Bricks

Lecture - 1

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Introduction of Brick

- The common building bricks is not only one of the oldest but also the most extensively used building material in construction work. It is essentially a local building material and consequently there exist considerable variations in the quality of raw material. the quality of the finished product depends upon the process of manufacture also. Therefore the Indian standards such as IS 1077, 3495 part 1-4 are developed to standardize the final product.
- Standard modular size of common building bricks
  - (L × W × H) = 190mm × 90mm × 90mm, 190mm × 90mm × 40mm
  - Non-modular sizes of the bricks
  - (L × W × H) = 230mm × 110mm × 70mm, 230mm × 110mm × 30mm

Composition of Good Brick Earth

☞ *Following are the constituents of good brick earth;*

Alumina
(20 to 30%)

↓

It absorbs water and renders the clay plastic.
A good brick-earth should contain 20 to 30 percent of alumina.
This constituent imparts plasticity to earth so that it can be molded.
If alumina is present in excess, raw bricks shrink and warp during drying and burning.

Silica
(50 to 60%)

↓

Presence of silica prevents cracks, shrinking and warping of raw bricks.
Durability of bricks depends on the proper proportion of silica in brick earth.
Excess of silica makes the brick brittle and weak on burning.

Composition of Good Brick Earth

☞ *Following are the constituents of good brick earth;*

Lime
(10%)

↓

Reduce the shrinkage on draying
Causes silica in clay to melt on burning and thus helps to bind it
In carbonated form, lime lowers the fusion point.
Excess of lime causes the brick to melt and the brick looses its shape.

Oxide of Iron
(5 to 6%)

↓

Improve impermeability and durability
Tend to lower the fusion point of the clay, especially if present as ferrous oxide.
Give strength and hardness. Excess of oxide of iron makes the bricks dark blue or blackish.

Duggal, SK. Building Materials

Composition of Good Brick Earth

☞ *Following are the constituents of good brick earth;*

Magnesia (<1%)

↓

A small quantity of magnesia in brick earth imparts yellow tint to bricks, and decreases shrinkage
It causes the clay to soften at slower rate than does lime and reduce warping.
But excess of magnesia causes decay of bricks.

Alkalis (<10%)

↓

Alkalis present in the brick earth lower the fusion temperature abnormally making the brick deform and twist. In addition, alkalis have hygroscopic properties.

Composition of Good Brick Earth

☞ *Following are the constituents of good brick earth;*

Alkalis
(<10%)

↓

When bricks come in contact with moisture, water is absorbed and the alkalis crystallise. On drying, the moisture evaporates, leaving behind grey or white powder deposites on the brick which spoil the appearance. This phenomenon is called efflorescence. Efflorescence should always be dry brushed away before rendering or plastering a wall; wetting it will carry the salts back into the wall to reappear later.

Composition of Good Brick Earth

☞ *Harmful ingredients are*

Iron Pyrites

↓

If iron pyrites are present in bricks earth ,the bricks are crystallized and disintegrated during burning because of the oxidation of the iron pyrites.

Pebbles

↓

In the presence of these, there is hindrance in molding the brick. In addition, the bricks cannot be cut to the required size, if needed, while erecting the wall.

Composition of Good Brick Earth

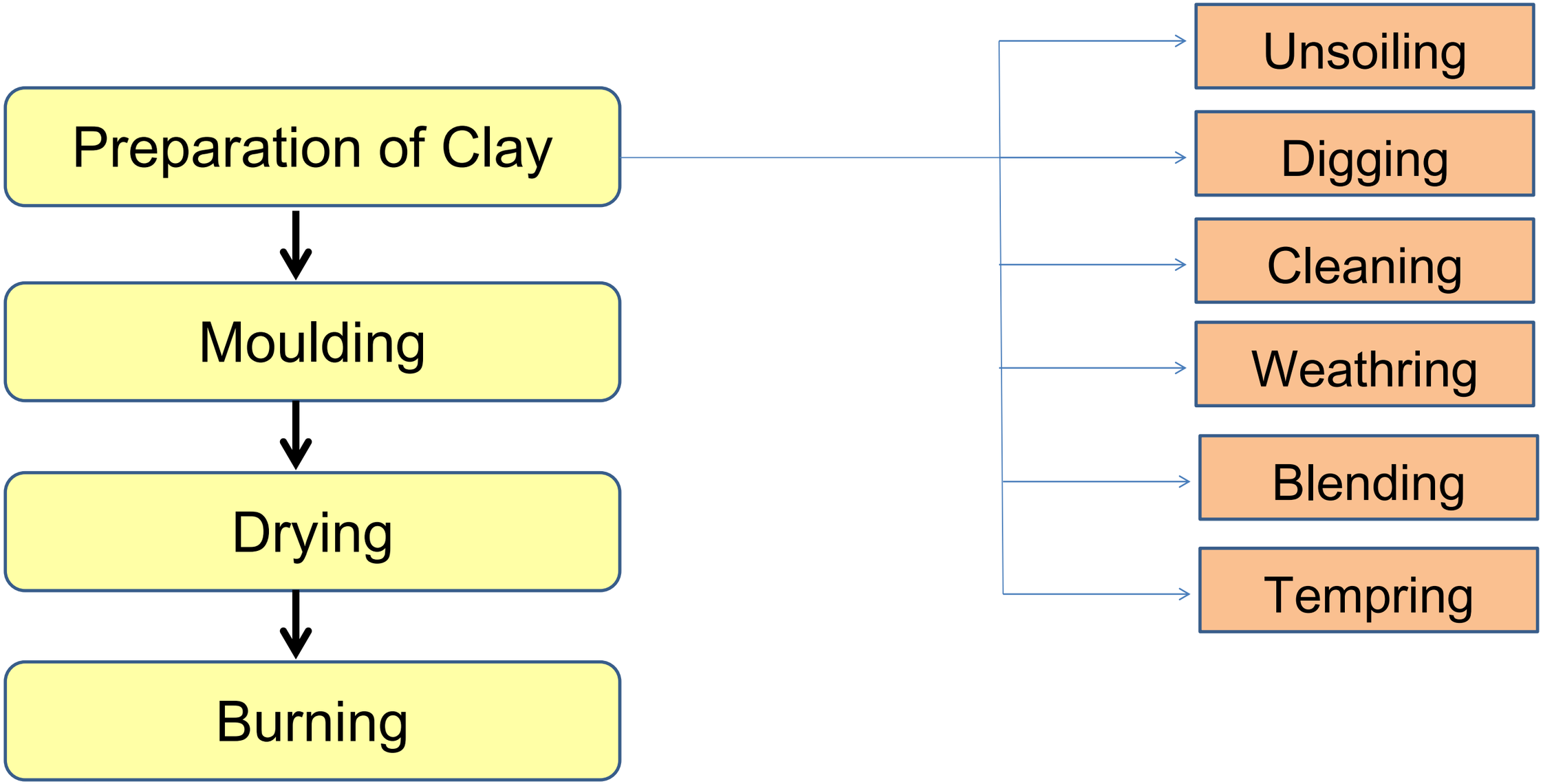
☞ *Harmful ingredients are*

Vegetation and Organic Matter

↓

Organic matters like roots, leaves etc. burn while the brick is burnt producing CO2. This Carbon dioxide creates porosity in bricks affecting the strength of bricks. Hence, organic matter should be avoided in brick-earth.

Manufacturing of Brick



Manufacturing of Brick

Preparation of Clay

- **Unsoiling** — *The top layer of the soil is taken out (20 cm top layer). The particle (gravel, coarse sand) size of more than 2mm is removed. This is because the clay in the top layer is full of impurities and hence it is rejected for the purpose of preparing bricks.*
- **Digging** — *The clay which is dug out is spread on a ground level, just little dipper than general ground level. The height of the heap of the clay is about 60-120cm.*
- **Cleaning** — *The clay should be made clean from pebbles, stones and vegetable matter. If these particles are in access, the clay should be washed and screneed, which is considered to be uneconomical.*
- **Weathring** — *The softening of clay is done by exposing it in the atmosphere. The period of exposure varies from weeks to full seasons. 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. The soil should be turned over atleast twice..*
- **Blending** — *The clay is made losse and any ingredient to be added is spread out as its top. Blending indicates intimate mixing. A small portion is taken out every time for mixing. Addition of water to the soil at the dumps is necessary for the easy mixing and workability.*
- **Tempering** — *In this stage the clay is brought to a proper degree of hardness and is made fit for moulding. Water in required quantity is added and the whole mass is mixed so as to form a mass of unifom character. a large scale tempering is usually done in a pug mill. The process of grinding clay with water and making it plastic is known as pugging.*

Manufacturing of Brick

Moulding

Moulding is the process of making rectangular shaped units for properly tempered clay.

The 2 types of moulding are;

Hand Moulding

Machine Moulding

This is presently the most common method for brick manufacture. This is adopted where man power is cheap and readily available. The moulds used for hand moulding are rectangular boxes made from well seasoned wood or steel open at the top and bottom.

Manufacturing of Brick

Moulding

Plastic clay machine

The machines containing regular opening of size equal to the length and width of brick. The pugged clay is placed in the machine and as it comes out through the openings it is cut into strips by wires fixed into frames. so it is known as " WIRE CUT BRICK. "

Machine Moulding

- Dry Clay Machine
- Plastic Clay Machine

Dry clay machine

In this machine , the strong clay is first converted to powder form. A small quantity of water is added to stiff plastic paste. Such paste is placed in mould and pressed by machine to form well shaped hard brick. This bricks are known as " PRESSED BRICK"

Manufacturing of Brick

Drying

Burning of dried bricks are essential to develop the desired engineering properties. like hardness, durability and resistance to decay. Three chemical changes are known to take place in the brick earth, namely Dehydration, Oxidation and Vitrification. Dehydration is completed within 425-750° degree Celsius temperature range and it results in expulsion of most of the water from bricks. Vitrification is an extreme reaction and occurs when heating is carried out beyond 900 degree Celsius.

11/3/2020

Summary

- *Introduction*
- *Composition of Good Brick Earth*
- *Process of Manufacturing*

THANK YOU