

# AMIRAJ

COLLEGE OF ENGINEERING & TECHNOLOGY

## Module - 2 Building Construction



Subject:- BCE  
Code:-3110004

Prepared by:  
Asst.Prof. Nutan Patel  
(Civil Department,ACET)

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# Classification of building

Based on Occupancy

Based on Structure

# Based on Occupancy

- 1) Residential Building
- 2) Education building
- 3) Institution building
- 4) Assembly building
- 5) Business building
- 6) Mercantile building
- 7) Industrial building
- 8) Storage building
- 9) Hazardous building

# Types of buildings:

Based upon Occupancy

## 1) RESIDENTIAL BUILDING:

These are meant for dwelling purpose.

ex: Bungalows ,flats ,cottages , huts,  
hostels ,motels , chawls.



## 2) EDUCATIONAL BUILDING:

These are meant for running schools and colleges , training institutes , libraries, university etc.



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### 3) Institutional building:

Institutional building means a building constructed by government, semi-government organizations, public sector undertaking, such as education, medical, recreational and culture, hostel for working women or man or for an auditorium or complex for cultural activities or for an hospice, care of orphans, aged persons etc.

#### 4) Assembly building:

These are building meant for assembly of a large number of people for amusement, recreation, social, religious, patriotic, civil and similar purpose.

ex :Theaters, halls, auditoria, Museums, gymnasiums, restaurants, place of worship (temple, church, mosque etc),Dance halls, club, art galleries, lecture hall, amusement park etc.





## 5) Business building:

These are meant for running business. For transaction, keeping of accounts and records and similar purpose.

ex: Banks, offices , city halls, court houses etc.





## 6) Mercantile building:

These are used as shops, stores, markets, for display and sale of merchandise either wholesale or retail.

## 7) Industrial building:

These are the building in which products or materials of all kinds and properties are fabricated assembled or processed.

They accommodate plates and machinery, refineries, dairies, saw mills, cleaning plants, power plants, pumping stations etc.



## 8) Storage Building:

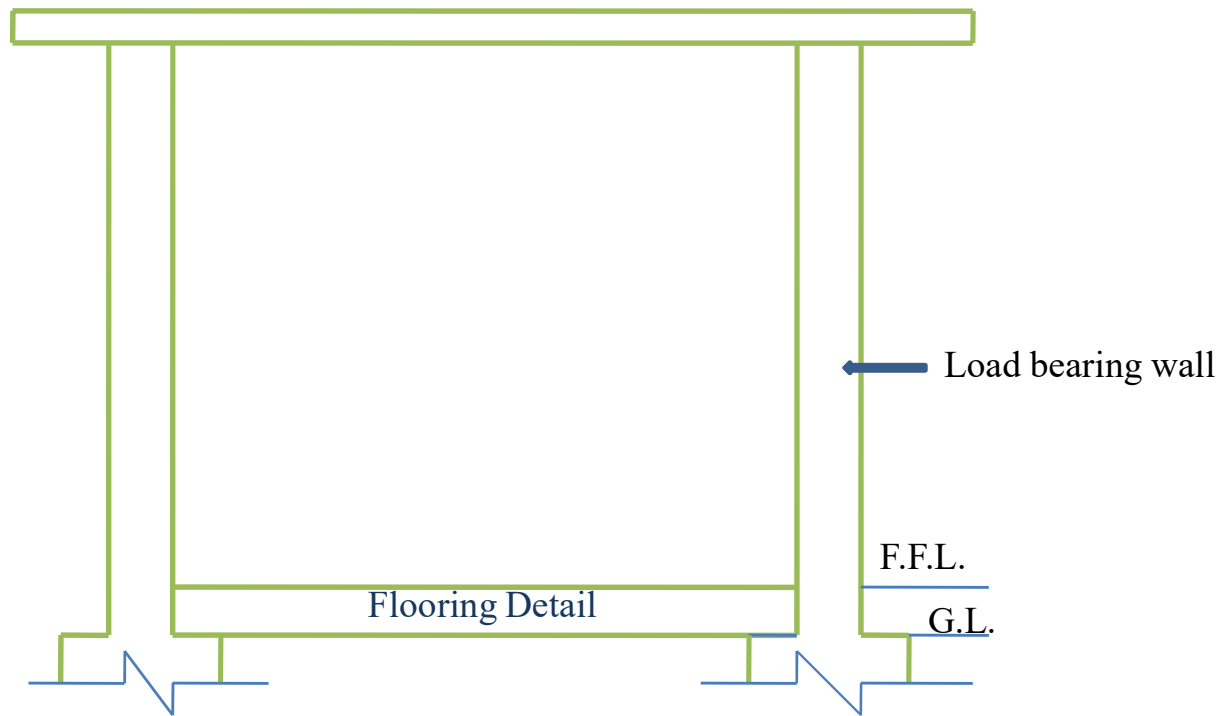
These are used for the storage or sheltering of goods, wares, vehicles etc.  
ex: warehouses , cold storage , godowns , freight depots ,transit sheds, store house, garages, hangers for aircraft etc.



## Based on Structure

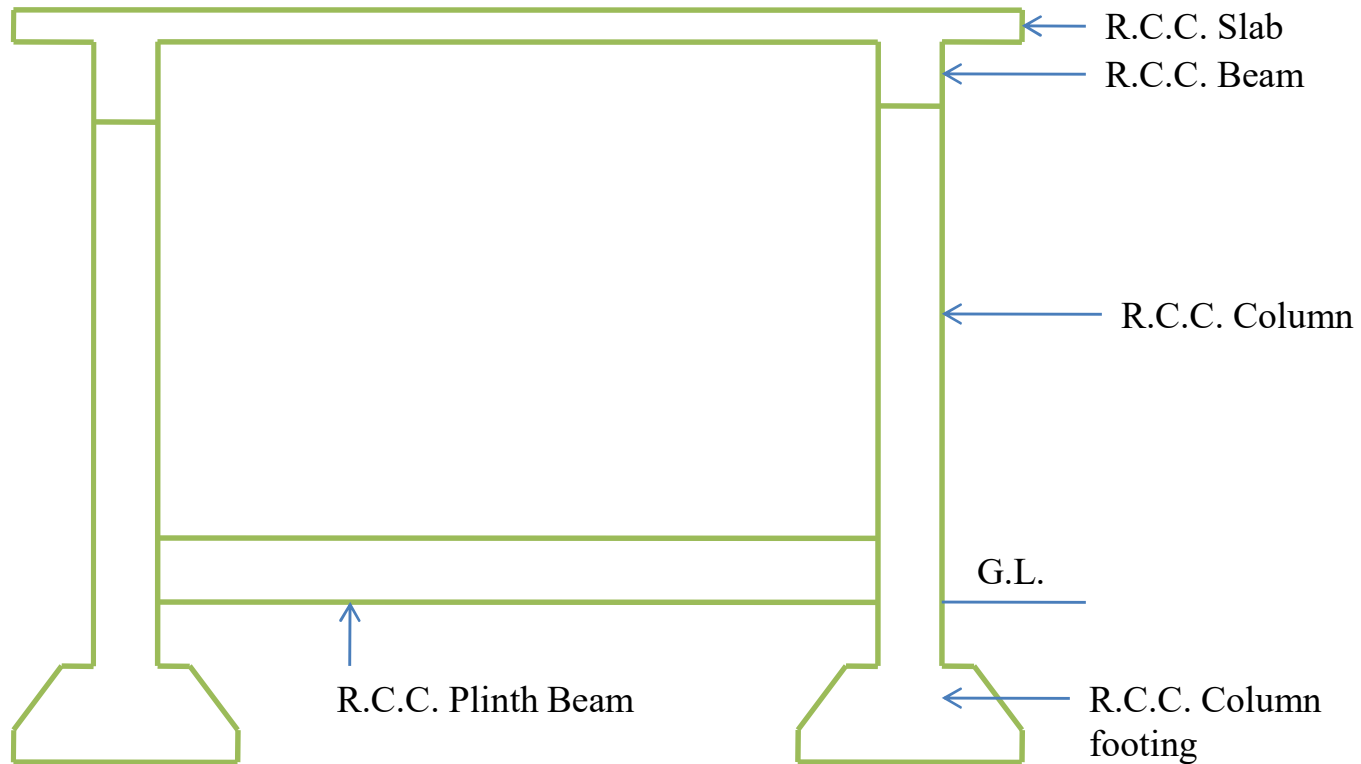
### [1] Load bearing structure:-

- ✓ Its has load bearing walls which receive the loads and transmit the same to the ground through their foundations.
- ✓ These load bearing walls support R.C.C. beams and slabs.
- ✓ Columns are avoided.
- ✓ 20, 30 and 40 cm thick walls are load bearing walls.
- ✓ Load bearing structure is adopted for the building up to 3 storey construction.
- ✓ It is provided where soil starts is hard at shallow depth.
- ✓ The wall on all the floors is provided one above another.
- ✓ As the construction activity proceeds vertically floor by floor the thickness of the wall reduces.



## LOAD BEARING STRUCTURE

- [2] Framed Structure: -
  - ✓ It consists of a rigidly connected network of columns and beams.
  - ✓ The beams support the walls and slabs.
  - ✓ The columns receive the whole load of the structure and transmit the same to the ground through their footing.
  - ✓ These provide greater floor area.
  - ✓ The walls are partitions walls.
  - ✓ Additions and alternations can be more easily done in framed structure.
  - ✓ On lower floors finishing work is easily carried out when frame work of upper floor is in progress.
  - ✓ Speed in construction of a framed structure can be easily achieved.
  - ✓ More number of persons can be accommodating per area of land.
  - ✓ Framed structures are adopted for low and high rise building.
  - ✓ To get resistance to various loads, especially of earthquake the columns are its up with each other by plinth beams.



Framed Structure



- [3] Composite structure: -
  - ✓ In composite structure columns as walls are provided.
  - ✓ Floor loads are transmitted to walls and beams.
  - ✓ The load is transmitted to the ground by columns and load bearing walls through is transmitted to the ground by columns and load bearings walls through their foundations.
  - ✓ Composite structure is preferred for construction of floor which has to cover larger area by slabs.
  - ✓ The areas are enclosed by load bearing walls and internal area is supported on beams and columns.
  - ✓ The extended or projected are is supported on beams and columns.

# Building Component

Building  
Component

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graph TD; A[Building Component] --> B[Sub Structure]; A --> C[Super Structure]
```

Sub  
Structure

Super  
Structure

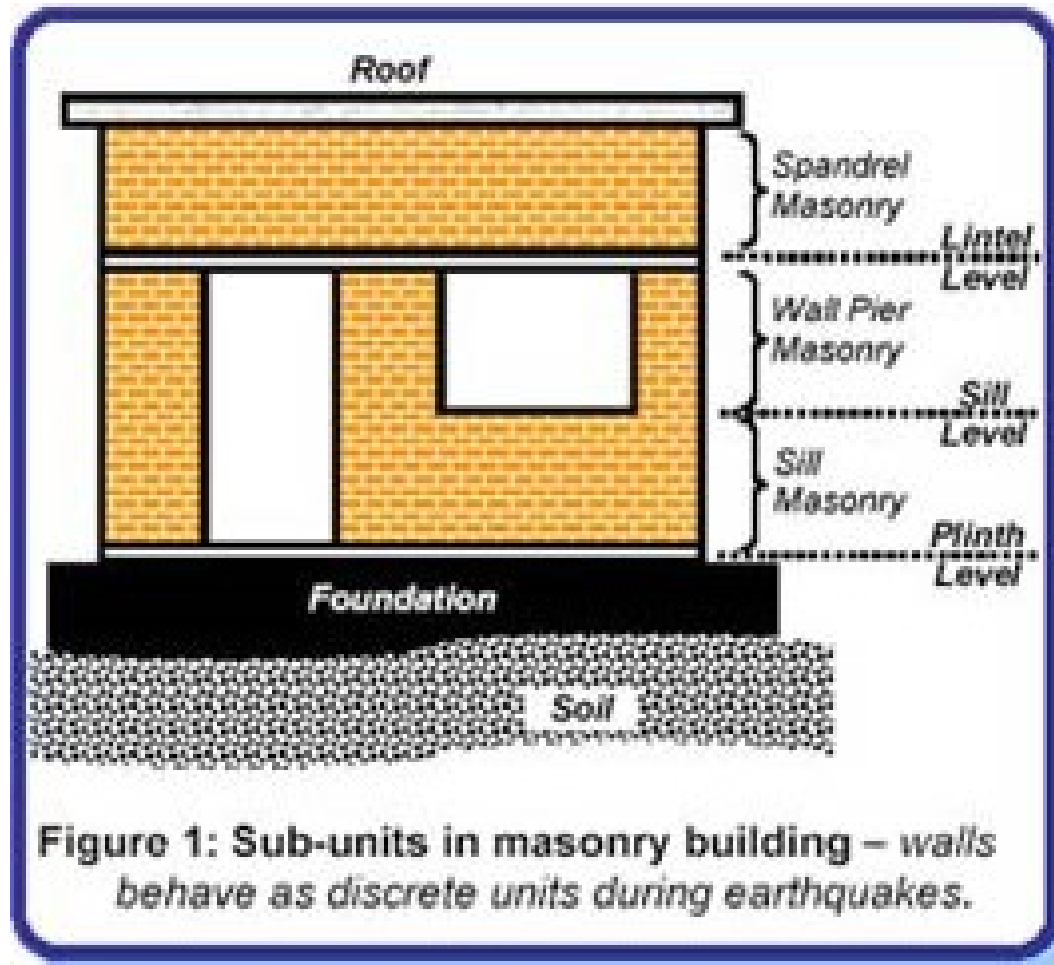
# Sub Structure

- The sub structure is the lower portion of the building, which is located below ground level which transmits the load of the super structure to the sub soil.
- Ex : Foundatuion

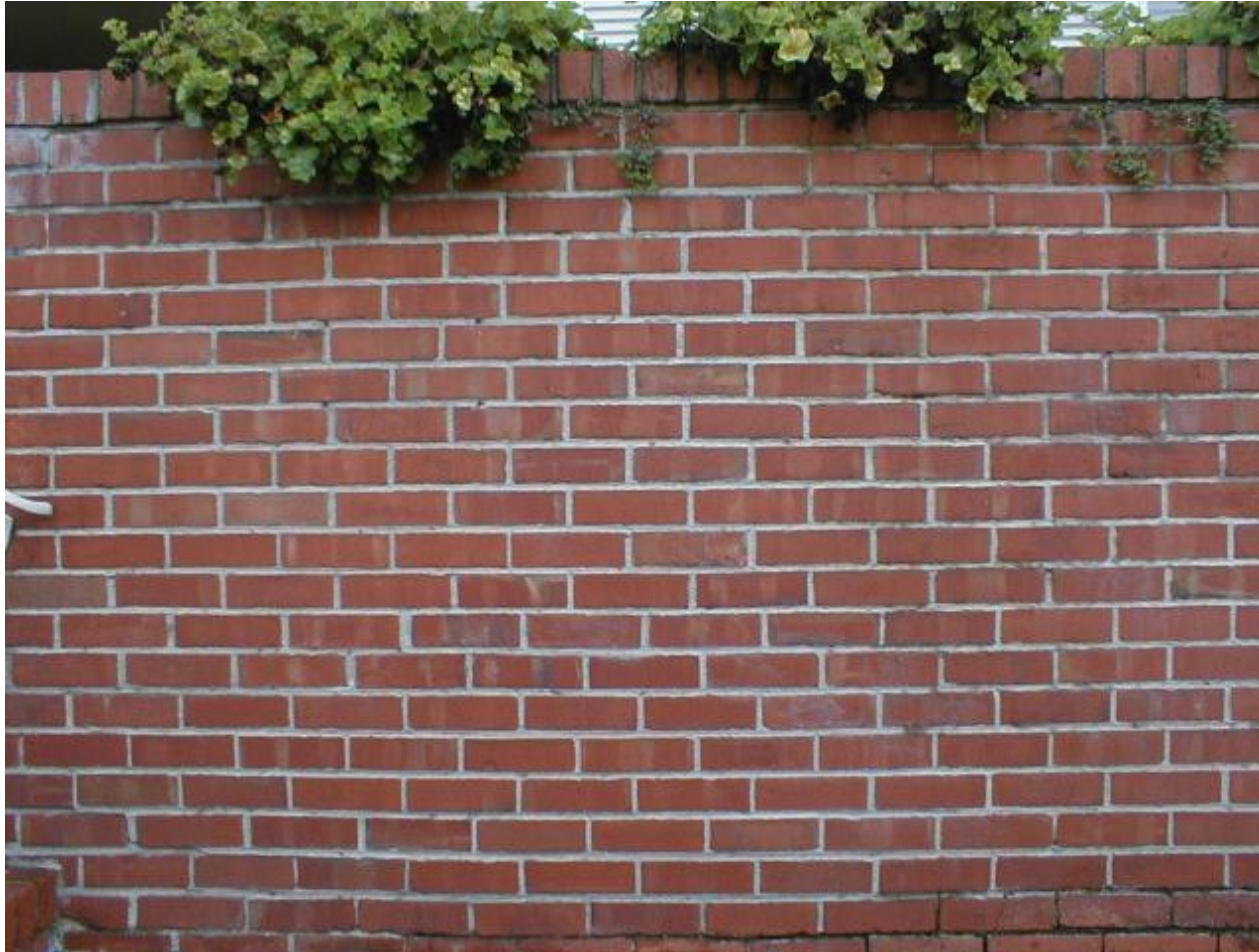
# Super Structure

- The superstructure is that part of the building which is above the ground and which serves the purpose of building's intended use.
- Ex :
- *Plinth*
- *Wall and columns*
- *Beams*
- *Arches*
- *Roofs and slabs*
- *Lintel and arches*
- *Chajjas*
- *Parapet*
- *Steps and stairs*

# Plinth



wall





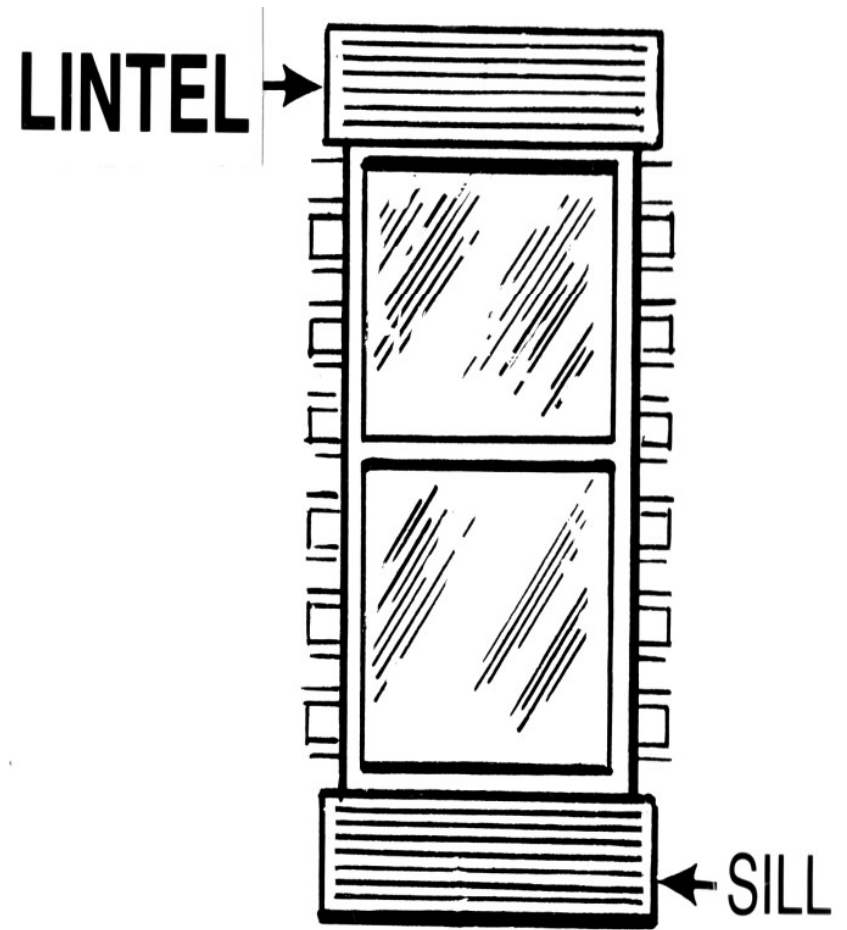
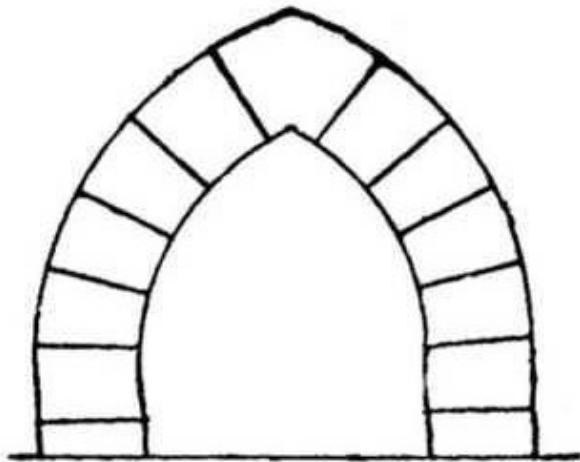
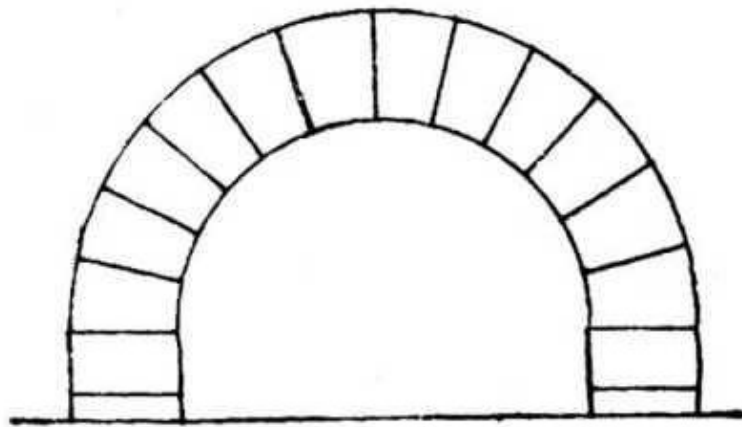
# Column



# Beam



# Arch and Lintel



# Roof/Slab



# Sill and Lintel



# Foundation

- Basic function of foundation is to transmit the dead load, live load and other types of the load to the soil on which they rest.
- There are main two type of the foundation



Shallow foundation



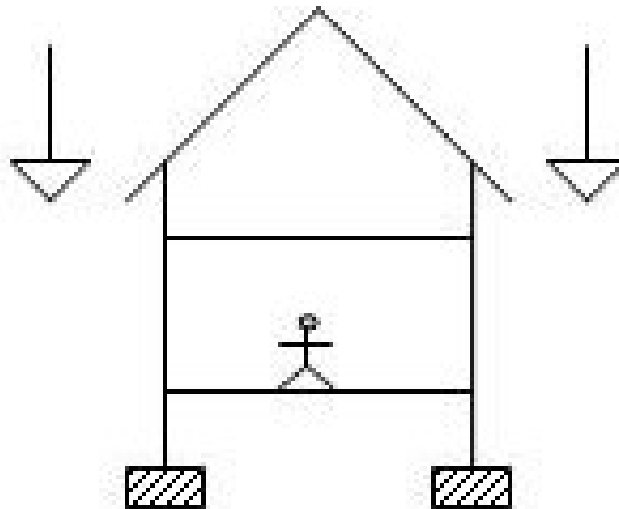
Deep Foundation

# Building Load



## Live load:

live loads consist of moving or variable loads due to people or occupants, their furniture, temporary stores, machinery, etc.



## Snow load:--

Actual load due to snow will depend upon the shape of the roofs and its capacity to retain the snow. The load due to snow may be assumed to  $2.5\text{kg/m}^2$  per centimeter depth of snow.



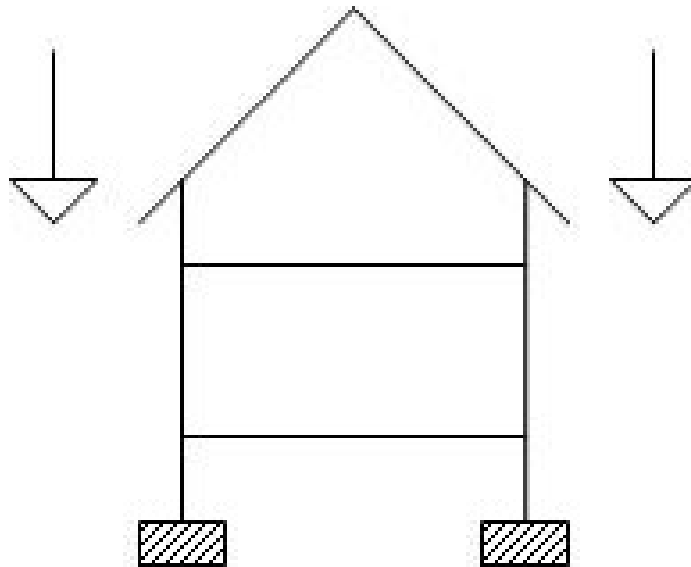
## Rain load:--

loads due to accumulation of rain water on roofs are considered separately and depend upon positioning, shape and drainage system for roofs.



## Dead load:

Dead load comprise of the weight of all walls, partitions, floors and roofs including all other permanent construction in the building.

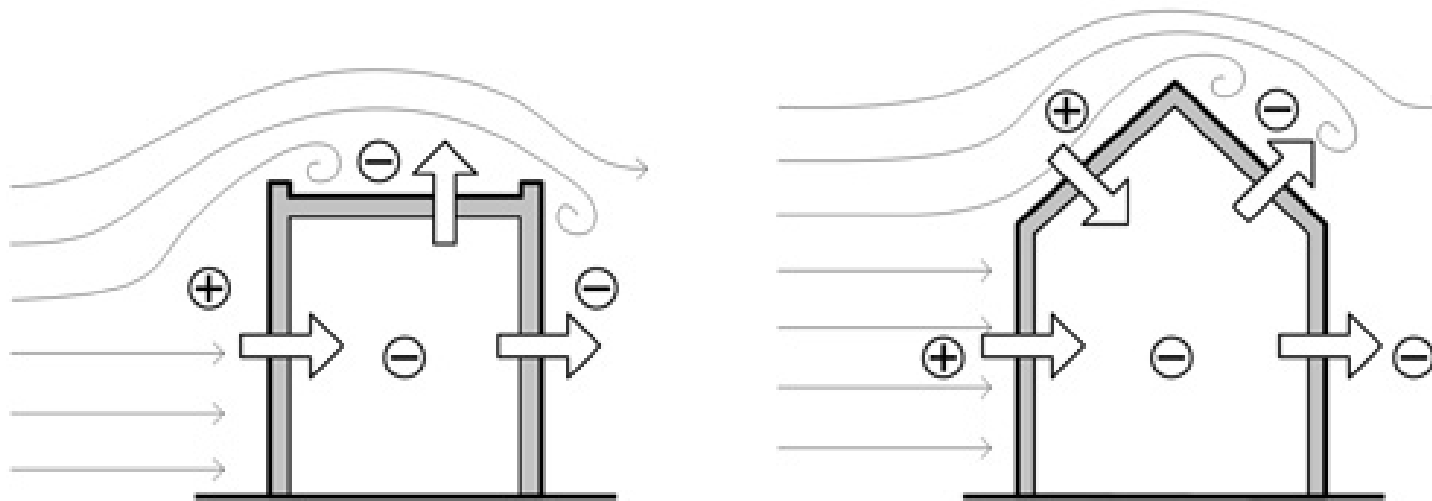


## Wind load:

- it is considered as basic wind pressure which is an equivalent static pressure in the direction of wind.
- Wind pressure  $p \text{ kg/m}^2 = K v^2$

where,  $k$  = Co-efficient, 0.006(as per building code)

$V$  = Wind velocity km/hr.



# Brick Masonry

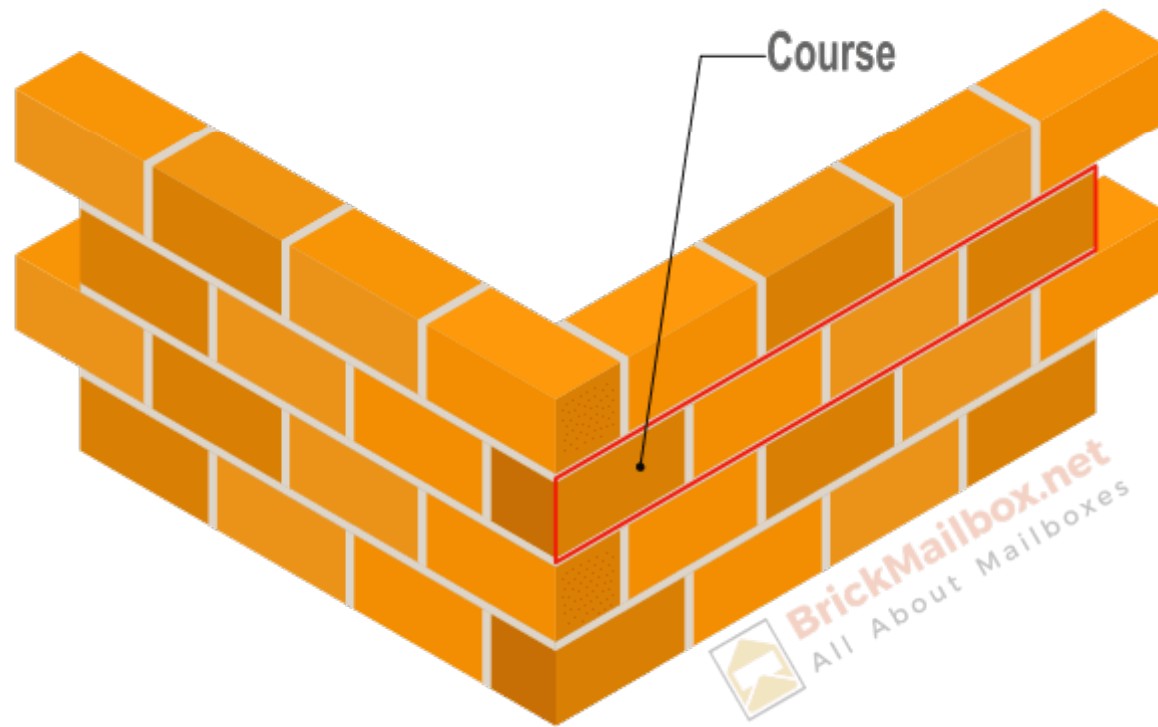
# Brick Masonry

- Laying of Brick bonded together with mortar is called Brick Masonry.
- Strength of Brick Masonry depend upon Bonding Material and Bonding method
- Mortar is mixture of Cement – Sand, Lime – Sand, or Cement – Sand – Lime

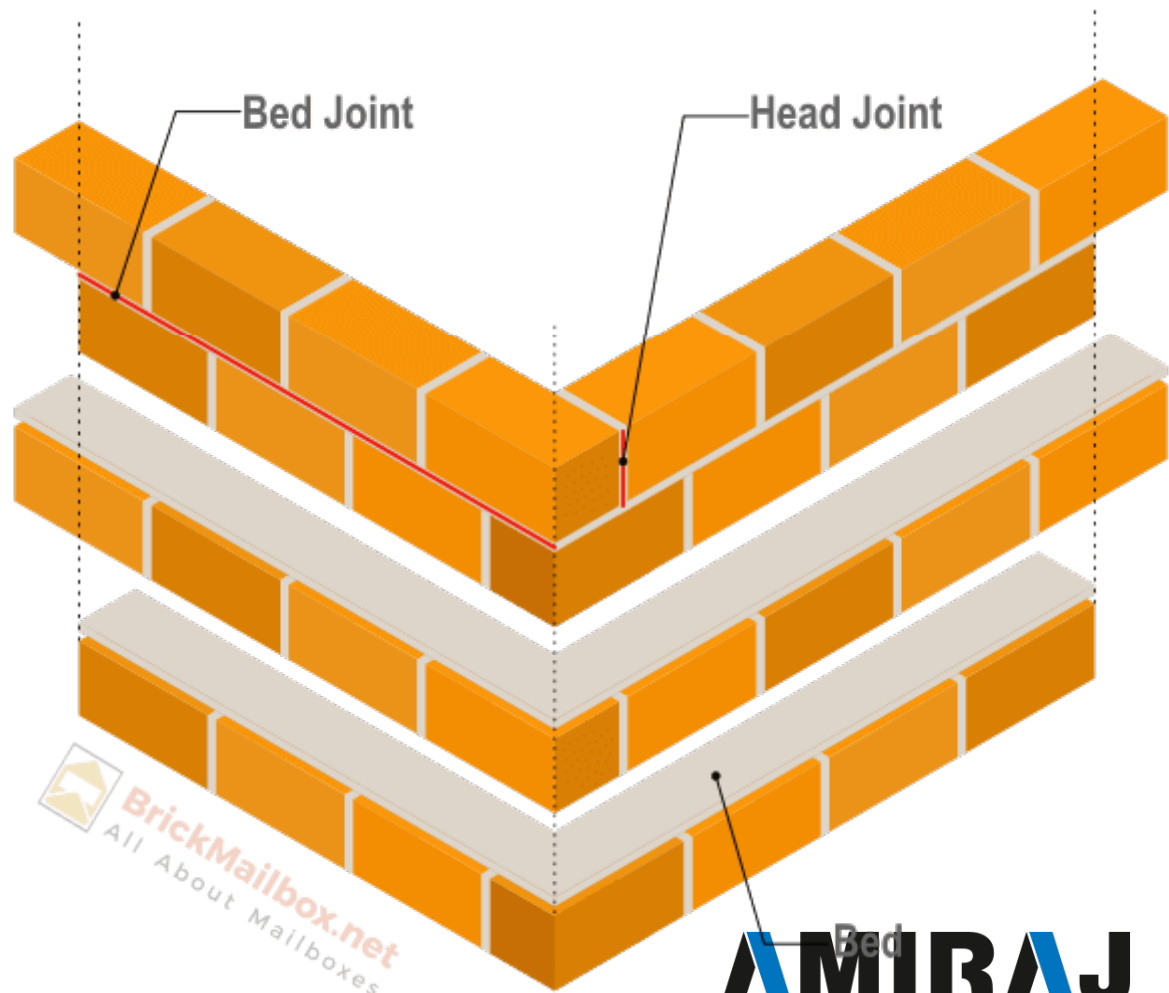


# Common Term Used in Brick Masonry

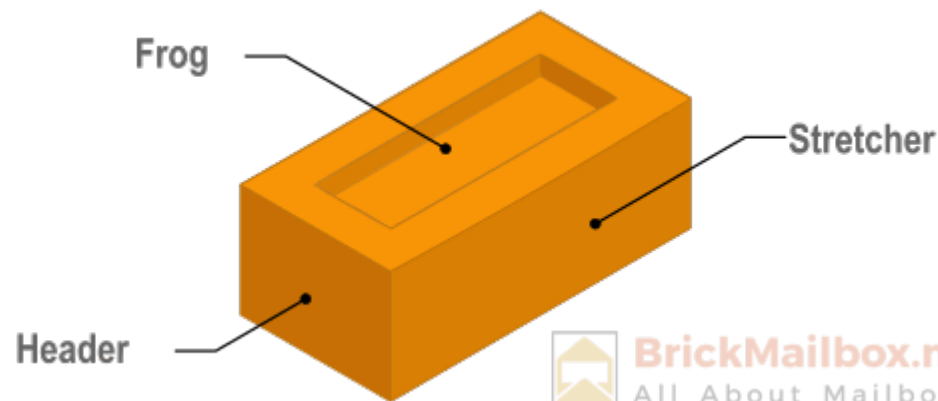
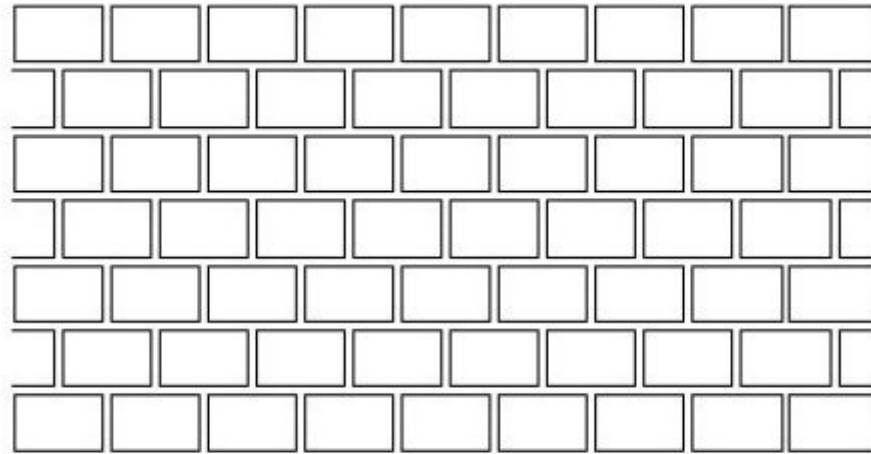
1. Course: Course is a horizontal layer of a brick in a wall.



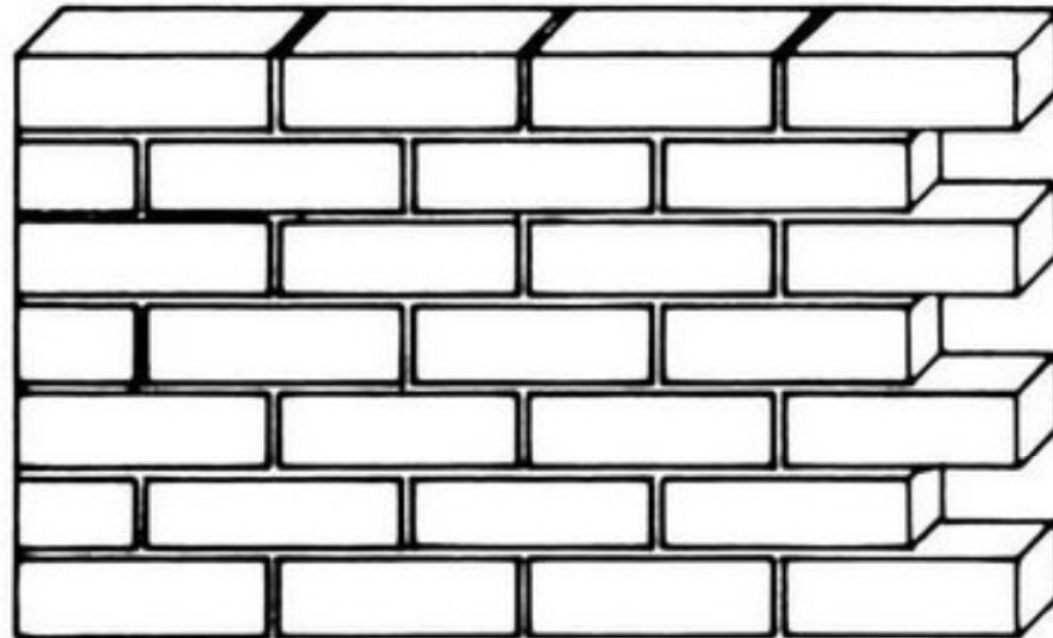
2. Joint: It is the junction of two or more bricks in a wall construction to joint with each other.



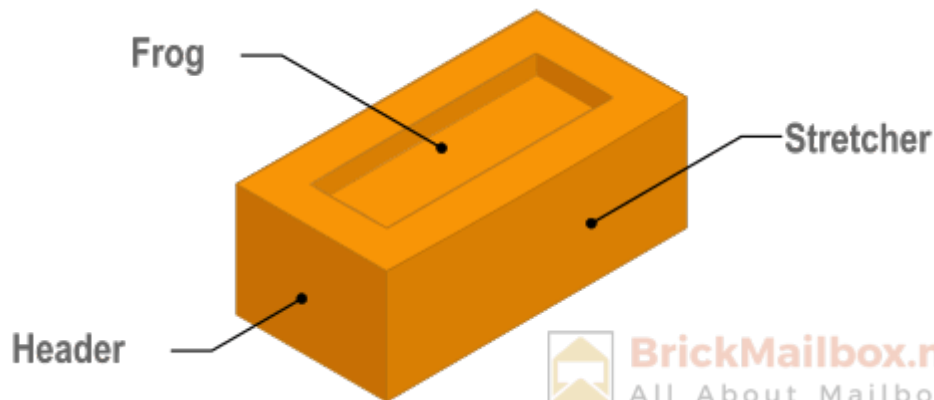
3. Header: It is a brick with lies with its greatest length at right angle to the face of masonry.



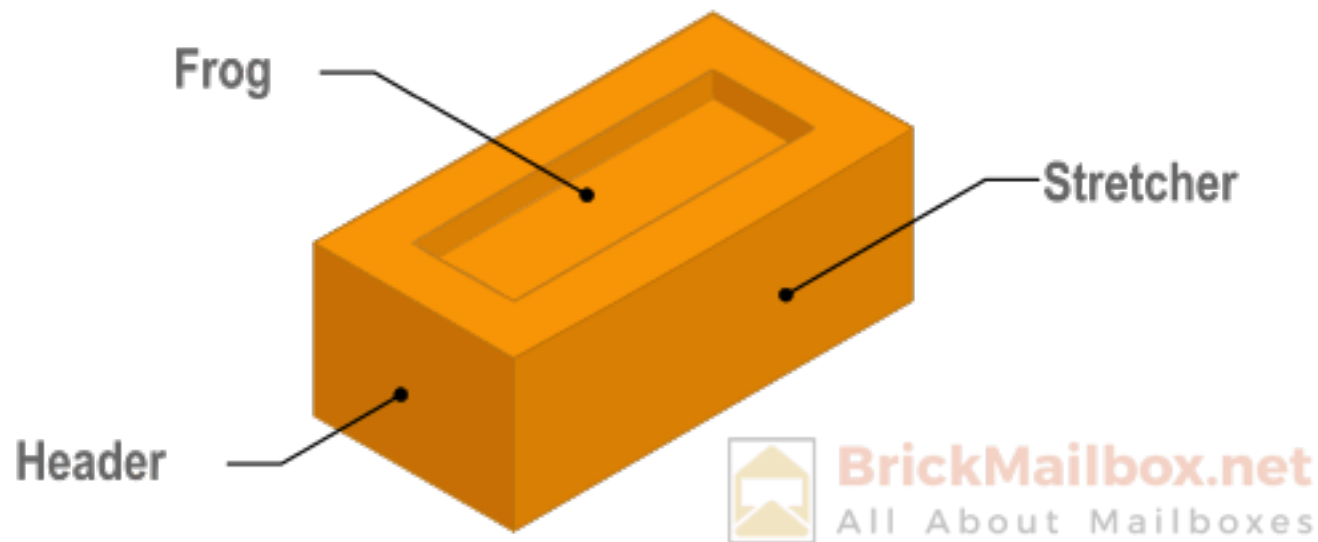
4. Stretcher: It is the brick which lies longest side parallel to the face of masonry work is called stretcher.



Stretcher bond



5. Frog: A small Depression created purposely on top side of brick is called Frog.



6. Face: the surface of wall exposed to the weather is called face.



7. Facing: The material used in the face to the wall is known as a Facing.



8. Back: The inner surface of the wall which is not exposed to weather is called Back.

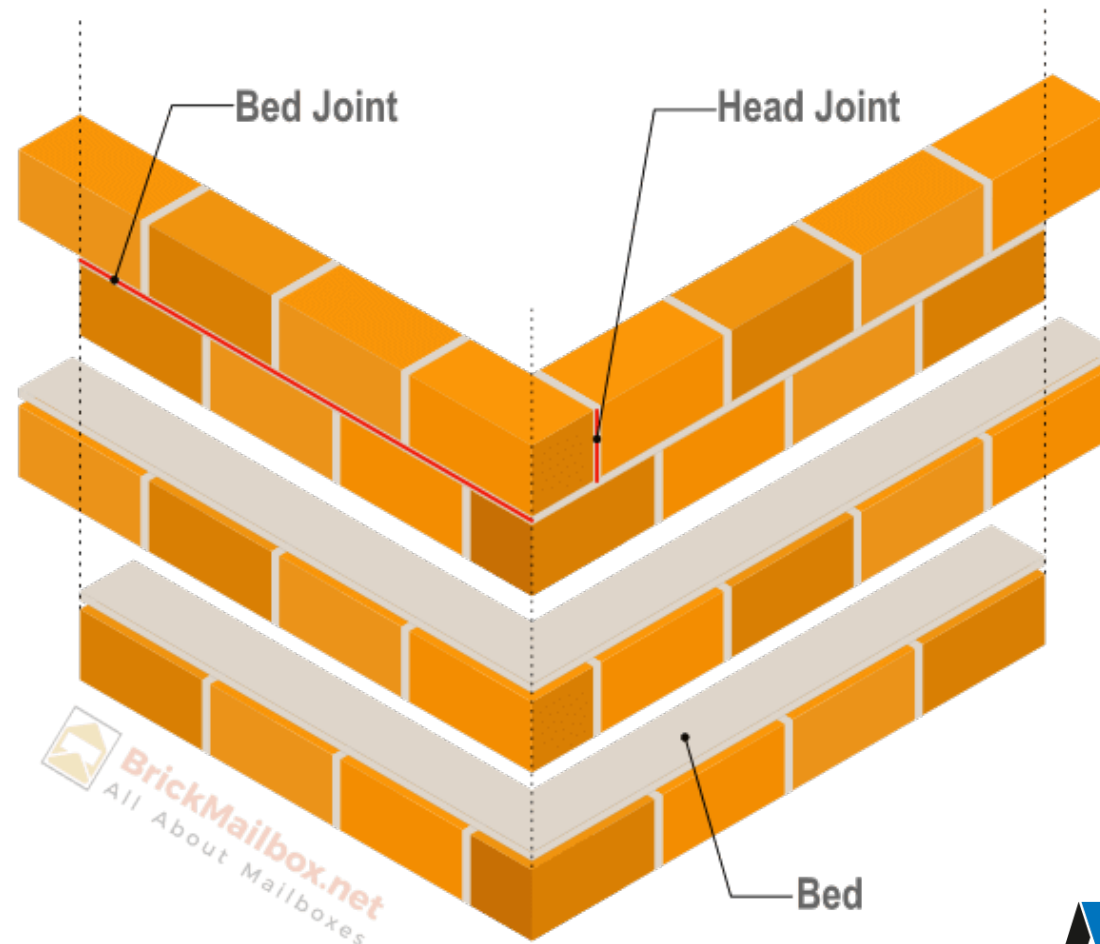




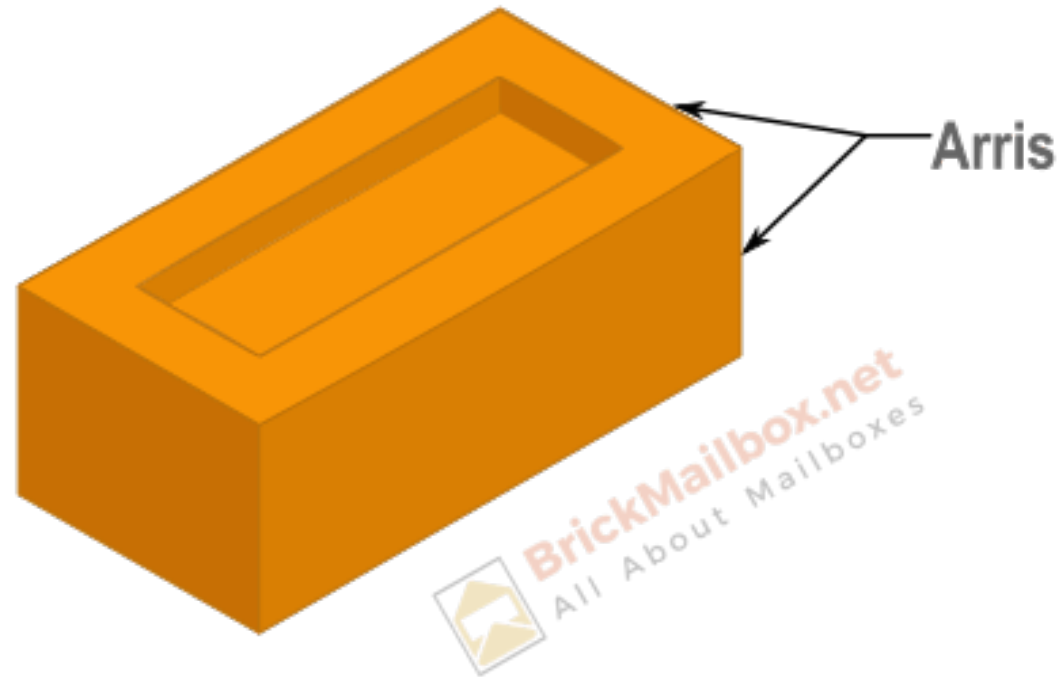
9. Backing: The material is forming or use in the back is known as baking.



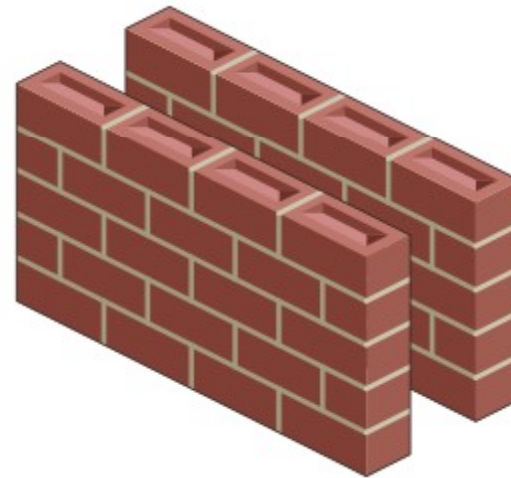
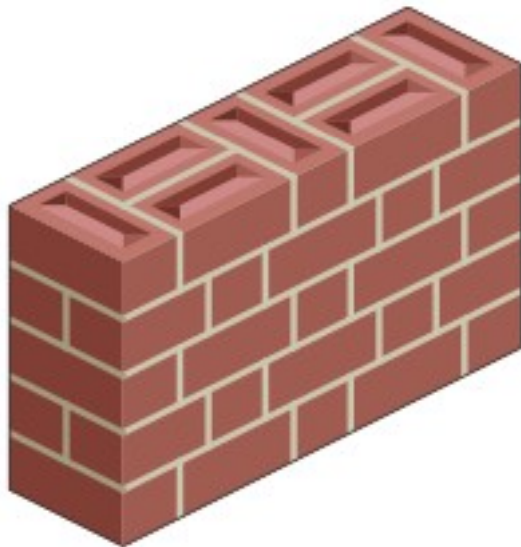
10. Bed: The bottom surface of the brick when laid flat is termed as Bed.



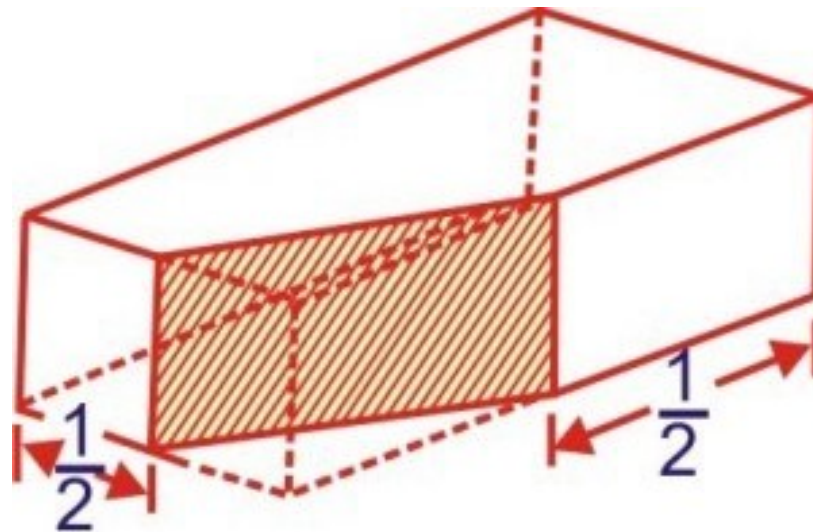
11. Arrises: The edges formed by the intersection of plane surface of the brick is called Arrises.



12. Hearting: The portion of a wall between facing and backing is called hearting.

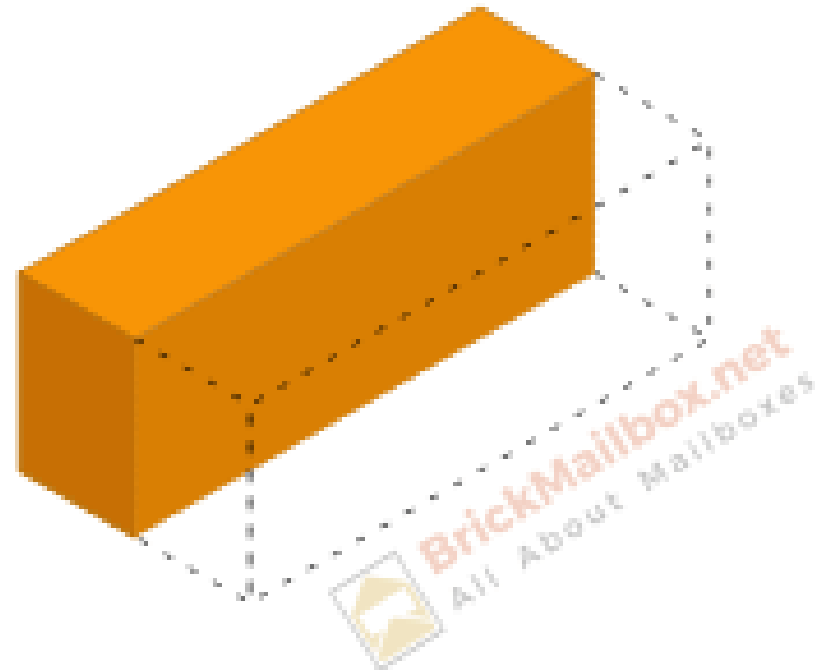


13. King Closer: King closer is obtained by cutting a piece of brick at the centre of header is called king closer.

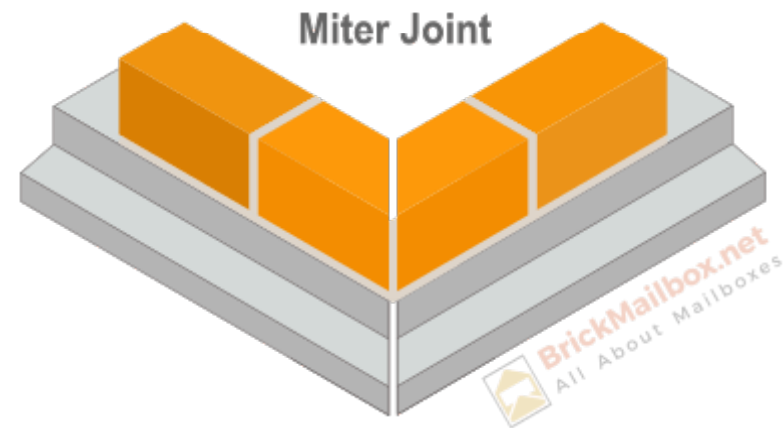
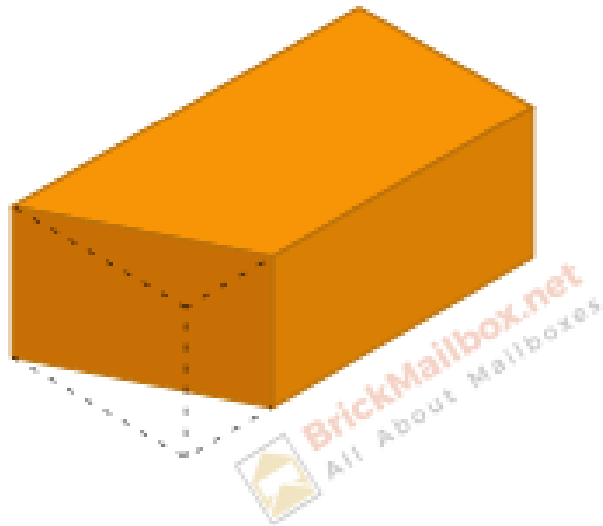


King closer

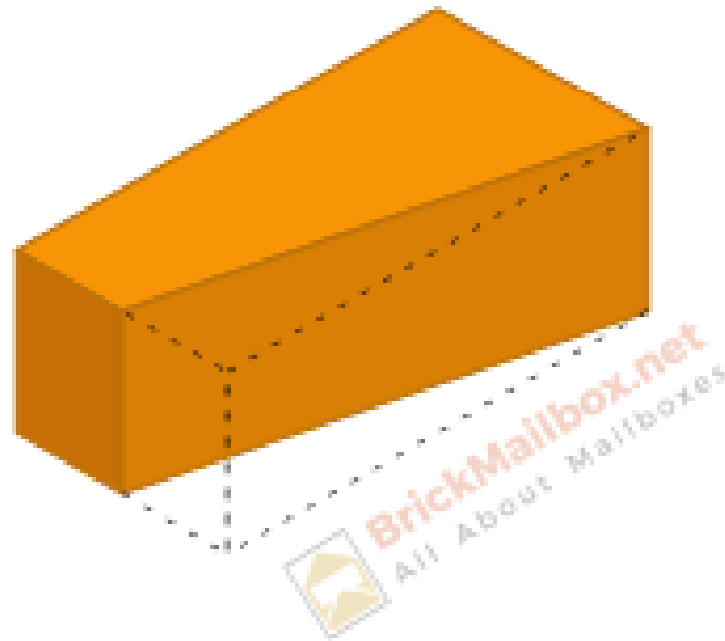
14. Queen Closer: Queen closer is obtained by cutting the brick length wise in to two piece is called queen closer.



15. Mitred Closer: When the triangular portion is cut through its width and making an angle of 45 to 60 degree with the length of brick.

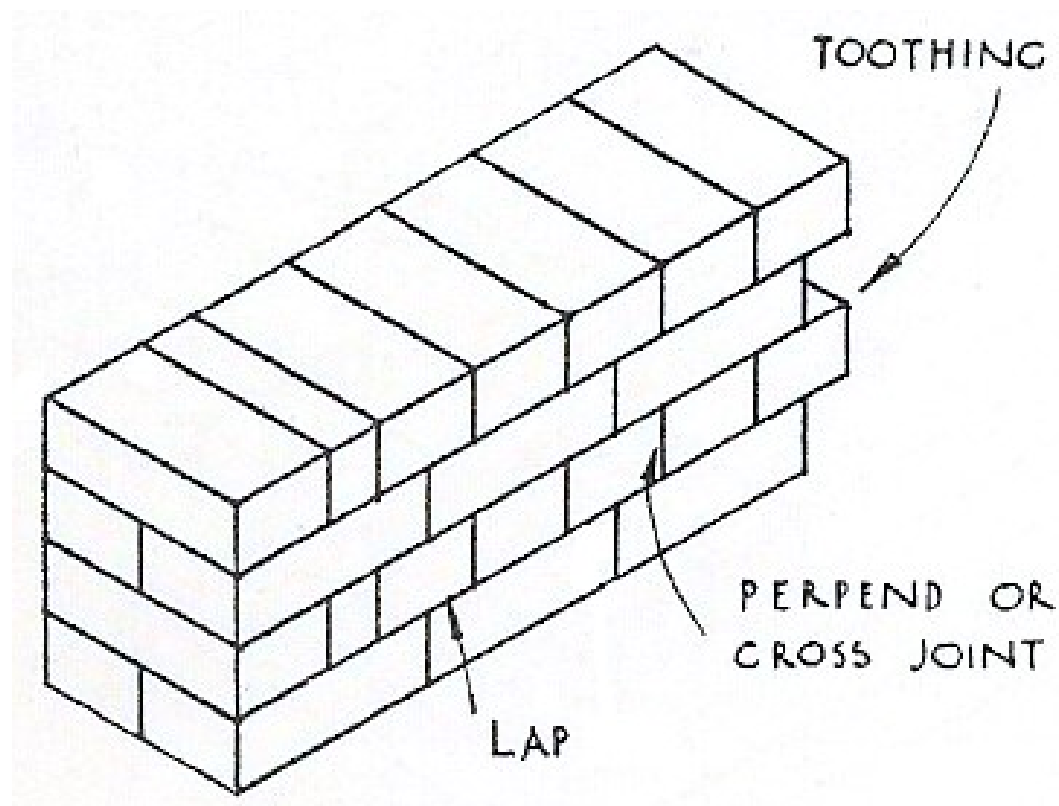


16. Bevelled closer: When a triangular portion of a brick is cut through its half width and to a full length is called bevelled closer.

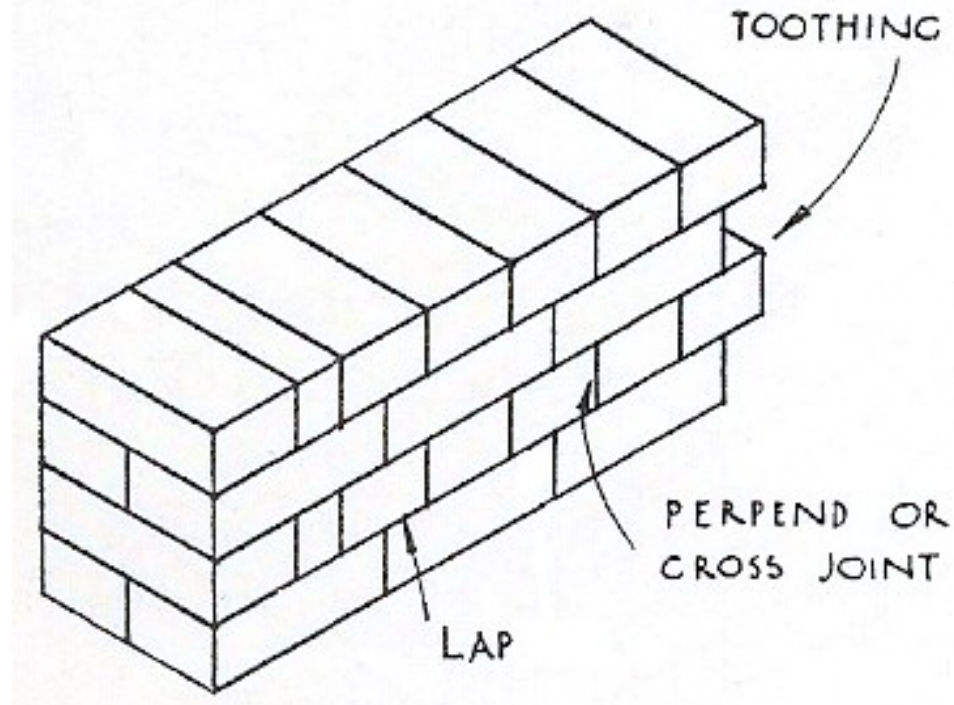




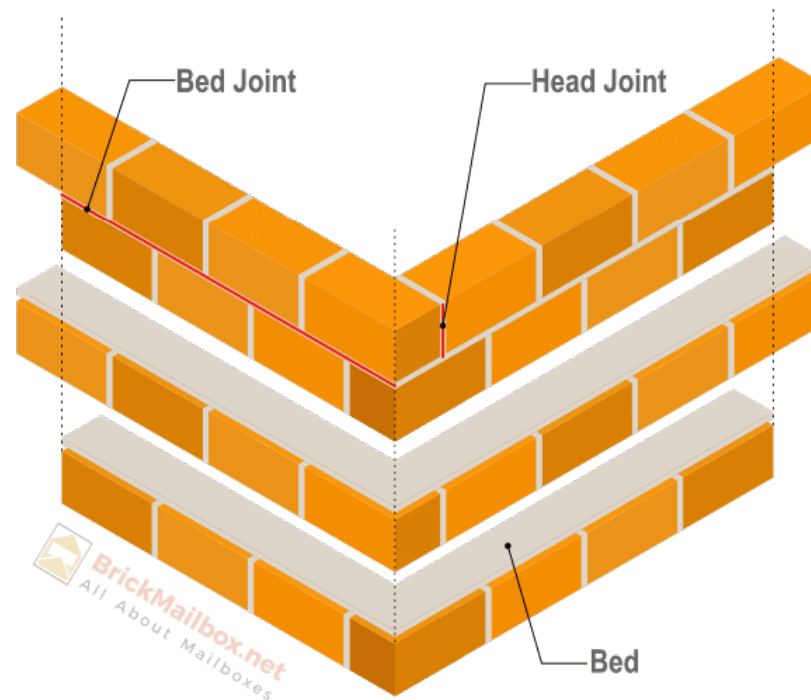
17. Lap: It is Horizontal distance between the vertical joints in course is called Lap.



18. Perpend: It is defined as the vertical joints in each course of Masonry work.

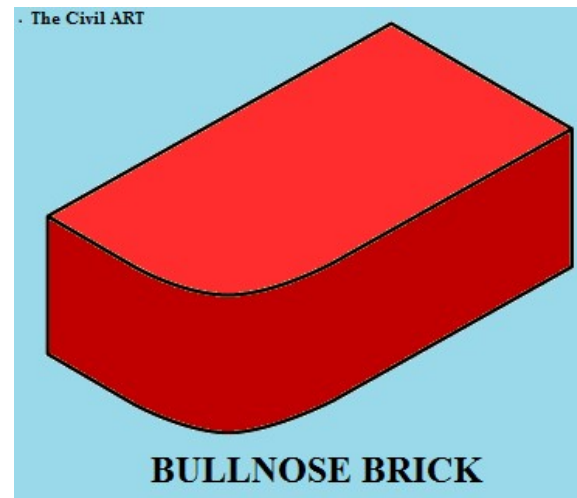
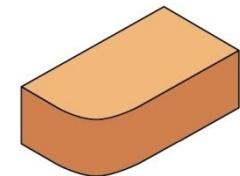


20. Bed Joint: It is defined as the horizontal layer of Mortar on which the bricks are laid is called Bed joint.

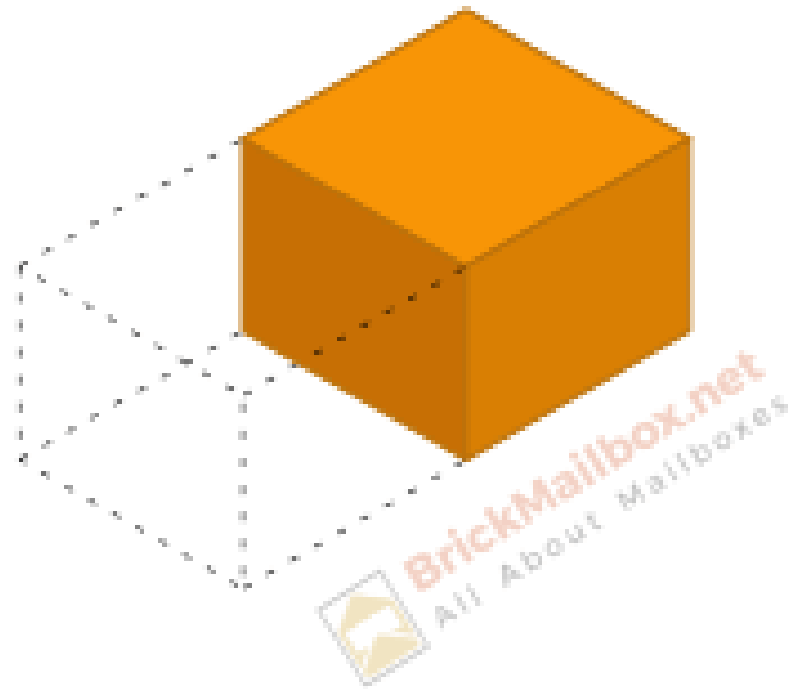


21. Bullnose: The brick which one edge round and the other is right angle is termed as single Bullnose

- The brick which two edge round at both the side is termed as double Bullnose



22. Bat: When Brick is cut across the width is called Bat.



23. Bond: The methods of arranging the bricks in course and tied together is called Bond.

# Bond In Brick

# Bonds in Brick

- Various arrangement of bricks to make rigid wall structure are called Bonds.

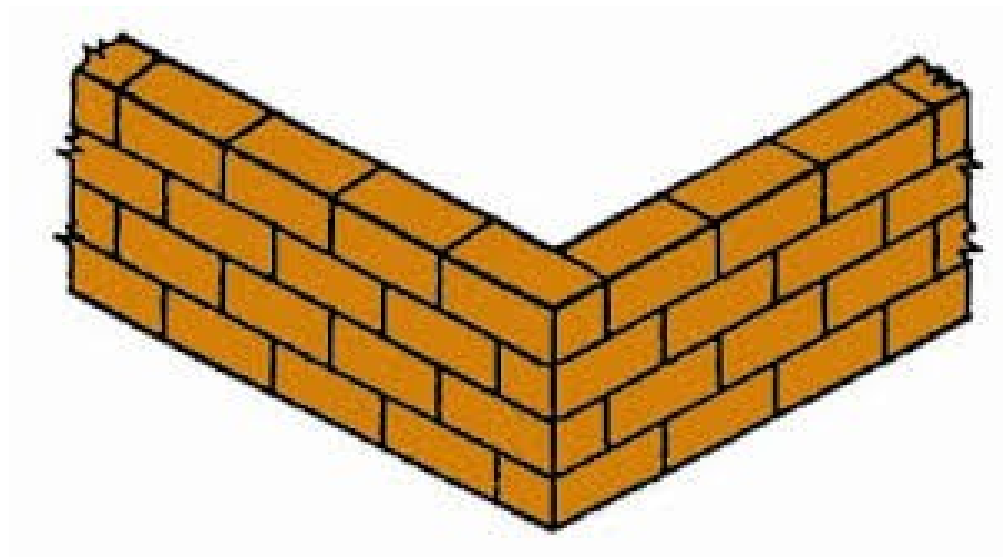


# Types of Brick Bond

1. Stretcher Bond
2. Header Bond
3. English Bond
4. Flemish Bond
5. Garden Wall Bond
6. Ranking Bond
7. Dutch Bond

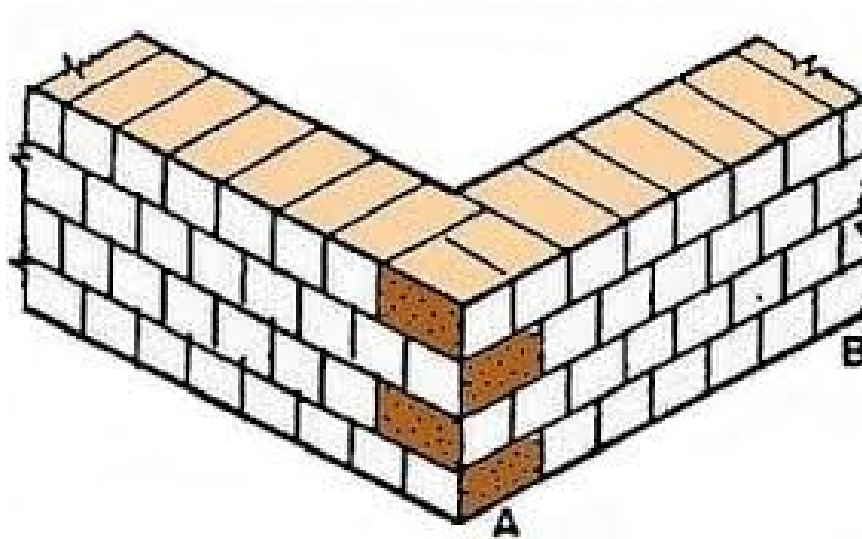
# Stretcher Bond

- Bricks are laid with their length in the direction of wall.
- Wall thickness is the half of the brick



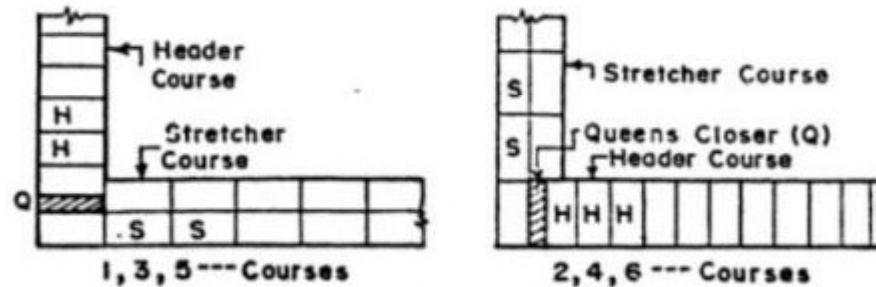
# Header Bond

- Bricks are laid with their end toward the face of wall.
- Wall thickness is the full length of the brick

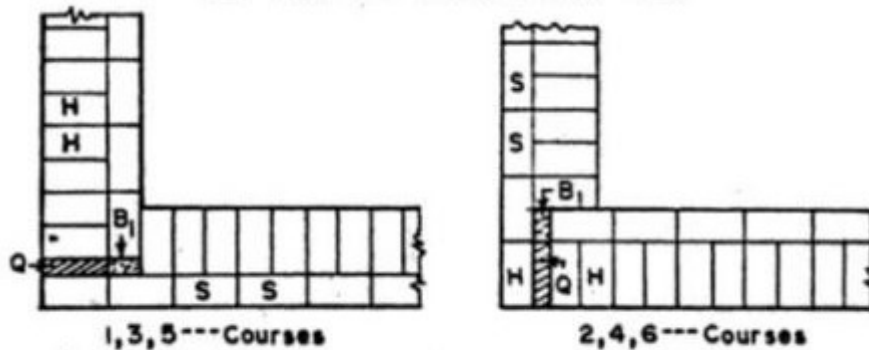


# English Bond

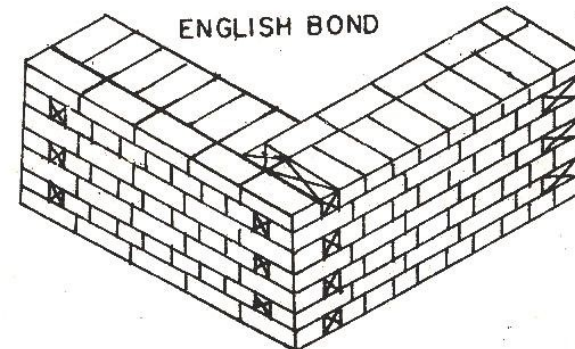
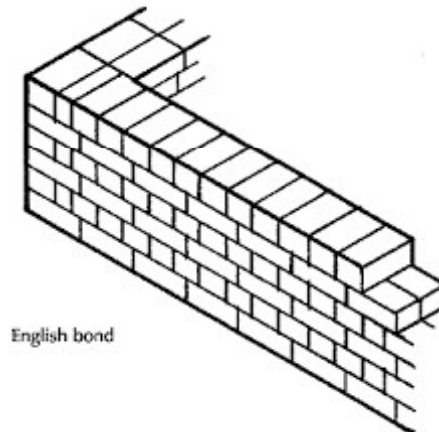
- Wall thickness 20cm or more.
- Equal balance of header and stretcher.



(a) Plan for 1 Brick Thick Wall



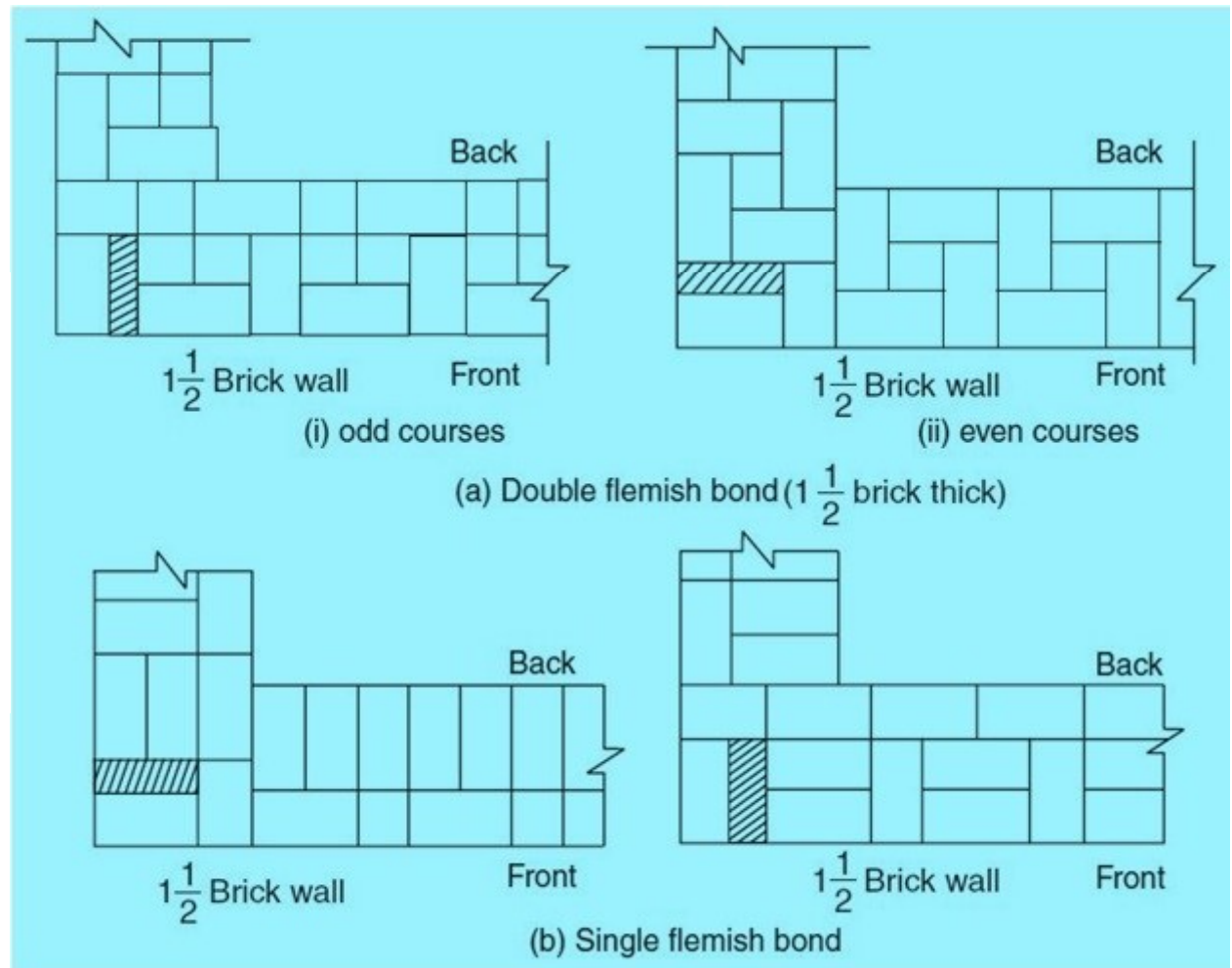
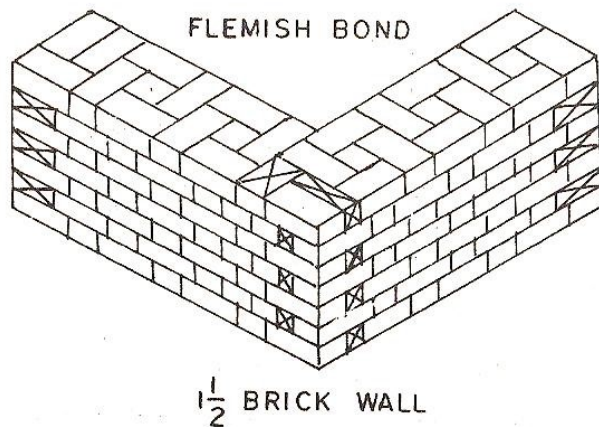
(b) Plan for 1 1/2 Brick Thick Wall



1 1/2 BRICK WALL

# Flemish Bond

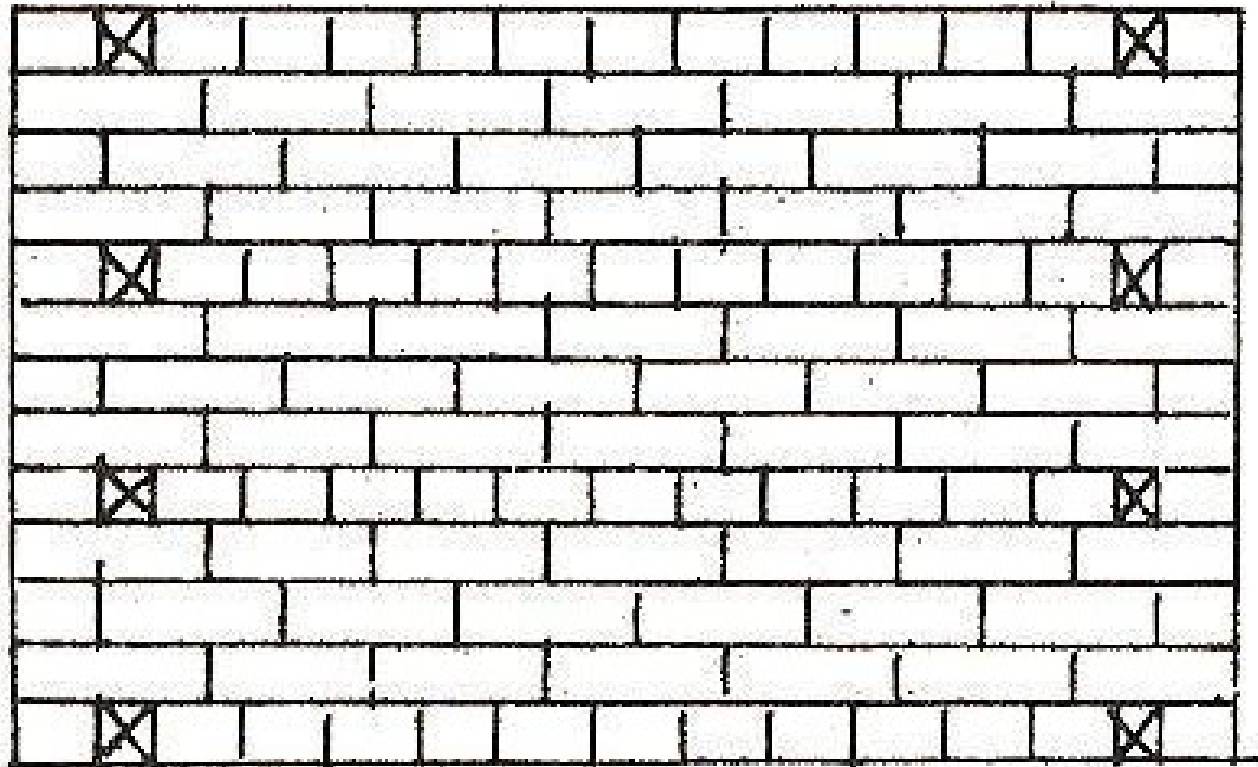
- In each course Header and Stretcher arranged.
- Each and every course start with header at corner.



- There are two types of Flemish Bond
  1. Single Flemish Bond : Combination of English bond and Flemish bond Resulting in to Single Flemish Bond
  2. Double Flemish Bond: Same appearance in Face and Back side.

# Garden Wall Bond

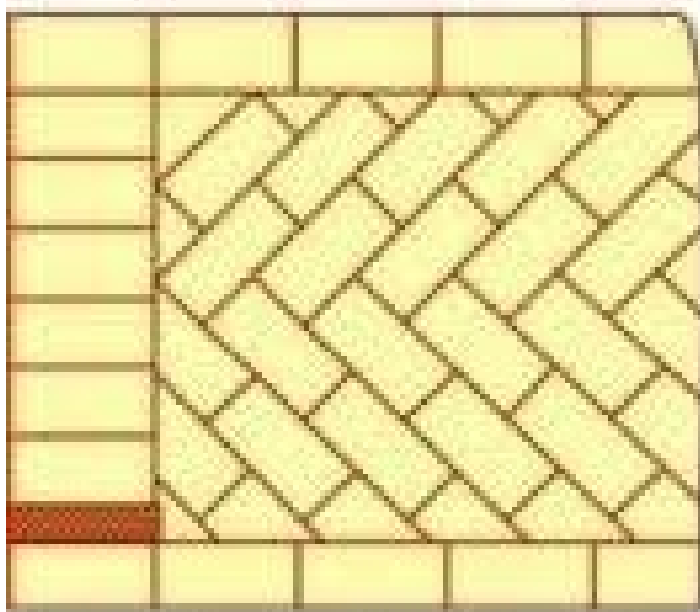
- User for
  1. Garden wall
  2. Boundary wall
  3. Compound Wall
- Height should not exceed 2m and thickness is 1 brick only.



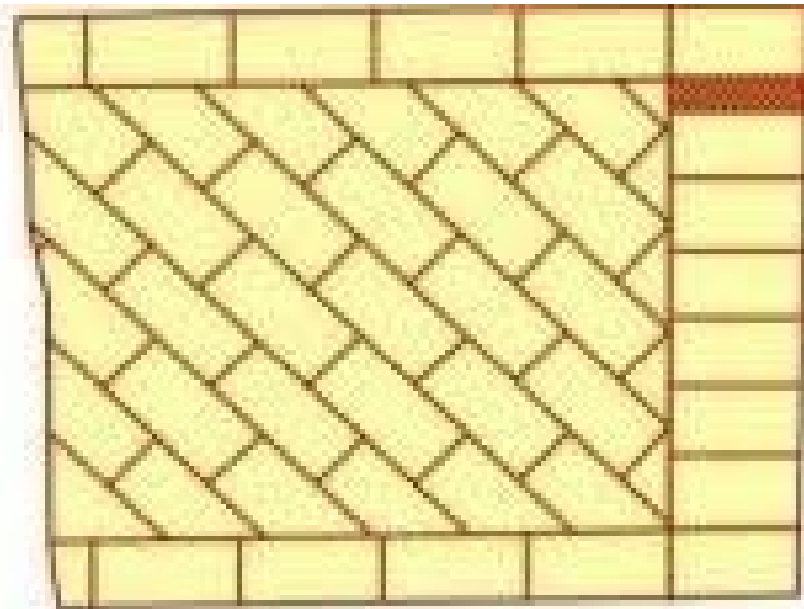


# Ranking Bond

- Ranking means inclination
- Types of Ranking Bond
  1. Diagonal Bond
    - Bricks laid at an inclination of  $45^{\circ}$
    - At the end of course bricks are cut in triangular shape.
  2. Herring bone Bond
    - Bricks laid at an inclination of  $45^{\circ}$  in the opposite direction from the centre of the wall













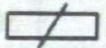







Herring bone bond.




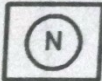

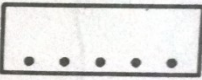

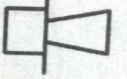
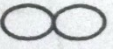
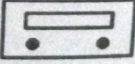
Diagonal bond.

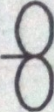





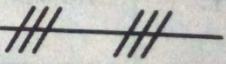
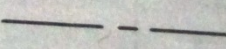


# Symbols used in Electrical Layout

Sr. No.	Name	Symbol
1.	Meter	
2.	Power Plug	
3.	Light Plug	
4.	Main Switches, Lighting	
5.	Light Bracket	
6.	Single Light Pendant	
7.	One-Way Switch	
8.	Two-Way Switch	

Sr. No.	Name	Symbol
9.	Intermediate Switch	
10.	Power Factor Capacitor	
11.	Fluorescent Light Single	
12.	Socket Outlet 2 Pin 5 Amp	
13.	Pendant Switch	
14.	Pull Switch	
15.	Immersion Heater	
16.	Socket Outlet 3 Pin 5 Amp	
17.	Bell	
18.	Bell Push	



Sr. No.	Name	Symbol
19.	Buzzer	
20.	Indicator	
21.	Amplifier	
22.	Control Board	
23.	Fire Alarm Push	
24.	Loudspeaker Outlet	
25.	Ceiling Fan	
26.	Receiver Outlet	

Sr. No.	Name	Symbol
27.	Bracket Fan	
28.	Aerial	
29.	Exhaust Fan	
30.	Siren	
31.	Earth Point	
32.	Fan Regulator	
33.	Electric signal line	
34.	Battery limit line	
35.	Lamp	
36.	Switch	

# Symbols used for Water Supply and Plumbing



Sr. No.	Name	Symbol
1.	90° elbow	
2.	Straight Tee	
3.	Reducing Tee	
4.	Gate valve	
5.	Shower head	
6.	Water meter	
7.	Tee	
8.	Union	



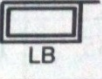
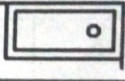

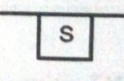

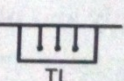
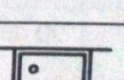
Sr. No.	Name	Symbol
9.	Cap	
10.	Hot water	
11.	Cold water	
12.	Gas pipe	

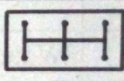
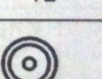
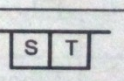
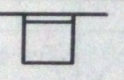
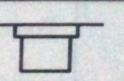
Sr. No.	Name	Symbol
13.	90 degree elbow	
14.	Reducer	
15.	Water heater	
16.	Elbow turned down	
17.	Elbow turned up	
18.	Elbow	
19.	Tee outlet down	
20.	Tee outlet up	




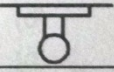
Sr. No.	Name	Symbol
21.	Drinking water	
22.	45° elbow	
23.	Water heater shut off	
24.	Major pipeline	

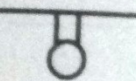
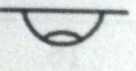
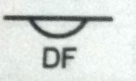
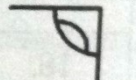
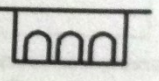
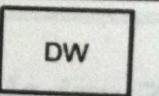
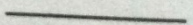
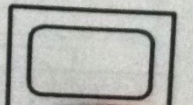
# Symbols Used For Sanitation

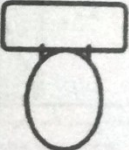
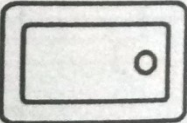
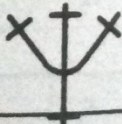
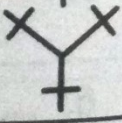
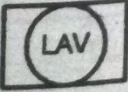


Sr. No.	Name	Symbol
1.	Shower Head	
2.	Pedestal Lavatory Basin	
3.	Wall Lavatory Basin	
4.	Rectangular Bath	
5.	Foot Bath	
6.	Shower Stall	
7.	Corner Lavatory Basin	
8.	Trough Lavatory wall type	
9.	Plain Kitchen Sink	

10.	Trough Lavatory Island type	
11.	Circular washing fountain	
12.	Sink and Tub sets	
13.	W. C.	
14.	W.C. low down	

Sr. No.	Name	Symbol
15.	Indian type W. C.	
16.	Pedestal type urinal	
17.	Pedestal drinking fountain	
18.	W. C. low tank	

Sr. No.	Name	Symbol
19.	W. C. no tank flush type	
20.	Urinal wall hung	
21.	Drinking fountain wall type	
22.	Urinal corner hung	
23.	Urinal stall	
24.	Dish water	
25.	Sanitary waste	
26.	Sink	

27.	Toilet	
28.	Bathtub	
29.	Fitting sewer through double Y	
30.	Fitting sewer true Y	
31.	Lavatory	
32.	P-Trap	