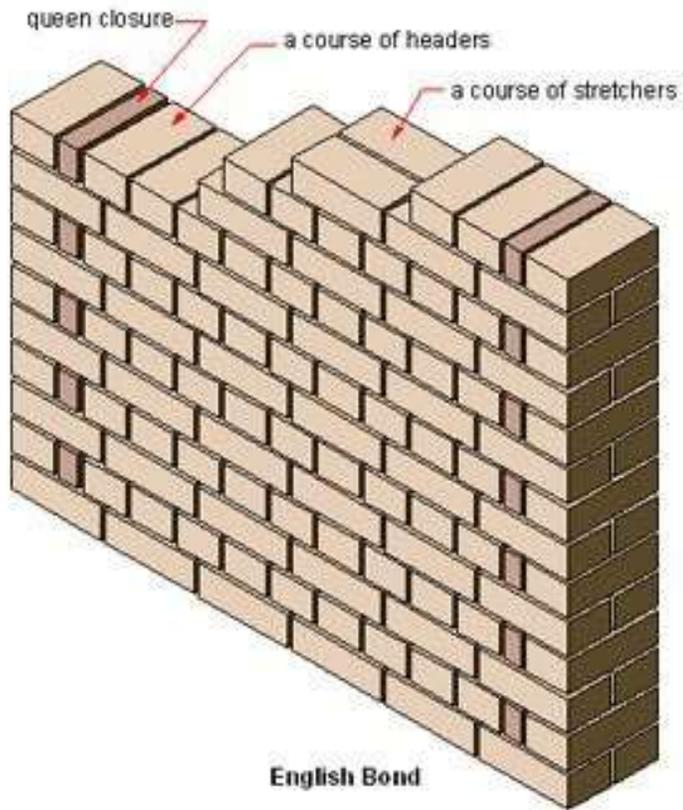


Fig-4: English Bond – Isometric View

4. Flemish Bond

For the breaking of vertical joints in the successive courses, closers are inserted in alternate courses next to the quoin header. In walls having their thickness equal to odd number of half bricks, bats are essentially used to achieve the bond.

Flemish bond, also known as Dutch bond, is created by laying alternate headers and stretchers in a single course. The next course of brick is laid such that header lies in the middle of the stretcher in the course below, i.e. the alternate headers of each course are centered on the stretcher of course below. Every alternate course of Flemish bond starts with header at the corner.

The thickness of Flemish bond is minimum one full brick. The disadvantage of using Flemish bond is that construction of Flemish bond is difficult and requires greater skill to lay it properly as all vertical mortar joints need to be aligned vertically for best effects. For the breaking of vertical joints in the successive courses, closers are

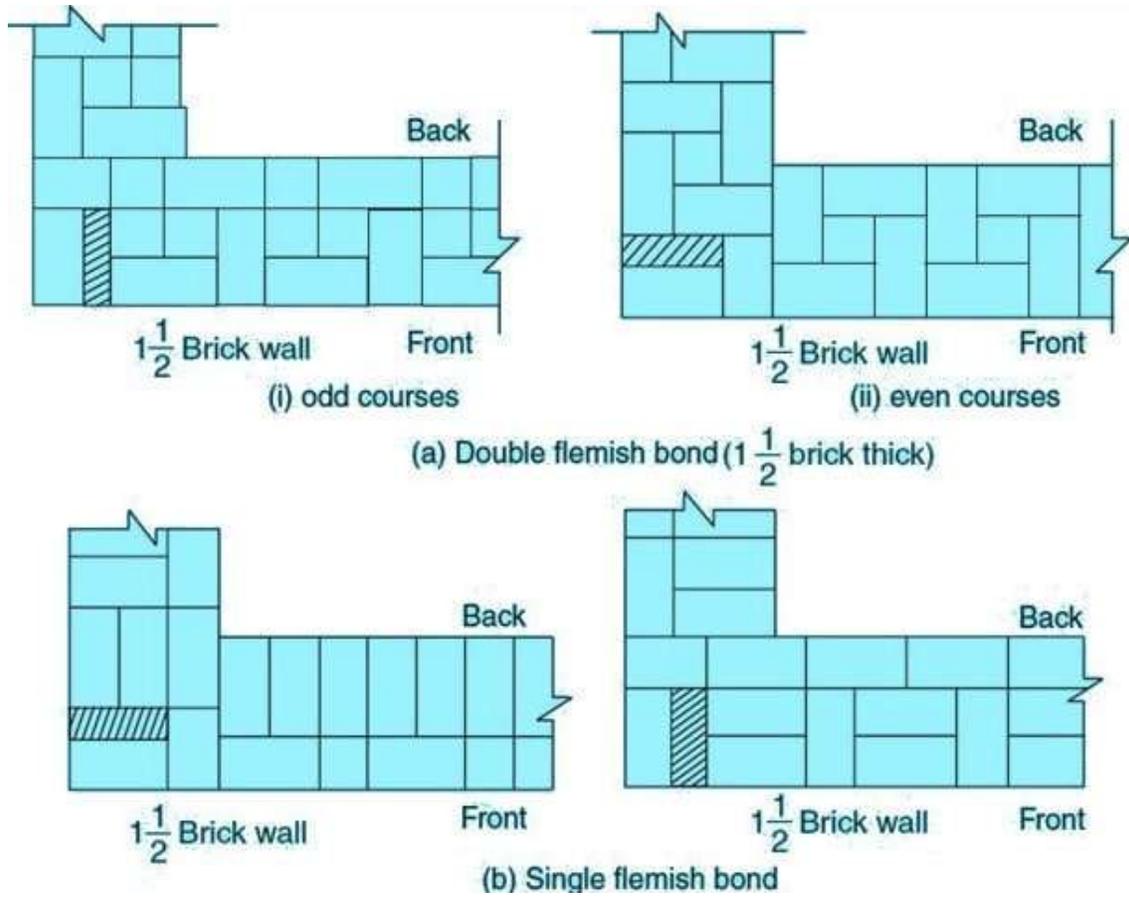


Fig-5: Flemish Bond

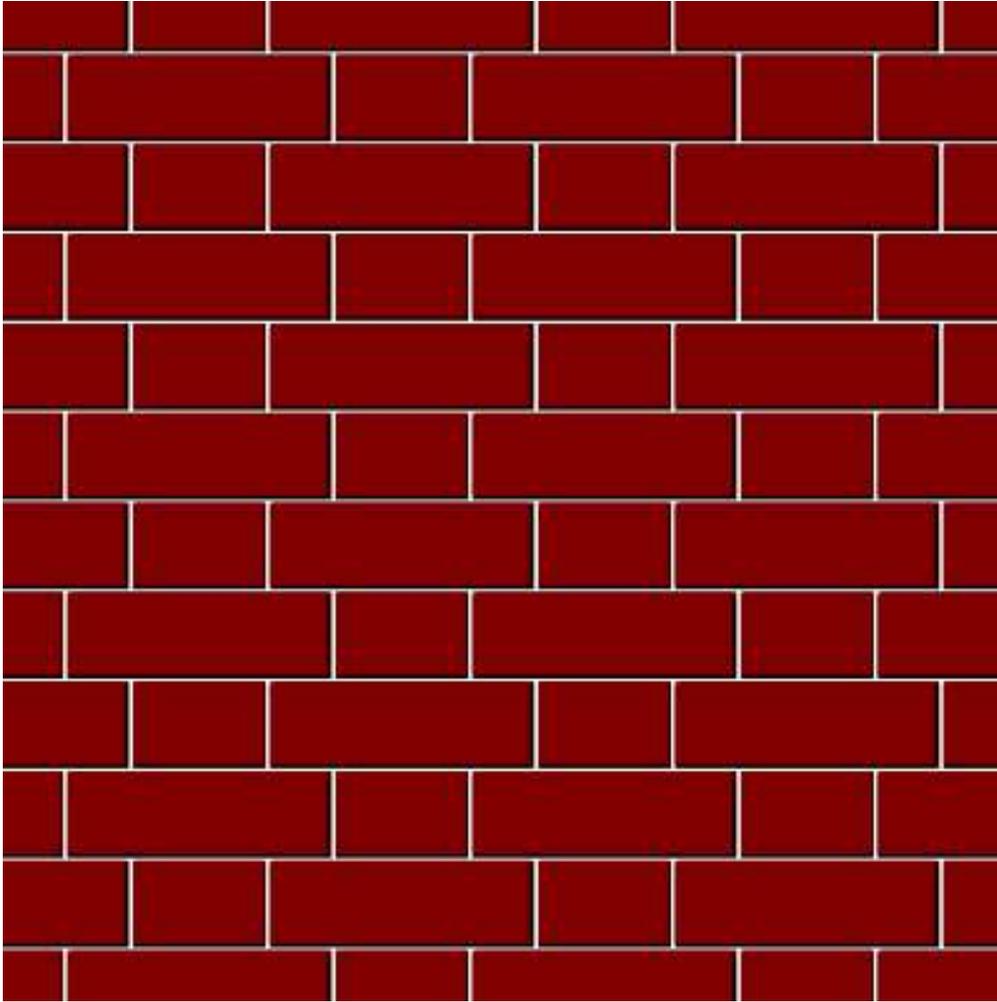


Fig-6: Flemish Bond Front Appearance

Flemish bonds are classified as:

- Single Flemish Bond
- Double Flemish Bond

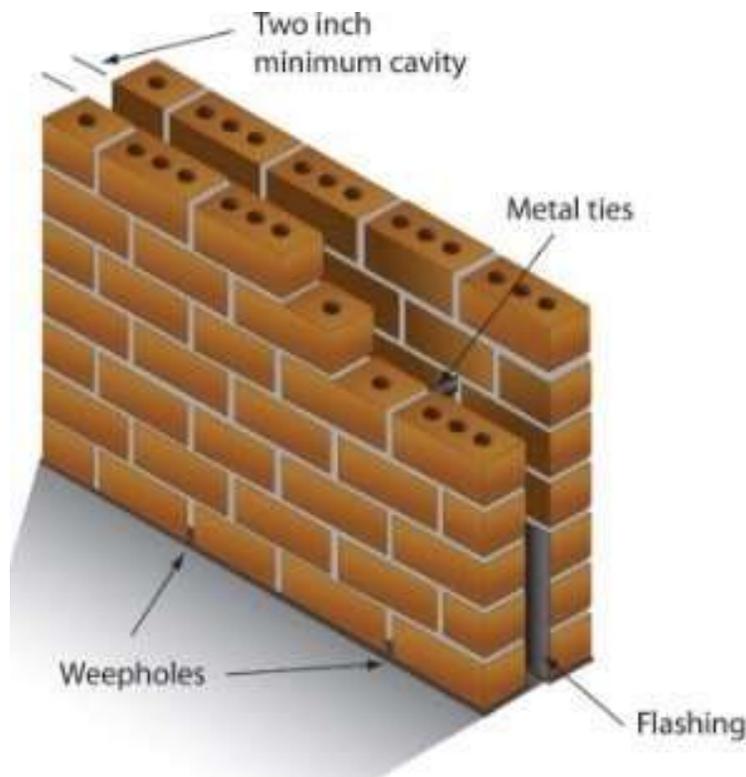
Single Flemish bond is a combination of English bond and Flemish bond. In this type of construction, the front exposed surface of wall consists of Flemish bond and the back surface of the wall consists of English bond in each course. Minimum thickness required for single Flemish bond is one and a half brick thickness. The main purpose of using single Flemish bond is to provide greater aesthetic appearance on the front surface with required strength in the brickwork with English bond.

Double Flemish Bond has the same appearance both in the front and back elevations, i.e. each course consists of alternate header and stretcher. This type of bonding is comparatively weaker than English bond.

Cavity Walls Construction and Advantages

What is a Cavity Wall?

Cavity walls are constructed with two separate walls for single wall purpose with some space or cavity between them. These two separate walls are called as leaves of cavity wall. The inner wall is called as internal leaf and outer wall is called as external leaf. Cavity wall is also called as Hollow wall.



For non-load bearing cavity wall, two leaves are of equal thickness or sometimes internal leaf with more thickness is provided. The cavity size should be in between 4 to 10cm. The internal and external leaves should have at least 10mm thickness. The two leaves are interconnected by metal ties or links as shown in above figure.

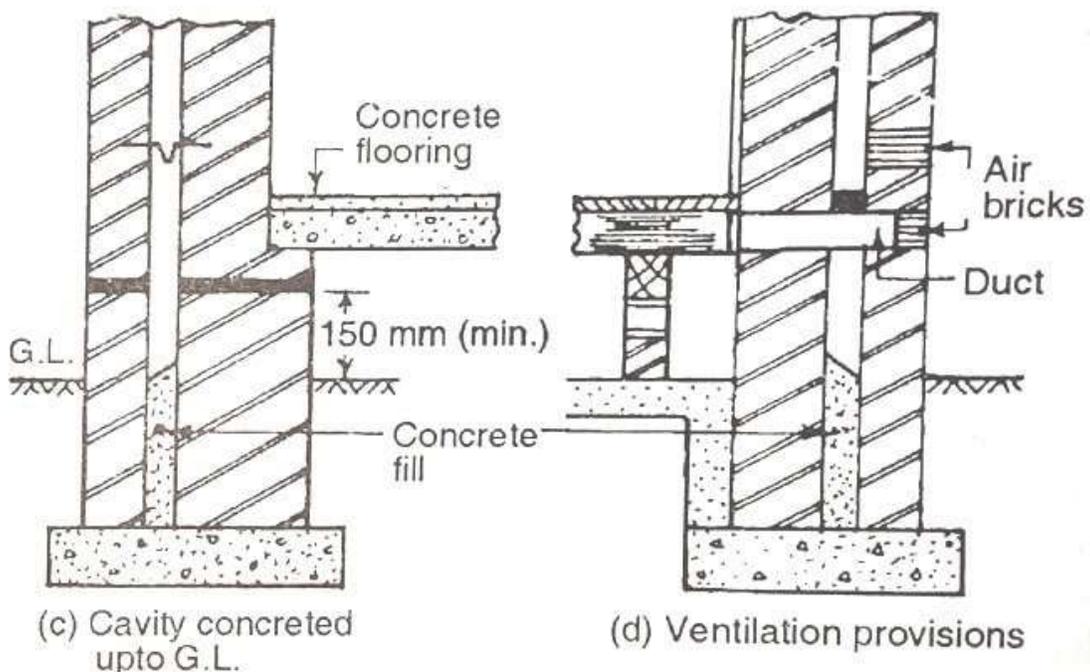
Advantages of Cavity Walls

Following are the advantages of cavity wall when compared to solid walls.

- Cavity walls give better thermal insulation than solid walls. It is because of the space provided between two leaves of cavity walls is full of air and reduces heat transmission into the building from outside.
- Economically they are cheaper than solid walls.
- Moisture content in outer atmosphere is does not allowed to enter because of hollow space between leaves. So, they also prevent dampness.
- They also act as good sound insulators.
- They also reduce the weights on foundation because of their lesser thickness.
- Outer Efflorescence is also prevented.

Construction of Cavity Walls

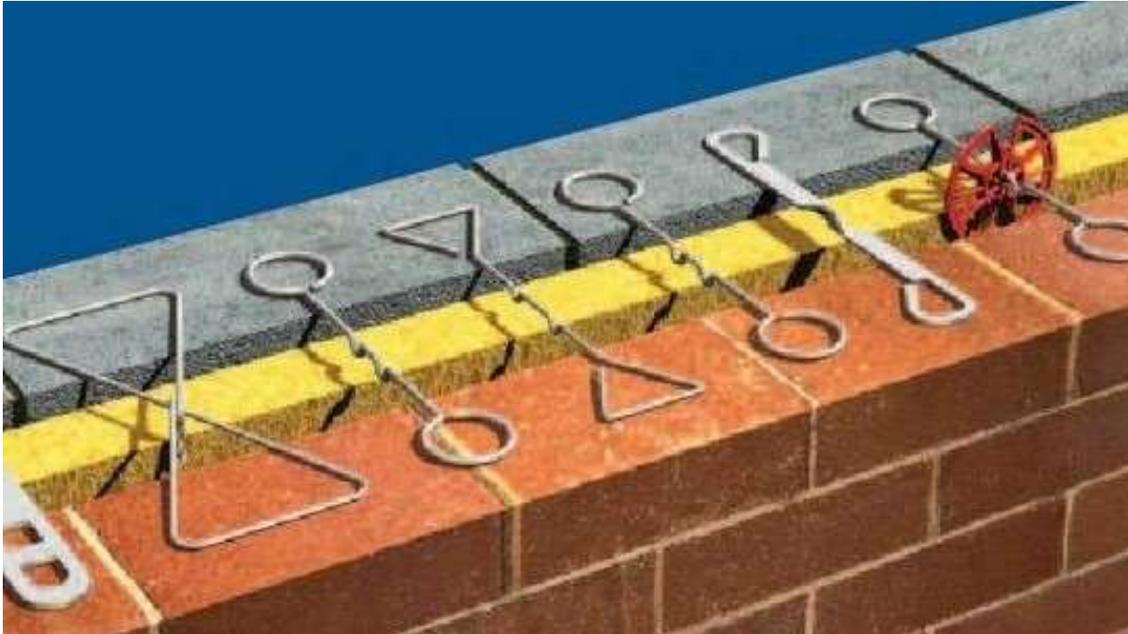
In general, cavity wall doesn't require any footings under it, just a strong concrete base is provided on which cavity wall is constructed centrally. Two leaves are constructed like normal masonry, but minimum cavity must be provided in between them. The cavity may be filled with lean concrete with some slope at top up to few centimeters above ground level as shown below.



Weep holes are provided for outer leaf at bottom with an interval of 1 m. Normal bricks are used for inner leaf and facing bricks are used for outer leaf. Different

masonry is also used for cavity wall leaves. The leaves are connected by metal ties or wall ties, which are generally made of steel and are rust proof.

The maximum horizontal spacing of wall ties is 900mm and maximum vertical spacing is 450mm. The wall ties are provided in such a way that they do not carry any moisture from outer leaf to inner leaf. Different shapes of wall ties are shown in below figure.



For half brick thickness leaves, stretcher bond is provided. And for one brick thickness or more thickness, English bond or Flemish bonds type constructions are provided. While laying bricks, care should be taken without filling the cavity with cement mortar.

To prevent mortar dropping in cavity, wooden battens are provided in the cavity with suitable dimensions. These battens are supported on wall ties and whenever the height of next wall tie location is reached, then the battens are removed using wires or ropes and wall ties are provided.



Two leaves should be constructed simultaneously. Spacing should be uniform and it is attained by predetermining the location of wall ties. Damp proof course is provided for two leaves separately. In case of doors and windows, weep holes are provided above the damp proof course.

Types of Partition Walls for Homes and Offices

Partition walls are vertical dividers which are used to separate building internal spaces into rooms and circulation areas like corridors. Partition wall types and their applications are discussed in the following sections.



Depending upon the material used partition walls may be divided into the following different types:

1. Brick partitions wall
2. Clay brick partition wall
3. Glass partitions wall
4. Concrete partitions wall
5. plaster slab partition wall
6. Metal lath partition wall
7. A.C. sheet or G.I. sheet partitions wall

8. wood-wool partition wall
9. Timber partitions

1. Brick Partitions

There are three types of brick partition walls which include plain brick partition wall, reinforced brick partition wall, and brick nogging partition wall.

Plain brick partition wall

- It is constructed from plain bricks, and it is common and cost effective
- The bricks are laid as stretchers in cement mortar.
- Thickness of plain brick partition wall is 10cm or half a brick.
- Recommended height is maximum 2m for construction in a day
- It is plastered on both sides
- Strong and fire resistant if the brick wall is constructed properly

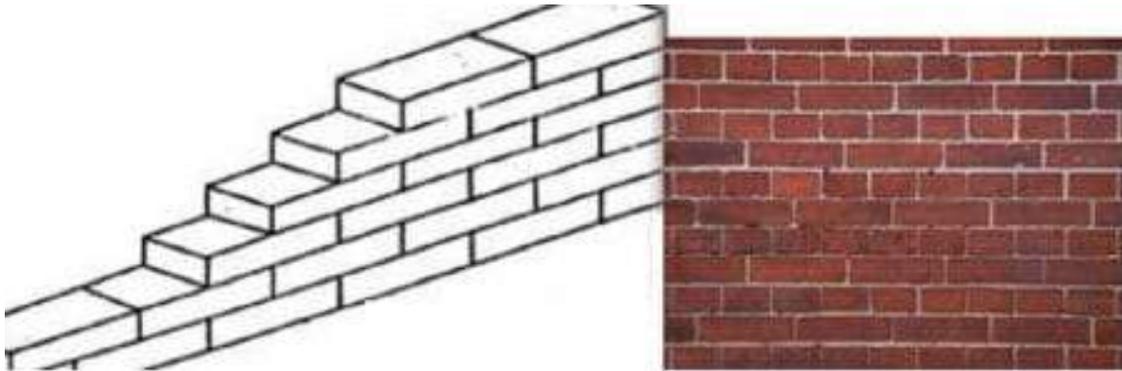


Fig. 1: Plain Brick Partition Wall

Reinforced brick partition wall

- It is similar to plain brick partition but reinforced brick is much stronger due to the placement of reinforcements.
- Reinforcements, which is in form of wire mesh strips or iron bare, are placed at every third or fourth course.
- Reinforced wire strip width ranges from 25mm to 28mm and thickness is 1.6mm.

- Steel bar diameter is 6mm
- The thickness of the wall equal to 10cm or half a brick
- This type of partition wall used when better longitudinal bond is need and when the partition wall has to support other super imposed loads.

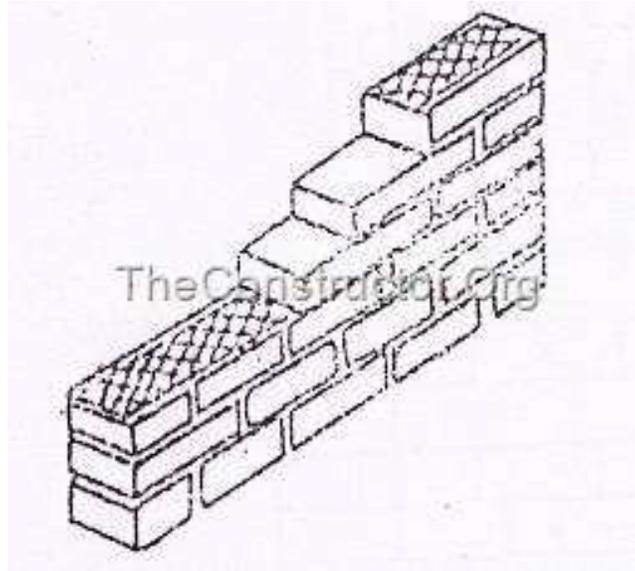


Fig. 2: Reinforced Brick Partition wall

Brick nogging partition wall

- Brick nogging partition wall consists of brickwork built within a framework of wooden members.
- The timber framework consists of vertical posts (studs). Horizontal members (nogging), sill, and head as explained in
- Studs spaced at 60 cm to 150 cm and held in position by nogging pieces.
- The nogging pieces are housed into the studs at 60 cm to 90cm apart vertically.
- The wooden framework provide stability to the partition against lateral loads and vibrations caused due to opening the adjoining door and windows
- The bricks are commonly laid flat, but they also may be laid on edge
- The brickwork is plastered from both sides.
- Cement mortar proportion 1:3 is used

- The size of the studs and nogging depends upon the thickness of partition wall.
- For 10cm thick partition wall, the studs and nogging should be 15 cm wide so that after the brickwork is plastered from both the faces, the timber framework may finish flush with the wall face.
- The surfaces of the timber frame work coming in contact with brick work are coated with coal tar.
- This type of partition wall suffers from the drawback of the timber getting delayed.
- The mortar used may not stick well to the timber members and thus the brickwork is likely to become loose after sometime.

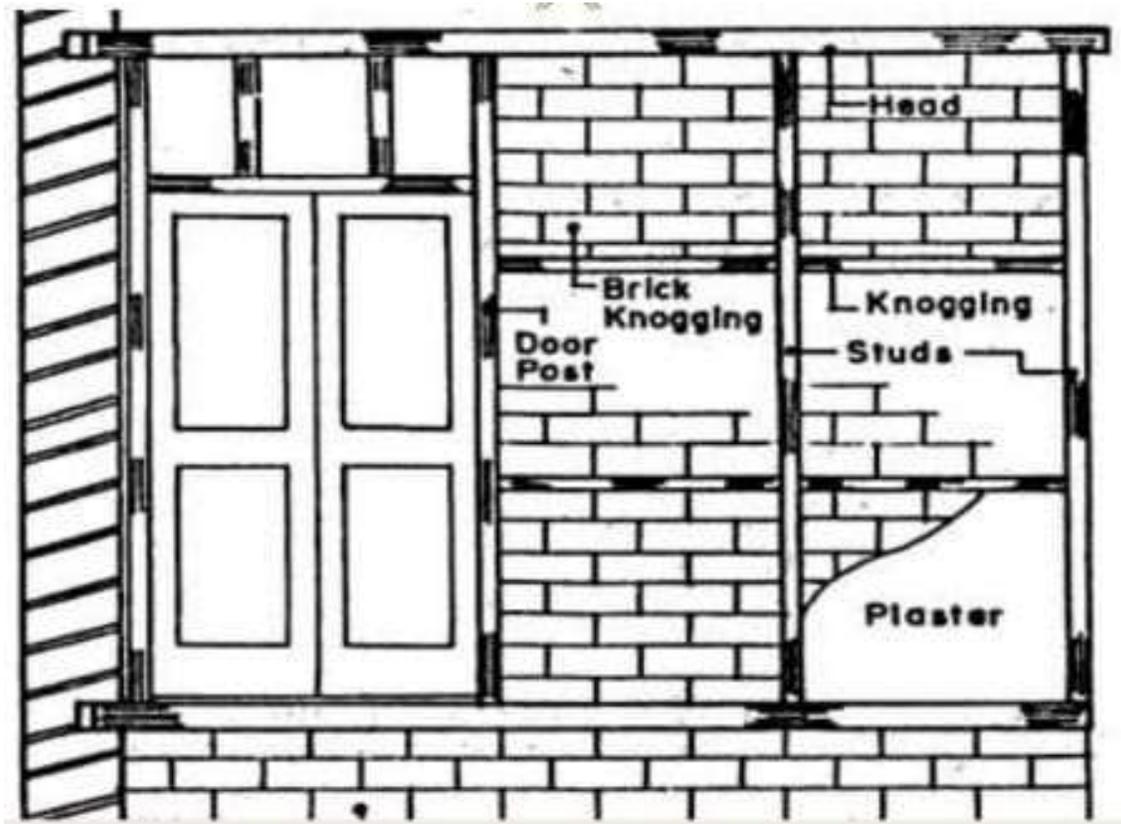


Fig. 3: Timber framework in brick nogging partition wall

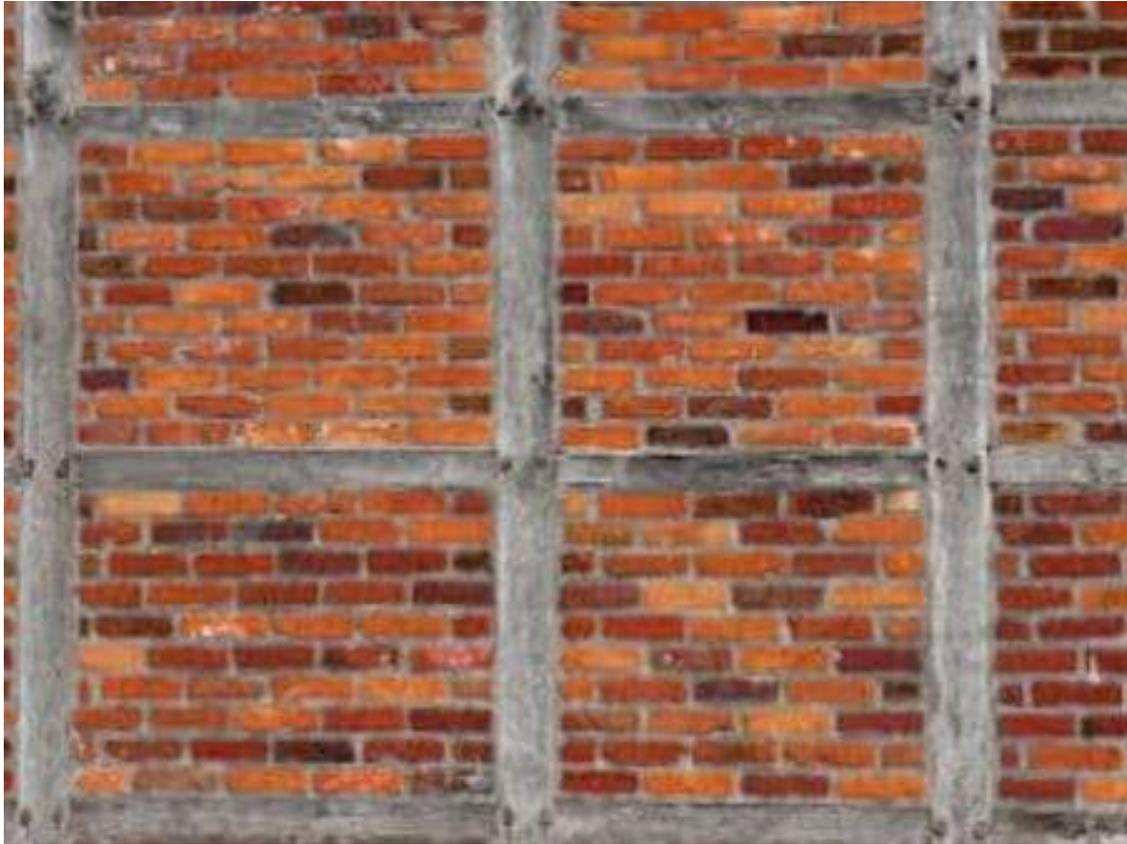


Fig. 4: Brick nogging partition wall; bricks are laid flat



Fig. 5: Brick nogging partition wall; bricks are laid on edge

2. Clay brick partition wall

- The blocks which are used for clay brick partition wall, is manufactured from clay or terracotta.
- Blocks may hollow or solid
- Hollow clay bricks are commonly employed for light partition wall
- The blocks are placed in mortar
- Hollow brick partition walls are rigid, economical, strong, fire resistant, and good heat sound insulator.
- The sizes of the hollow blocks differ with the texture of the material.
- The thickness of this type of partition wall varies between 6 cm to 15 cm.
- Hollow brick partitions walls are constructed in similar manner as structural load bearing walls.

- Grooves are provided on top, bottom, and sides of block to improve the bond between the block and plaster.

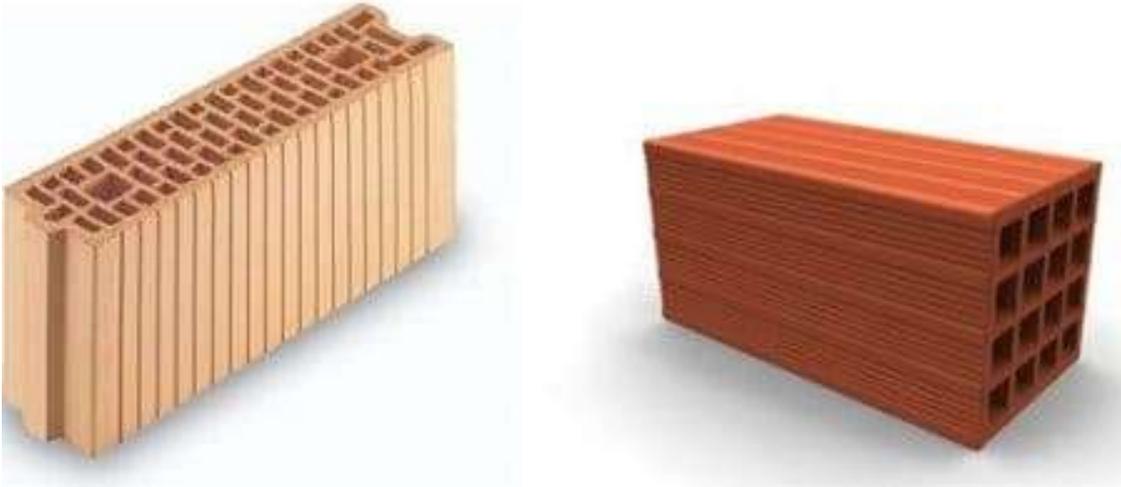


Fig. 6: hollow clay brick units

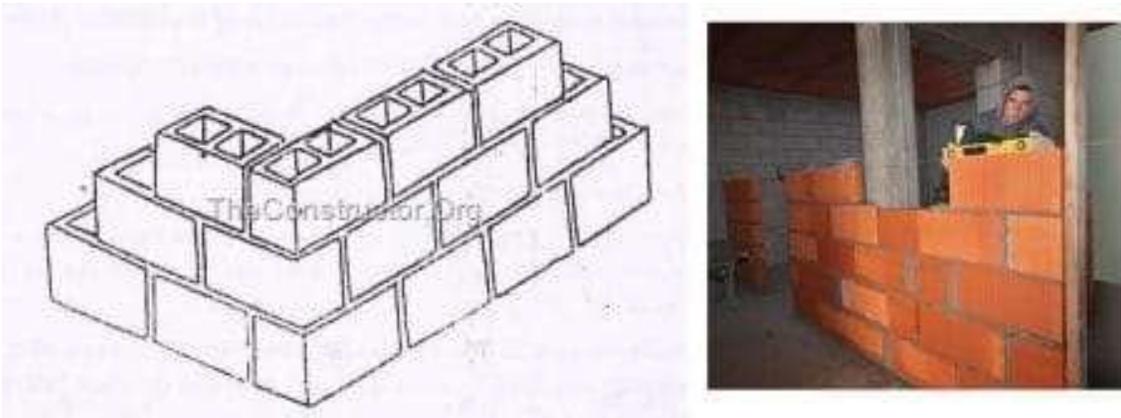


Fig.7: Hollow Clay Brick Partition wall

3.Glass partition walls

They are cheap, light, and easy in construction and provide reasonable privacy and sound insulation. such walls are constructed from glass sheet or hollow glass blocks which will be discussed below

Glass sheet partition wall

- It is constructed by fixing sheet of glass in a wooden framework.

- Glass sheets are fixed in timber framework using using timber beadings or by putty.
- The wooden framework consists of a number of horizontal and vertical posts, suitably spaced, to divide the entire area into a number of panels.
- The panels might be rectangular or square and their size varies with the choice of individual.
- Glass sheet partition wall is light, vermin proof, damp proof, and sound proof.
- Wired glass, bullet proof glass, and three-ply glass are examples of strong glass sheets which are suitable for glass sheet partition wall construction.



Fig.8: glass sheet partion wall

Hollow glass block partition wall

- It is constructed from hollow glass blocks.
- Hollow glass blocks are translucent glass units which are light and manufacture with various thicknesses, shapes, and sizes.
- The size of square hollow glass blocks, which is most widely used, is 14X14cm or 19X19cm with a thickness of 10cm.

- The hollow blocks are
- The jointing edges are painted internally and sanded externally to help the bond between mortar and glass block.
- The front and back sides are either decorated or left plain.
- Block glass is laid in cement- lime mortar- fine sand (1:1:4)
- All joints shall be filled adequately
- Metal strip reinforcement is placed at every third or fourth course for block height up to 15.
- Reinforcement is placed at every course if the blocks height exceeds 25cm
- There is another type of glass block with joggles and end grooves as well.



Fig.9: Glass block partition wall

4. Concrete Partition wall

It consists of concrete slab, plain or reinforced, supported laterally by vertical members. These slabs may be either precast or cast in situ.

Cast in situ concrete partition wall

- Thickness ranges from 80mm to 100mm

- It is poured monolithically with intermediate columns
- It is rigid and stable both in vertical and horizontal directions but the framework is costly.
- The reinforcement consisting of mild steel bars or B R C fabric is placed in the center of the wall thickness.
- Concrete mix usually adopted in the work is M15 (1:2:4).

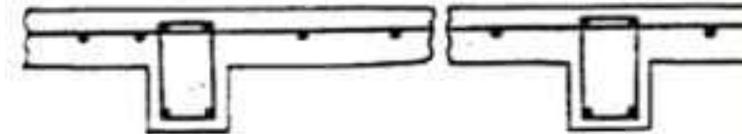


Fig.10: Cast in situ concrete partition wall

Precast concrete slab partitions wall

- the wall is built from precast concrete slab units
- precast unit thickness ranges from 25mm to 40mm
- precast units are secured to precast posts
- joints shall be filled with mortar
- Concrete mix is M15 (1:2:4).

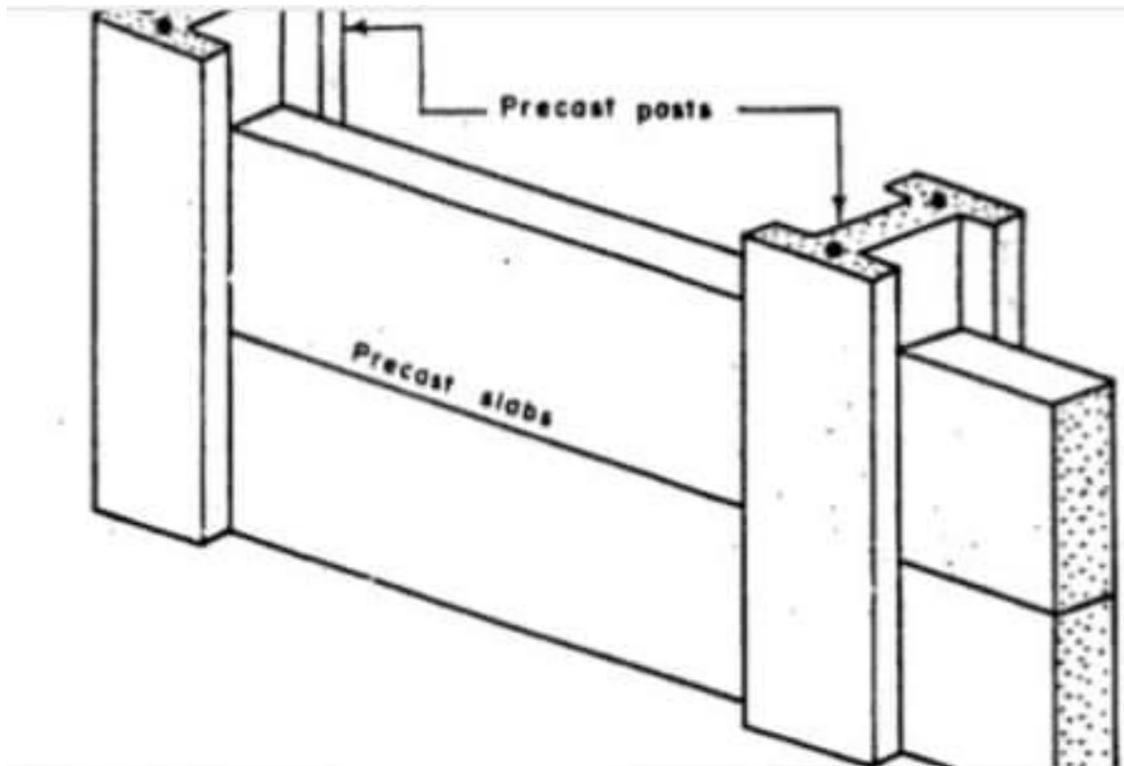


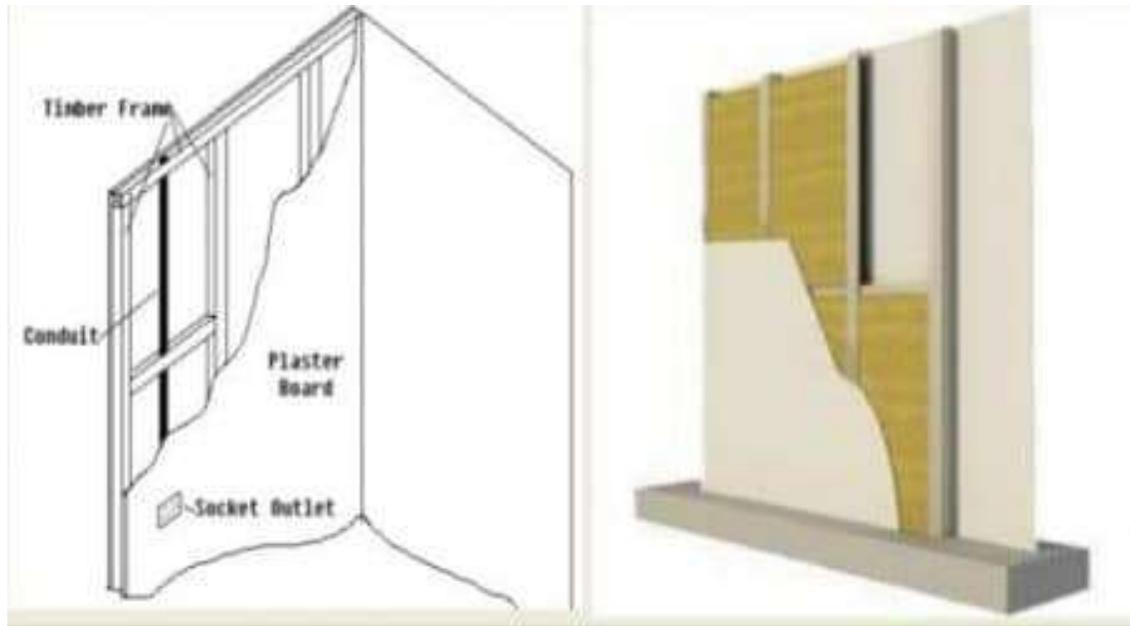
Fig.11: Precast concrete partition wall

Wall partitions constructed from special precast units

- the wall is constructed from precast T-shaped or L-shaped units
- light weight, hollow partitions can be built without the need for vertical posts
- cement mortar mix proportion of 1:3 is used for jointing

5.Plaster slab partition wall

- Plaster slabs or plaster boards are made from burnt gypsum or plaster of paris, mixed with sawdust or other fibrous material to reduce its weight
- Units of plaster slab prepared in an iron or timber mould with size 1 to 2m long, 30cm high and 50 to 100mm thick.
- they are equipped with suitable grooves to create rigid joints
- Plaster slab surface may be smooth or rough. The former is not plastered but rough surface act as key for plaster.



• Fig.12: Plaster slab partition wall

6.Metal lath partition wall

- Metal lath partition wall are thin, strong, durable and considerably fire resistant.
- Metal lath partition walls are constructed by placing 2cm or 2.5cm channels vertically (called studs) and fixing metal lath to it on one side.
- Plaster is applied to both the sides of the metal
- If hallow partition is required, metal lath is fixed to the channels on both the sides and then plaster is applied.

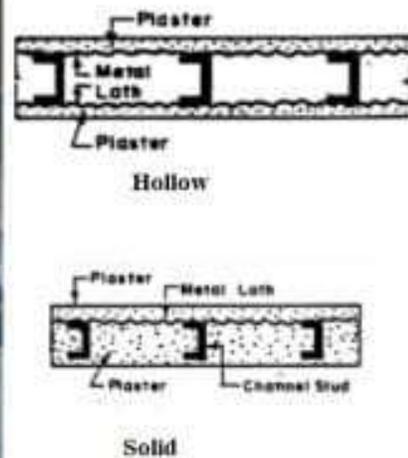


Fig.13: Metal lath partition wall

7. A.C. Sheet or G.I. Sheet partition wall

- Partition walls constructed from asbestos cement sheeting or galvanized sheet fixed to wooden or steel frame.
- It is mostly adopted in works of temporary character.
- Such walls are economical, light and fairly rigid if constructed properly.
- Slab consists of core or corrugated asbestos cement sheet with the plain asbestos cement sheet attached to it on either side. The use of such slabs renders the partition wall more fire-resistant and makes it have good heat and sound insulation properties.

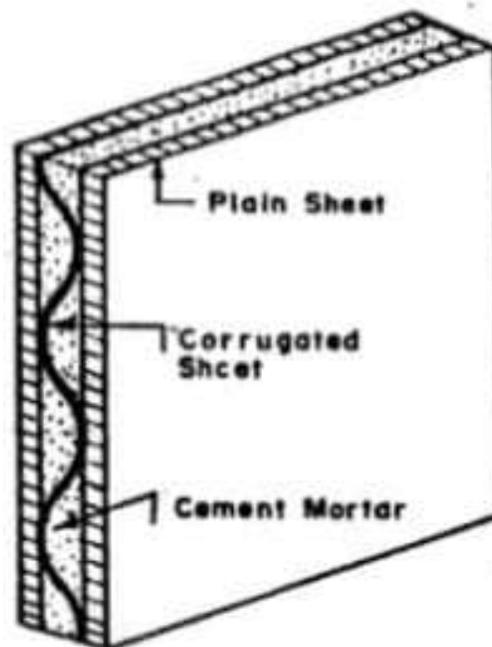


Fig.14:Asbestos sheet or GI sheet partition wall

8.Wood-wool partition wall

- Wood wool consist of long tangled wood fibers, uncompacted, coated and bound together with cement or plaster, and with a rough open surface which provides an excellent key for plaster.
- It is good heat and sound insulator

Fig.16:Timber Partition wall

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