SNS COLLEGE OF TECHNOLOGY
COIMBATORE-35

DEPARTMENT OF CIVIL ENGINEERING

CIVIL ENGINEERING MATERIALS

CIVIL ENGINEERING MATERIALS

It's also known as Building construction materials, they are obtained from nature or after conversion by manufacturing process.

1. **Brick**
2. **Sand**
3. **Cement**
4. **Stone**
5. **Cement Concrete**
6. **Mortar**
7. **Steel sections**

BRICKS

Bricks are artificial blocks manufactured from clay.

Composition:

Alumina	- 20-30 %
Silica	- 50-60%
lime	- 5%
Iron oxide	- 5-6%
Magnesia	
Alkalis	

Properties of Brick

1. Colour
2. Perfect edges
3. Shape & Size
4. Burning equally
5. Metallic ringing sound
6. Homogeneous structure
7. Hardness
8. Water absorption
9. Low thermal conductivity
10. Crushing strength
11. Weight
12. Fire resistant

Manufacture of Brick

1. PREPARATION OF CLAY :

1. Removal of loose soil
2. Digging & spreading
3. Weathering
4. Blending
5. Tempering

2. MOULDING OF BRICKS

1. Hand Moulding
2. Machine Moulding

3. DRYING OF BRICKS

4. BURNING OF BRICKS

1. Clamp burning
2. Kiln burning

Preparation of clay

- Selection of site & unsoiling
- Digging and cleaning
- Weathering and blending
- Tempering
  - Pug mill or clay mixer
    - » Dimensions – Top dia – 120 cm
      Bottom dia – 75 cm
      Height – 180 cm
    - » Vertical iron shaft & horizontalarm
    - » Clay and water ratio – 1:0.25
    - » Kneading – 30m^3 everyday

Moulding of Bricks

- Hand moulding

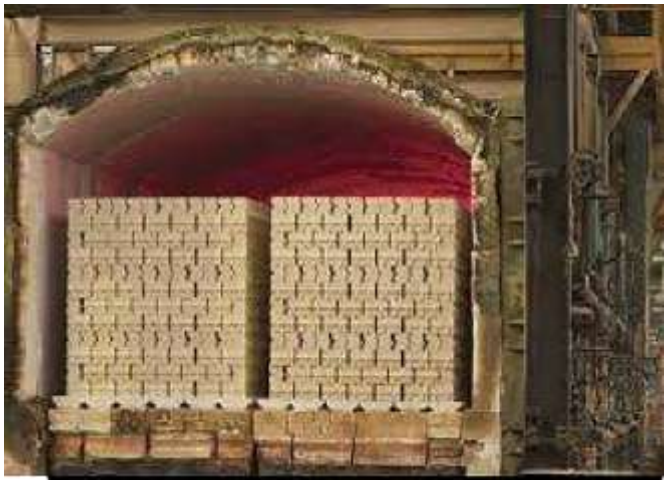
  Ground moulding / Table moulding

- Machine moulding

  Plastic method / Dry process method

Drying of bricks

- Natural drying
- Artificial drying



Burning of bricks

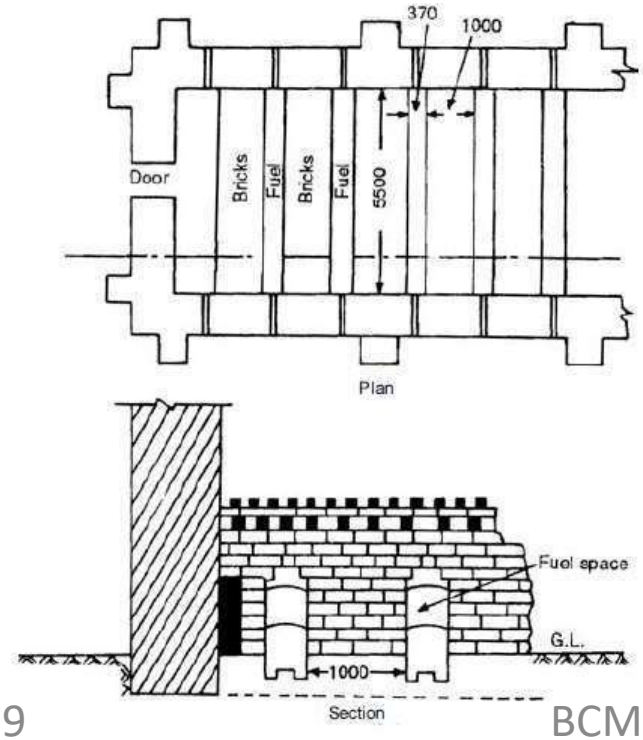
- Clamp or open kiln
- Intermittent kiln
- Continuous kiln
  - Bull's trench kiln
  - Hoffman's kiln
  - Tunnel kiln

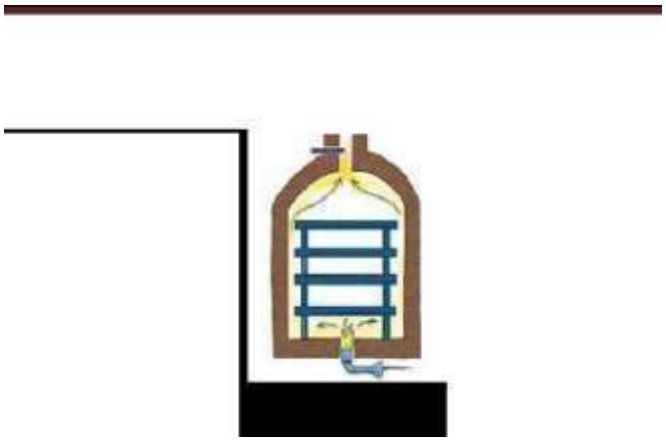
Clamp kiln

A brick clamp is a traditional method of baking bricks, done by stacking the unbaked bricks with fuel under or among them and then setting the fuel on fire. The clamp is considered a type of kiln. If the clamp is insulated by packing earth or mud around it, it becomes a scove kiln

Intermittent kiln

Intermittent kilns work by firing cool wares using a heat source, where the temperature is slowly increased throughout the firing process. Traditionally, intermittent kilns were nothing more than a trench drug in the ground filled with a fuel source and unfired pots. Intermittent kiln may be either rectangular circular or oval shaped.





Continuous kiln

Bull's trench kiln

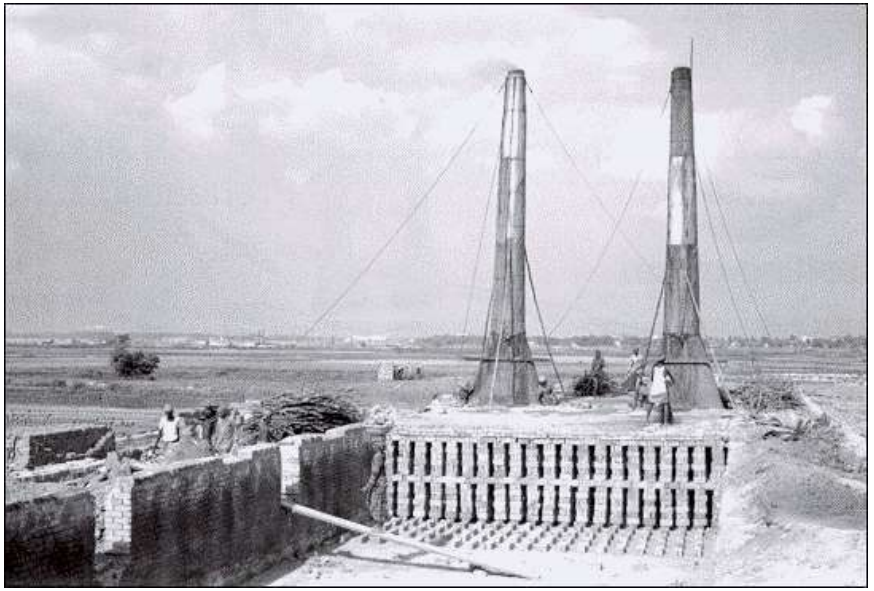
BULL'S TRENCH KILN

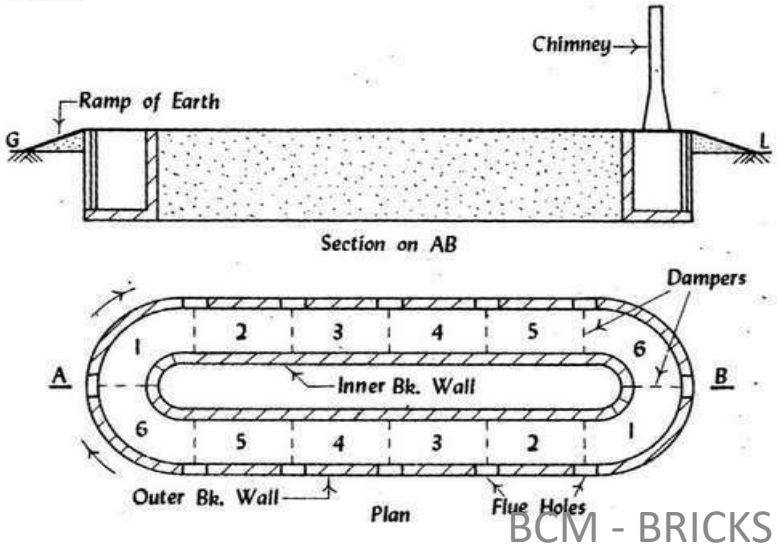
Bull's trench kiln consist of a rectangular, circular or oval plan shape. They are constructed below the ground level by excavating a trench of the required width for the given capacity of brick manufacturing.

This Trench is divided generally in **12 chambers** so that 2 numbers of cycles of brick burning can take place at the same time for the larger production of the bricks.
Once fire is started it constantly travels from one chamber to the other chamber, while other operations like loading, unloading, cooling, burning and preheating taking place simultaneously.

Its manufacturing capacity of about 20,000 bricks per day.

Bull's trench kiln





Bull's Trench Kiln

Section 1 – loading

Section 2 – empty

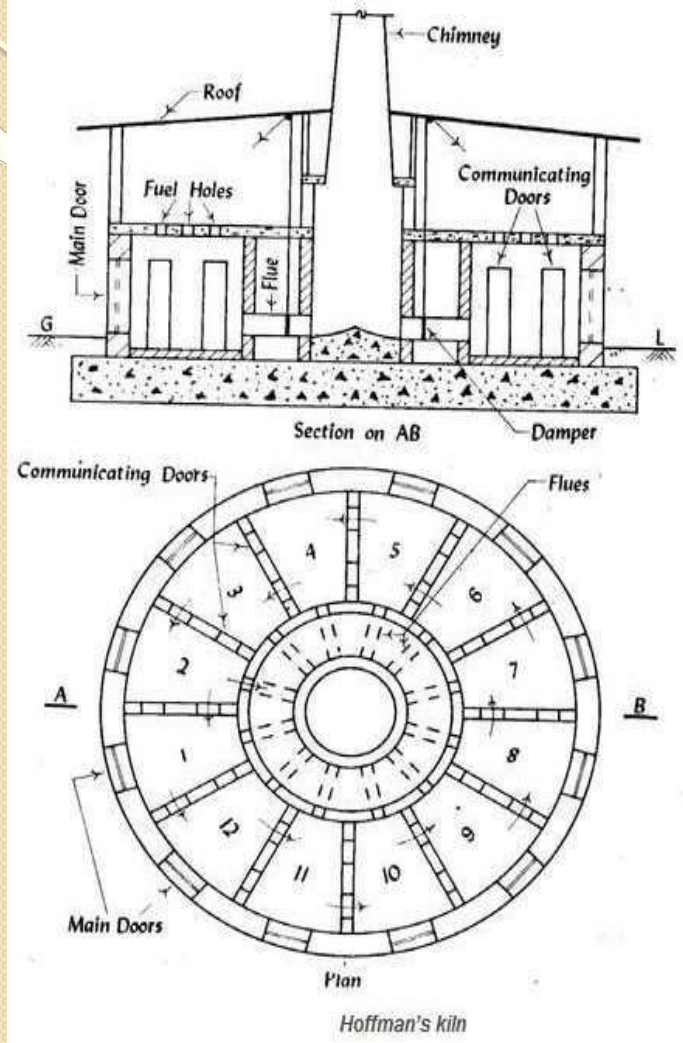
Section 3 – unloading

Section 4 – cooling

Section 5 – Burning

Section 6 – Heating

Hoffman's kiln



Hoffman's kiln

The main difference between the Bull's trench kiln and the Hoffman kilns are:

Hoffman's kiln is an over the ground structure while Bull's TrenchKiln isan underground structure.

Hoffman's kiln have a permanent roof while Bull's trench Kiln do not have so it former can be used in 12 months a year to manufacture bricks but later is stopped in the monsoon season.

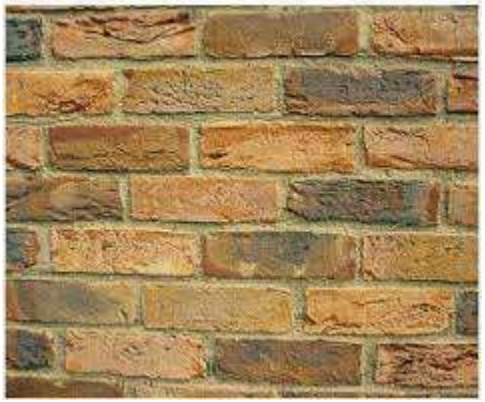
Hoffman's kiln is generally circular in plan, and is constructed over the ground. The whole structure is divided into the 12 chambers and all the processes takes place simultaneously like in Bull's trench Kiln.

Classifications of Bricks

1. According to method of manufacturing :
    1. Sun-dried or Unburnt bricks
    2. Burnt bricks
2. According to Quality of bricks
    1. First class
    2. Second class
    3. Third class
    4. Fourth class
3. Special types of bricks
    1. Specially shaped bricks
    2. Heavy duty bricks
    3. Perforated bricks
    4. Burnt Clay hollow bricks
    5. Burnt Clay facing bricks
    6. Sand-Lime bricks
    7. Sewer bricks
    8. Acid resistant bricks

Special bricks (cont….)

- **Burnt clay facing bricks**
  - Used without any further surface protection
  - Economical when external plastering or rendering – frequently renewed



- **Heavy duty bricks**
  - High compressive strength
  - Low durability
  - Low water absorption
  - High bulk density

Special bricks (cont….)

- **Perforated bricks**
  - Contain holes throughouttheir thickness
  - Perforation gives maximum amount of ventilation
  - Light in weight
  - Reduce dead load

- **Burnt clay hollow blocks**
  - insulation against heat, sound, dampness
  - Light in weight

Special bricks (cont….)

- **Sand lime bricks**
  - Calcium silicate bricks
  - Consists of uniform mixture of siliceous sand and lime
  - Used for masonry construction – like burnt clay bricks

- **Sewer bricks**
  - Used for lining of walls, roofs and floors of sewers
  - Suits for domestic sewers
  - Does not suits for industrial sewage

USES OF BRICKS

Brick plays very important role in the field of civil engineering construction. Bricks are used as an alternative of stones in construction purpose. Here some main uses of construction brick are given below.

- Construction of walls of any size
- Construction of floors
- Construction of arches and cornices
- Construction of brick retaining wall
- Making Khoa (Broken bricks of required size) to use as an aggregate in concrete
- Manufacture of surki (powdered bricks) to be used in lime plaster and lime concrete