

TYPES OF BONDS

BONDS

Bond is the arrangement of bricks or stones in each course, so as to ensure the greatest possible interlocking and to avoid the continuity of vertical joints in two successive courses, both on the face and in the body of a wall.

OBJECTIVES OF BONDS

A bond is provided to achieve the following objectives:

- ❖ The primary objective of providing a bond is to break the continuity of the vertical joints in the successive courses both in the length and thickness of masonry structure.
- ❖ The structure will act as a bounded mass and its load will be transmitted uniformly to the foundations.
- ❖ To ensure longitudinal and lateral strength of the structure.
- ❖ To provide pleasing appearance by laying bricks symmetrically.
- ❖ To do masonry work quickly by engaging more masons on a job at a time.

Introduction

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.

Brick Manufacturing Process

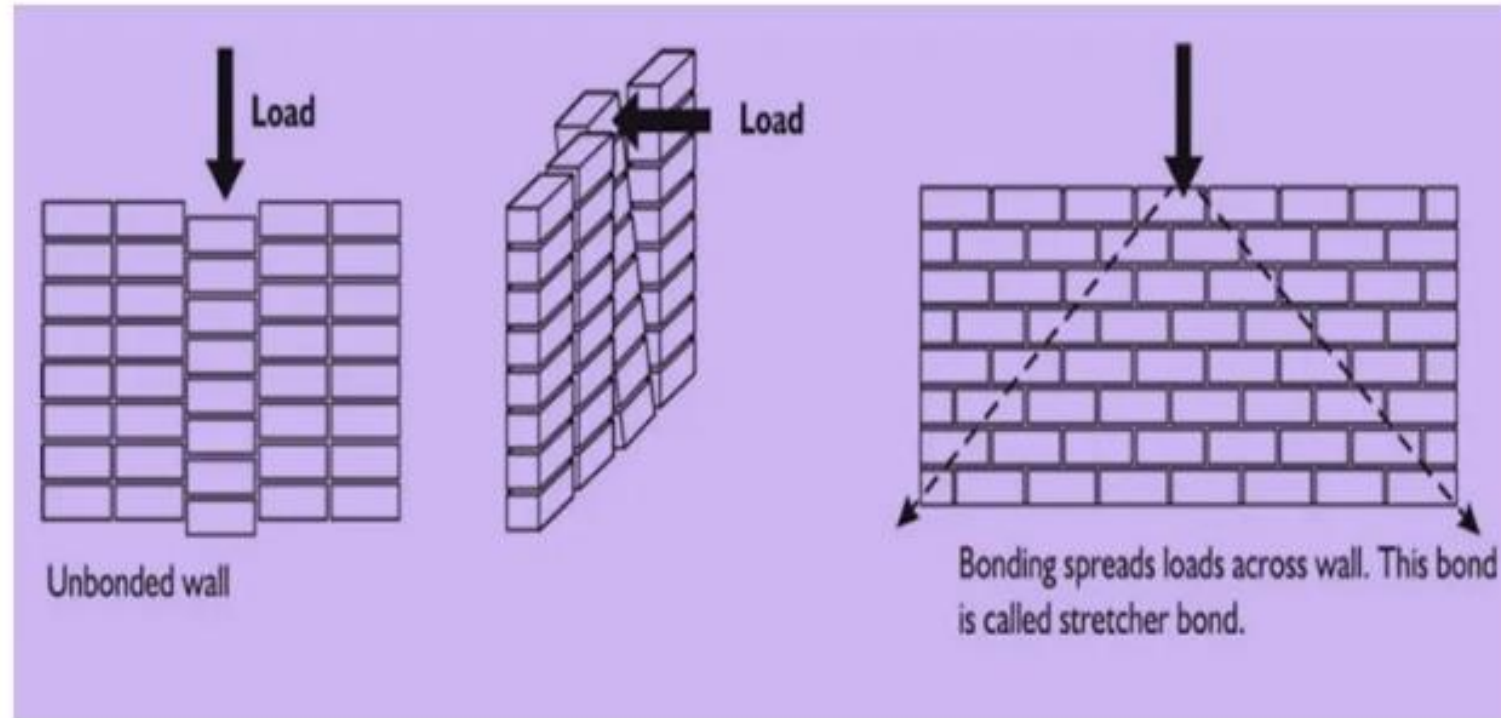
The process of manufacturing of bricks from clay involves preparation of clay, molding and then drying and burning of bricks. The bricks are building materials which are generally available as rectangular blocks. The bricks do not require any dressing and brick laying is very simple compared to stone masonry.

The manufacturing process of bricks can be explained as follows:

- Preparation of clay material
- Moulding of bricks in rectangular shapes
- Drying of bricks
- Burning of bricks

PURPOSES OF BRICK BONDING

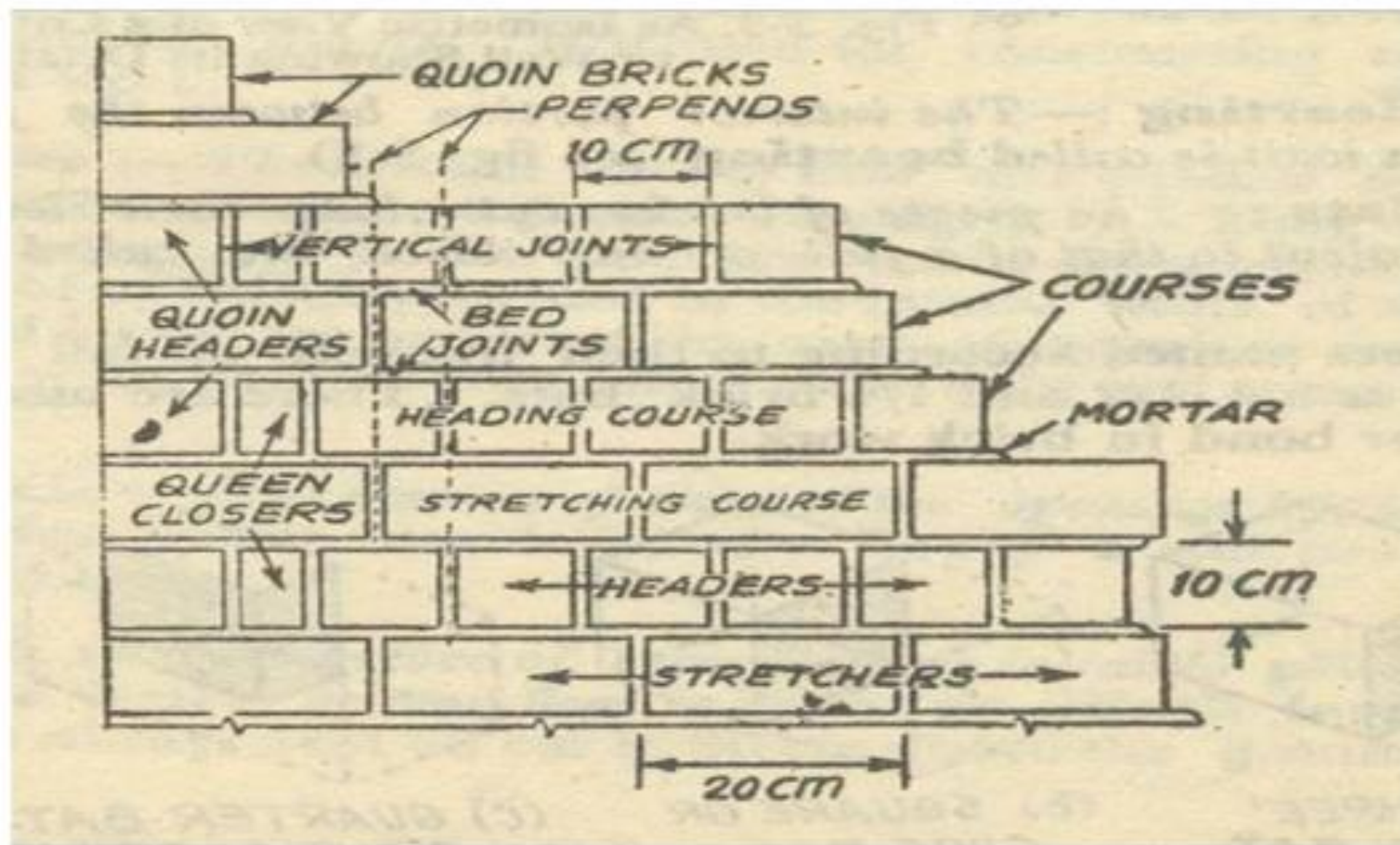
- Obtain maximum strength whilst distributing the loads to be carried throughout the wall, column or pier.
- If bonds in brick work are not arranged properly, then a continuous vertical joint will result. This is called an unbonded wall having little strength and stability. (See fig. below)



Unbounded wall & Load Distribution in a Well Bonded Wall

- To ensure lateral stability and resistance to side thrusts.
- To create an acceptable appearance.

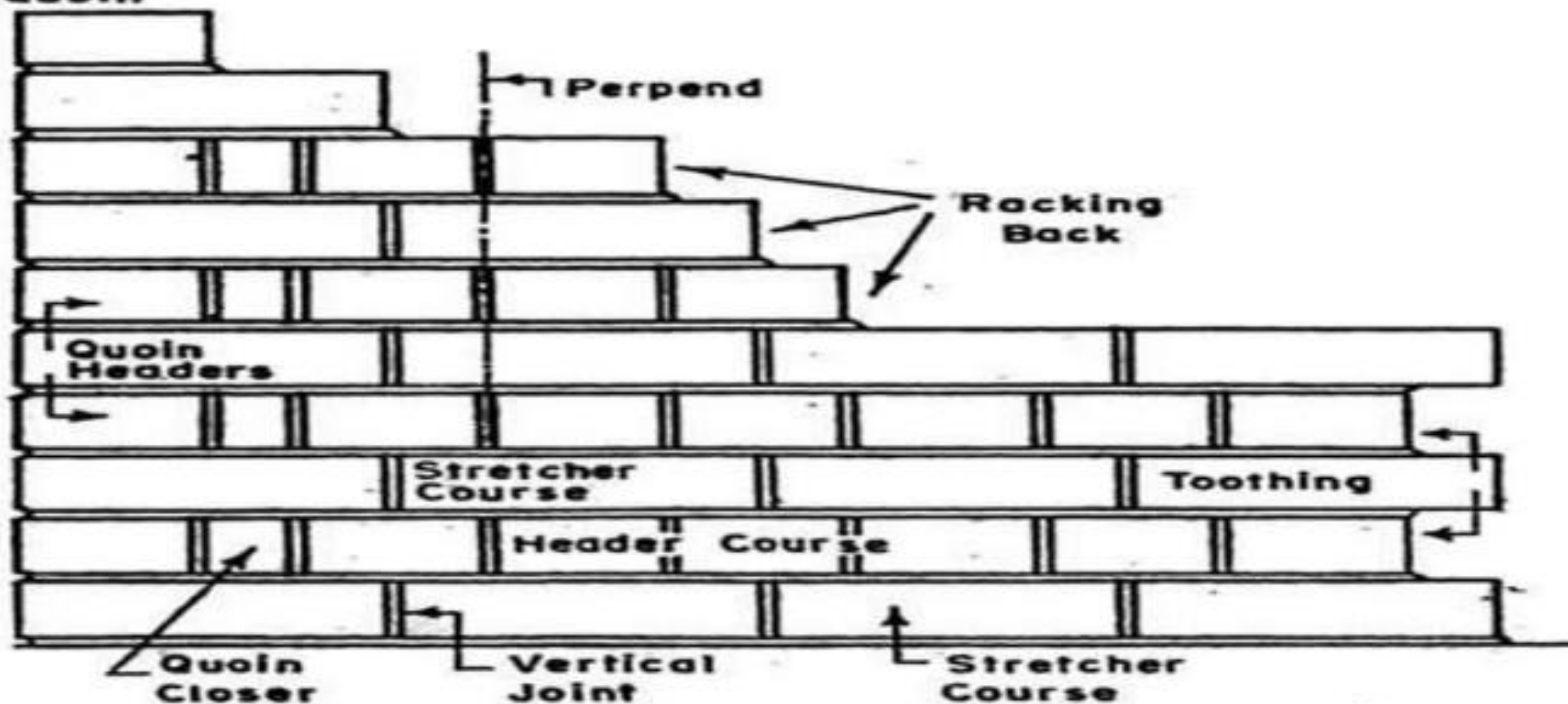
Some Definitions:



Racking Back: It is the termination of a wall in stepped fashion as shown in fig.

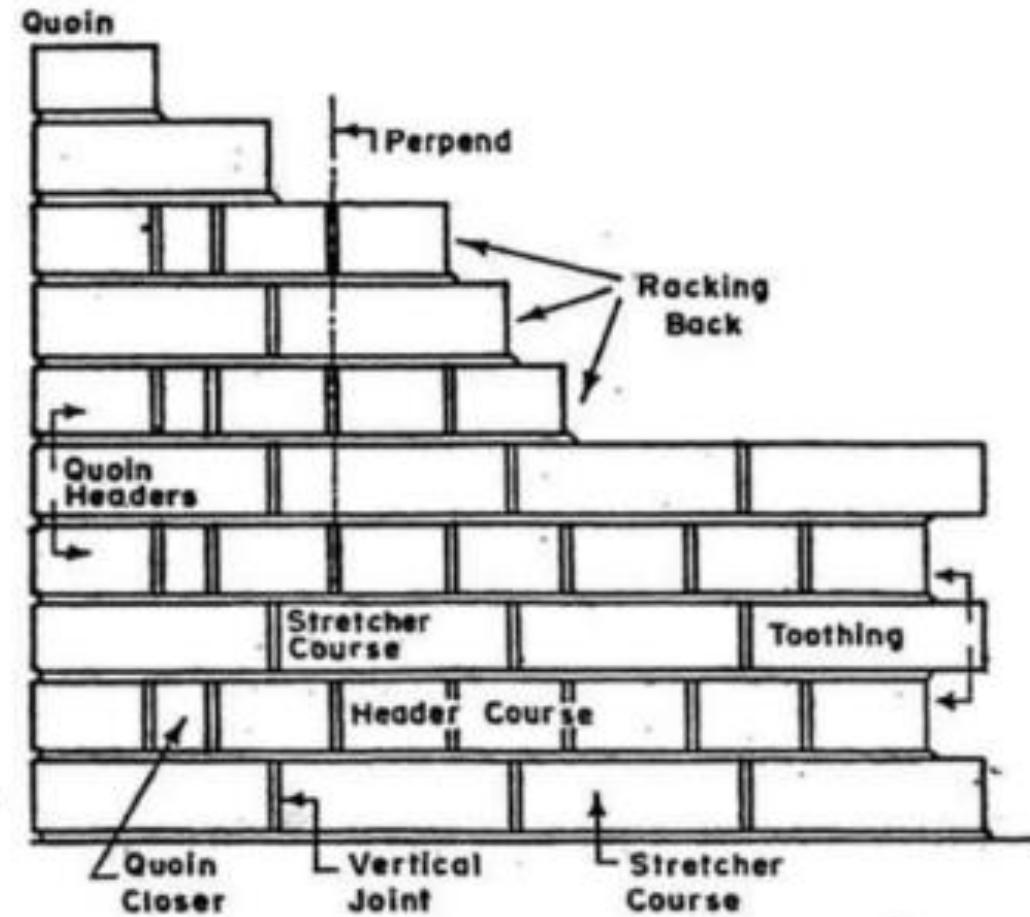
Toothing: It is the termination of the wall in such a fashion that each alternate course at the end projects, in order to provide adequate bond if the wall is continued horizontally at a later stage.

Quoin



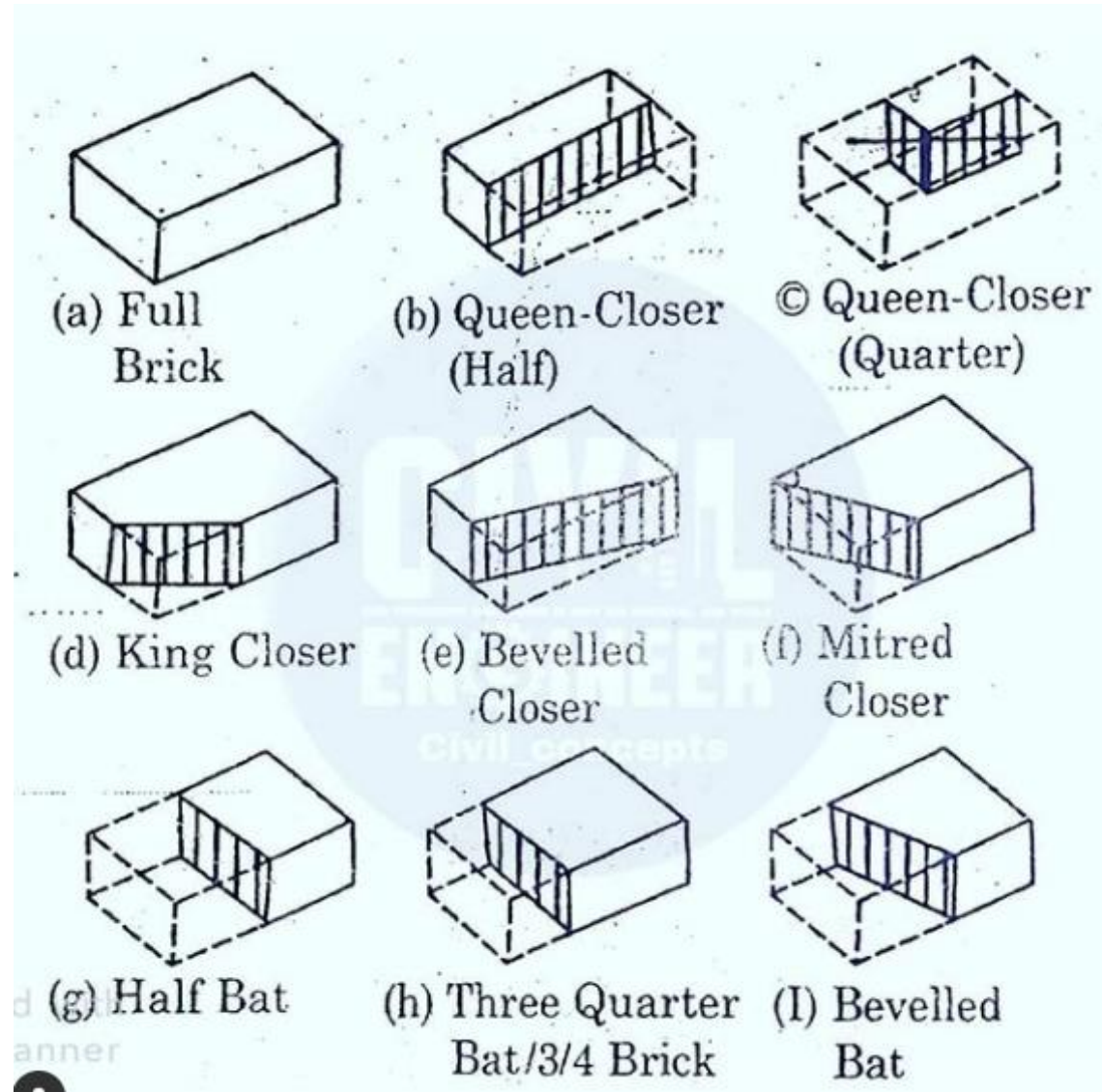
Some terminologies:

- **Lap:** It is the horizontal distance between the vertical joints of successive brick courses.
- **Perpend:** It is an imaginary vertical line which includes the vertical joint separating two adjoining bricks.
- **Bed:** It is the lower surface of the brick when laid flat.
- **Racking Back:** It is the termination of a wall in stepped fashion as shown in fig.
- **Toothing:** It is the termination of the wall in such a fashion that each alternate course at the end projects, in order to provide adequate bond if the wall is continued horizontally at a later stage.



Elevation of a Brick Wall

Brick Bats



Rules to get a good brick bond

- ❖ Amount of lap should be minimum one fourth brick along the length of wall and one half brick across thickness of wall
- ❖ Bricks should be uniform in size to get uniform lap
- ❖ Stretchers should be in facing
- ❖ Use of brick bats should be discouraged except under special circumstances
- ❖ Vertical joints in the alternate courses should be along same perpendicular

Types of Bonds in Brick Masonry Wall Construction :

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

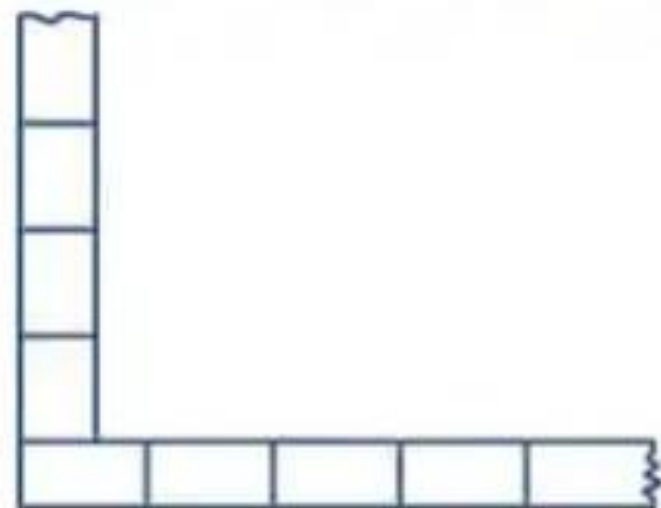
1. Stretcher bond
2. Header bond
3. English bond and
4. Flemish bond

The 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.



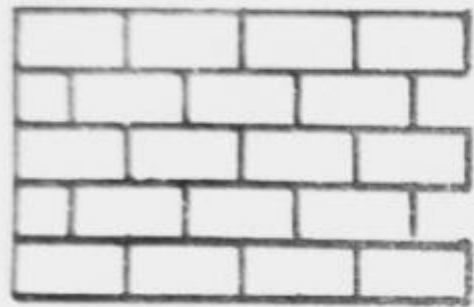
(a) Elevation



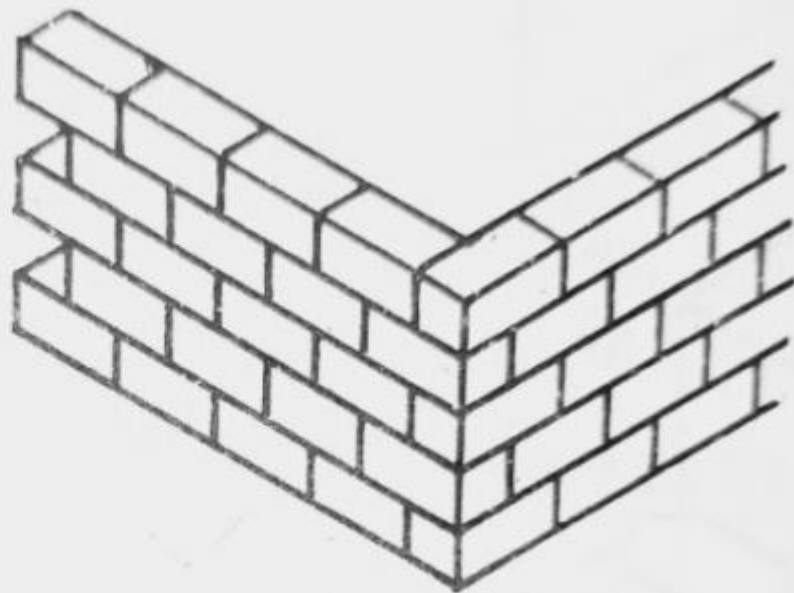
1, 3, 5 ... Courses

(b) Plan

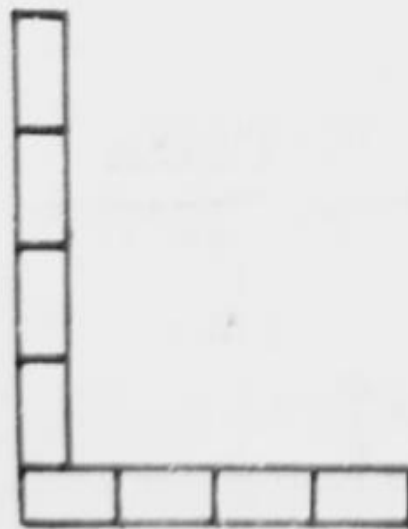
STRETCHER BOND



ELEVATION



ISOMETRIC VIEW



PLAN



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.

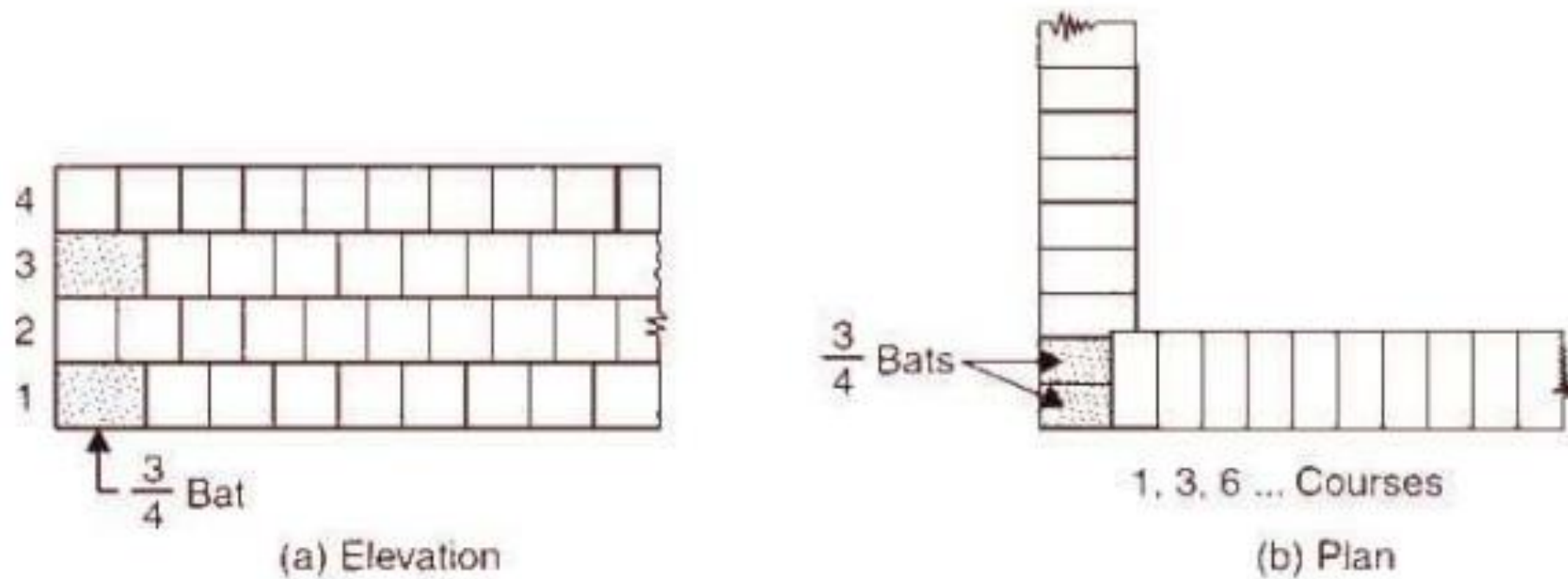


Fig-2: Header Bond

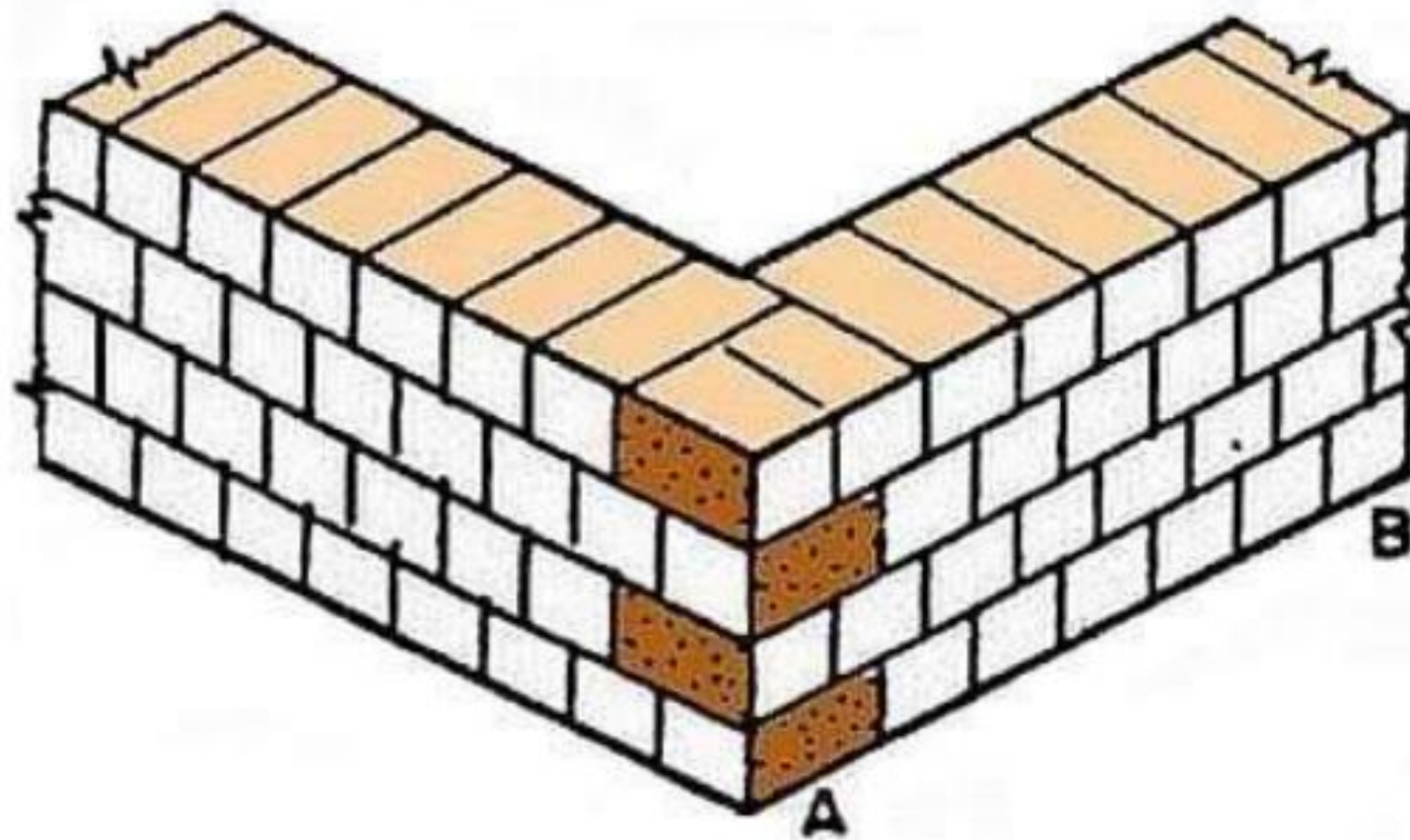


Fig-3: Header Bond Isometric View

■ Header bond

- ❑ All bricks arranged in header courses
- ❑ Overlap is equal to half width of brick
- ❑ Does not have strength to transmit pressure in the direction of length of wall
- ❑ Not suitable for load bearing walls, but used in curved surfaces

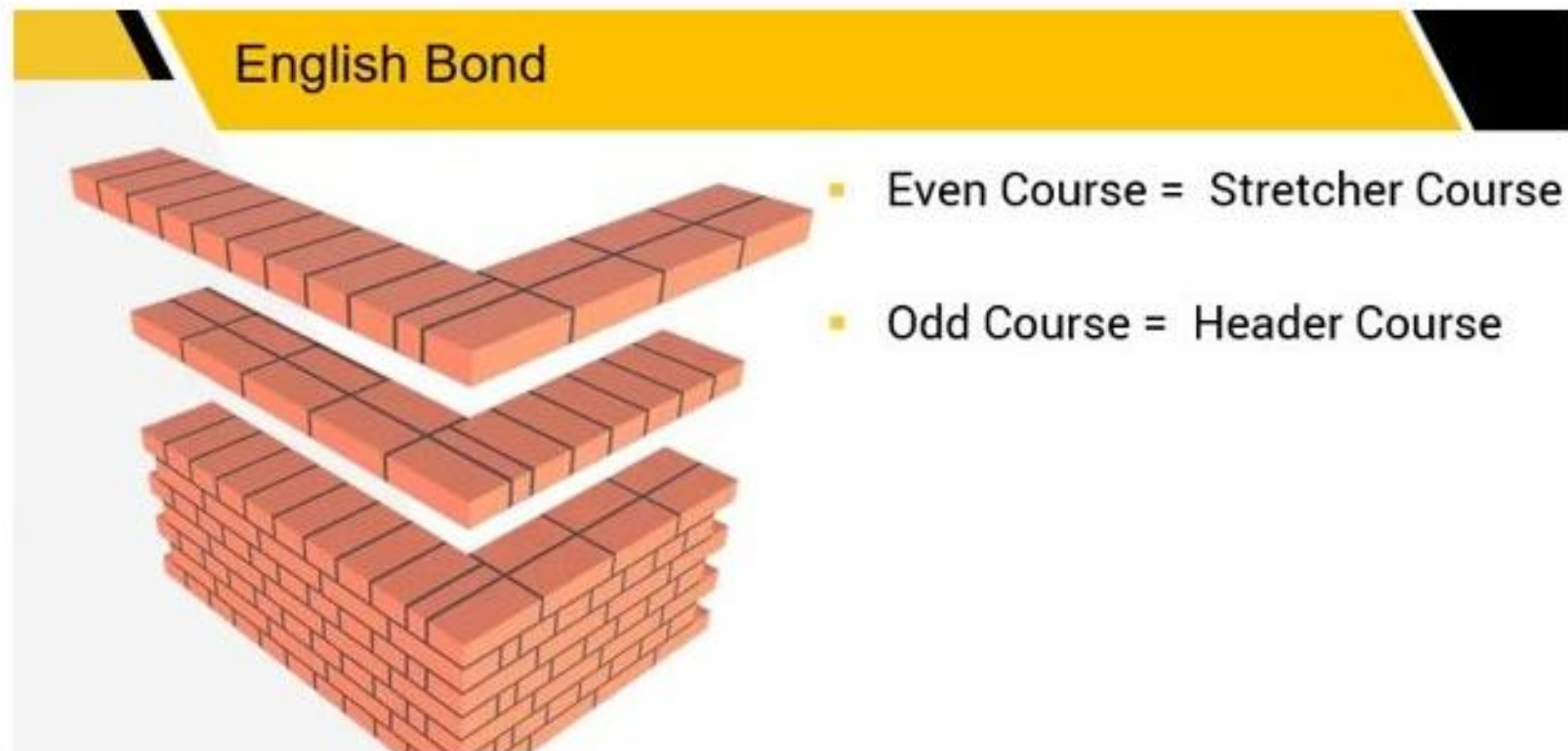
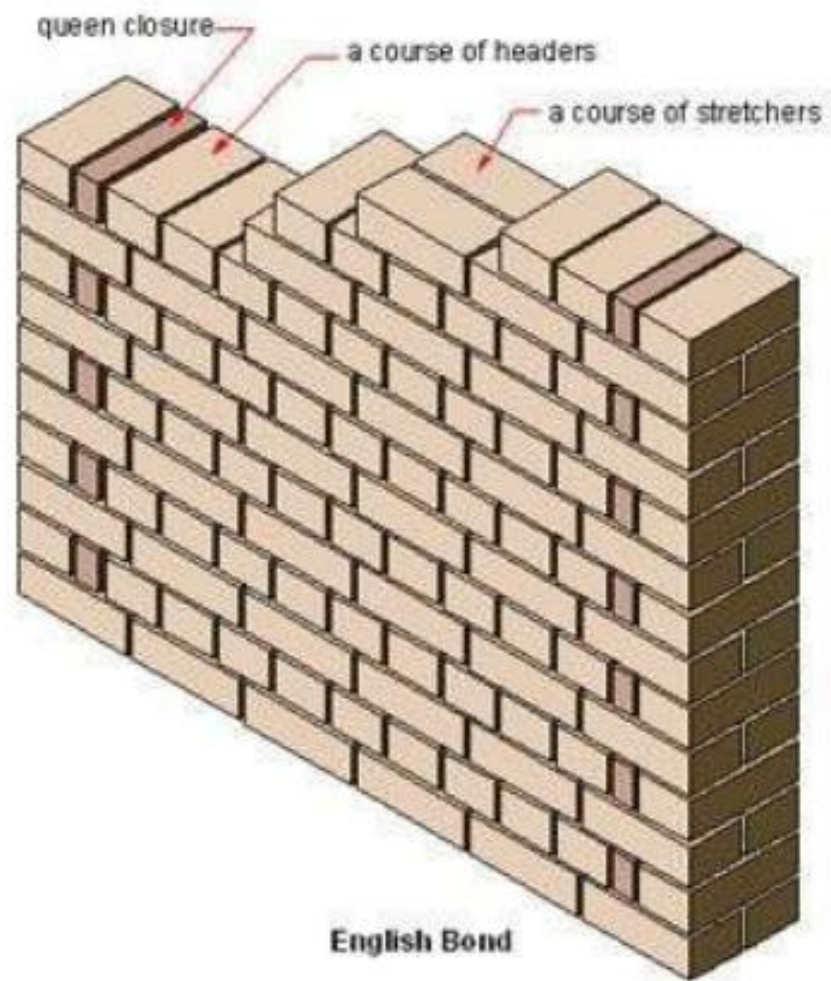


3. English Bond

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.



ENGLISH BOND

- ❖ Strongest bond in brick work
- ❖ Alternate course consists of headers and stretchers
- ❖ Queen closer is put next to quoin header to develop lap
- ❖ Each alternate header is centrally supported over a stretcher
- ❖ Continuous vertical joints are not formed other than at certain points
- ❖ If wall thickness is even multiple of half brick- front and back elevation will have headers and stretchers, if uneven multiple, it will show different sides on front and back elevation
- ❖ Number of joints in header course is twice that of stretcher, hence they should be made thinner
- ❖ Header course should never start with a queen closer

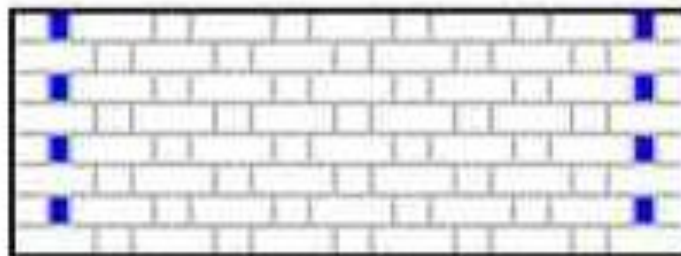
4. Flemish Bond

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.

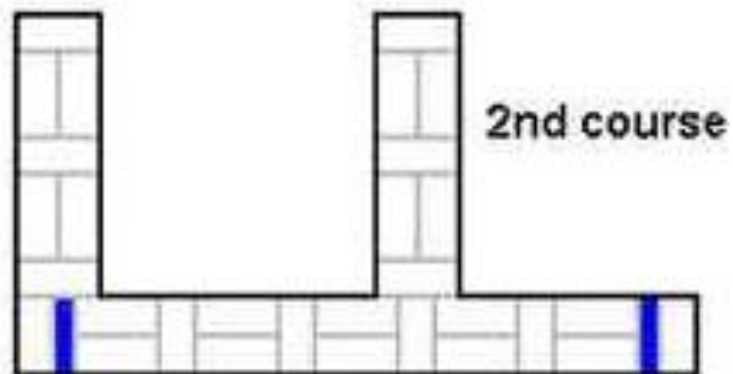
Flemish bond, also known as Dutch bond, is created by laying alternate headers and stretchers in a single course. The next course of brick is laid such that header lies in the middle of the stretcher in the course below, i.e. the alternate headers of each course are centered on the stretcher of course 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 inserted in alternate courses next to the quoin header. In walls having their thickness equal to odd number of half bricks, bats are used to achieve the bond.

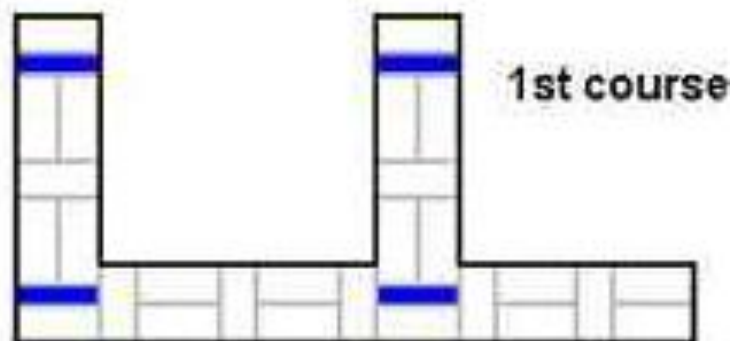
Flemish bonds have better appearance but are weaker than English bonds for load bearing wall construction. Thus, if the pointing has to be done for brick masonry walls, then Flemish bond may be used for better aesthetic view. If the walls have to be plastered, then it is better to use English bond.



Elevation



2nd course



1st course

Comparison of English Bond and Flemish bond

<i>Sl No.</i>	<i>English Bonds</i>	<i>Flemish bond</i>
1	This bond consists of headers and stretchers laid in alternative courses.	This bond consists of headers and stretchers laid alternatively in each course.
2	It is strongest of all the bonds.	It is less strong for walls having thickness more than 13 ½ inches.
3	It provides rough appearance especially for one brick thick walls.	It provides good appearance for all thickness of walls.
4	There are no noticeable continuous vertical joints in the structure built in this bond.	There are partly continuous vertical joints in the structure built in this bond.
5	Much attention is not required in providing this bond.	Special attention is required in providing this bond.
6	Progress of work is more.	Progress of work is less.
7	It is costly because the use of brick bats is not allowed.	It is economical because brick bats are allowed for forming this bond.