FACULTY OF ENGINEERING & TECHNOLOGY

TOPIC : BRICKS (L-5)

❖ Properties of Brick:

❑ The following are the required properties of good bricks:

- A good brick should be able to resist the effects of weathering agencies like temperature, rain, etc.
- Colour: Colour should be uniform and bright.
- Shape: Bricks should have plane faces. They should have sharp and true right angled corners and uniform in shape.
- Size: Bricks should be of standard sizes as prescribed by codes.
- Texture: They should possess fine, dense and uniform texture. They should not possess fissures, cavities, loose grit and un-burnt lime.
- Soundness: When struck with hammer or with another brick, it should produce metallic ringing sound.
- Hardness: The bricks should be sufficiently hard finger nail scratching should not produce any impression on the brick.
- 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.
- Water Absorption: After immersing the brick in water for 24 hours, water absorption should not be more than 20% by weight for class-I, bricks and 22 % by weight for second class bricks.

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- 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 sulphates of calcium, magnesium and potassium. They keep the masonry permanently in damp and wet conditions.
- Thermal Conductivity: Bricks should have low thermal conductivity, so that buildings built with them are cool in summer and warm in winter.
- Sound Insulation: Heavier bricks are poor insulators of sound while light weight and hollow bricks provide good sound insulation.
- Fire Resistance: Fire resistance of bricks is usually good. In fact bricks are used to encase steel columns to protect them from fire.

❖ Uses of Bricks:

❑ As a Structural Unit Since the clay bricks or burnt bricks are strong, hard, durable, resistive to abrasion and fire, therefore, they are used as a structural material in different structures:-

- Buildings,
- Bridges,
- Foundations,

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- Arches,
- Pavement & Footpath,
- Roads,
- Drains,
- Tunnels,
- Boundary Walls etc.

- As an Aesthetic Unit/
- Surface Finish Bricks of different colors, sizes and orientations are used to get different surface designs. As an aesthetic material bricks are used in Landscaping, as Facing Brick, as a Fire Resistant Material.
- Bricks in the metallurgy and glass industries are often used for lining furnaces.
- Bricks are used to prepare brick jail.
- Manufacture of surkhi (powder bricks).
- Construction of brick retaining wall.

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❖ Advantages of Bricks:

- Clay Brick is naturally energy efficient:-Brick is a building material that has exceptional "thermal mass" properties i.e. the ability to store heat and then slowly release it. During the summer months brick home stays cool during the hottest part of the day. During the winter, brick walls store home's heat and radiate it back. Produces less environmental pollution during manufacturing process
- Clay brick is the most sustainable green building material having countless Recycling Options. Brick can be salvaged, crushed brick for sub-base materials, and chipped brick for permanent landscaping mulch.
- Brick offers lasting value. It doesn't rot, dent, tear or be eaten by termites. 4. Brick absorbs noise, giving it an acoustic advantage over other materials.
- Bricks are cheaper and lighter than normal concrete as well as RCC, which enable a lesser dead load of the entire structure. This results in economical design of structure including the foundations.
- Brickwork needs only the masons whereas the concrete (Reinforced cement concrete] needs carpenters , fitters and masons apart from centering , shuttering , staging material.
- It is easy to alter /modify a brick wall than a concrete element.
- Demolishing of brick structures is very easy, less time consuming and hence economic.

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- Economical (Raw material is easily available),
- Hard and durable
- Highly fire resistant.
- Compressive strength is good enough for ordinary construction.
- Very low maintenance cost

❖ Disadvantages of Bricks:

- Time consuming construction
- Cannot be used in high seismic zones
- Very less tensile strength
- Since bricks absorbs water easily, therefore it causes effloroescence when not exposed to air
- Rough surfaces of bricks may cause mould growth if not properly cleaned

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❖ Classification of Bricks:

❑ **Classification Based On Method Of Manufacturing Bricks** can broadly be categorized into two types as follows on the basis of how its manufactured:

- Unburnt or sun-dried bricks:- Are the types of bricks which are dried with the help of heat received from sun after the process of moulding. These bricks can only be used in the construction of temporary and cheap structures. Such bricks should not be used at places exposed.
- Burnt bricks:-Are prepared by burning the brick-mould in the kiln inside the factory. These are the most commonly used bricks for construction works.
  - They can be further classified into four categories:

▪ **Classification Based on Shape:** The ordinary bricks are rectangular solids. But sometimes the bricks are given different shapes to make them suitable for particular type of construction. Different types of bricks available with various shapes:

- **Bull Nose Bricks**: A brick moulded with a rounded angle is termed as a “bull nose”. It is used for a rounded quoin i.e. connection which is formed when a wall takes a turn The centre of the curved portion is situated on the long centre line of brick.

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- **Bull Nose Bricks**: A brick moulded with a rounded angle is termed as a “bull nose”. It is used for a rounded quoin i.e. connection which is formed when a wall takes a turn The centre of the curved portion is situated on the long centre line of brick.
- **Channel Bricks:** These bricks are moulded to the shape of a gutter or a channel and they are very often glazed. These bricks are used to function as drains.
- **Coping Bricks:** These bricks are made to suit the thickness of walls on which coping is to be provided. Such bricks take various forms such as chamfered, half round or saddle- back.
- **Cownose Bricks:** Also called double bull nose; it has both corners of the brick rounded off at one of the ends. It is used for wall capping or vertical or horizontal curves around window and door reveals.
- **Curved Sector Bricks:** These bricks are in the form of curved sector and they are used in the construction of circular brick masonry, pillars, brick chimneys.
- **Perforated Bricks:** These bricks contain cylindrical holes throughout their thickness. These bricks are light in weight. The perforated bricks are used in the construction of brick panels for light weight structures and multistoried framed structure. The perforation may be circular, square, rectangular or any other regular shape in cross section. Cownose bricks:

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- **Paving Bricks:** These bricks are prepared from clay containing a higher percentage of iron. Excess iron vitrifies the bricks at a low temperature. Such bricks resists better the abrasive action of traffic. Paving bricks may be plain or chequered.
- **Hollow Bricks:** These are also known as cellular or cavity bricks. Such bricks have wall thickness of about 20 cm to 25cm. They are prepared from special homogeneous clay or concrete. They are light in weight about one-third the weight of the ordinary brick of the same Size. These bricks can be laid almost about four times as fast as they ordinary bricks and thus the use of such bricks leads to speedy construction. They also reduce the transmission of heat, sound and damp. They are used in the construction of brick partitioning.
- **Queen Closer Bricks:** The queen closer is usually placed next to the first brick in header course. The queen closer-1/2 is obtained by cutting an ordinary brick into half bats and then splitting one into half. The queen closer quarter is more often used than queen closer-half as it is easier to cut, all though it is generally produced a 56mm wide continuous vertical joint.
- **King Closer Bricks:** The king closer is formed by removing a corner and leaving half-header and half stretcher faces. They are used to fnish corners.
- **Dogleg / Angle Bricks:** This brick are used to ensure a satisfactory bond at quoins which depart from a right angle and to be prepared to the mitred closers. The angle and lengths of faces forming the dogleg vary..

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1. Bullnose brick

2. Channel bricks

3. Coping bricks

4.Cownose bricks:

5. Curved sector bricks

6.Hollow bricks

7.Paving bricks

8.Perforated bricks:

9. Purpose-made bricks

10. Dogleg/angle

11. Queen closer.

12. King Closer

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❑ **Other Shapes of Bricks:**

- Bat:-The portion of brick tha

1. Three Quarter Bat:- When

2. Beveled Bat:- When a bat h

   the angle being anything bu

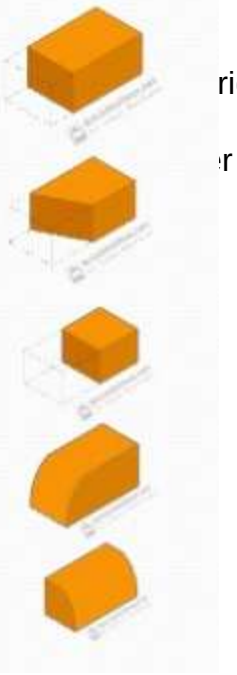
3. Half Bat:- When the length

- Single Bull Nose Header:-T

Other Shapes of Bricks:-

- **Bat:-**The portion of brick that is cut across the width.

1. Three Quarter Bat:- When the length of the bat is equal to three-quarters of the length of the original brick.
2. Beveled Bat:- When a bat has its width beveled. Bevel is the incline surface that meets another of the same body with the angle being anything but a 90-degree angle.
3. Half Bat:- When the length of a bat is equal to half of the length of the original brick.

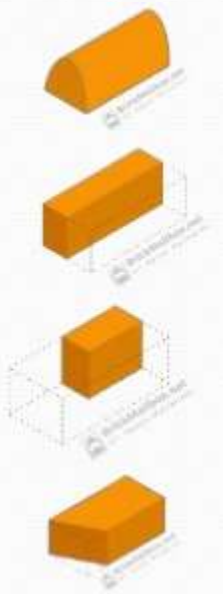


riginal brick.

r of the same body with

header
l off.
r:-Top
rick is

- Bull Nose Double Stretcher:-Both top stretcher side corners of the brick are rounded off.
- Queen Closer (Half):-The piece of brick taken by cutting a brick lengthwise into two parts.
- Queen Closer (Quarter):-When the queen closer is cut in half, then it is called a queen closer quarter.
- Mitred Closer:-These are bricks where one end is cut at an angle from 45 to 60 degrees.



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❑ Classification of Burnt Clay Bricks On the basis of manufacturing and quality burnt clay bricks are classified as:

- ❑ First Class Bricks (Grade A):-These bricks are hard, sound and of uniform shape, well burnt in kilns, table moulded and rectangular with sharp edges. Surface is clean, smooth, straight and have no cracks. First class bricks are mainly used for face worked structure or used for superior work.
- ❑ Second Class Bricks (Grade B):-These bricks are also hard, burnt in kilns and ground moulded but with slightly rough and irregular in shape. They may have hair cracks and spots. Their edges may not be sharp and uniform. Second class bricks are mainly used for ordinary structures and also used at places where brick work is to be provided with plaster coat.
- ❑ Third Class Bricks (Grade C):-These bricks are ground moulded and burnt in clamps and are slightly soft. Third class bricks have rough surfaces with irregular, blunt and distorted edges. These bricks are used for unimportant and temporary structure and at place where rainfall is not heavy. These bricks give dull sound when they are struck together.
- ❑ Fourth Class Bricks (Grade D):-These bricks are over burnt bricks with rough surface, irregular shape and dark colour. These bricks are very hard. These bricks are used as aggregates for concrete foundation, floors, roads etc.

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❖ TEST ON BRICKS :

❑ Bricks are the building blocks of a building. If the quality of brick used in a structure is not good then it can lead to serious damages of building. Therefore it is necessary to check the quality of brick before using it in any construction activities. There are some field tests that are conducted in the field in order to check the quality of bricks. These tests are as follows.

➢ **Water Absorption:** Take few (say 5) bricks and weigh them dry and calculate the average dry weight of 5 bricks. Thereafter immersed them in water for a period of 24 hours. After 24 hours of immersion, weigh them again and calculate average of 5 bricks . The difference of the final average weight and initial average weight indicates the amount of water absorbed by the bricks. It should not in any case exceed 20percent of average weight of dry bricks. It should not in any case exceed 20% of wet of dry bricks.

➢ **Visual Inspection:** In this test bricks are closely inspected for its shape. The bricks of good quality should be uniform in shape and should have truly rectangular shape with sharp edges.

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- **Efflorescence:** This test should be conducted in a well ventilated room. The brick to be placed vertically in a dish 30 cm x 20 cm approximately in size with 2.5 cm immersed in distilled water. The whole water shall be allowed to be absorbed by the brick and evaporated through it. After the bricks appear dry, a similar quantity of water to be placed in the dish, and the water to be allowed to evaporate as before. The brick is to be examined after the second evaporation and reported as follows: evaporation and reported as follows:

a) Nil: When there is no perceptible deposit of salt.

b) Slight: When not more than 10% of the area of brick is covered with salt.

c) Moderate: When there is heavy deposit covering 50% of the area of the brick but unaccompanied by powdering or flaking of the surface.

d) Heavy: When there is heavy deposit covering more than 50% of the area of the brick accompanied by powdering or flaking of the surface.

e) Serious: When there is heavy deposit of salts accompanied by powdering and/or flaking of the surface and this deposition tends to increase in the repeated wetting of the specimen.. Bricks for general construction should not have more than slight to moderate efflorescence.

- **Dimensional Tolerance:** Select few (say twenty) bricks at random to check measurement of length, width and height. These dimensions are to be measured in one or two lots of ten each . Variation in dimensions are allowed only within narrow limits, ±3% for class one and ±8% for other classes.

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- **Hardness:** In this test, a scratch is made on brick surface with the help of a finger nail. If no impression is left on the surface, brick is treated as to be sufficiently hard.
- **Soundness:** Take two bricks, one in each hand, struck them with each other lightly. A brick of good quality should not break and a clear ringing sound should be produced.
- **Structure:** Break brick and examine its structure. It should be homogeneous, compact and free from any defects such as holes, lumps etc
- **Crushing Strength:** Crushing strength of brick is found out by placing it in compressive test ing machine.

  - Frog is filled with 1:3 cement-sand mortar and allowed to harden.
  - It is pressed till it breaks
  - The minimum crushing strength of brick is 55kg/cm2

Thank You