1.2 Bricks – Classification – Manufacturing of clay bricks

Bricks are commonly used construction materials that are rectangular in shape and made from various materials such as clay, concrete, and sand-lime. They are used for building walls, pavements, and other structural elements.

Bricks – Classification

Bricks can be of many types depending on

- Quality
- Building Process
- Manufacturing Method
- Raw Material
- Weather-resisting Capability
- Purpose of Using

Classification of Bricks Based on Quality

- **First Class Brick**: The brick which has a compressive strength of 10N/mm^2 is called as a First class brick The color of these bricks is uniform yellow or red. It is well burnt, regular texture, uniform shape. The absorption capacity is less than 10%,
- **Second Class Brick:** The brick with compressive strength of 7N/mm^2 is called as a Second class brick. The size is standard, color is uniform yellow or red. It is well burnt, slightly over burnt is acceptable. It has a regular shape; efflorescence is not appreciable. The absorption capacity is more than 10%
- **Building brick:** The brick which we use for building has a compressive strength of 3.5N/mm^2
- **Sundried Brick:** The sun dried brick has a compressive strength of 1.5N/mm^2 to 2.5N/mm^2

Classification of Bricks Based on Building Process

- **Unburnt Bricks**: These are half burnt bricks. The color is yellow. The strength is low. They are used as surki in lime terracing. They are used as soiling under RCC footing or basement. Such bricks should not be exposed to rainwater.
- **Burnt Bricks**: Burnt bricks are made by burning them in the kiln. First class, Second Class, Third Class bricks are burnt bricks.

Classification of Bricks Based on Manufacturing Method

- **Extruded Brick**: It is created by forcing clay and water into a steel die, with a very regular shape and size, then cutting the resulting column into shorter units with wires before firing. It is used in constructions with limited budgets. It has three or four holes constituting up to 25% volume of the brick.

- **Molded Brick**: It is shaped in molds by hand rather being in the machine. Molded bricks between 50-65mm are available instantly. Other size and shapes are available in 6-8 weeks after the order.
- **Dry pressed Brick**: It is the traditional types of bricks which are made by compressing clay into molds. It has a deep frog in one bedding surface and shallow frog in another.

Classification of Bricks Based on Raw Materials

- **Burnt Clay Brick**: It is obtained by pressing the clay in molds and fried and dried in kilns. It is the most used bricks. It requires plastering when used in construction works.
- **Fly ash clay Brick:** It is manufactured when fly ash and clay are molded in 1000 degree Celsius. It contains a high volume of calcium oxide in fly ash. It proved a smooth surface so it doesn't need plastering.
- **Concrete Brick:** It is made of concrete. It is the least used bricks. It has low compression strength and is of low quality. These bricks are used above and below the damp proof course.
- **Sand-lime Brick:** Sand, fly ash and lime are mixed and molded under pressure. During wet mixing, a chemical reaction takes place to bond the mixtures. Then they are placed in the molds. The color is greyish as it offers something of an aesthetic view.
- **Firebrick:** It is also known as refractory bricks. It is manufactured from a specially designed earth. After burning, it can withstand very high temperature without affecting its shape, size, and strength. It is used for the lining of chimney and furnaces where the usual temperature is expected to be very high.

Classification of Bricks Based on Weather-resisting Capability

- **Severe Weather Grade:** These types of bricks are used in the countries which are covered in snow most of the time of year. These bricks are resistant to any kind of freeze-thaw actions.
- **Moderate Weather Grade:** These types of bricks are used in tropical countries. They can withstand any high temperature.
- **No Weather Grade:** These bricks do not have any weather resisting capabilities and used on the inside walls.

Classification of Bricks Based on Their Using

- **Common Bricks:** These bricks are the most common bricks used. They don't have any special features or requirements. They have low resistance, low quality, low compressive strength. They are usually used on the interior walls.
- **Engineering Bricks:** These bricks are known for many reasons. They have high compressive strength and low absorption capacity. They are very strong and dense. They have good load bearing capacity, damp proof, and chemical resistance properties. They have a uniform red color. They are classified as Class A, class B, class C. Class A is the strongest but Class B is most used. They are used for mainly civil engineering works like sewers, manholes, ground works, retaining walls, damp proof courses, etc.

Manufacturing of clay bricks

The process of manufacturing of bricks from clay involves preparation of clay, molding and then drying and burning of bricks. The bricks are building materials which are generally available as rectangular blocks. The bricks do not require any dressing and brick laying is very simple compared to stone masonry.

There are four different operations are involved in the process of manufacturing of bricks:

1. Preparation of clay
2. Molding
3. Drying
4. Burning

1. Preparation of clay for brick manufacturing:

Preparation of clay for bricks manufacturing is done in six steps:

- **Unsoiling of clay** We need pure clay for the preparation of bricks. The top layer of soil may contain impurities, so the clay in top layer of soil about 200mm depth is thrown away. This is called unsoiling.
- **Digging** After the removal of top layer, the clay is dug out from the ground and spread on the plain ground.
- **Cleaning** in this stage, the clay is cleaned of stones, vegetable matter etc. if large quantity of particulate matter is present, then the clay is washed and screened. The lumps of clay are converted into powder with earth crushing rollers.
- **Weathering** The cleaned clay is exposed to atmosphere for softening. The period of weathering may be 3 to 4 weeks or a full rainy season. Generally, the clay is dug out just before the rainy season for larger projects.
- **Blending** If we want to add any ingredient to the clay, it is to be added in this stage by making the clay loose and spread the ingredient over it. Then take small portion of clay into the hands and tuning it up and down in vertical direction. This process is called blending of clay.
- **Tempering** in this stage, water is added to clay and pressed or mixed. The pressing will be done by cattle or with feet of men for small scale projects, pug mill is used as grinder for large scale projects. So, the clay obtains the plastic nature and now it is suitable for molding.

2. Molding of clay for brick manufacturing

In the molding process, prepared clay is mold into brick shape (generally rectangular). This process can be done in two ways according to scale of project.

- Hand molding (for small scale)
- Machine molding (for large scale)

Hand molding of bricks

If manufacturing of bricks is on a small scale and manpower is also cheap then we can go for hand molding. The molds are in rectangular shape made of wood or steel which are opened at the top and bottom. The longer sides of molds are projected out of the box to serve it as handles. If we take durability in consideration steel molds are better than wooden molds.

In hand molding again there are two types and they are

- Ground molded bricks
- Table-molded bricks

Ground molded bricks, also known as pressed bricks or machine-made bricks, are a type of brick that is manufactured through a molding process using machines. These bricks are formed by pressing a mixture of clay, sand, and other additives into molds under high pressure. The resulting bricks have a uniform shape and size. round molded bricks are made using automated machines that compress the raw material mixture into molds. The mixture typically consists of clay, sand, and sometimes other additives like lime or cement to enhance the properties of the bricks.

Table molded bricks, this process is similar to ground molding process, but here the bricks on molded on the table of size 2m x 1m. Ground molding is economical when compared to table molding.

Machine molding of bricks

The bricks required are in large quantity, then machine molding is economical and also saves more time. Here also we are having two types of machines,

1. Plastic clay machines
2. Dry clay machines

Plastic clay machines This machines contain an opening in rectangular shape and when we place the tempered clay in to this machine it will come out through this opening. Now, the rectangular strips coming out the opening are cut by wires to get required thickness of brick. So, these are also called wire cut bricks. Now these raw bricks are ready for the drying process.

Dry clay machines Dry clay machines are more time saving machines. We can put the blended clay into these machines directly without tempering. Means tempering is also done in this machine by adding some water. When the required stiffness is obtained the clay is placed in mold and pressed hard and well-shaped bricks are delivered. These are called pressed bricks and these do not require drying they may directly send to burning process.

3. Drying of raw bricks

- After molding process, the bricks contain some amount of moisture in it. So, drying is to be done otherwise they may have cracked while burning. The drying of raw bricks is done by natural process.
- The bricks are laid in stacks. A stack consists 8 to 10 stairs. The bricks in these stacks should be arranged in such a way that circulation of air in between the bricks is free.
- The period of drying may be 3 to 10 days. It also depends upon the weather conditions.
- The drying yards are also prepared on higher level than the normal ground for the prevention of bricks from rain water.
- In Some situations, artificial drying is adopted under special dryers or hot gases.

4. Burning of bricks

In the process of burning, the dried bricks are burned either in clamps (small scale) or kilns (large scale) up to certain degree temperature. In this stage, the bricks will gain hardness and strength so it is important stage in manufacturing of bricks.

The temperature required for burning is about 1100^0c. If they burnt beyond this limit they will be brittle and easy to break. If they burnt under this limit, they will not gain full strength and there is a chance to absorb moisture from the atmosphere.Hence burning should be done properly to meet the requirements of good brick.