

# 9

## BRICK WORK

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### 9.1 INTRODUCTION

The walls of a building are generally constructed by bricks and the method of joining bricks in different fashions is called brick work.

### 9.2 OBJECTIVES

After going through this chapter you will be able to:

- describe the importance of brickwork in building construction;
- explain the method of performing of brickwork;
- explain the different types of bonds used in brick work;
- enumerate precautions which are required to be observed during brickwork.

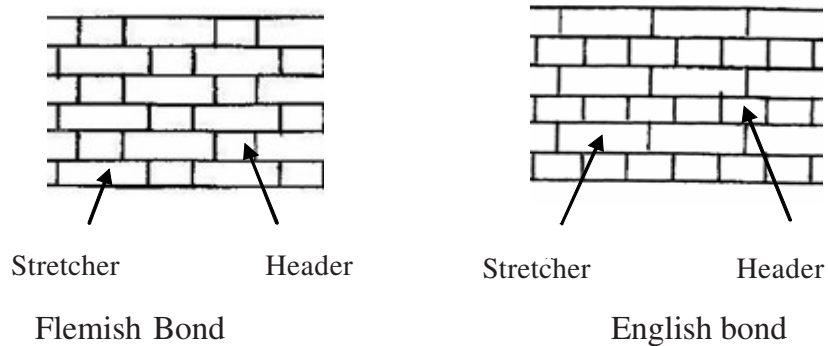
### 9.3 BRICKWORK IN BUILDING WORKS

1. **Brickwork in Clay:** In this, wet clay is used for joining the bricks. The clay should be cohesive with permissible amount of sand. The thickness of clay/earth mortar is 12 mm and the maximum height of building constructed with clay is restricted to 2.5 m.
  2. **Brick work in Cement or Lime Mortar:** In this type of Brick work cement or lime mortar is used. Cement mortar consists of Cement and sand with water in appropriate proportions and the lime mortar consist of lime and Surkhi with water in appropriate proportions. The thickness of the joint in this type of work is kept not more than 10.0 mm. Other materials such as
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stones and cement blocks are also used in brick work. Sometimes corners are made of bricks where it is required to keep the brick open (without plaster). This type of brick work is called “facing brickwork”.

The end view of the brick facing long side is called “stretcher” and the end view of the brickwork which faces breadth of the brick is called “header”. It means that when we view the brick work from the front and see the face  $9'' \times 3''$  it is stretcher and when we see the face  $4.5'' \times 3''$  it is header.

**Queen Closer:** A brick cut lengthwise in  $9'' \times 2\frac{1}{4}''$ , is called a queen closer and is placed next to the header course to break the joints.



**Fig. 9.1**

The Bricks should be fully soaked in water before starting the brick work. If the bricks get dried during transportation from the wetting site to the place where brickworks is going to be carried out, then again it should be made fully wet before putting it for use in brickwork. In any case very wet or dried bricks should not be used in brick work. Table 9.1, 9.2 and 9.3 give information about the consumption of cement in different modes of brick work.

**Table 9.1:** Consumption of Cement in one Cubic meter of Cement Mortar

Mix Ratio (Cement : sand)	No. of bags of cement required per cubic meter of Mix	Mix ration (Cement : Sand)	No. of bags of cement per cubic meter of Mix
1 : 1	20.4	1 : 2	13.60
1 : 3	10.20	1 : 4	7.60
1 : 5	6.20	1 : 6	5.00

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**Table 9.2:** Consumption of Cement and Sand per Cubic meter of Brick work

Mix Ratio (Cement : Sand)	No. of bags of cement required per cubic meter of Mix	Mix ratio (Cement : Sand)	No. of bags of cement per cubic meter of Mix
1 : 6	1.30	1 : 5	1.60
1 : 4	1.90	1 : 3	2.60

**Table 9.3:** Consumption of Cement in 115 mm thick Brick Work (BW) per sq. m.

Mix Ratio (Cement : Sand)	No. of bags of cement required per cubic meter of Mix	Mix ratio (Cement : Sand)	No. of bags of cement per cubic meter of Mix
1 : 3	0.30	1 : 4	0.22

## 9.4 METHOD OF MAKING MORTAR FOR BRICKWORK (B/W)

For example, to make a mortar of ratio 1 : 4 take 4 volumes of sand on a flat space. Then lay 1 volume of cement over it and continue to mix it thoroughly with shovel till uniform color is obtained. After this, pour water over it only to the extent that it becomes workable but water does not flow out of it.

**Fig. 9.2:** Pan Mixer

The mortar must be consumed in Brick work within 30 minutes of pouring water otherwise it starts setting.

Petty or Boxes are used for measuring sand. The size of the box is generally 30 cm × 30 cm × 38 cm deep. For different ratios of mix, boxes of special sizes can also be made as per the direction of the Engineer.

**Table 9.4:** Amount of Cement and Sand per cub. m. of mortar

Mix Ratio	Cement in Bags	Sand Cub.m.	Mix Ratio	Cement in Bags	Sand Cub.m.
1 : 1	20.40	0.71	1 : 2	13.60	0.95
1 : 3	10.20	1.05	1 : 4	7.60	1.05
1 : 5	6.20	1.05	1 : 6	5.00	1.05
1 : 7	4.20	1.05	1 : 8	4.00	1.05

**Table 9.5:** Consumption of materials per cubic m. of Brick work

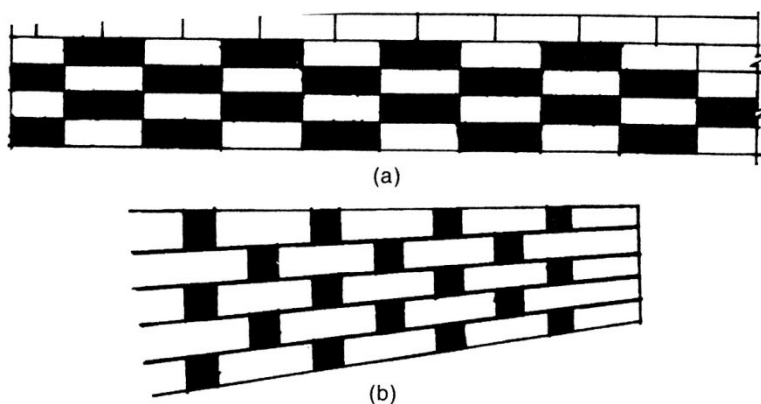
Mix Ratio (Cement : Sand)	Cement Bags (Nos.)	Sand in cubic m.	Bricks (No.)	Mix Ratio (Cement : Sand)	Cement Bags (Nos.)	Sand in cubic m.	Bricks (No.)
1 : 3	2.6	0.275	500	1 : 4	1.9	0.275	500
1 : 5	1.6	0.275		1 : 6	1.3	0.275	
1 : 7	1.1	0.275		1 : 8	0.95	0.275	

At a time not more than 1.0 m height of Brickwork should be carried out. Spirit level should be used at the time of Brick work. Pipe or water level should not be used. The excess mortar should be removed from the joints before setting of the Cement. After finishing the days work, the date of work should be written with chalk etc on the Brickwork portion itself. This is necessary because the date up to which the brickwork is to be kept wet is decided on the basis of that date, the putting up the date facilitates the inspection work later on regarding wetting period etc. The brickwork is cured for a minimum period of 7 days. In

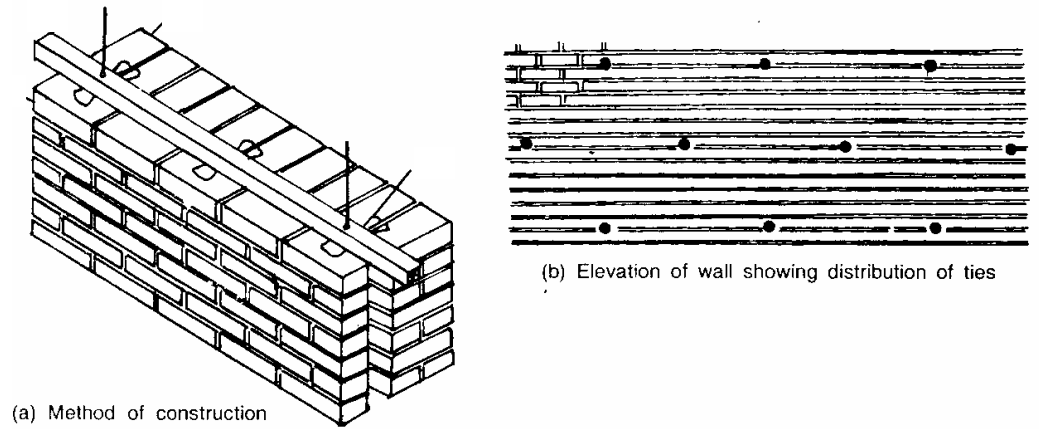
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case of  $\frac{1}{2}$  brick thick walls, 6.0 mm dia steel reinforcement is placed after every four layers. The length of this steel rod is kept at 2 ft nearly. These reinforcements are used to connect the pillars, which are provided at every ft or less. All the  $\frac{1}{2}$  bricks should not be placed at one place during the brickwork.

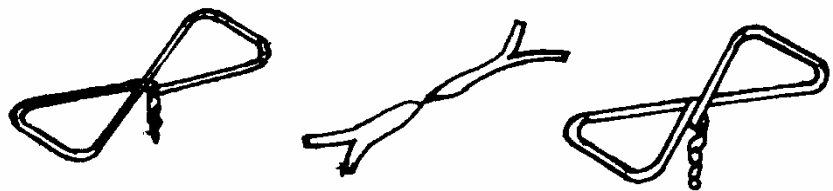
To start the brickwork at any place first of all the corners of the wall are fixed and centre lines of both the walls are demarcated. The cotton thread is stretched on the corners of both the walls by wrapping it around the brick and kept attached to the outer face of the wall, so that the outer face remains in line and at the same time it remains horizontal too. As per the requirement of the bond, Queen closers are provided and at a time four layers of bricks are constructed. It's total height should be measured to the accuracy up to 1.0 mm. The requirement of layers to be laid should be in whole numbers. If required the thickness of mortar between the bricks can be adjusted as per requirement. A big stick should be used as gauge and marking should be done on it. In this manner more no. of stick gauges can be made. At least two gauges should be available at a time of constructing a wall. At the time of construction of wall these gauges are required to be kept erect on both the sides of the wall and every time the cotton thread should be raised for keeping the height of brick layer same throughout its length. At some places it is required to leave holes of the size of header for holding bamboo scaffolding or platforms for brickwork at higher levels from the ground. Sometime for decorative purposes also holes are left. In that case, this type of brickwork is called "honeycomb brickwork". In general the thickness of this type of brickwork is kept as 11.5 cm. The brick should overlap by 2 cm on each side. (Refer Fig. 9.3)



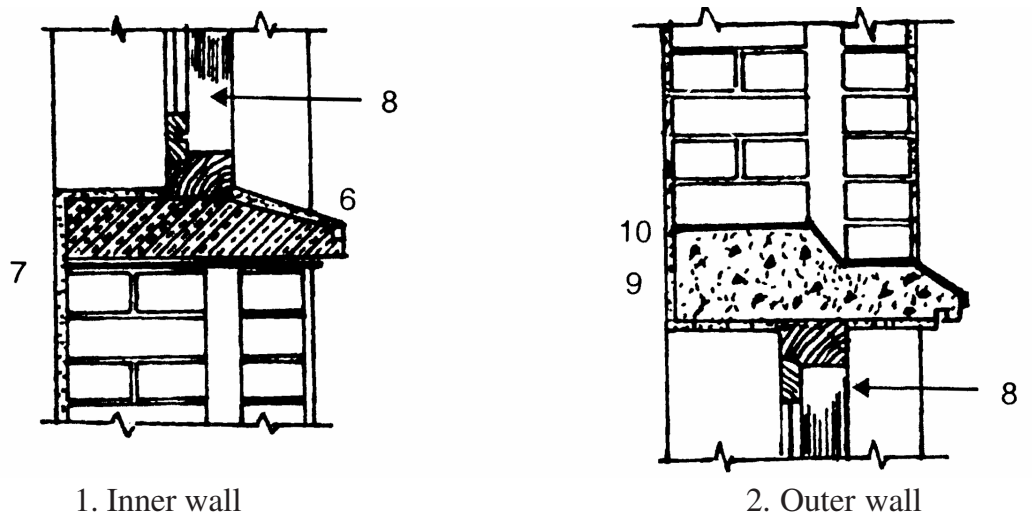
**Fig. 9.3:** Honey Comb Brickwork



**Fig. 9.4:** Cavity wall BW



**Fig. 9.5:** Cavity wall clamps or wall ties

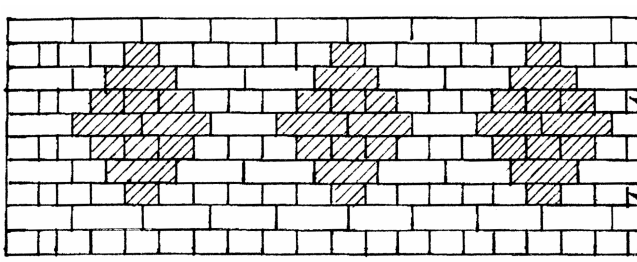


**Fig. 9.6:** Cavity wall

In order to hold the doors and windows fast with the wall either of the two methods are adopted. A hold fast of the shape of Z is jammed with concrete put in the hole of the wall made for this purpose, when the frame is being put at the time of construction. And if the frame is to be put later on then fastners are used.

## Bond

In general Brickwork is done in English Bond, however different types of bonds can also be used if asked for e.g. Flemish Bond, American Bond, Garden Wall Bond, and English Bond. Some of the useful Bonds are shown in the Fig. 9.7 – 9.13 below.

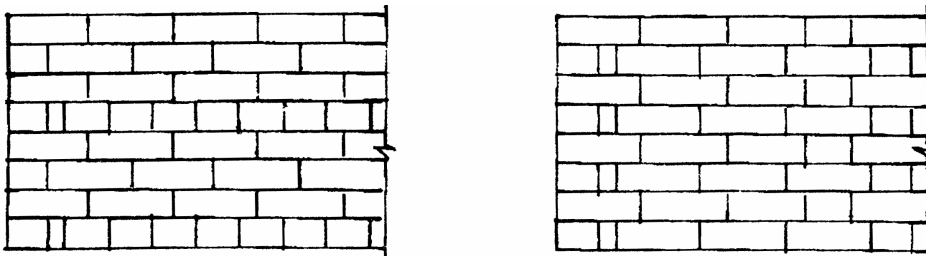


**Fig. 9.7:** English Cross Bond

(For creating pattern Bricks in English Bond or painted)

## English Garden Bond

In English Garden Bond 3 stretcher course is followed by one Header Bond

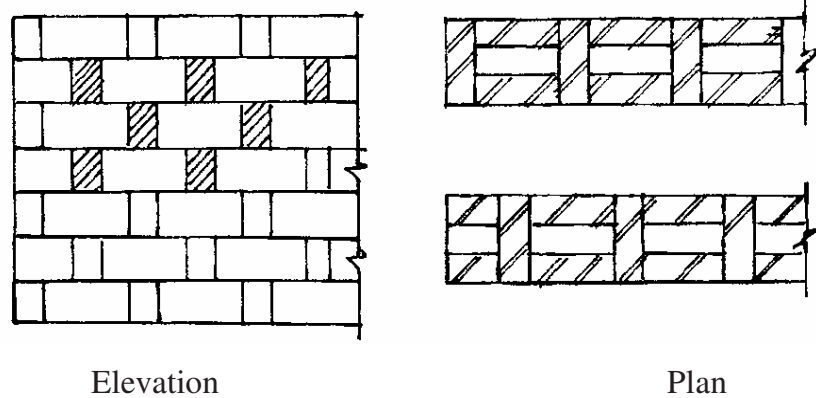


**Fig. 9.8**

### Flemish Garden Bond

In Flemish Garden Bond also one Header course is provided after three stretcher course

**Fig. 9.9**



Elevation

Plan

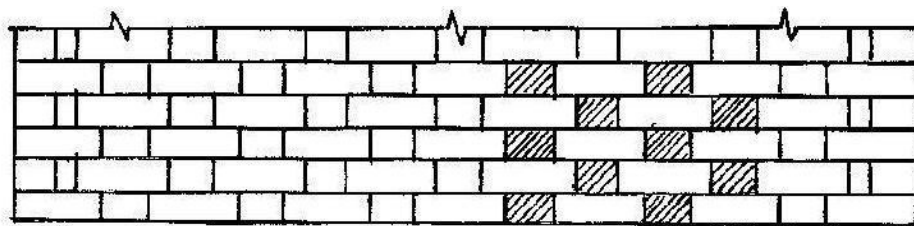
**Fig. 9.10:** Rap Trap Bond using brick on Edge

Sometimes two types are used simultaneously. This is called Mixed Bond. This is done when two walls meet or when wall and Pillars meet.

**Fig. 9.11:** Mixed Bond

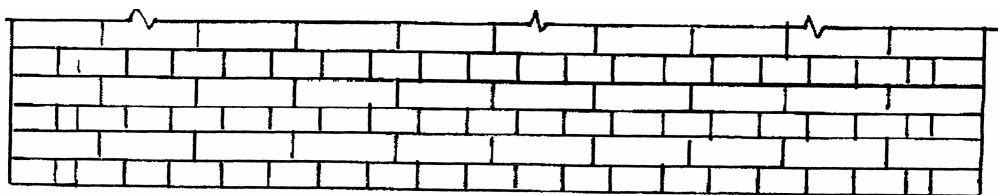
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**Fig. 9.12:** Flemish Bond

The specialty of Flemish Bond is that in every course one brick is kept in Header Position and the next brick is kept in Stretcher position.



**Fig. 9.13:** English Bond

In English Bond one course is laid as stretcher layer and the next course is laid as Header layer.

In both the types of bond closers (King closer and Queen closers) are used in the full thickness of the wall.

In American Bond after every four or five courses one stretcher course is layed.

During brickwork construction it should be kept in mind that the joint of first course and second course should not fall in one line. This is kept like this with the aim that the loads are distributed diagonally up to the foundation. The combined thickness of one course including that of the mortar should not exceed 7.6 cm in any layer/course.

The brickwork for all is always started from both the ends. In general walls are constructed as  $\frac{1}{2}$  brick thick,  $1\frac{1}{2}$  bricks thick, 2 bricks thick,  $2\frac{1}{2}$  brick thick and 3 brick thick which we see in our daily life. However, in Boundary walls one brick thick wall are also constructed. In English Bond the lay outs of 1<sup>st</sup> layer,

3<sup>rd</sup> layer and 5<sup>th</sup> layer etc are same they are called odd layers and the layouts of all even layers (course) are similarly same. The joints are not actually cut but they are made to overlap.

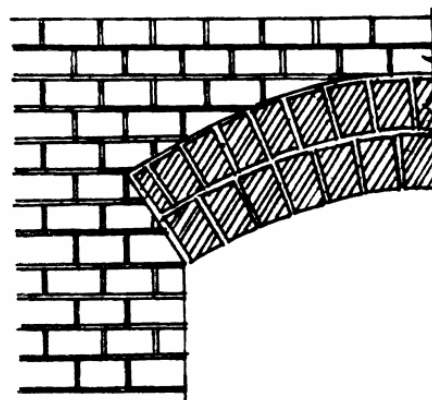
Any wall which is more than 23 cm in thickness Plumb bob and vertical gauge is put on both the sides of the wall and the cotton string is also stretched on both the faces of the wall. If the wall is being constructed on all the four sides, all the walls should be raised up to the same height and left at 45° for next day's work, so that good bond can be made.

**Joints:** All joints should be cut up to 12 mm deep, so that at the time of plastering good bond is made between the brick and the plaster. It acts like a key.

**Curing:** In general brickworks are cured at least for 7 days.

**Measurement:** Measurements for the purpose of payment will be done considering the thickness of wall in the multiple of 11.5 cm i.e. 11.5, 23.0 cm etc.

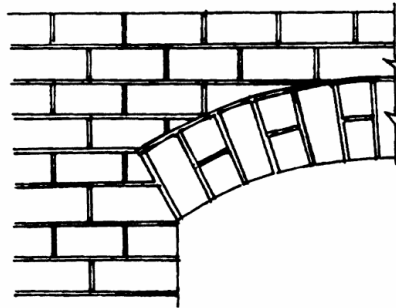
**Arch construction (DOT):** At certain places in the openings of doors and windows of building Arches are constructed. Arches are classified as segmental, Gothic etc. The lower portion of the arch is generally a part of the circle. (Fig. 9.14)



**Fig. 9.14:**Arch

(In this arch the thickness of the mortar between the brick is varied to make the Arch)

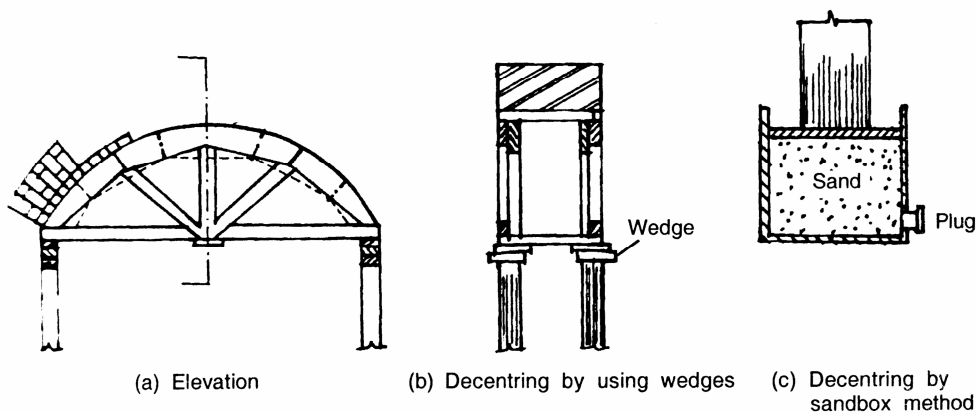
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**Fig. 9.15**

(In this type of arch the glazed bricks are rubbed and cut to make the arch)

Temporary support (shuttering) is required to be constructed at the time of construction for supporting the arch under construction. Centre is required to be marked. The starting point of the arch is called “Spring” and the line joining two springs is called spring line. This operation is called centring and shuttering.

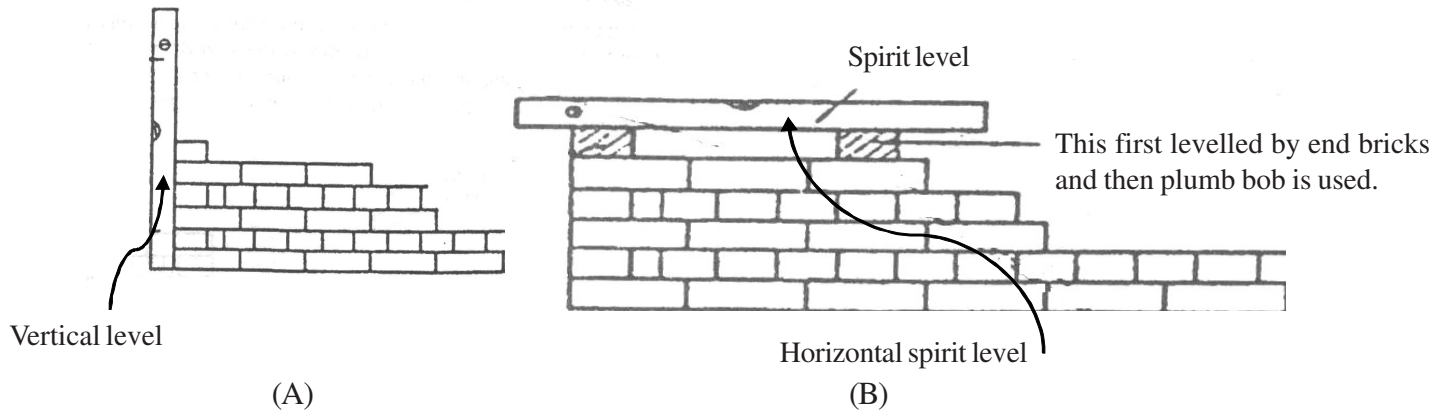


**Fig. 9.16:** Various stages of Arch Construction

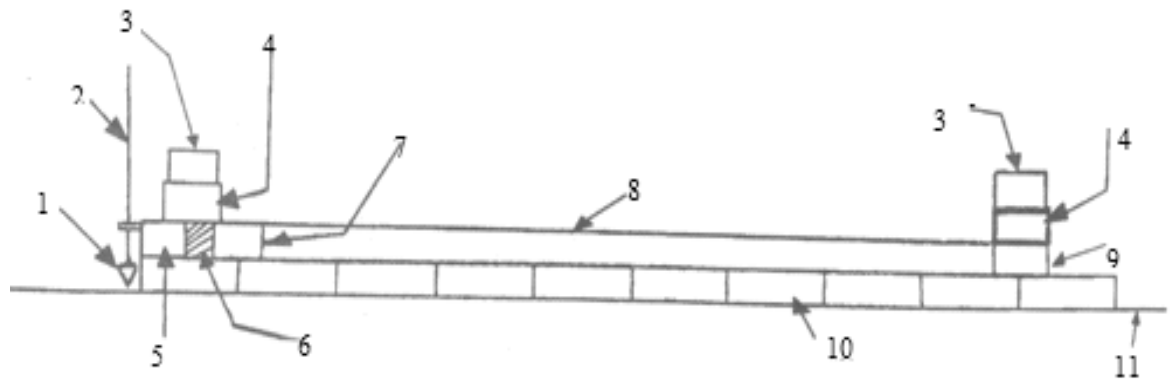
### 9.5 POINTS TO BE NOTED AT THE TIME OF BRICKWORK CONSTRUCTION

- It should be ensured that the brick being used is as per requirement.
- The brick should be wet for atleast two hours before starting the construction for which a water tank is needed at the work site.
- The brick should be properly placed on the even surface and the mortar should fully cover the brick surface before laying the other course.

- The brick work should be raised in layers in an uniform manner and it due to any reason it is not possible stepping should be made in brick wall under construction for future work.
- Vertical layer and horizontal layer both should be controlled while constructing a brick wall.



**Fig. 9.17:** Process to be observed before laying a fresh course of B/W



**Fig. 9.18:** Process of starting the second course of brick work by using plumb bob

1. Plumb bob, 2. String of plumb-bob, 3. Dry brick for increasing the weight, 4. Dry brick for wrapping of cotton string, 5. The corner of the header of the second course, which is set in the corner of the stretcher coinciding with the string of the plumb -bob, 6. Closer -brick, 7. The brick set for second course of B.W., 8. Cotton- string, 9. The brick level fixed for the second layer, 10. First layer of B.W., 11. Base Concrete.

- Approved cement mortar should only be used for B/W
- It is not permissible to use small brick bats or  $\frac{1}{2}$  bricks in the B/W

- The B/W should be carried out maintaining the vertical and horizontal level.
- The brick work should be cured for atleast 2-3 weeks with water if it is in cement mortar and for 1 to 2 weeks if it is in lime mortar.

The defect in B/W may be of the following nature: defect in joints, loose particles in brick, improper drying or efflorescence.

## **9.6 PLINTH BEAM**

It has become very necessary these days to cast a beam at the plinth level. It joins all the walls from each side. Its thickness and width is kept as per design. It keeps the total building bounded together and helps in the providing safety to the building during earthquake etc.

In the same way at plinth level also ring beam is provided which joins all the walls.

## **9.7 WHAT HAVE YOU LEARNT**

- Brickwork and its type
- Bonds and its types used in Brickwork.
- Points which should be kept in mind at the time of Brickwork.
- Plinth beam

## **9.8 TERMINAL QUESTIONS**

1. What is the importance of Brickwork in building construction?
  2. How many types of bonds are used in Brickwork?
  3. What points should be kept in mind during Brick work?
  4. What do you know about the Plinth Beam?
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