Cleaner Fly Ash Brick Production
Raw Materials

• Overview
  – Source
  – Composition
  – Quality Parameter

Types of Raw Materials

- Pulverised Fuel Ash (Fly Ash)
- Lime
- Gypsum
- Cement
- Chemical Admixtures
- Stone Dust
Pulverised Fuel Ash (Fly Ash)

- Pulverized fuel Ash commonly known as fly Ash is a useful by-product from thermal power stations using pulverized coal as fuel and has considerable pozzolonic activity. More than 150 MT Fly Ash generate by as per More than 400 thermal power Plant in India (CEA Report Dec-2017).
- Pulverized fuel ash commonly known as fly ash shall conform to Grade 1 or Grade2 of IS 3812.

ESP Ash / Chimney Ash / Dry fly Ash

- The major portion of the Ash comes out along with the flue gases and is collected through electrostatic precipitator this part of Ash is generally known as ESP Ash.
- Bottom Ash tested as according to IS 1727.

Pond Ash / Mound ash

- When pulverized coal (bituminous/lignite is burnt in the boiler of a thermal power station, a part of Ash falls down at the bottom of the boiler and is known as bottom Ash.

The residual ESP Ash and bottom Ash are taken to lagoons known as Ash ponds for deposition. The Ash deposited in the Ash pond is known as pond Ash similarly ash stored as heaps in open is called mound Ash.
Lime is basically Calcium Oxide (CaO) in natural association with magnesium oxide (MgO).
- Lime reacts with fly ash at ordinary temperature and forms a compound possessing cementitious properties.
- Lime shall conform to Class C hydrated lime of IS712.

Lime Sludge

Residual of Dry Acetylene gas plants using Calcium Carbide for cutting gas production.
- Available Locally in sludge/ paste from with high Caoh2 content.

Hydrated Lime

Quick Lime when submerged in water for more than 48 hours the heat evaporates as the heat of hydration and the dried lime thus is Pulverised as Hydrated lime powder.
Lime

Quick Lime

• Calcium Oxide, commonly known as quicklime or burnt lime, is a widely used chemical compound. It is a white, caustic, alkaline, crystalline solid at room temperature.
• Mostly available in many states like Rajasthan, M.P, Uttarakhand, North east etc. in form of lime stone rocks.
• Used for refining in industries & paints coloring the national household. We use the residual of above left over at lime kiln.
• Available in lumps & powder both packed in bags.
• Generally Quick Lime above 70-80% Cao content is preferred for Fly Ash Bricks.
Gypsum

- Gypsum is a rock like mineral commonly found in the earth’s crust, extracted, processed and used by Man in construction or decoration in the form of plaster and alabaster since 9000 B.C.
- Gypsum should be tested for its purity as per IS 1288 -1982

- Gypsum is a soft sulfate mineral composed of calcium sulfate dehydrate, with the chemical formula Cao & 2H2O.
- It is widely mined and is used as a fertilizer, and as the main constituent in many forms of plaster, blackboard chalk and wallboard.
- Gypsum can either be turned into gypsum board or remain in its powder form and be called "Plaster of Paris" or POP.
Gypsum as per IS 1288 -1982 Massive gypsum rock forms within layers of sedimentary rock, typically found in thick beds or layers.

- It forms in lagoons where ocean waters high in calcium and sulfate content can slowly evaporate and be regularly replenished with new sources of water.

- By products of Floron & other refrigeration gases containing high value of calcium sulphates i.e. Caso4
Cement

- A cement is a binder, a substance used for construction that sets, hardens and adheres to other materials, binding them together.
- Cement is used with fine aggregate to produce mortar for masonry or with sand and gravel aggregates to produce concrete.
- Ordinary Portland cement conforming to IS 269.

- Portland cement is the most common type of cement in general use around the world as a basic ingredient of concrete, mortar, stucco, and non-specialty grout. It was developed from other types of hydraulic lime in England in the mid 19th century and usually originates from limestone.
- OPC Cement as recommended in our BIS 12894 & 16720 is used as OPC cement already contains fly ash.
Cement complying with any of the following Indian Standards may be used:

1. Ordinary Portland cement, conforming to IS 269
2. Portland slag cement, conforming to IS 455
3. Portland pozzalana cement: fly ash based, conforming to IS 1489 (Part 1)
4. Portland pozzolana cement: calcined clay based, conforming to IS 1489 (Part 2)
5. Sulphates resisting Portland cement, conforming to IS 12330
6. Super sulphated cement, conforming to IS 6909
7. Rapid hardening Portland cement, conforming to IS 8041
8. White Portland cement, conforming to IS 8042
9. Hydrophobic Portland cement, conforming to IS 8043
10. Composite cement, conforming to IS 16415
Stone dust

- Residual of masonry stone dust crushers with minimum silt content as measured in conformation to relevant pries slandered.
- Below 6 mm fineness is advise able to allow the chemistry of Lime + Gypsum or Cement flow in a most cohesive way.
Chemical Admixtures

- Chemical admixtures, when used shall conform to IS 9103.
- Previous experience with and data on such materials should be considered in relation to the specified standards of mechanization, supervision and workmanship in production of pulverized fuel ash cement bricks.
- They may be added for specific requirements without affecting of specified quality parameters.

The different types of admixtures covered in this standard are as follows:

a) Accelerating admixtures
b) Retarding admixtures
c) Water-reducing admixtures
d) Air-entraining admixtures and - 3 Super plasticizing admixtures.
Thank You
It has taken 20 long years to change the colour of brick from **Red** to **Grey** in architecture, engineering and diploma textbooks

Though
Yesterday was **Red**, But
Tomorrow must be **Green**

Together We Can and Together We Will...
References

- IS 3115:1992 – Specification for lime based blocks
- IS 10049: 1981 (Reaffirmed 2009) – Code of Practice for Manufacture of Lime Based Blocks
- IS 4098:1983 – Specification for lime-pozzolana mixture
- IS 10359:1982 – Code of practice for manufacture and use of lime- pozzolana concrete blocks for paving
- IS 10772:1983 – Specification for quick setting lime pozzolana
- IS 12654:1989 – Code of practice for use of low grade gypsum in building industry
- IS 12679:1989 – Specification for By-product gypsum for use in plaster, blocks and boards
- IS 3495:1992 – Compressive Strength of Brick