Stone masonry

Stone masonry is used for the construction of walls, columns, lintels, arches, beams, etc., of a building. Stones are abundantly available in nature and when cut and dressed to proper shapes, they provide an economical material for the construction of various parts of building.

Materials used for stone masonry:

The materials used for masonry are stone and mortar.

The natural stones used in building can be classified to their origin as:

1. Igneous: The igneous stone principally used in building is granite, which was formed from the fusion of minerals under great heat below the earth’s surface many thousands of years ago.

2. Sedimentary: It was formed gradually over thousands of years from particle of calcium carbonate or sand deposited by settlement in bodies of water. Gradually layer upon layer of particles of lime or sand settled into depression in the earth’s surface and in course of time these layers of lime or sand particles became compacted by the water or earth above them.

3. Metamorphic: Those that have been changed from igneous or sedimentary stone or from earth into metamorphic stone by pressure, or heat, or both in the earth’s crust. Example are marble which was formed from limestone and slate and shale formed from clay.

The common types of stones available are:

1. Granite: It consists of grains of quartz in combination with felspar and mica. These are the hardest types of stones and difficult to work with. They are available in various colors ranging from white to green. These are used for the construction of steps, walls, sills and as facing over other masonry.

2. Sandstone: They are made of quartz cemented by a matrix of silica. They also contain mica, felspar and oxides of iron. The colors of sandstones are due to the presence other minerals in them. They can be worked easily to take any ornamental shape. Their texture being coarse, they give a good appearance when used along with brick masonry. Colored sandstones are used in the face work of building to give architectural treatment. They are used for walls, columns, facing, steps, flooring, etc.

3. Limestone: These are calcareous rocks and consist of carbonate of lime. They are available in various colors and easy to work with. They are used for walls, floors, steps, etc.
4. Marbles: They are like limestone, are calcareous rocks and consist and consist of carbonate of lime. They are very useful material for flooring and monumental structures. Marble are available in various colors and can very good polish.

5. Slates: These are available in hilly areas and are metamorphic rocks. Generally they have a black color. Slates can be split in thin sheets along their bedding planes. They mostly used for roofing work.

**The properties of stones:**

The proprieties of stones which are important for stone masonry are strength and durability. Economy and appearance are additional requirements. The main considerations for durability are the lasting qualities of the stone itself and the locality where it is to be used. Porous stones are unsuitable for areas prone to heavy rainfall and frost. Stones, e.g. marbles having low porosity and low coefficients of expansion and contraction should be used in areas subjected to large variations in rainfall and temperatures.

Generally lime and cement mortars are used for stone masonry. Their function is to provide a workable matrix and ultimately a hard building material, which renders masonry into a monolithic unit.

**Cutting and dressing of stones:**

Stones found in nature, have to be quarried from their thick beds. After quarrying large pieces of stones, it is essential to break them into smaller sizes so that they can be used in a building. They are also dressed into suitable shapes and polished to give a smooth surface, if desired. Various types of finishes and the methods of dressing and cutting the stones to get the desired surfaces are described below:

1. Scrabbling: Irregular edges of the stones are broken off and the stone is shaped somewhat.
2. Hammer dressed: Large raised portions of the stones are cut and the stone is made somewhat flat but rough due to hammer marks.
3. Boasted or droved finish: The stone is cut to a little level face and is finished by means of a boaster.
4. Tooled finish: In this case the chisel marks are continuous and parallel throughout the width of stone.
5. Furrowed finish: In this case about 1 cm vertical or horizontal grooves are sunk with a chisel having its end shaped as a hollow semi-circle.
6. Reticulated finish: In this type of work, irregular shaped sinking is made within the center portion of the stone having a 2 cm wide margin on its sides.
7. Vermiculated finish: The sinking is of the reticulated type except that they are more curved and give a worm eaten type of appearance.
8. Combed or dragged finish: This type of finish is done on soft stones. A comb is driven over the surface of this stone to remove all elevating portions.
9. Punched finish: Depressions are formed on the rough surface with a punch.
10. Picked finish: This type of finish is obtained by dressing stones with a point and the depressions are smaller than the above type.
11. Chisel drafted margins: They give a better appearance and help in getting uniform joints.
12. Moulded finish: Mouldings of various types can be worked on the stones to improve their appearance.
13. Rubbed finish: The surfaces of the stones are rubbed get a smoother surface finish.
14. Polished finish: Stones which can take polish, e.g., granites, marbles, lime-stones are first rubbed to a smooth surface and then polished by using rubber and pad, sand and water, pumice, and putty powder.
15. Sand Blasting: This is done to imprint letterings and designs on the surface of granites.
**Types of stone masonry:**

Masonry can be classified according to the thickness of joints, continuity of courses and finish of face.

Broadly speaking there are two types of stone masonry, namely:

1. Rubble masonry: This consists of blocks of stones either undressed or roughly dressed and having wider joints.
   a. Random rubble:
      i. Uncoursed
      ii. Coursed
b. Squared rubble
   i. Uncoursed
   ii. Coursed
   iii. Built to regular courses
2. Ashlar masonry: This built of stones carefully dressed and has narrow joints.
**General principles to be followed in the construction of stone masonry:**

1. The stone used shall be hard, durable and tough. All stones should be laid on its natural bed.

2. The pressure acting on the stones should not act parallel to the bedding planes. This will try to split the stones. Sometimes stones used in corbels are laid with pressure acting parallel to bedding planes.

3. The bond stones and headers should not be of dumb-bell shape.

4. Large flat stones should be laid under the ends of girders, roof trusses, etc.

5. In all slopping retaining walls, the beds of the stones and the plan of the courses should be at right angles to the slope.

6. All laid fine dressed stone work should be protected against damage during further construction by means of wooden boxes.

7. Jambs for door and window openings should be made of quoins which are equal in height to the course. They should be in breadth equal to at least 1½ times the height of the course and their length should be at least twice the height.

8. All the surfaces should be kept wet while the work is in progress and also till the mortar has set.

9. Double scaffolding will be used wherever it is difficult to fit in the stones later on.

10. All the portions of the masonry should be raised uniformly. Wherever this is not possible, the stone work built earlier should be raked (stepped) so that the new work can be bonded well with the old.

11. Sufficient through stones should be used and they should form ¼th of the area in elevation.

12. The hearting of the masonry should be properly packed with mortar and chips, if necessary, to avoid any hollows or very thick mortar joints.

13. Vertical faces of the masonry walls should be checked with a plumb rule and the battered faces should be tested with wooden template corresponding to the batter and a plumb rule to ensure a constant batter.

14. The stones used in the masonry should be wetted before use to avoid moisture being sucked from the mortar.

15. Masonry should not be allowed to take tension.

Reference:

1. BARRY, The construction of building, vol. 2
2. S.K.SHARMA, Building construction