## 3.2 Stone Masonry – Brick Masonry – Plastering and Pointing

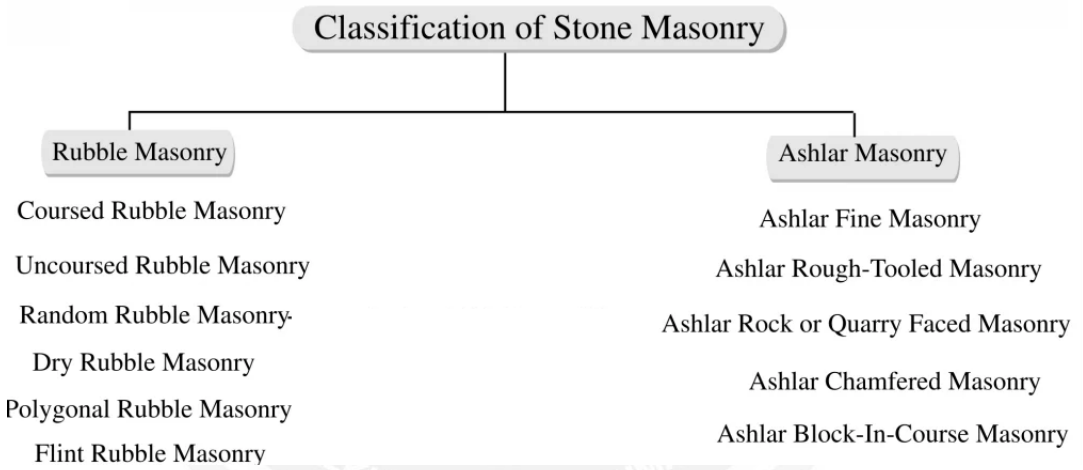
### Stone Masonry

- The stones which are used in the construction of stone masonry should be hard, tough**,** and durable.The pressure which is acting on the stones should be in the vertical plane.
- The heads and the stones should not be of dumb bell shape. The stone should be dressed properly as per the requirements. A large flat stone should be used under the ends of girders and trusses two uniformly distributed loads. The water which is used in the construction of the stone masonry should be of good quality. The plumb bob should be used to check the accurate verticality of the stone masonry
  walls. Stonemasonry should be design to take the compressive stresses and not tensile stresses.
- The stone masonry section should always be designed to take compression and not the
  tensile stresses. The properly wetted stones should be used to avoid mortar moisture being sucked

### Types 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

- Rubble masonry 2. Ashlar masonry




### 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.

| | | |
|---|---|---|
|  **Coursed Rubble Masonary** |  **Uncoursed Rubble Masonary** |  **Random Rubble Masonary** |
|  **Dry Rubble Masonary** |  **Polygonal rubble masonry** |  **Flint rubble masonry** |

**Coursed Rubble Masonry;** This type of masonry is commonly used in the construction of low height walls of public buildings, residential buildings, abutment and piers of ordinary bridges. The stones of 5 to 20cm size are used in each course.

**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. Uncoursed rumble masonry are again subdivided into following type.

a) Uncoursed random rubble

b) Uncoursed square rubble

**Uncoursed random rubble:** The weak corners and edges are removed with mason's hammer. Generally, bigger stone blocks are employed at quoins and jambs to increase the strength of masonry.

**Uncoursed square rubble:** In this type the stone blocks are made roughly square with hammer. Generally, the facing stones are given hammer-dressed finish. Large stones are used as quoins. As far as possible the use of chips in bedding is avoided.

**Random Rubble Masonary**: Random Rubble Masonry is slightly superior to uncoursed rubble masonry. In this form the stones used in the work are hammer or chisel-dressed. The stones are not suitably shaped or finished and as such the elevation of this type of stone masonry shows irregular shaped stones with non-uniform joints. In a good work the face stones are of uniform colour and approximately equal in size. The height of stones should be greater than their breadth or length of tail into the work.

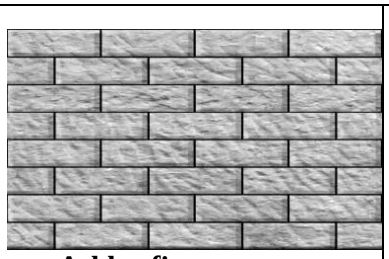
**Dry rubble masonry:** This type of masonry is used in the construction of retaining walls pitching earthen dams and canal slopes in the form of random rubble masonry without any mortar. The hallow

**Polygonal rubble masonry:** In this type of masonry the stones are roughly 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

**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 30 cm are arranged in the facing in the form of course or uncoursed masonry.

**Ashlar masonry**:

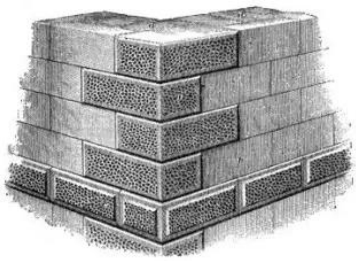
Ashlar masonry is a type of stone masonry which is formed using finely dressed stones of same size, shape, and texture laid together in cement or lime mortar of equal size joints at right angles to each other. This type of masonry is built from accurately dressed stones with uniform and fine joints of 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.



**Ashlar fine**

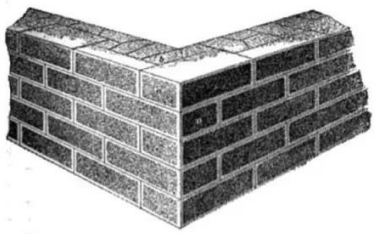
**Ashlar rough**

**Ashlar rock or quarry faced**



**Ashlar facing**

**Ashlar chamfered**



**Ashlar block in course**

**Ashlar Rough Tooled** M**asonry:** In this type of ashlar masonry, the beds and sides are finely chisel dressed but the exposed face is dressed by rough tooling. This dressing gives the masonry a rough exposed finish to the masonry.

**Ashlar Fine Tooled Masonry:** This is the finest type of ashlar stone masonry. The bed, joints and faces of the stones are chisel-dressed to remove all unevenness and obtain perfectly horizontal and vertical joints. The mortar joints are so thin that they are barely exposed which gives this type of masonry, a very close and packed finish.

**Ashlar Facing:** This type of ashlar masonry is used to give the building an exposed and good aesthetics. The exposed faces of the stones are rough tooled and chamfered

**Coursed Ashlar Masonry:** This type of ashlar masonry has uniform sized stones with alternating vertical joints which strengthens the wall. The stones are laid in such a way that the joints formed by the lower layer are covered.

**Chamfered Ashlar Masonry:** It is a special type of ashlar rock faced in which the strip provided around the perimeter of the exposed face is chamfered at an angle of 45 degree to a depth of 25 mm.

**Random Ashlar Masonry:** The stone block arrangement doesn't have any specific rule of placement. It has a general course of alignment, however, the vertical joints need not be one over the other.

**Advantages of stone masonry**

1. Provides great strength.
2. Offers good resistance to weather effects.
3. As stone is able to withstand wear, pressure, and damage it provides good durability.
4. Stones come in a variety of textures, sizes, and even colours so provides variety of

option for aesthetical purpose.
5. Due to its durability, the buildings constructed through stone masonry require very little maintenance.

**Disadvantages of stone masonry**

1. The stones used are heavy and produce thick walls.
2. It requires skilled worker.
3. Due to the thickness and heavyweight of the stones, handling these aspects can be challenging and accidents can easily happen.
4. The construction cost of stone masonry is a bit on the higher side because of the skilled labour required, the expensive equipment to be used and many other costs incurred.
5. Stones are mostly found in designated areas such as quarries and therefore, transportation of these stones to the sites is necessary. This is then more costly because of the weight of the stones.
6. The total construction period takes a lot of time.

**Brick Masonry**

**Masonry** is bricks or pieces of stone which have been stuck together with cement as part of a wall or building. Masonry is the bricks and pieces of stone that are used to make a building. Brick masonry is defined as the placement of bricks in a systematic manner using mortar to bind the bricks together and create a solid mass that can withstand a great deal of pressure.

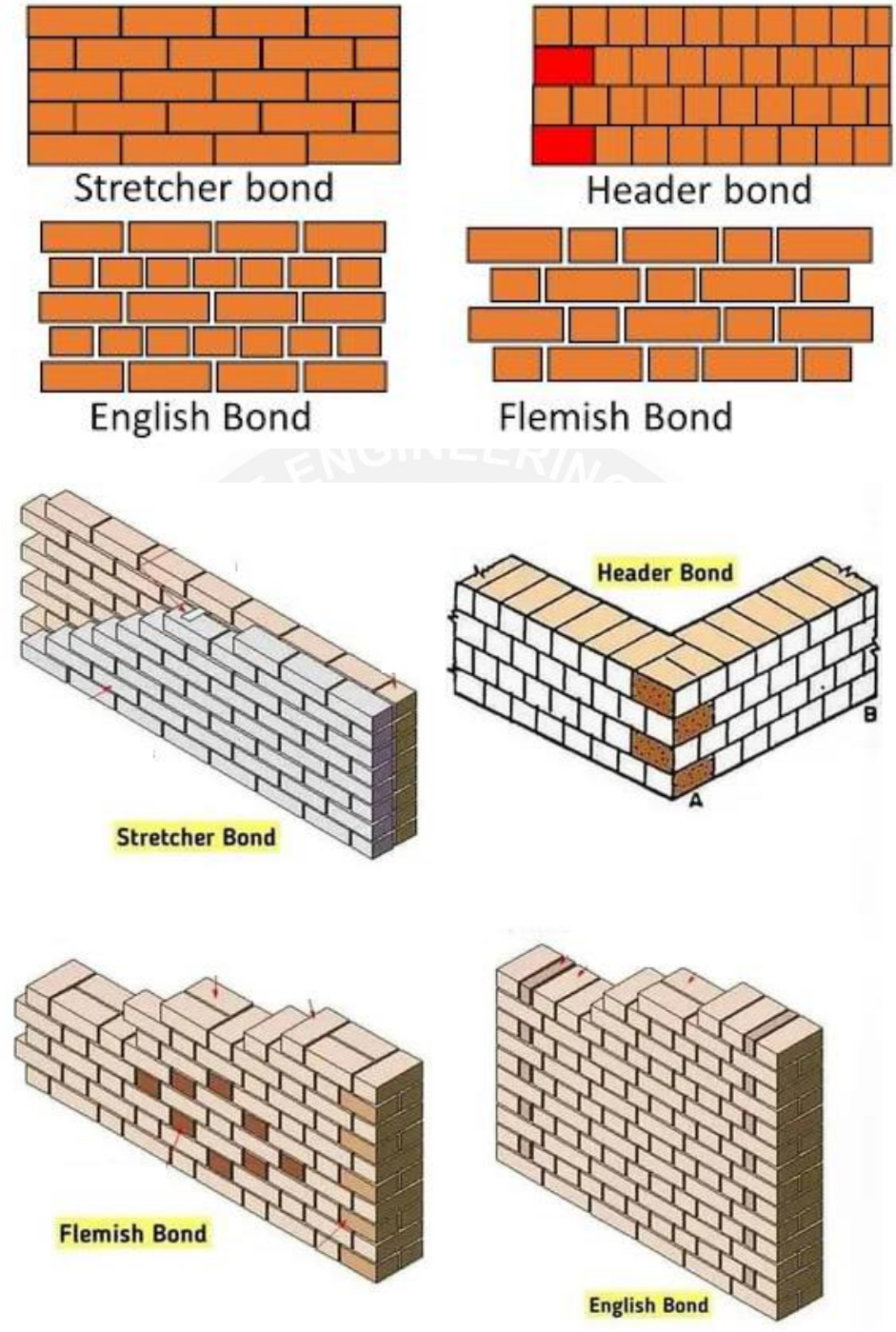
**Types of Bonds in Brick Masonry Wall Construction:**

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

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

**Other Types of bonds are:**

1. Facing bond
2. Dutch bond
3. English cross bond
4. Brick on edge bond
5. Raking bond
6. Zigzag bond
7. Garden wall bond




**Stretcher bond**

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.

**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.

**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.

**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.

**Plastering and Pointing**

**Plastering**

plastering is a layer provide over masonry or concrete surface for the purpose of protect wall and other concrete element against the atmospheric effect, and also provide finishing surface. . Mortar used for plastering may be lime mortar, cement mortar or lime-cement mortar. Lime mortar used shall have fat lime to sand ratio of 1 : 3 or 1 : 4. If hydraulic lime is used mix proportion (lime: sand) is 1 : 2.

Cement mortar of 1 : 4 or 1 : 6 mix is very commonly used for plastering, richer mix being used for outer walls. To combine the cost effectiveness of lime mortar and good quality of cement mortar many use lime-cement mortar of proportion (cement : lime : sand) of 1 : 1 : 6 or 1 : 1 : 8 or 1 : 2 : 8.

**The objective of plastering are:**

1. To conceal defective workmanship
2. To give smooth surface to avoid catching of dust.
3. To give good look.
4. To protect the wall from rain water and other atmospheric agencies.
5. To protect surfaces against vermit.

**Requirement of good plaster are:**

1. It should adhere to the background easily.
2. It should be hard and durable.
3. It should prevent penetration by moisture
4. It should be cheap.

Lime mortar is usually applied in 3 coats while cement mortar is applied in two or three coats for the stone and brick masonry. For concrete surfaces cement mortar may be applied in two or three coats.

For concrete building blocks many times only one coat of cement mortar is applied. The first coat provides means of getting level surface. The final coat provides smooth surface. If three coats are used second coat is known as floating coat. The average thickness of first coat is 10 to 15 mm. Middle coat thickness is 6–8 mm. The final coat is just 2 to 3 mm thick. If single coat is used its thickness is kept between 6 to 12 mm. Such coats are used on concrete surfaces not exposed to rain.

**Different Layers of plaster:**

**Three Coat Plaster**

The procedure of applying three-coat plaster is similar to two-coat plaster only difference is that an intermediate coat is known as a floating coat. The purpose of this coat is to bring the plaster to an even surface. In the case of 3-coat plaster, the first coat is known id rendering coat, the second coat is known as a floating coat, and third coat is known as setting coat or finishing coat. The rendering coat is applied, and scratches are made. The floating coat is applied, and after seven days finished coat is applied, after 6 hours of applying a floating coat.

**Two Coat Plaster**

The joints are ranked at a depth of 20 mm. The surface is cleaned, and water is sprinkled property on it. Before the first coat is applied preliminary coat is applied to make an uneven surface. Then, the first coat is applied. The first coat is racked as a rendering coat. The thickness first coat is kept 2 to 3 mm less than a total thickness of plaster. To maintain interim thickness and vertically of plaster 15 cm * 15 cm dots or are provided, Then a vertical strip of mortar known as the spread is formed at a distance of

2 m. spacing. Then the spaces between screeds are filled with mortar and properly finished. Scratches are made on rendering coat to provide mechanical key before it hardens. The rendering coat is watered for 2 days and then dried.

**Single Coat Plaster**

This is used only in interior quality work. It is applied similar to two coat plaster except that the rendering coat as applied fro two-coat plaster is finishing off immediately after it has sufficiently hardened

**Pointing**:

**Definition of pointing:** Pointing is the finishing of mortar joints in brick or stone masonry construction. Pointing is the implementing of joints to a depth of 10 mm to 20 mm and filling it with better quality mortar in desired shape. It is done for cement mortar and lime mortar joints.

**Purpose of pointing:**

- For the protection of exposed surface from adverse effects due to atmospheric action like rain, sun, wind, snow etc.
- To hide the interior mortar and inferior quality.
- To develop a decorative impact or to enhance the appearance.

**Methods of pointing:**

- Mortar joints of the surface (Brick Masonry or Stone Masonry) to be pointed are raked out to a depth of about 13 to 20 mm.
- The raked joints are cleaned from loose mortar and completely wetted. Mortar is taken in small flat rectangular plates made of iron.

**Types of pointing:**

1. **Flush Pointing**

- Flush pointing is the most accessible type of pointing and is generally utilized in brick masonry and stone masonry.
- In flush pointing, mortar is pushed into the raked joints and joints are made flush with the edge of the stone or brick to provide a uniform appearance.
- After that, with the help of a trowel and straight edge, edges are precisely trimmed. This type of pointing doesn't have a good appearance, but it doesn't have any space for dust and water which make it long-lasting.

**2. Recessed Pointing**

- Recessed pointing has a vertical pointing face and provides a better appearance. A recessed pointing mortar is pushed back inside the surface of the wall with a vertical pointing face with the help of a suitable pointing tool.

**3. Beaded Pointing**

- Beaded pointing is made with the help of a steel or iron rod having a concave edge. Beaded pointing provides a better appearance, but it is susceptible to damage and maintenance is difficult.

**4. Struck Pointing**

- In struck pointing, have inclined or sloping pointing face as shown in the image. The upper edge of the joint is about 3 to 6 mm pushed back inside from the face of the brick. This joint helps to dispose of water quickly. When the lower edge of the joint is kept inside from the face of brick or stone, it is called overhand struck pointing. But it will not make an adequate joint because water may collect in the joint.

**5. Rubbed, Keyed or Grooved Pointing**

- In tuck pointing, a channel or groove of 5mm width and 3 mm depth is created at the middle of the mortar joint. Then the groove or track is packed up by white cement putty having a projection of 3 mm. If the node is made in the mortar, it is known as bastard pointing or half – tuck pointing.

**6. Tuck Pointing**

- In this case mortar is pressed in the raked joint first and finishing flush with the face. While the pressed mortar is green, groove or narrow channel is cut in the center of groove which is having 5mm width and 3mm depth. This groove is then filled with white cement putty, kept projecting beyond the face of the joint by 3 mm. if projection is done in mortar, it is called bastard pointing or half tuck pointing.

**7. V- Grooved Pointing**

- This type of point is similar to keyed or grooved pointing except that instead of a normal groove, v groove is formed using a suitable shaped steel rod.