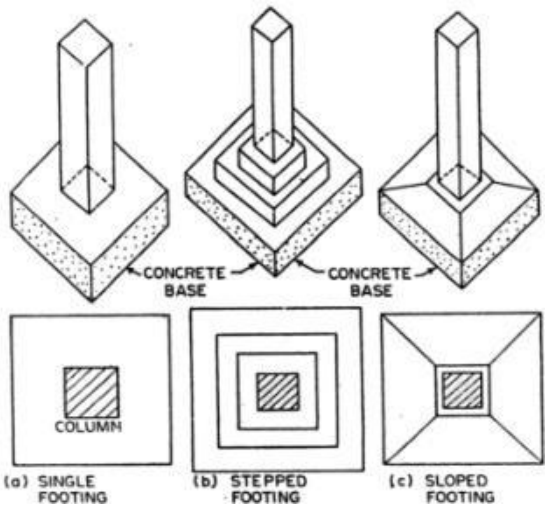
Internal Assesment Test – I

Building materials and Construction- Solution

1.Spread or Isolated Footings: They are used to support individual column. Isolated footings are stepped type, simple type or slope type, having projections in the base concrete. To support heavy loads, reinforcement is also provided at the base. The reinforcement provided is in the form of steel bars and is placed in both direction

Classification of spread footing

- Single footing for a column
- Stepped footing for a column – base is made of concrete and provided with steps for heavily loaded column
- Sloped footing for a column- concrete base does not have uniform thickness. It has greater thickness at the junction and lesser thickness at ends.
- Wall footing without steps- Mainly for compound walls
- Stepped footing for a wall
- Grillage foundations



Combined Footing

A combined footing supports two or sometimes three column in a row. Combined footing is used when property lines, equipment locations, column spacing or other considerations limit the footing clearance at the column locations. The combined footing can be rectangular in

shape if both the columns carry equal loads, or can be trapezoidal if there is a space limitation and they carry unequal loads. Generally they are constructed of reinforced concrete.

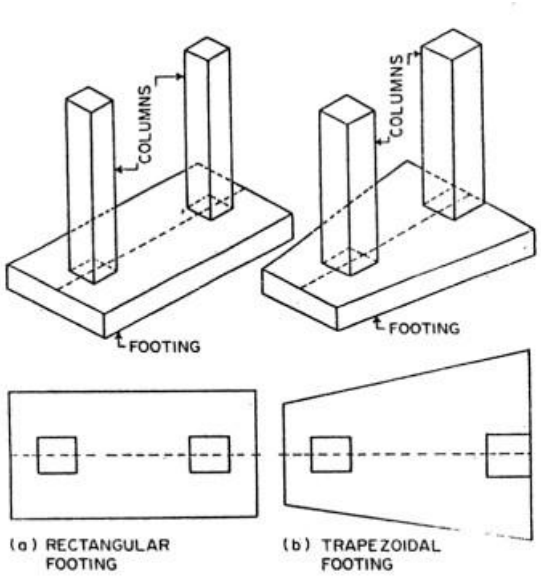
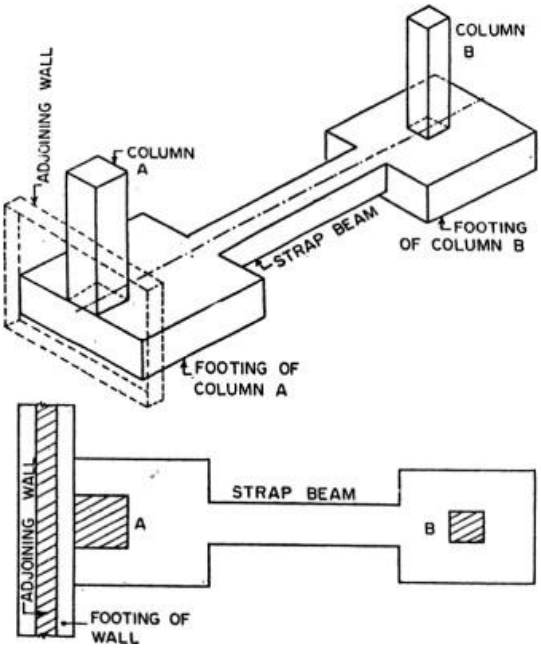


FIG. 2.5. COMBINED FOOTINGS FOR COLUMNS.

Cantilever or Strap Footing

Cantilever footing consists of two individual footings connected by a beam called a strap. It is also sometimes called as strap footing. Cantilever footing may be used where the distance between the columns is so great that a trapezoidal combined footing becomes quite narrow, resulting high bending moments. The strap beam does not remain in contact with soil so a strap doesn't transfer any pressure to the soil.



2. Classification of stone masonry

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

Rubble masonry

The stones used are either undressed or roughly dressed having wider joints. The stones as obtained from the quarry are taken in use in the same form or they are broken and shaped in suitable sizes by means of hammer as the work proceeds.

I. Coursed Rubble masonry - Height of stones vary from 50 mm to 200mm. The stones are sorted out from the work. The masonry work is then carried out in courses such that the stones in a particular course are of equal heights. This type is used in construction of public buildings and residential buildings.

II. Un coursed rubble masonry – Here the stones are not dressed. But they are used as they are available from the quarry, except knocking out some corners. Courses are not maintained regularly. Larger stones are laid first and the spaces between them are then filled by means of spalls or snecks. The wall is brought to a level every 300 to

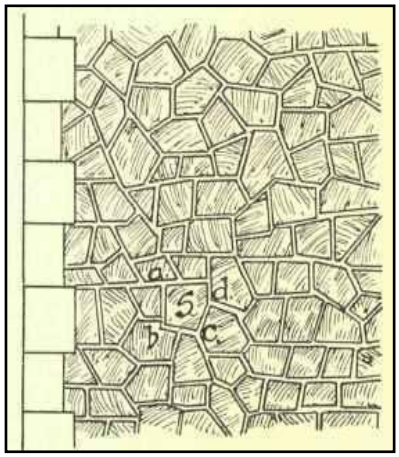
500mm. This type of rubble masonry being cheaper is used for the construction of compound walls, godowns , garages , labour quarters etc.

III. Dry rubble masonry - This is just similar in construction to the coursed rubble masonry III sort except that no mortar is used in the joints. This type of construction is the cheapest, but it requires more skill in construction. It is used extensively in compound walls, pitching on bridge approaches , retaining walls. In order to prevent the displacement of stones and to make it more stable, two courses at top and about 500mm length at the ends are sometimes built in mortar.

Dry Rubble masonry

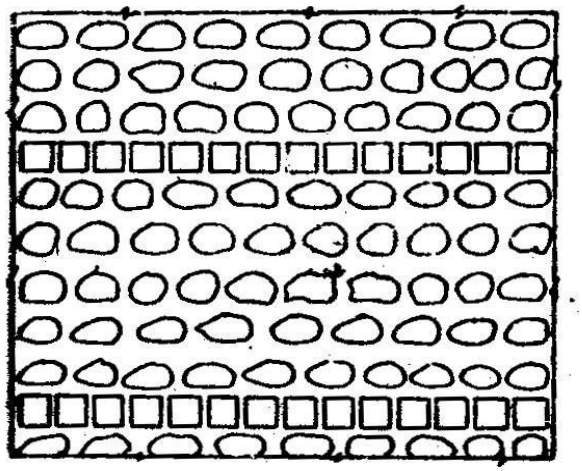
IV. Polygonal rubble masonry

In this type of masonry the stones are roughly hammer dressed to an irregular polygonal shape. The stones should be so arranged as to avoid long vertical joints in face work and to break joints as much as possible. Small stone chips should not be used to support the stones on the facing. It requires more skill in the construction of this type of masonry.



Polygonal rubble masonry

V. Flint rubble masonry - This type of masonry is used in the areas where the flint is available in plenty. The flint stones varying in thickness from 8 to 15cm and in length from 15 to 30cm are arranged in the facing in the form of coursed or uncoursed masonry. They are irregular shaped nodules of silica which are extremely hard and brittle. Strength of the wall is increased by introducing lacing courses of either thin long stones or bricks or tiles at vertical distances of 1 to 2m.



Flint rubble masonry

Ashlar Masonry

- In this type of construction, square or rectangular blocks of stones are used.
- 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 size of stones blocks should be in proportion to wall thickness. The height of stones varies from 250mm to 300mm. The length of the stones should not exceed three times the height and depth into the wall should be at least equal to half the height.

Different types of Ashlar masonry are

I. Ashlar fine masonry – In this type of Ashlar masonry, beds, sides and faces are finely chisel dressed. The stones are arranged in proper bond and thickness of the mortar joints does not exceed 3mm. This type of construction gives perfectly smooth appearance, but it is costly in construction. The thickness of the course is generally not less than 15cm. All the angles and edges that remain exposed in the final position remain as perfect squares and are free from chippings. Headers and stretchers are laid in alternate courses. The exposed joints are finely pointed. The width of the stone is not kept less than its height.

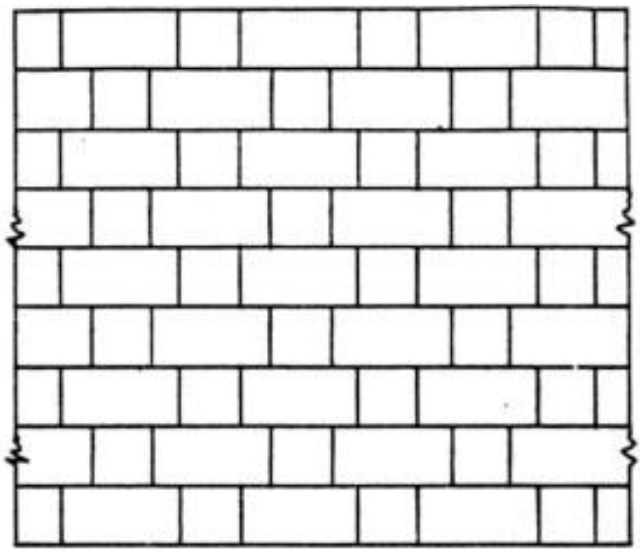


FIG. 5.21. FINE TOOLED ASHLAR MASONRY.

II. Ashlar rough tooled masonry – In these beds and sides are finely chisel dressed. The face is made rough by means of tools. A strip of 25mm width is provided around the perimeter of every stone exposed for view. Thickness of joints should not exceed 6mm.

III. Ashlar quarry faced or rock faced - In this type of ashlar masonry , a strip of 25mm wide is made by chisel around the perimeter of every stone exposed for view as in case of rough tooled ashlar. But the remaining portion of the face is left in the same form as received from quarry. Only projections on the face known as the buildings, exceeding 80mm are removed by a hammer. This type gives a massive appearance.

IV. Ashlar chamfered masonry- The strip is provided as above. It is then chamfered or bevelled at an angle of 45 degrees by means of chisel for a depth of about 25mm.

another strip 12mm is provided on the remaining exposed face of the stone and the surface inside this strip is left in the same form as received from quarry. A neat appearance of grooved joints is obtained with the help of this type of construction.

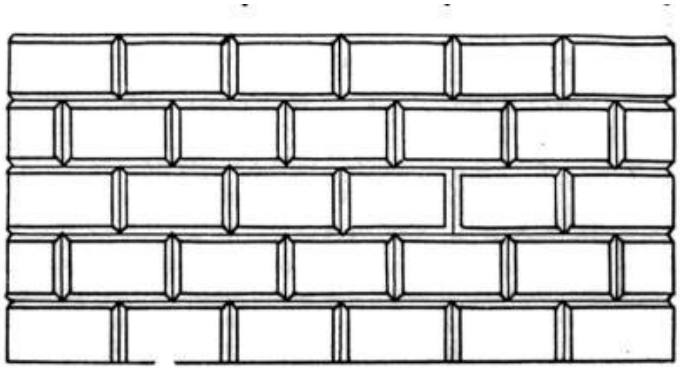
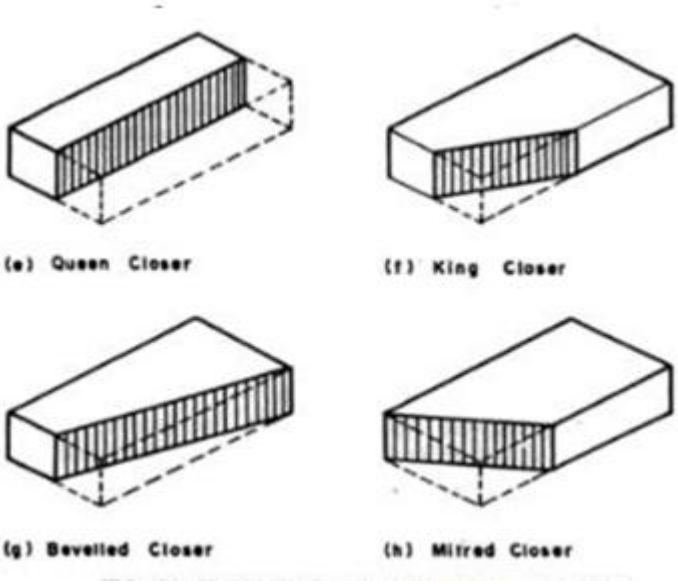


FIG. 5.22. ASHLAR CHAMFERED.

V. Ashlar block in course - This occupies an intermediate position between rubble masonry and ashlar masonry. The faces of the stones are generally hammer dressed and the thickness of mortar joints does not exceed 6mm. The depth of the courses may from 15 to 30 cm.

3.

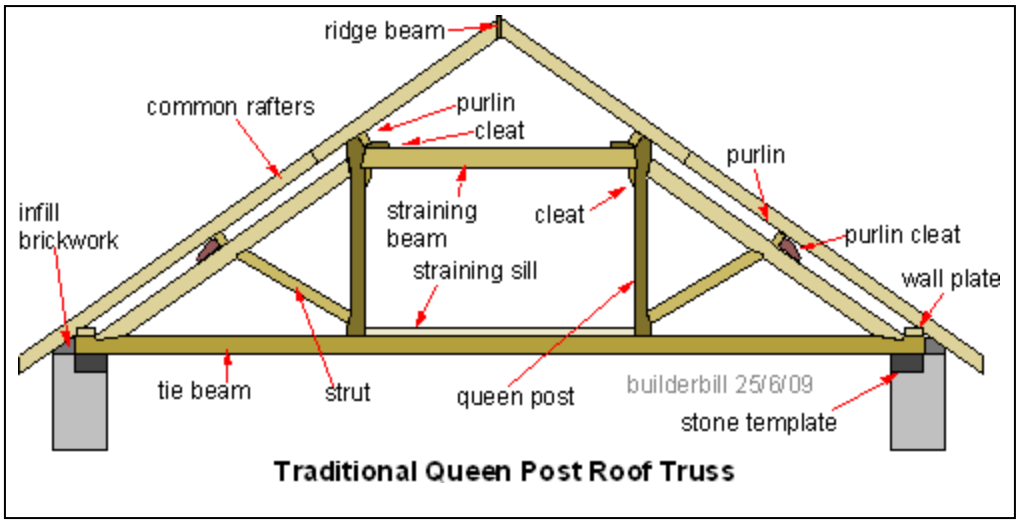
(i) Bevelled closer – Portion of the brick obtained by cutting half width at one end and full length at the other end.
(ii)Mitred closer – Brick whose one end is splayed. The angle of the splay is 45° to 60°.
(iii) King closer – Portion of the brick obtained by cutting triangular piece half along its length and half along its breadth.
(iv) Queen closer – Portion of the brick cut length wise



3. 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 rafters and 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.



4. <u>Requirement of good roof</u>

1. It should have adequate strength and stability to carry the superimposed dead and live loads.
2. It should effectively protect the building against rain, sun , wind etc and it should be durable against the adverse effects of these agencies.
3. It should be waterproof, and should have efficient drainage arrangements.
4. It should provide adequate thermal insulation.
5. It should be fire resistant.
6. It should provide adequate insulation against sound.

<u>Factors affecting the selection of roofing material</u>

- Type of building
- Type of framework
- Initial cost
- Maintenance requirements
- Fabrication facilities
- Appearance and special features of locality
- Availability of material

- Climate of locality

6. Cement flooring

- Commonly used for residential, commercial and industrial building
- The floor consists of two components- (i) Base concrete and (ii)Topping or wearing surface
- Base course may be 7.5 to 10cm thick, lean cement concrete (1:3:6 to 1:5:10). It will be compacted, hardened, cleaned and wetted. Cement slurry will be laid over it.
- Topping consists of panels of 1:2:4 cement concrete, thickness (usually 4cm)

Mosaic flooring

- Concrete base prepared, over it 5 to 8cm thick lime- surkhi mortar is spread and levelled
- On this 3mm thick cementing material is laid
- Broken piece of tiles or broken marble pieces are spread and hammered
- Surface is rolled

Tile flooring

- Tile flooring consists of square, hexagonal or other shapes made of clay or cement concrete
- Over concrete base, 25 to 30 mm thick layer of lime mortar 1:3 is spread and then cement slurry spread
- Tiles will be laid. Next day, joints are cleaned. Cured for 7 days