Internal Assesment Test - I – September 2019

Solution

BUILDING MATERIALS AND CONSTRUCTION (18CV34)

1. Pile foundation

These foundations are known as deep foundations. A pile is a slender column made of wood, concrete or steel. A pile is either driven into the soil or formed in situ by excavating a hole and then filling it with concrete. A group of piles are driven to the required depth and are capped with R.C.C. slab, over which super structure is built. The pile transfer the load to soil by friction or by direct bearing, in the latter case, piles being taken up to hard strata. This type of foundations is used when top soil is not capable of taking the load of the structure even at 3–4 m depth.

Classification of Piles According to Load Transfer or functions:

End bearing piles

Bearing piles rest on hard strata and transfer the load by bearing. Such piles are preferred. These piles are used if the hard strata is available at reasonable depth.

Friction piles

Friction piles transfer the load to the soil by the friction between soil and the pile. Such piles are used if hard strata is not available to a considerable depth. The friction developed is to be properly assessed before deciding the length of the pile. The surface of such piles is made rough to increase the skin friction so that required length of pile is reduced. They are generally used in granular soil.

Combined end bearing and friction piles

Here the load is transferred through combined action of end bearing and friction.

Compaction piles

They are used to compact granular soil. A pile tube is inserted in soil first and taken out. Later it is filled with sand forming a sand pile.

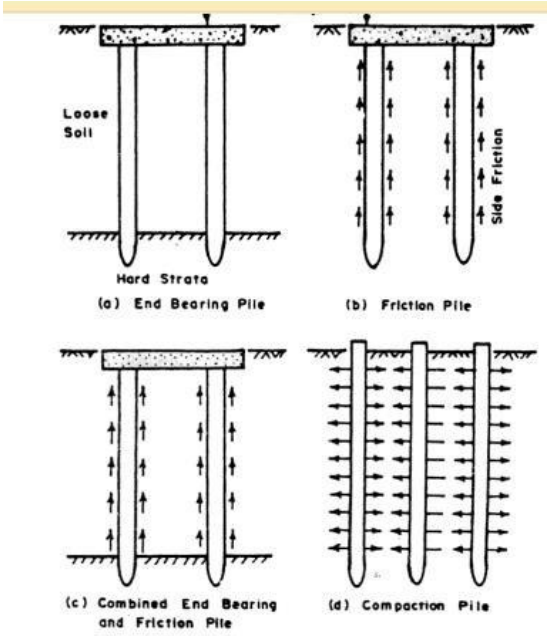


FIG. 2.8. PILE FOUNDATIONS

2. Flemish bond

a) Double Flemish bond

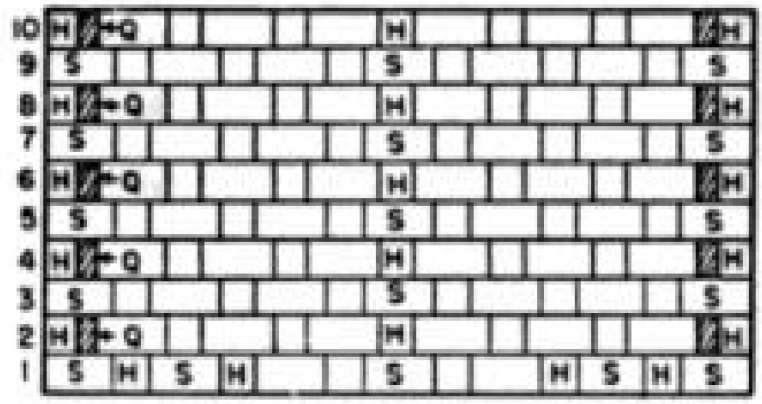
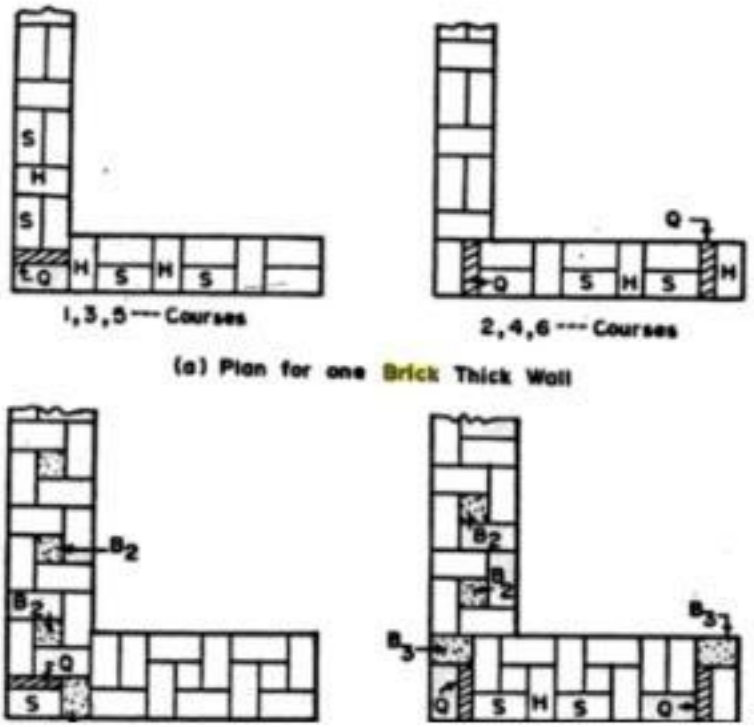


FIG. 6.9. FLEMISH BOND (ELEVATION).

a) Every course consists of alternate header and stretcher in the same course.
b) The facing and backing has same appearance
c) Quion closers are kept next to quoin headers
d) For walls having even multiples of half bricks no bat are used
e) For walls having odd multiples of half bricks ,half bats and three fourth bats are used

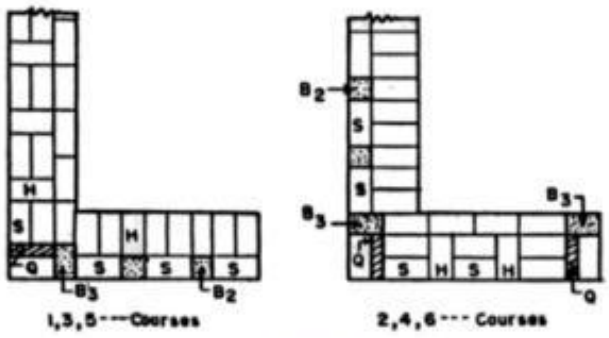
b) Single Flemish bond

a) It is composed of double Flemish bond facing and English bond backing and hearting in each course.
b) This bond uses appearance of Flemish and strength of English bond.
c) Construction is done using good quality expensive bricks.
d) Cheaper bricks can be used for backing and hearting.
e) It can be used for 1 ½ brick brick thick wall.



S = STRETCHER ; H = HEADER ; Q = QUEENS CLOSER ;
B_2 = HALF BAT ; $B_3 = \frac{3}{4}$ BRICK ; B_1 = QUARTER BAT

FIG. 6.10. DOUBLE FLEMISH BOND.



(a) Plan for $1\frac{1}{2}$ Brick Thick Wall

S = STRETCHER ; Q = QUEENS CLOSER ;

B_2 = HALF BAT ; $B_3 = \frac{3}{4}$ BRICK ; B_1 = QUARTER BAT

FIG. 6.11. SINGLE FLEMISH BOND.

3. Reinforced cement concrete lintels

- Common in used.
- They may be pre-cast.
- For smaller span, the pre-cast concrete lintels are used.
- For cast in situ units, form work is required.
- Depth of lintel depends on span.
- Fire resistant
- Ease in construction
- Depth of lintel and reinforcement depends upon the span and the magnitude of loading
- Longitudinal reinforcements consists of mild steel bars are provided near the bottom of lintel to take up tensile stresses.

Stone lintels

- Used , where stones are easily available.
- Consists of a simple stone slab of greater thickness.
- Due to high cost and its inability to with stand the transverse stress load.
- The depth of stone lintel is kept equal to 10cm per metre of span , with minimum of 15cm.
- They are used for 2m span.
- It cracks when subjected to vibratory loads. So it should be used with caution where

shock waves are quite common.

4. FAILURE OF AN ARCH

- Every element of arch remains in compression.

An arch fail due to:-

1) Crushing of the masonry.

2) Sliding of voussoirs.

3) Rotation of some joints about an edge.

4) Uneven settlement of an abutment or pier.

1.Crushing of the masonry.

If the compressive stress exceeds the safe crushing strength of the masonry unit and mortar, the arch will fail in crushing.

The material should be of adequate strength and size of voussoirs should be properly designed to bear the thrust transmitted through them. The height of voussiors should not be less than 1/12 th of span.

2) Sliding of voussoirs.

To safeguard against sliding of voussoirs past each other due to transverse shear, the voussoirs of greater height should be provided.

3) Rotation of some joints about an edge.

Rotation can be prevented, if the line of resistance is kept within intrados and extrados. Also, the line of thrust should be made to cross the joint away from the edge to prevent the crushing of that edge.

4) Uneven settlement of abutment, which causes secondary stresses in arch.

Hence, the abutment which has ultimately to bear the entire load transferred to the arch

should be strong enough. Also, the arch should be symmetrical, so that unequal settlements of the two abutments is minimised.

5. Based on the arrangement of the stone in the construction and degree of refinement in the surface finish, the stone masonry can be classified broadly in the following two categories

1. Rubble masonry
2. Ashlar masonry

1. Rubble masonry

In this category, the stones used are either undressed or roughly dressed having wider joints. This can be further subdivided as uncoursed, coursed, random, dry, polygonal and Flint.

(i) Uncoursed rubble masonry: This is the cheapest, roughest and poorest form of stone masonry. The stones used in this type of masonry very much vary in their shape and size and are directly obtained from quarry.

(ii) Built to regular course: In this type of stone masonry the uniform height stones are used in horizontal layers not less than 13cm in height. Generally, the stone beds are hammered or chisel dressed to a depth of at least 10cm from the face.

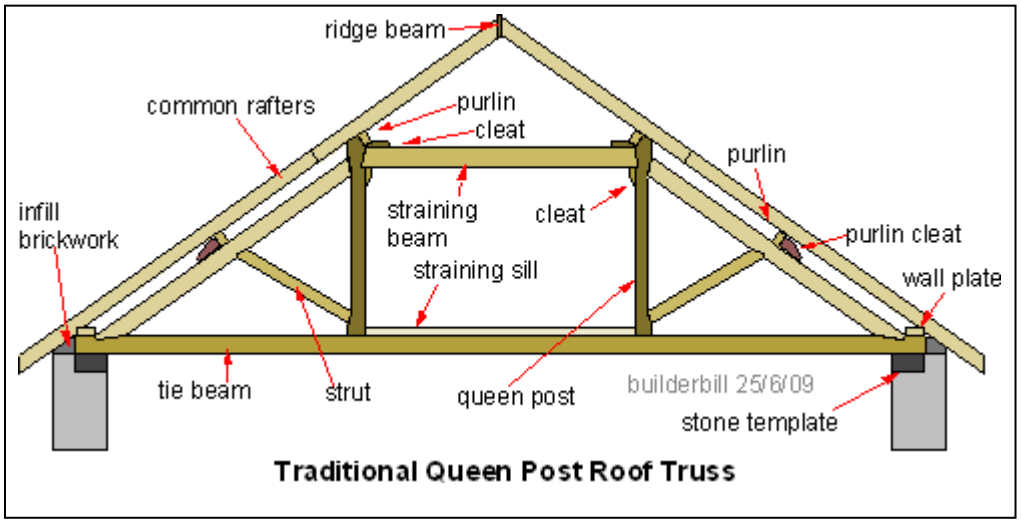
Ashlar Masonry

This type of masonry is built from accurately dressed stones with uniform and fine joints of about 3mm thickness by arranging the stone blocks in various patterns. The backing of Ashlar masonry walls may be built of Ashlar masonry or rubble masonry. The size of stones blocks should be in proportion to wall thickness.

The various types of masonry can be classified under the following categories are 1) Ashlar fine 2) Ashlar rough 3) Ashlar rock or quarry faced 4) Ashlar facing 5) Ashlar chamfered 6) Ashlar block in course

6. Queen post truss

If the span length is in between, 8 to 12 meter then queen post trusses are used. Two vertical posts are provided in two sides at a distance that are termed as queen posts. The vertical posts are connected by a horizontal piece called straining beam. The queen posts are tension members. The tops of the posts are connected by a horizontal piece called straining beam. Two struts are provided to join the feet of each queen post to the principal rafters. The straining beams receive the thrust from the principal raftersand keep the junction in stable position. A straining sill is introduced on the tie beam between the queen posts to counteract the thrust from the inclined struts that are in compression. In the absence of the straining sill, the thrust from the strut would tend to force the foot of the queen post inwards. Purlins with cleats are provided as in king post truss.



The head of the queen post is wider and the head of the principal rafter and the end of straining beam are tenoned into it. The joint is further strengthened by fixing a 3way strap of wrought iron or steel on each face.