Bricks:

One of the oldest building material brick continues to be a most popular and leading construction material because of being cheap, durable and easy to handle and work with. Clay bricks are used for building-up exterior and interior walls, partitions, piers, footings and other load bearing structures. Brick is rectangular in shape and of size that can be conveniently handled with one hand. Brick may be made of burnt clay or mixture of sand and lime or of Portland cement concrete. Clay bricks are commonly used since these are economical and easily available.

Bricks can define as a construction unit made of inorganic metal strong and solid compounds in regular geometric shapes. Brick and knows many titles, depending on the quality and source of raw materials and preparation methods in various forms, as well as its durability and resistance to standard conditions of thermal insulation, moisture prevent, acid erosion and physical phenomena like Expansion, contraction and freezing water in pores.

Types of Bricks

Bricks may be broadly classified as:

(1) Building bricks-

(2) Paving bricks

(3) Fire bricks

(4) Special bricks.

(1) Building Bricks: These bricks are used for the construction of walls.

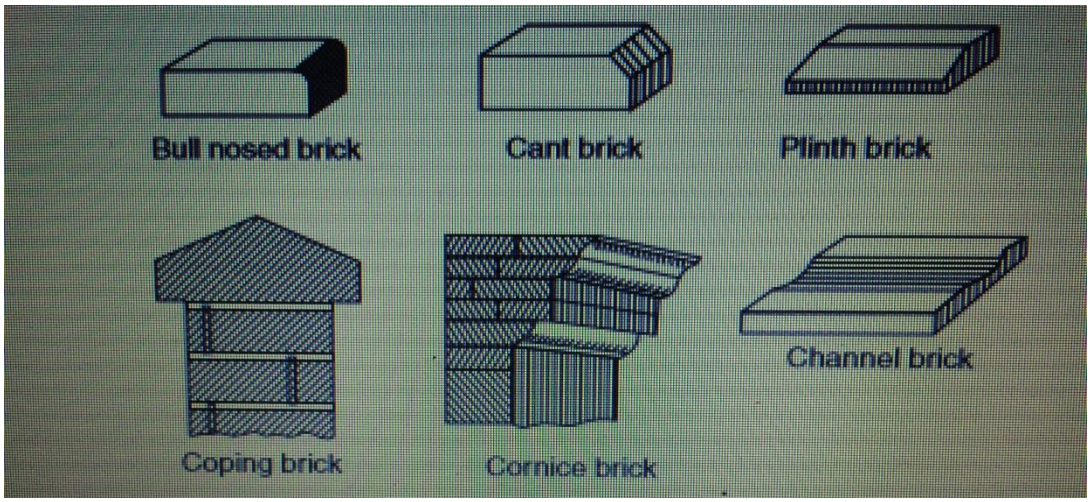
(2) Paving Bricks: These are vitrified bricks and are used as pavers.

(3) Fire Bricks: These bricks are specially made to withstand furnace temperature. Silica bricks belong to this category.

(4) Special Bricks: These bricks are different from the commonly used building bricks with respect to their shape and the purpose for which they are made. Some of such bricks are listed below:

(a) Specially shaped bricks (b) Facing bricks (c) Perforated building bricks (d) Burnt clay hollow bricks (e) Sewer bricks (f) Acid resistant bricks.

(a) Specially Shaped Bricks: Bricks of special shapes are manufactured to meet the requirements of different situations. Some of them are shown in Fig. 1.



(b) Facing Bricks:

These bricks are used in the outer face of masonry. Once these bricks are provided, plastering is not required. The standard sizes of these bricks are 190 × 90 × 90 mm or 190 × 90 × 40 mm.

(c) Perforated Building Bricks:

These bricks are manufactured with area of perforation of 30 to 45 per cent. The area of each perforation should not exceed 500 mm^2. The perforation should be uniformly distributed over the surface. They are manufactured in the size 190 × 190 × 90 mm and 290 × 90 × 90 mm.

(d) Burnt Clay Hollow Bricks:

They are light in weight. They are used for the construction of partition walls. They provide good thermal insulation to buildings. They are manufactured in the sizes 190 × 190 × 90 mm, 290 × 90 × 90 mm and 290 × 140 × 90 mm. The thickness of any shell should not be less than 11 mm

(e) Sewer Bricks:

These bricks are used for the construction of sewage lines. They are manufactured from surface clay, fire clay shale or with the combination of these. They are manufactured in the sizes 190 × 90 × 90 mm and 190 × 90 × 40 mm. The average strength of these bricks should be a minimum of 17.5 N/mm^2. The water absorption should not be more than 10 per cent.

(f) Acid Resistant Bricks:

These bricks are used for floorings likely to be subjected to acid attacks, lining of chambers in chemical plants, lining of sewers carrying industrial wastes etc. These bricks are made of clay or shale of suitable composition with low lime and iron content, flint or sand and vitrified at high temperature in a ceramic kiln.

Properties of Bricks

The following are the required properties of good bricks:

(1) Color: Color should be uniform and bright.

(2) Shape: Bricks should have plane faces. They should have sharp and true right angled corners.

(3) Size: Bricks should be of standard sizes as prescribed by codes.

(4) Texture: They should possess fine, dense and uniform texture. They should not possess fissures, cavities, loose grit and un burnt lime.

(5) Soundness: When struck with hammer or with another brick, it should produce metallic sound.

(6) Hardness: Finger scratching should not produce any impression on the brick.

(7) Strength: Crushing strength of brick should not be less than 3.5 N/mm2. A field test for strength is that when dropped from a height of 0.9 to 1.0 m on a hard ground, the brick should not break into pieces.

(8) Water Absorption: After immersing the brick in water for 24 hours, water absorption should not be more than 20 per cent by weight.

(9) Efflorescence: Bricks should not show white patches when soaked in water for 24 hours and then allowed to dry in shade. White patches are due to the presence of sulphate of calcium, magnesium and potassium. They keep the masonry permanently in damp and wet conditions.

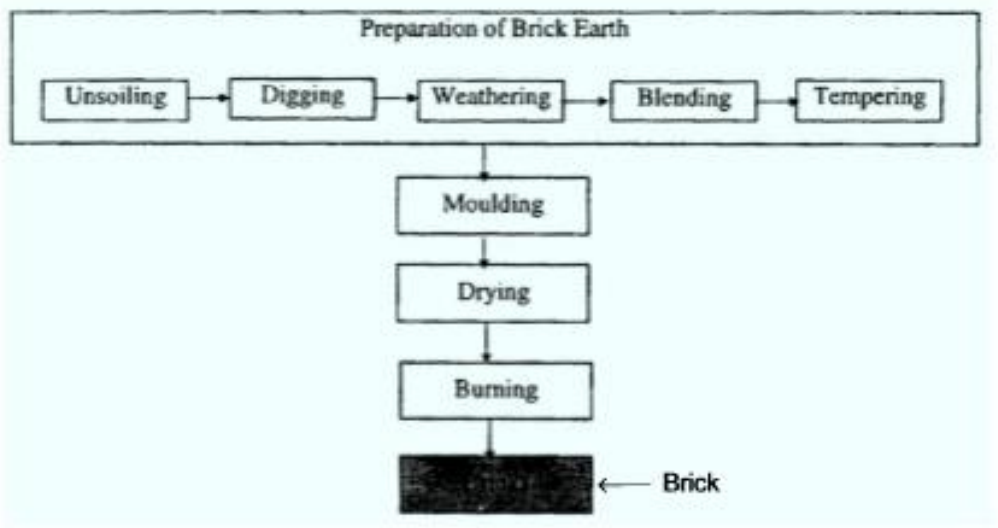
(10) Thermal Conductivity: Bricks should have low thermal conductivity, so that buildings built with them are cool in summer and warm in winter.

(11) Sound Insulation: Heavier bricks are poor insulators of sound while light weight and hollow bricks provide good sound insulation.

(12) Fire Resistance: Fire resistance of bricks is usually good. In fact bricks are used to encase steel columns to protect them from fire.

Manufacturing of bricks

It consists of the following operations.



Unsoiling:

The soil used for making building bricks should be processed so as to be free of gravel, coarse sand (practical size more than 2 mm), lime and clinker particles, organic matter, etc. About 20 cm of the top layer of the earth, normally containing stones, pebbles, gravel, roots, etc., is removed after clearing the trees and vegetation.

Digging:

After removing the top layer of the earth, proportions of additives such as fly ash, sandy loam, rice husk ash, stone dust, etc. should be spread over the plane ground surface on volume basis. The soil mass is then manually excavated, puddled, watered and left over for weathering and subsequent processing. The digging operation should be done before rains.

Weathering:

Stones, gravels, pebbles, roots, etc. are removed from the dug earth and the soil is heaped on level ground in layers of 60–120 cm. The soil is left in heaps and exposed to weather for at least one month in cases where such weathering is considered necessary for the soil. This is done to develop homogeneity in the mass of soil, particularly if they are from different sources, and also to eliminate the impurities which get oxidized. Soluble salts in the clay would also be eroded by rain to some extent, which otherwise could have caused scrumming at the time of burning of the bricks in the kiln. The soil should be turned over at least twice and it should be ensured that the entire soil is wet throughout the period of weathering. In order to keep it wet, water may be sprayed as often as necessary. The plasticity and strength of the clay are improved by exposing the clay to weather.

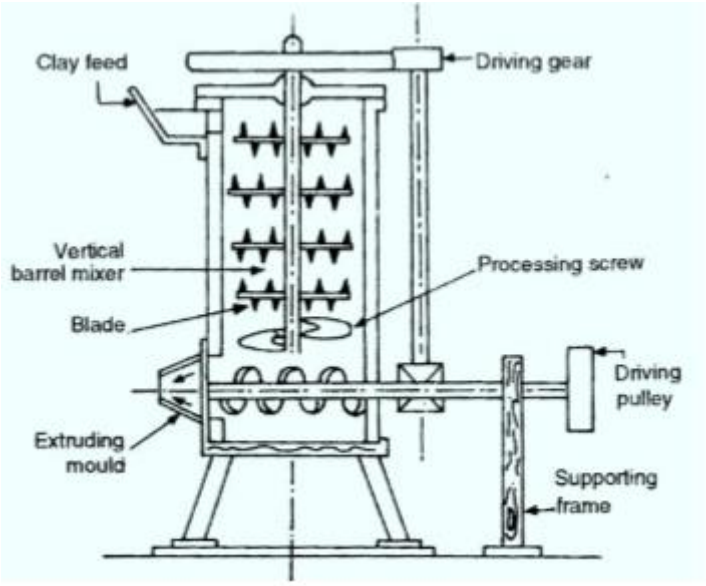
Blending:

The earth is then mixed with sandy-earth and calcareous-earth in suitable proportions to modify the composition of soil. Moderate amount of water is mixed so as to obtain the right consistency for molding. The mass is then mixed uniformly with spades. Addition of water to the soil at the dumps is necessary for the easy mixing and workability, but the addition of water should be controlled in such a way that it may not create a

problem in molding and drying. Excessive moisture content may affect the size and shape of the finished brick.

Tempering

Tempering consists of kneading the earth with feet so as to make the mass stiff and plastics (by plasticity, we mean the property which wet clay has of being permanently deformed without cracking). It should preferably be carried out by storing the soil in a cool place in layers of about 30 cm thickness for not less than 36 hours. This will ensure homogeneity in the mass of clay for subsequent processing. For manufacturing good brick, tempering is done in pug mills and the operation is called pugging.



Pug mills