

BT- 204 (Basic Civil Engineering and Engineering Mechanics)

Unit-I

Topic- Bricks

Brick is obtained by molding good clay into a block, which is dried and then burnt. This is the oldest building block to replace stone. Manufacture of brick started with hand moulding, sun drying and burning in clamps. A considerable amount of technological development has taken place with better knowledge about to properties of raw materials, better machineries and improved techniques of moulding drying and burning. The size of the bricks are of 190 mm × 90 mm × 90 mm and With mortar joints, the size of these bricks are taken as 200 mm × 100 mm × 100 mm commonly used in India.

Manufacturing of Bricks

Brick manufacturing involves the following steps-

(i) Selection of earth & preparation of earth brick:- The upper layer (20-25cms)of the ground is removed. Now clay is dug out and lumps are broken by ensuring that the soil is free from gravel, coarse sand and vegetable matters etc. then clay is exposed to the atmosphere for softening. The period of exposure varies from few weeks to full season. This improves its plasticity strength. Water may be sprayed on the heap from time to time and heap turned over.

(ii) Moulding of bricks: - the bricks are given the required shape and size with the help of mould. Moulding can be achieved in the following ways-

(a) Hand moulding- ground moulding bricks or table moulding bricks

(b) Machine moulding bricks

(iii) Drying of bricks: - before the burning process, the brick should be dried so as to become sufficient hard to handle and stick in clamps without getting damage. Drying period depend on weather condition.

(iv) Burning of bricks:- Burning of brick achieved either in clamps or in kilns. The clamps are adopted when the bricks are to be manufactured on small scale. If the quantity of bricks to be manufactured is large then kilns burning are preferred.

Properties of Bricks

The following are the required properties of good bricks:

(i) Colour: Colour should be uniform and bright.

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

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

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

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

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

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

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

(ix) 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.

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

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

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

Tests on Bricks

The following laboratory tests may be conducted on the bricks to find their suitability:

(i) Crushing strength

(ii) Water Absorption

(iii) Efflorescence.

(i) Crushing Strength: the brick specimens are immersed in water for 24 hours. The frog of the brick is filled flush with 1:3 cement mortars and the specimen is stored in damp jute bag for 24 hours and then immersed in clean water for 24 hours. The specimen is placed in compression testing machine with 6 mm plywood on top and bottom of it to get uniform load on the specimen. Then load is applied axially at a uniform rate of 14 N/mm^2 . The crushing load is noted. Then the crushing strength is the ratio of crushing load to the area of brick loaded. Average of five specimens is taken as the crushing strength.

(ii) Water Absorption Test: Brick specimen is weighed dry. Then they are immersed in water for a period of 24 hours. The specimen are taken out and wiped with cloth. The weight of each specimen in wet condition is determined. The differences in weight indicate the water absorbed. Then the percentage absorption is the ratio of water absorbed to dry weight multiplied by 100. The average of five specimens is taken. This value should not exceed 20 per cent.

(iii) Efflorescence:- The presence of alkalis in brick is not desirable because they form patches of gray powder by absorbing moisture. Hence to determine the presence of alkalis this test is performed as explained below:

Place the brick specimen in a glass dish containing water to a depth of 25 mm in a well ventilated room. After all the water is absorbed or evaporated again add water for a depth of 25 mm. After second evaporation observe the bricks for white/grey patches. The observation is reported as 'nil', 'slight', 'moderate', 'heavy' or serious to mean

(a) Nil: No patches

(b) Slight: 10% of area covered with deposits

(c) Moderate: 10 to 50% area covered with deposit but unaccompanied by flaking of the surface.

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(d) Heavy: More than 50 per cent area covered with deposits but unaccompanied by flaking of the surface.

(e) Serious: Heavy deposits of salt accompanied by flaking of the surface.

The following field tests help in ascertaining the good quality bricks:

(i) Uniformity in Size: A good brick should have rectangular plane surface and uniform in size. This check is made in the field by observation.

(ii) Uniformity in Colour: A good brick will be having uniform colour throughout. This observation may be made before purchasing the brick.

(iii) Structure: A few bricks may be broken in the field and their cross-section observed. The section should be homogeneous, compact and free from defects such as holes and lumps.

(iv) Sound Test: If two bricks are struck with each other they should produce clear ringing sound. The sound should not be dull.

(v) Hardness Test: For this a simple field test is scratch the brick with nail. If no impression is marked on the surface, the brick is sufficiently hard.

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

Classification of Bricks:- The bricks are classified in to following 4 categories-

- (a)** First Class Bricks
- (b)** Second Class Bricks
- (c)** Third Class Bricks
- (d)** Overburnt bricks or Jhama bricks

(a) First Class Bricks:-

- (i)** These bricks are well burnt, somewhat irregular in shape, smooth and size, have slight rough surface.
- (ii)** They have uniform brick red colour. These bricks may be slight overburnt.
- (iii)** They have uniform compact texture.
- (iv)** When struck with each other then these will give clear metallic ringing sound.
- (v)** When scratch with finger nail, no impression is left.
- (vi)** These bricks will not absorbed water more than 20 % by weight when kept immersed in water for 24 hours.
- (vii)** These may have only very less presence of efflorescence.

Uses- these bricks are generally used for good quality work or face work when no plaster is applied. They are also used for flooring and reinforced brick works.

(b) Second Class Bricks:-

- (i)** These bricks are well burnt, perfect rectangular shape, smooth and even surfaces, free from cracks.
- (ii)** They have uniform brick red colour.
- (iii)** They have uniform compact texture.
- (iv)** When struck with each other then these will give clear metallic ringing sound.
- (v)** When scratch with finger nail, no impression is left.

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(vi) These bricks will not absorb water more than 22 % by weight when kept immersed in water for 24 hours.

(vii) These bricks show moderate efflorescence.

Uses- these bricks are to be used for internal walls which are not exposed to atmosphere or when the walls are to be plastered.

(c) Third Class Bricks:-

(i) These bricks are not burnt properly.

(ii) These bricks have irregular shape & size and uneven surface.

(iii) These are soft and lighter in colour.

(iv) When struck each other, these will give dull sound.

(v) When scratched with finger nail, impressions are formed.

(vi) Water absorption should not be more than 25 % by weight.

(vii) These bricks show moderate efflorescence.

Uses: These are used for inferior type of construction and at a place where rainfall or dampness is less.

(d) Overburnt bricks or Jhama bricks

(i) these bricks are overburnt and lose their shape, get distorted.

(ii) The colour of these bricks is dark blue.

Uses: These bricks can be used in foundation of structures, as concrete aggregate, as road metals and in floors as soling materials.

Uses of Bricks

Bricks are used in the following civil works:

(i) As building blocks.

(ii) For lining of ovens, furnaces and chimneys.

(iii) For protecting steel columns from fire.

(iv) As aggregates in providing water proofing to R.C.C. roofs.

(v) For pavers for footpaths and cycle tracks.

(vi) For lining sewer lines.

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