CHAPTER - 2
:::::: BRICKS

Introduction:

Brick is obtained by moulding 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 machinaries and improved techniques of moulding drying and burning.

Classification of Bricks:

The bricks used in construction are classified as:

(*i*) First class bricks

(*ii*) Second class bricks

(*iii*) Third class bricks and

(*iv*) Fourth class bricks

(*i*) **First Class Bricks:** These bricks are of standard shape and size. They are burnt in kilns. They fulfill all desirable properties of bricks.

(*ii*) **Second Class Bricks:** These bricks are ground moulded and burnt in kilns. The edges may not be sharp and uniform. The surface may be some what rough. Such bricks are commonly used for the construction of walls which are going to be plastered.

(*iii*) **Third Class Bricks:** These bricks are ground moulded and burnt in clamps. Their edges are somewhat distorted. They produce dull sound when struck together. They are used for temporary and unimportant structures.

(*iv*) **Fourth Class Bricks:** These are the over burnt bricks. They are dark in colour. The shape is irregular. They are used as aggregates for concrete in foundations, floors and roads.

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$^{2.}$ A field test for strength is that when dropped from a height of 0.9 m to 1.0 mm on a hard ground, the brick should not break into pieces.

(*viii*) **Water Absorption:** After immercing the brick in water for 24 hours, water absorption should not be more than 20 per cent by weight. For class-I works this limit is 15 per cent.

(*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*) Absorption

(*iii*) Shape and size and

(*iv*) Efflorescence.

(*i*) **Crushing Strength:** The brick specimen are immersed in water for 24 hours. The frog of the brick is filled flush with 1:3 cement mortar 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 specimen is taken as the crushing strength.

(*ii*) **Absorption Test:** Brick specimen are 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 difference 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 specimen is taken. This value should not exceed 20 per cent.

(*iii*) **Shape and Size:** Bricks should be of standard size and edges should be truely rectangular with sharp edges. To check it, 20 bricks are selected at random and they are stacked along the length, along the width and then along the height. For the standard bricks of size 190 mm × 90 mm × 90 mm. IS code permits the following limits:

Lengthwise:	3680	to	3920 mm
Widthwise:	1740	to	1860 mm
Heightwise:	1740	to	1860 mm.

The following *field tests* help in acertaining the good quality bricks:

(*i*) uniformity in size

(*ii*) uniformity in colour

(*iii*) structure

(*iv*) hardness test

(*v*) sound test

(*vi*) strength test.

(*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*) ***Efflorescense:*** The presence of alkalies in brick is not desirable because they form patches of gray powder by absorbing moisture. Hence to determine the presence of alkalies 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.

(*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.

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.