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NEED OF FLY ASH BRICK IN TODAYS CONSTRUCTION

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ABSTRACT

Brick is the oldest manufactured building material, and much of its history is lost in antiquity. The oldest burnt or fired bricks have been found on the sites of the ancient cities of Babylonia, some of which are estimated to be about 6000 years old. Clay bricks are used in a wide range of buildings from housing to factories. But while using clay bricks the thousands of acres top layer of soil dug out for brick manufacturing and this affect on top layer of soil, also for manufacturing of clay brick required more time therefore considering future scope of brick we can use fly ash in brick for better mechanical properties & large quantity production in less time with economy.

KEYWORDS: shearmodel,shear span to depth ratio(a/d).

INTRODUCTION

The180 billion tones of common burnt clay bricks are consumed annually, approximately 340 billion tones of clay – about 5000 acres of top layer of soil dug out for bricks manufacture, soil erosion, emission from coal burning or fire woods which cause deforestation are the serious problems posed by brick industry. The above problems can be reduced some extent by using fly ash bricks ,Since 60% of country's electricity comes from coal based power station, thecountry has a huge stock of fly ash amounting to 60 million tones annually. Despiteall the efforts present scenario is not too encouraging as only 5% of country's totalash has been consumed in different sectors.

Fly ash is comprised of the non-combustible mineral portion of coal. When coal is consumed in a power plant, it is first ground to the fineness of powder. Blown into the power plant's boiler, the carbon is consumed leaving molten particles rich in silica, alumina and calcium. These particles solidify as microscopic, glassy spheres that are collected from the power plant's exhaust before they can "fly" away hence the product's name: Fly Ash. After mixing, the mixture is shifted to the hydraulic Brick Making machines. The bricks are carried on wooden pellets to the open area where they are dried and water cured for 14-21 days. The bricks are tested and sorted before dispatch.

MATERIALS

Fly ash based building products are manufactured by using Major percentage of fly ash generated from Thermal Power stations who uses Boiler & captive power plant produces bulk quantity of Fly Ash our country. Other raw materials used along with Fly Ash are lime, calcined gypsum, cement and sand, with requisite quantity of water is mixed. The percentage of above material in brick manufacturing depending on various factors such as, fineness of fly ash, moisture content, size of particles and strength, water absorption, durability and use.

MANUFACTURING PROCESS

Fly ash, hydrated lime, grit, cement and gypsum are manually fed into a pan mixer where water is added in the required proportion for intimate mixing. The proportion of the raw material is generally depending upon the quality of raw materials. After mixing, the mixture is shifted to the hydraulic Brick Making machines. The bricks are carried on wooden pellets to the open area where they are dried and water cured for 14-21 days. The bricks are tested and sorted before dispatch.

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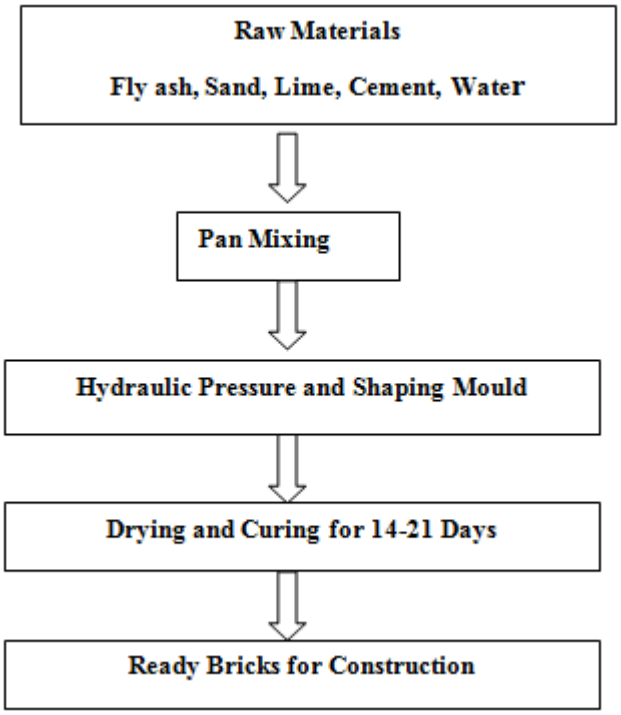

Fig. 1 manufacturing process of fly ash brick

Chemically, fly ash is a Pozzolane. When mixed with lime (calcium hydroxide), Pozzolane combine to form cementatious compounds. Concrete containing fly ash.Becomes stronger, more durable, and more resistant to chemical attack.Mechanically, fly ash also pays dividends for concrete production. Because fly ash particles are small, they effectively fill voids. Because fly ash particles are hard and round, they have a "ball bearing" effect that allows concrete to be produced using less water. Both characteristics contribute to enhanced concrete workability and durability. Finally, fly ash use creates significant benefits for our environment. Fly ash use conserves natural resources and avoids landfill disposal of ash products. By making concrete more durable, life cycle costs of roads and structures are reduced. Furthermore, fly ash use partially displaces production of other concrete ingredients, resulting in significant energy savings and reductions in greenhouse gas emissions.

Fig. 2 Fly ash brick Masonry at Palghar.

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Fig. 3 Fly ash brick Masonry at Boisar.

INSPECTION AND QUALITY CONTROL

The Bureau of Indian Standards has formulated and published the specifications for maintaining quality of product and testing purpose. IS: 12894: 2002.

According to IS code the test procedure for compressive strength and water absorption is same as clay brick (IS 3495:1992).As per IS: 12894: 2002 The compressive strength of fly ash brick is divided in to four classes, class-I - 7N/mm^2, class-II - 10N/mm^2, class-III - 15N/mm^2, class-IV -20N/mm^2, and average water absorption for class up to 10N/mm^2 not more than 20%. For higher class i.e.15 N/mm^2&20N/mm^2 not more than 15%.

Whereas for clay brick (IS 3495:1992). The compressive strength is classified in to three classes. First class-more than 10.5 N/mm^2, second class-more than 7 N/mm^2, third class-more than 3.5 N/mm^2.And water absorption for First class-less than 20%, second class-less than 22%, third class-less than 25%.

Referring above IS codes we test the bricks, is brick is suitable for required construction or not. The quality control can be done by proper mixing, curing, handling and transporting the brick at required location. The survey is done on clay brick and fly ash brick site where brick is manufactured and following results are obtained.

SURVEY AT DIFFERENT SITES

During survey at Boisar it is observed that the fly ash used was finely divided dust and boiler ash obtained from the thermal power station at Dahanu. The sand used was fine crushed sand(grit powder).the proportions of materials as 8 % cement + 50% boiler ash + 42% grit powder and water according to present of moisture in boiler ash & in grit powder.

CASTING OF BRICKS AND RESULTS

The required quantities of constituent materials were mixed thoroughly before adding water. Then Water were added and clearly mixed. Then wet mix was then filled in the mould automatically with the help of conveyer belt and then compressed to form brick specimens of 227mm x107 mm x72mm with a pressure of hydraulic operated cylinder capacity 56 ton.After casting, curing ware done by sprinkling the water on brick twice a day for the period of 14days. The Avg. compressive strength was found as 6.25 N/mm2 & water absorption was 7.58 %.

Where as in Palghar it is observed that by using 65% CS +30% FA + 5 % C the average compressive strength was found by applying 18 ton pressure on 225 mm x150mm x85 mm size brick was 10.72 ,6.25 N/mm^2& water absorption was 8.2 %.

As per Shirke Bricks &BlocksPune Nagar Rd, Shikrapur, Pune they recommend that following sizes of bricks and typical properties of Fly ash Bricksa) 230 x 110 x 75 (mm) b) 230 x 110 x 70 (mm) c) 230 x 150 x 80 (mm) .Stone crusher dust (45-50%), Fly ash (25-30%), Cement – (7-10%) and results are suggested compressive strength- 60 to 250 kg/Cm Sq., water absorption-5 to 12%,Density: 1.5 gms/cc.

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Tab. 1 Advantages of Fly ash brick over Normal Clay Brick

DESCRIPTION	NORMAL CLAY BRICK	FLY ASH BRICK
colour	Varying colour as per soil	Uniform pleasing colour like cement
shape	Uneven shape as hand made	Uniform in shape and smooth in finish
composition	Lightly bonded	Dense composition
Plastering	Plastering required	No plastering required
weight	Heavier in weight	Lighter in weight
Compressive strength	Compressive strength is around 35 Kg/cm2	Compressive strength is around 100 Kg/cm2
porous	More porous	Less porous
Thermal conductivity	Thermal conductivity 1.25 – 1.35 W/m2 ºC	Thermal conductivity 0.90-1.05 W/m2 ºC
Water absorption	Water absorption 20-25%	Water absorption 6-12%
manufacture	Difficult to manufacture in rainy season.	Manufacture in rainy season also.
loading and handling loss	Around 10%	less than 0.02%

CONCLUSION

1. Due to high strength, Fly Ash bricks have no breakage during transport & use.
2. Uniform size of Fly Ash bricks help to reduce mortar by considerable amount.
3. The water absorption in Clay bricks varies a lot and sometimes is more than 20% whereas in Fly Ash bricks it's less than 20%, thus it reduces chances of damp, salinity and wetting.
4. Fly Ash bricks do not require soaking in water for 24 hours. Only sprinkling of water before use is enough.
5. Fly ash brick plant can set up & shift on required location.
6.

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