8

Masonry—Stone Masonry

8·1. GENERAL

The construction of stone, brick or tile which in hardened by heat is termed as masonry, It may also be defined as construction of building units bonded together with mortar. The selection of the type of material (*i.e.* brick or stone etc) for the masonry is made keeping in view the requirements of strength, water proofing, thermal insulation, fire resistance, durability and economy.

Masonry is basically a wall material. Masonry walls can be divided into following three categories.

(*i*) *Load bearing walls*

(*ii*) *Non-load bearing walls*

(*iii*) *Retaining walls*

(*i*) **Load Bearing Wall.** A wall designed to carry superimposed loads from floors and roof is termed as load bearing wall. Such walls have continuous foundation to carry the entire super imposed load including their self weight.

(*ii*) **Non-load Bearing Wall.** Also known as panel wall, curtain wall or filler wall, is a type of wall which carries no superimposed load. It is provided to serve as screen for privacy and to keep out wind and weather. The load from floors and roof in this case is borne by either brick piers or by a system of R.C.C. or steel beam and column frames.

(*iii*) **Retaining Wall.** This is a type of wall built to resist the pressure of earth, granular material or liquid filled behind it after it is built.

Depending upon the type of material used, masonry can be broadly divided in the following categories.

(*i*) *Stone masonry*

(*ii*) *Brick masonry*

(*iii*) *Reinforced brick masonry*

(iv) *Composite masonry*

(v) *Hollow concrete block masonry*

(vi) *Load bearing wall tile masonry*

Stone masonry has been covered within the scope of this chapter whereas the remaining types of masonry have been detailed in Chapter 9 (Brick masonry) and Chapter 10 (Composite masonry).

8·2. COMPARISON BETWEEN STONE MASONRY AND BRICK MASONRY

(1) From times immemorial, stone has been used both for residential as well as public buildings. Historical buildings that stand today are the living examples of the strength, durability and the excellent weather-resisting qualities of stone masonry. Brick on the other hand has much less strength, durability and weather-resisting qualities.

(2) On account of its high crushing strength stone is used in the construction of piers, docks, dams and other marine structures. Brick, on the other hand, is not considered suitable in all such places.

(3) Shining texture of good class of stone masonry requires no treatment to enhance its appearance. On the other hand, plastering is necessary to conceal the defects in brick masonry.

(4) In buildings of monumental nature where architecture requires heavy mouldings with large projections, stone is best suited, brick being suitable for light ornamental work.

(5) Bricks when exposed are liable to get damp. Dampness may ultimately lead to the disintegration of the masonry. Stonework on the other hand suffers from no such danger.

(6) Certain salts present in the sewage react chemically with exposed brick and as such when brick-work happens to come in contact with sewage, it is always plastered. Stone on the other hand can be used in such places without providing any protective coat.

(7) On account of the high cost of stone masonry, its usage is generally restricted to hilly areas or stone districts; bricks on the other hand are easily available in allmost at all places and the masonry constructed with bricks costs much less.

(8) First class bricks possess all such qualities which are required for a good construction and hence brick masonry has now practically replaced stone masonry.

(9) On account of their regular shape and size, bricks afford great facility in maintaining proper bond in the masonry. It also results in quick construction. On the other hand, in stone masonry, the process of dressing and placing stones requires a great deal of time and extra labour.

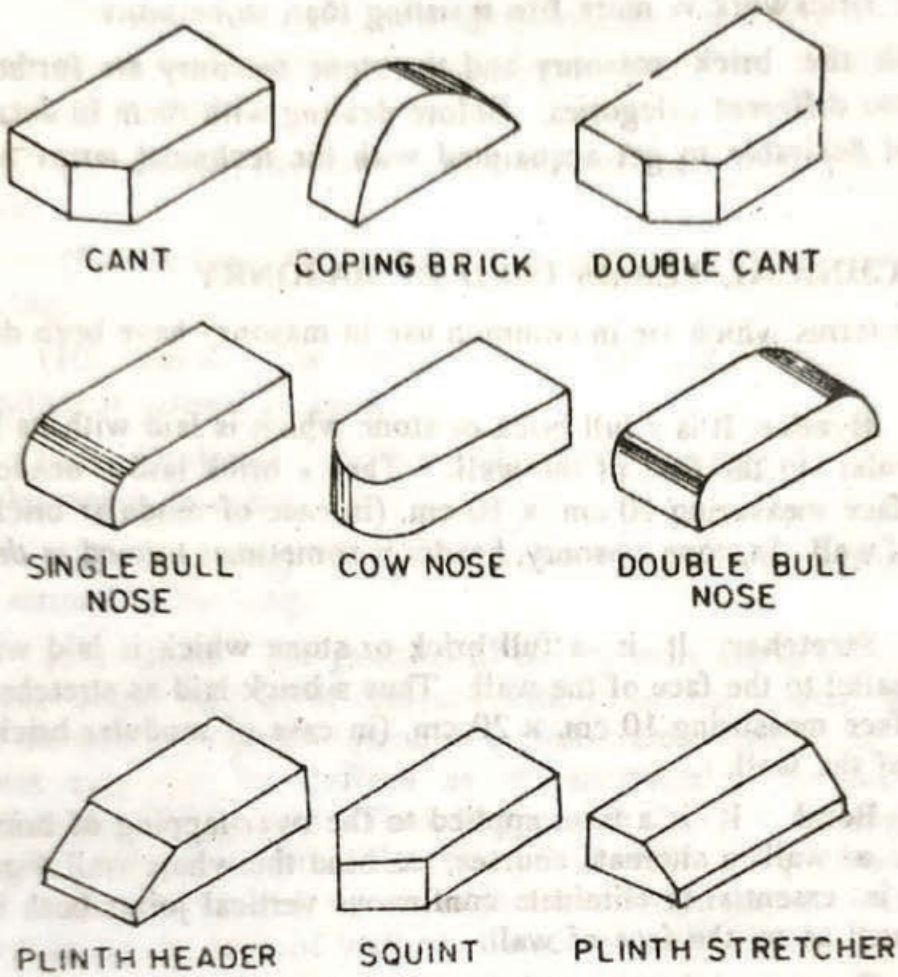


Fig. 8·1—Fig. 8·2

Bricks moulded in different shapes

(10) For the construction of jambs of doors and windows and for the walls meeting at obtuse or acute angle, bricks offer greater facility than stone.

(11) Bricks can be conveniently moulded into any desired shape at reasonable cost while the expense of the moulding of stone work is far more than that of brick.

(12) Skilled labour is required for good stone masonry construction because the defects left by a careless mason cannot be rectified easily, while in brick masonry the defects of a careless bricklayer can be concealed by plastering.

(13) On account of their convenient size and light weight, bricks require no lifting tackle while in stone masonry the large blocks of stone have to be kept in position with the aid of some lifting device

(14) Brick walls can be easily built in small thickness of 10 cm. and 20 cm. while the minimum thickness of a stone wall is generally restricted to 30 cm.

(15) Brickwork is more fire resisting than stone work.

Both the brick masonry and the stone masonry are further sub-divided into different categories. Before dealing with them in detail it is considered desirable to get acquainted with the technical terms used in masonry.

8·3. TECHNICAL TERMS USED IN MASONRY

The terms which are in common use in masonry have been defined below :

(1) **Header.** It is a full brick or stone which is laid with its length perpendicular to the face of the wall. Thus a brick laid as header will show its face measuring 10 cm. x 10 cm. (in case of modular brick) on the face of wall. In stone masonry, header is sometimes termed as *through stone.*

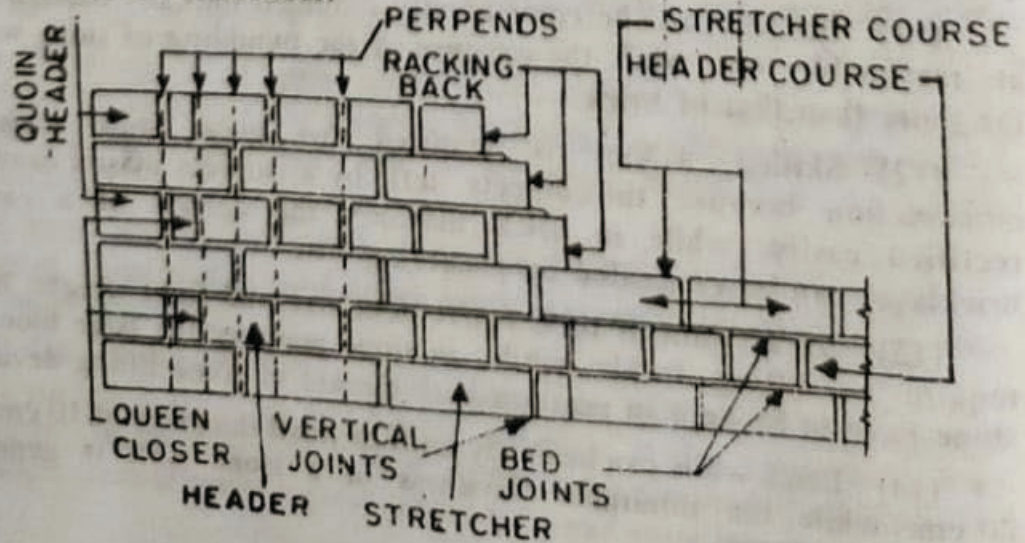
(2) **Stretcher.** It is a full brick or stone which is laid with its length parallel to the face of the wall. Thus a brick laid as stretcher will show its face measuring 10 cm. x 20 cm. (in case of modular brick) on the face of the wall.

(3) **Bond.** It is a term applied to the over-lapping of bricks or stones in a wall in alternate courses, to bind the whole wall together. Bonding is essential to eliminate continuous vertical joints both in the body as well as on the face of wall.

(4) **Course.** A horizontal layer of bricks or stones is termed as a course. Thus in brick masonry with modular bricks the thickness of a course will generally be equal to 10 cm. plus thickness of one mortar joint.

(5) **Header course.** It is a course of brickwork entirely composed of headers.

(6) **Stretcher course.** It is a course of brickwork in which all the bricks are laid as stretchers.



(7) **Bed.** It is a term used to indicate the lower surface of bricks or stones in each course. It may also be termed as the surface of bricks on which it rests.

(8) **Face.** The surface of a wall exposed to weather is termed as face.

(9) **Facing.** The material used in the face of the wall is known as facing.

(10) **Back.** The inner surface of wall which is not exposed to weather is termed as back.

(11) **Backing.** The material used in forming the back of the wall is known as backing.

(12) **Hearting.** The portion of a wall between facing and backing is termed as hearting.

(13) **Joint.** The junction of two or more bricks or stones is called joint. Joints may be of cement mortar or of lime mortar. Joints parallel to the bed of bricks or stone in a course are termed as bed joints. Bed joint can also be defined as the horizontal mortar joint upon which masonry units are laid. Thus the pressure always acts normal to the bed joints. The joints (other than bed joint) which are perpendicular to face of wall are termed as cross joints or simple joints. Joints which are parallel to the face of wall are termed as wall joints.

(14) **Racking back.** The process of stopping the unfinished end of a wall in stepped fashion.

(15) **Bat.** It is the portion of a brick cut across the width or a brick cut by some fraction of its length.

(16) **Closer.** It is a portion of a brick cut in such a manner that its one long face remains uncut.

(17) **King closer.** It is a brick which is cut in such a way that the width of one of its end is half that of a full brick. It is formed by cutting off the triangular piece, between the centre of one end and the centre of one side.

(18) **Queen closer.** It is a term applied to a brick which is half as wide as a full brick. Queen closer is made by cutting a brick lengthwise into two portions.

(19) **Bevelled closer.** It is similar to king closer with the only difference that the whole length of the brick is bevelled for maintaining half width at one end and full width at the other.

(20) **Mitred closer.** It is a brick whose one end is cut splayed or mitred for the full width.

(21) **Perpend.** It is a vertical joint on the face of a wall directly over vertical joints in alternate course.

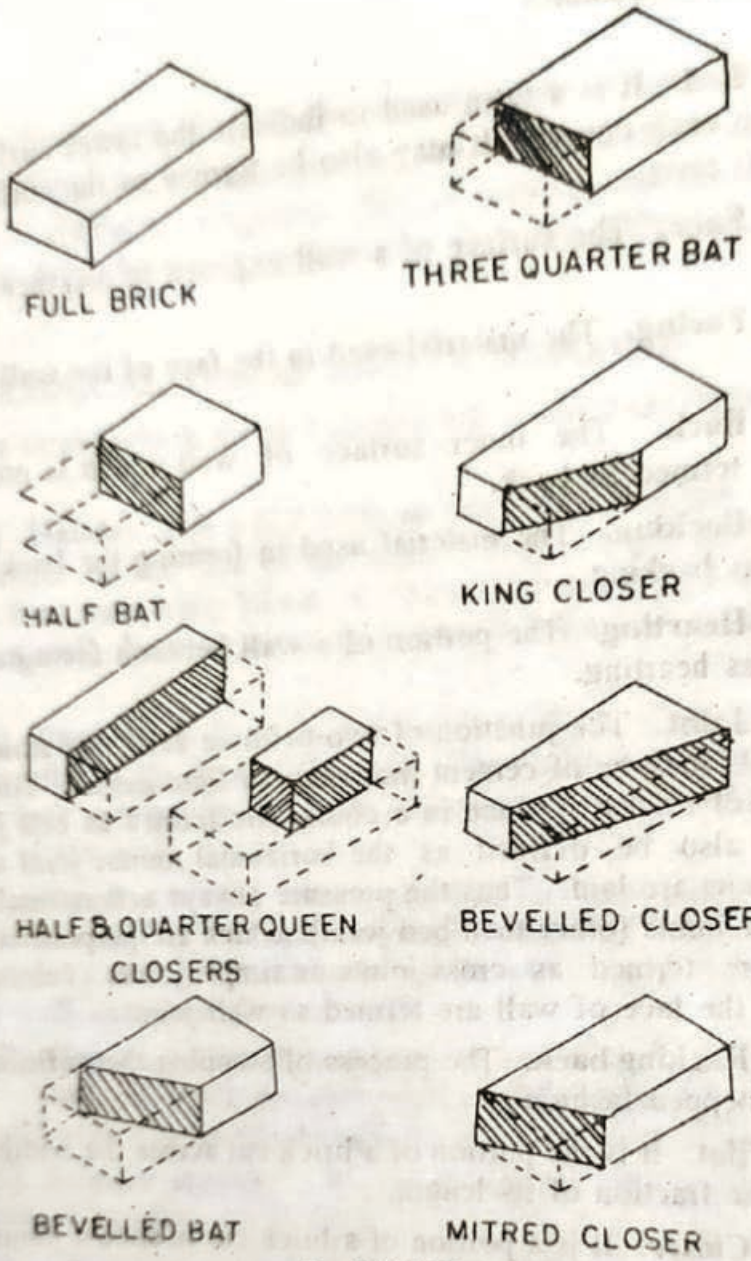


Fig. 8·10-8·17

(22) **Frog**. It is a depression on the top face of a brick. Frog provides a recess for the mortar which on setting forms a key and prevents the displacement of the brick above.

(23) **Quoin**. The exterior angle or corner of a wall is termed as quoin. The brick or wedge shaped stone used for the corner of walls is also known as quoin.

(24) **Plinth**. The horizontal projecting or flush course of stone or brick provided at the base of the wall above ground level is known as plinth. It raises the level of the ground floor of the building above the natural ground level with the aim of protecting the ground floor from flooding due to rain water and other weather effects.

(25) **Plinth Course**. It is the topmost course of plinth and is finished flush with the ground floor surface.

(26) **Sill.** It is a horizontal member of brick, stone, concrete or wood provided to give support for the vertical members of a window. It is also employed for the purpose of shedding off rain water from the face of wall immediately below the window opening.

(27) **Jambs.** The vertical sides of a finished opening for door, window or fire place etc. are termed as jambs. Jambs may be plain or rebated or splayed.

(28) **Reveals.** Reveals are the exposed vertical surfaces left on the sides of an opening after the door or window frame has been fitted in position.

(29) **Lintel.** A horizontal member of stone, brick, wood, steel or R.C.C., used to support the masonry or load above an opening.

(30) **Arch.** A mechanical arrangement of wedge-shaped blocks of stone or brick arranged in the form of a curve supporting the masonry or load above an opening.

(31) **String course.** It is a horizontal course of masonry projecting from the face of the wall and is generally at every floor or sill level throughout the length of the wall. It is intended to improve the elevation of the structure.

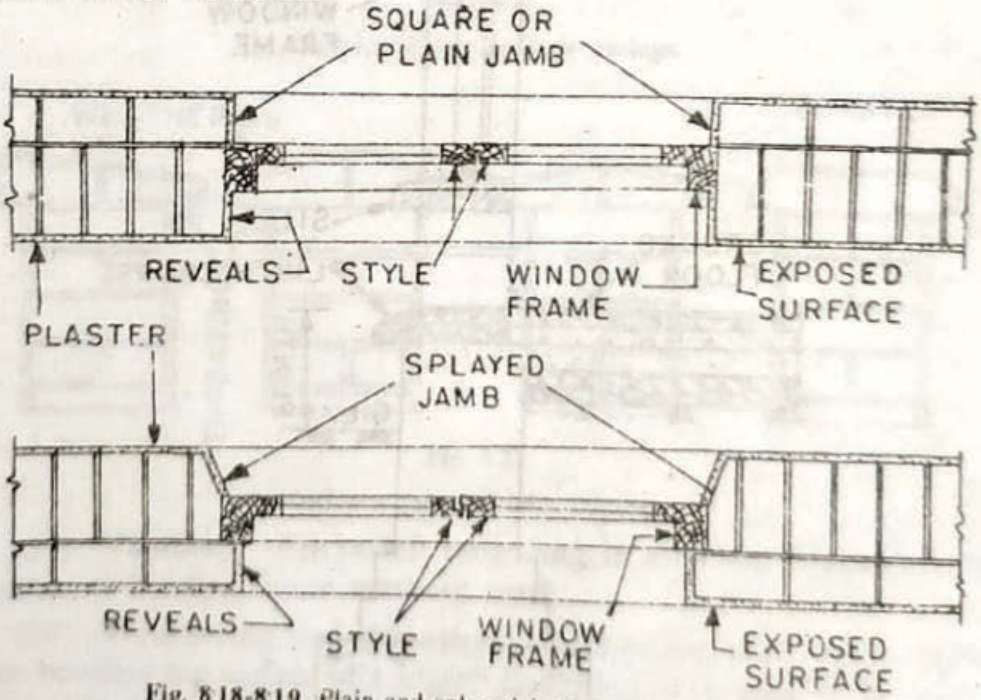


Fig. 818-819 Plain and splayed jambs

(32) **Cornice.** It is a horizontal moulded projection provided near the top of a building or at the junction of a wall and ceiling. It not only increases the architectural beauty of the structure, but also serves as a barrier for shedding the rain water off the face of the wall.

(33) **Frieze.** It is a course of stone masonry provided imme-

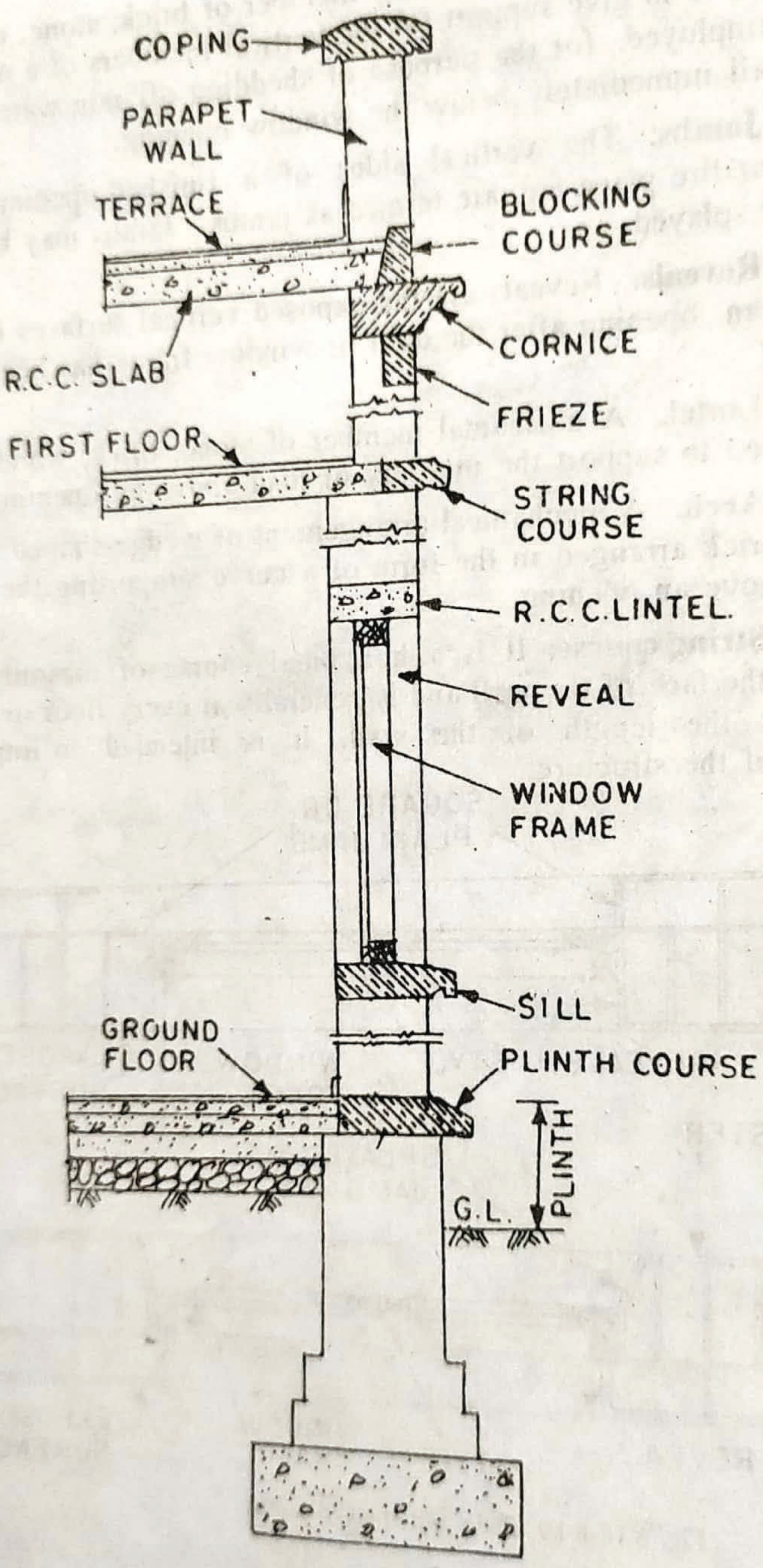


Fig. 8·20

diately below a cornice. This may be flushed with the wall or may be moulded. It is provided to enhance the appearance of wall.

(34) **Blocking course.** It is a course of stone masonry provided immediately above the cornice to check the tendency of the cornice to overturn and incidentally it adds to its appearance.

(35) **Parapet.** It is a term applied to a low wall built around a flat roof to act as a protective solid balustrades for the users of the terrace (flat roof). In pitched roof, parapet wall is provided to conceal the gutter at eaves level and for imparting an architectural effect to the structure.

(36) **Coping.** Coping is a covering placed on the exposed top of an external wall. It is essentially provided to prevent the seepage of water through the joints of the topmost course of wall. It may be of concrete, stone, brick or terra-cotta.

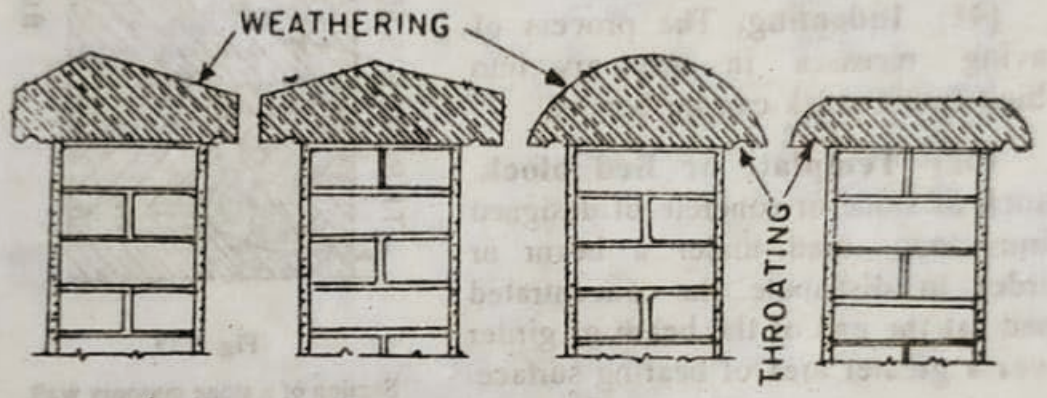


Fig. 8·21

Different forms of stone copings

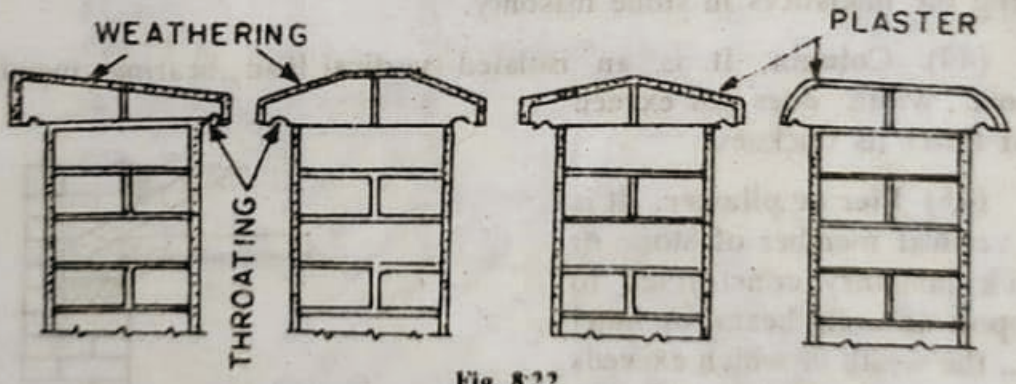


Fig. 8·22

Different forms of brick copings

(37) **Toothing.** Bricks left projecting in alternate courses for the purposes of bonding future masonry work.

(38) **Weathering and throating.** Weathering is the term applied to the bevelled top surface of a stone. Bevelling or sloping of the surface is necessary to enable the rain water to flow off the surface. Throating is the term applied to the groove cut on the underside of a projecting course of masonry in order to check the creepage of rain water from the underside of projected portion. If the rain water is not intercepted by such groove, it will spread across the bottom of the projected surface and will finally start flowing along the vertical surface of the wall, making it damp.

(39) **Gable.** It is a triangular shaped portion of masonry at the end of a sloped roof.

(40) **Through Stone.** A stone passing through a wall from front to back face and acting as a binder for the two faces of the wall is termed as through stone.

(41) **Indenting.** The process of leaving recesses in masonry into which future work can be bonded.

(42) **Template or Bed block.** Block of stone or concrete of designed dimensions used under a beam or girder to distribute the concentrated load at the end of the beam or girder over a greater area of bearing surface.

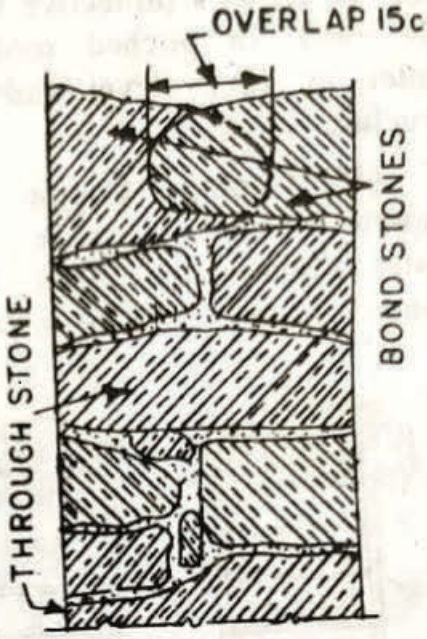


Fig. 8·23
Section of a stone masonry wall showing through stone

(43) **Spalls.** Chips or small pieces of stone broken off a large block are termed as spalls. They are used in filling the interstices in stone masonry.

(44) **Column.** It is an isolated vertical load bearing member whose width does not exceed four times its thickness.

(45) **Pier or pilaster.** It is a vertical member of stone or brick masonry constructed to support an arch, beam, or lintel etc., the width of which exceeds four times its thickness. Generally piers are made monolithic with the wall for the purpose of increasing the stability and stiffness of the wall to carry more concentrated loads.

(46) **Buttress.** It is similar to a pier built on the exterior of a wall and properly bonded to it. Buttresses are placed at intervals along the wall to make it stable for resisting outward thrust.

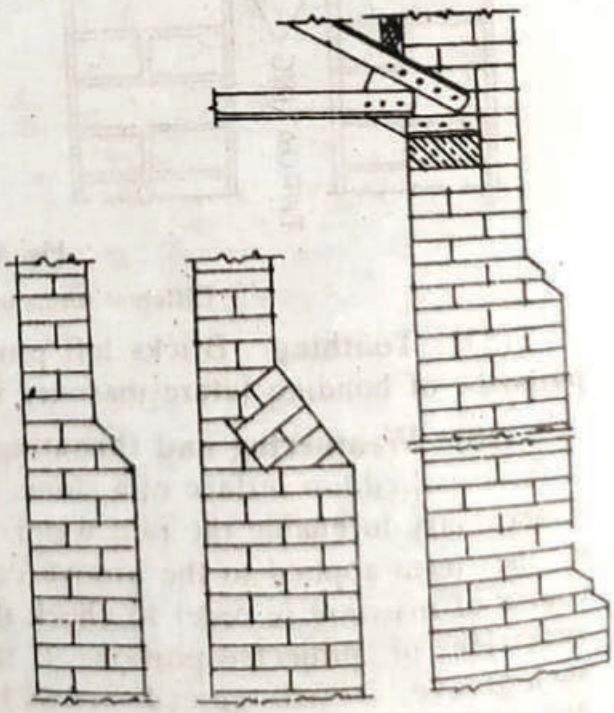


Fig. 8·24
Different forms of buttresses

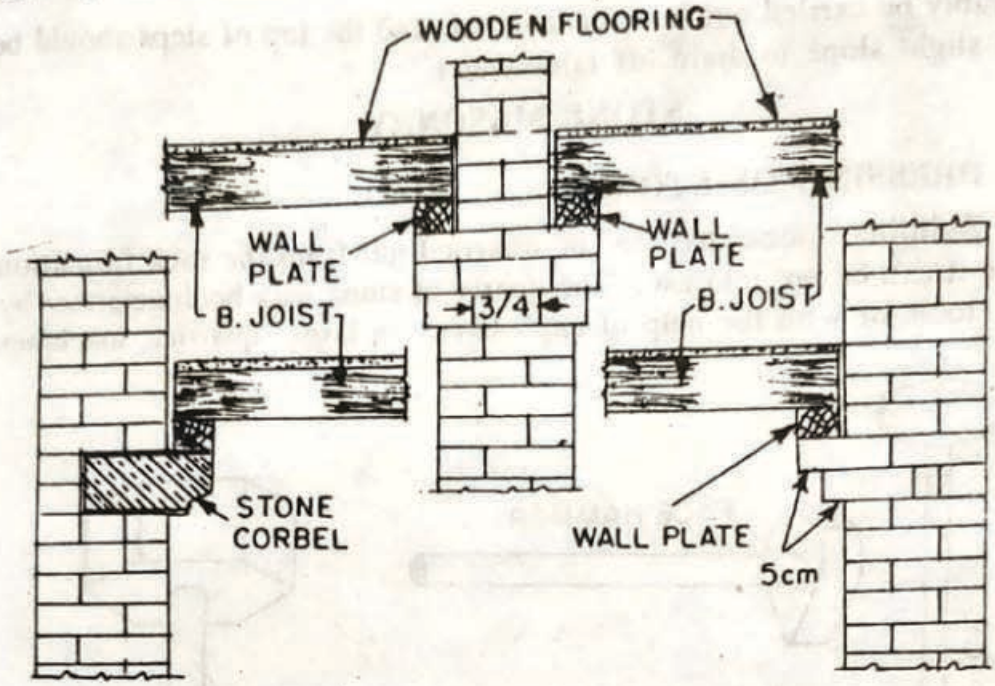


Fig. 8·25

Different types of Corbels

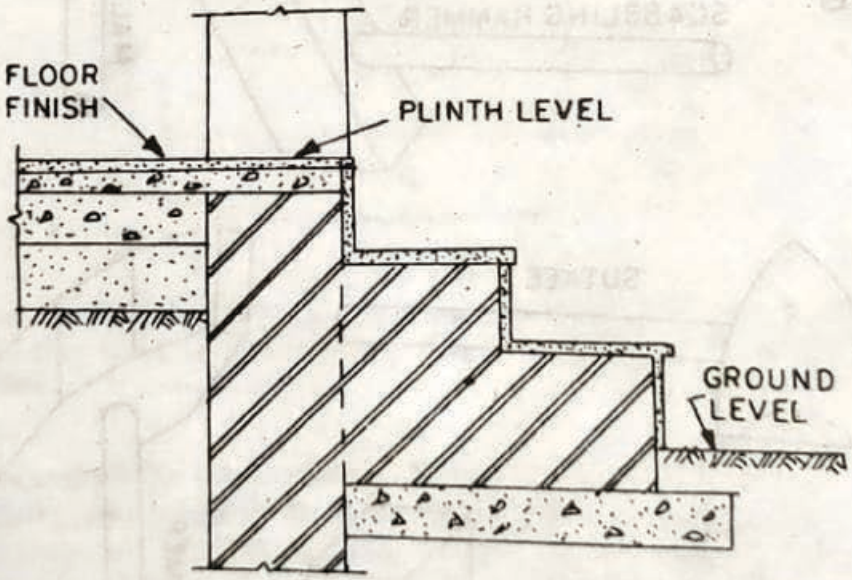


Fig. 8·26

Threshold

(47) **Corbel.** It is the extension of one or more courses of brick or stone from the face of a wall. The projection of courses, which is generally ornamental in shape, serves as a support for wall plate etc.

(48) **Thresholds.** The arrangement of steps provided from ground level to reach plinth level on external doors and verandah is termed as threshold. Thresholds are constructed at the last stage when other construction activities have almost come to an end. This work should

preferably be carried out in cement mortar and the top of steps should be given slight slope to drain off rain water.

STONE MASONRY

8·4. DRESSING OF STONE

Building stone has to be quarried out from the rock formation before it can be put into use. The quarry of stone may be done either by hand tools or with the help of explosives. In large quarries, machines

Fig. 8·27

Tools and implements used in dressing of stone