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FLY ASH CEMENT BRICK BY USING SHREDDED PLASTIC WASTE BOTTLES

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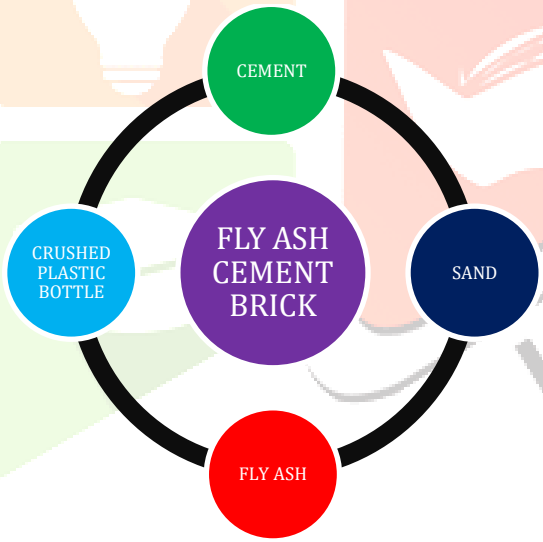
ABSTRACT

A brick whose solid ingredient is Fly Ash and waste plastic bottles has been manufactured. The manufacturing process uses techniques and equipment similar to those used in clay brick factories. The common characteristic of the Fly Ash, plastic bottle bricks have also been studied. It includes water absorption capacity, the initial rate of absorption, compressive strength, and durability. The values of this characteristic of Fly Ash, plastic bottle bricks have been determined and have to be compared with those of clay bricks. The new bricks seen have been given the name Fly Ash, cement, plastic Bottle brick. Fly Ash, cement, and plastic bottle bricks are made of fly ash, cement, sand, and waste plastic bottles. These can be extensively used in the footpath and boundary walls constructional activities similar to that of common burnt clay bricks. The fly ash and plastic bottle bricks are comparatively lighter in weight and stronger than common clay bricks. Since fly ash and plastic bottles are being built up as waste material in large quantities near thermal power plants and garbage creating serious environmental pollution problems, its utilization as the main raw material in the manufacture of bricks will not only create enough opportunities for its proper and useful disposal but also help in environmental pollution control to a larger extent in the surrounding areas. Given the superior quality and eco-friendly nature. This dissertation is to study the role of cement in fly ash and plastic bottle bricks. The fly ash and plastic bottle bricks are comparatively lighter in weight and stronger than common clay Bricks. Fly ash is useful by-product from thermal power stations using pulverized coal as a fuel and has considerable pozzolanic activity. The present generation of fly ash and waste plastics in India by thermal power stations and garbage is more than 100 million tons per annum. This national resource can be gainfully utilized for the manufacture of fly ash bottle bricks as a supplement to common burnt clay building bricks leading to the conservation of natural resources and improvement in environmental quality. Considering the importance and increasing demand for this material, a systematic study based on properties and industrial applications has been carried out in this project. These bricks are suitable for use in masonry construction just like common burnt clay bricks. Production of pulverized fuel fly ash, and plastic bottle bricks has already started in the country and it is expected that this standard would encourage production and use on a mass scale.

Key Words: --FLY ASH, WASTE PLASTIC BOTTLES, CEMENT AND SAND.

INTRODUCTION

Fly ash Cement plastic bottle brick (FCPB) is the component of building material. FCPB is the mixture of sand, cement, plastic shredder plastic bottle, and fly ash. FCPB can be used extensively in all footpaths and boundary wall construction activities like burnt clay bricks. FCPB are comparatively lighter in weight and stronger than normal clay bricks. Because fly ash and plastic crushed bottle is built up as waste material in large quantities near thermal power plants, garbage causes serious environmental pollution problems. Its use as the main raw material in the manufacture of bricks will not only create enough opportunities for its proper and useful disposal but will also help controls environmental pollution to a great extent. Fly ash, cement, sand, and Plastic crushed bottle are mixed in a proper proportion of the required amount of water, which produced slow-setting cement. The resulting mass is pressed into bricks of any deprived strength. The current generation of fly ash and waste plastics in India by thermal power stations and garbage is more than 100 million tons per annum. One kilogram of coal of fired yields fly ash ranging from 250 to 500 grams. At present only 10%, fly ash and 9% are being utilized. This national resource can be gainfully utilized for the manufacture of fly ash bottle bricks as a supplement to common burnt clay building bricks leading to the conservation of natural resources and improvement in environmental quality.



INGREDIENTS OF ASH CEMENT BRICK BY USING OF WASTE PLASTIC BOTTLE

INGREDIENTS

The major ingredients required to produce a fly ash Plastic bottle brick are fly ash, Sand, Cement, and Plastic crushed bottles shown in the above figure.

Fly Ash Fly Ash is used as material to make bricks and plaster, as filler in metal and plastic composites and paints and adhesives, and as structural fill for road construction. Fly ash use in concrete improves the workability of plastic concrete and the strength and durability of hardened concrete. Fly ash use is also cost-effective. When fly ash is added to concrete, the amount of Portland cement may be reduced.

Sand Sand is a granular material composed of finely divided rock and mineral particles. Sand has various compositions but is defined by its grain size. Sand is used for making concrete, mortars, and plasters and for filling under floors, and basements. Being a solid, Sand can sustain shear stresses at rest but it can also undergo large plastic deformations without considerable changes in its properties, behaving thus like a fluid. As a product of erosion, Sand cannot be broken into parts because it is already a broken material.

Cement is a binder, a substance used for construction that sets, hardens, and adheres to other materials to bind them together. These are some functions of cement:-

1. Usage in mortar for plastering and masonry work.
2. Usage for making joints for drains and pipes.
3. Used in concrete for laying floors, roofs, and constructing lintels, beams, stairs, pillars, etc.
4. Used for the water tightness of a structure.

Plastic Crushed bottle plastic is a life-changing resource, but the same qualities that make it useful alongside poor waste management have created a global waste challenge. In addition to reducing greenhouse gas emission, recycling plastic water bottles also help to decrease the amount of pollution in the air and water sources. Many landfill facilities will incinerate plastic bottles to save waste, which can emit toxic pollutants or irritants into the air.

METHODOLOGY

1. Preparation of shredded waste plastic

We have cut the plastic bottle in small of 1 to 1.5 cm. The shape of plastic cut bottle is different but size is almost same.

Fig. No. 01 Shredded Plastic Bottle

2. Weighing the materials

We have taken several ratio of the various components & have calculated the composition weight after that we have weighted the material as per calculation for mixing.

The various components are: FLY ASH, CEMENT, SAND, AND PLASTIC SHREDDED PLASTIC BOTTLE.

Fig. No. 02 Material weighing

3. Mixing the Material

After weighing all the material in a proper ratio, mix all the material in an appropriate way for the excellent binding and good strength.

Fig. No. 03 Mixing the Materials

4. Moulding

The mixing materials are ready to fill in the mould for a good bricks; the mix material is compressed by hand for good compaction of mortar.

Fig. No. 04 Moulding of Bricks

5. Curing

After 24 hours bricks are removed from the mould and then we have been curing of bricks according to our different specimens (7days, 14days, 21days& 28days).

Fig. No. 05 Curing of Bricks

6. Testing of Brick is Compressive testing machine, which are use, to test the bricks.

Fig. No. 06 Testing of Bricks

EXPERIMENT RESULT

Fly ash, Plastic crushed bottle bricks are prepared using eight different proportions. Among these eight proportions, four different proportions were prepared with cement, sand, fly ash and plastic crushed bottle. Three bricks of each proportion were made and tested to check their compressive strength. It can be observed that the maximum stress and minimum stress generated are 7.5 MPa and 2MPa respectively by combination of fly-ash, sand, cement and plastic crushed bottle in the proportion of 1:1:3.5 (10% plastic of cement). The average stress being 6MPa.When the fly ash is increasing in various proportions 0.5,1, 1.5 and 2. The average stress generated is increased to 6MPa. The graph plotted if the fly ash and plastic crushed bottle are kept approximately of similar proportion to that in experiment, the load carrying capacity might be increased by increasing the amount of cement up to 15 percent. The maximum stress generated in this case is increased to 9.38MPa.

Table No.1 Specific gravity of fly ash, cement, sand, plastic crushed bottle

Materials	Fly ash	Cement	Sand	Plastic crushed bottle
Specific Gravity	2.125	3.15	2.74	1.4

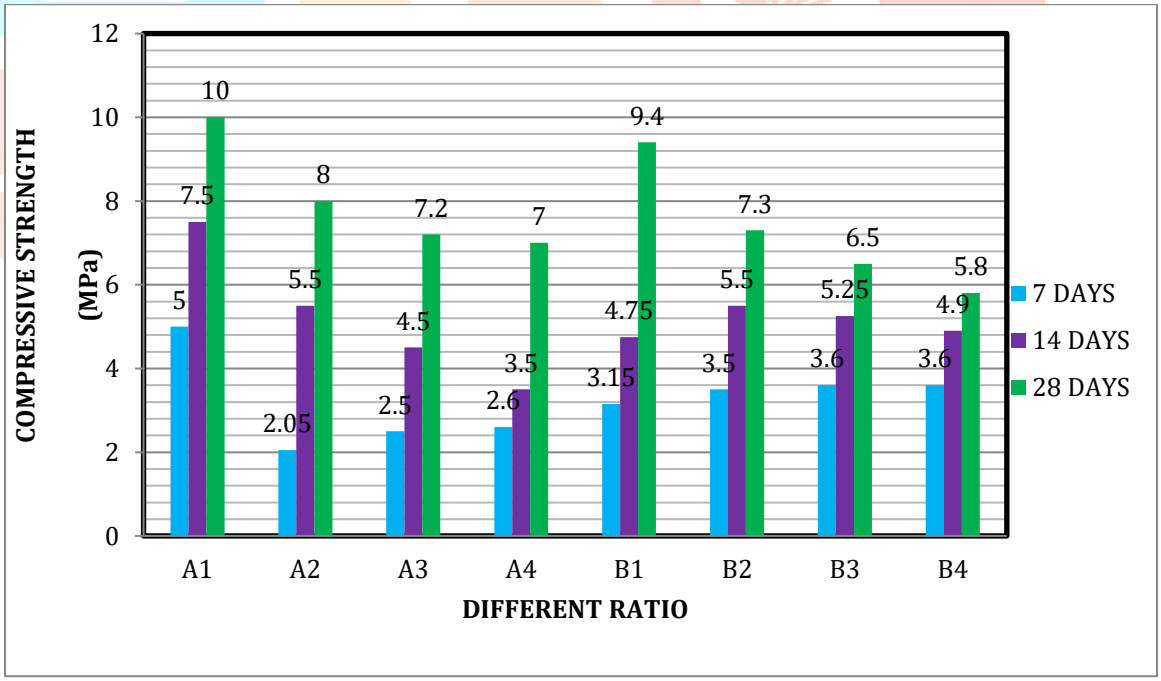
We have prepared samples in two categories, firstly keeping cement sand ratio (1:1) and increasing the Fly Ash content from 3.5, 4, 4.5 to 5. Further second sample considering Cement Sand ratio (1:1.5) and increasing Fly Ash content from 3.5, 4, 4.5 to 5 respectively. Those we have total eight category of samples i.e; - A1= 1:1:3.5, A2= 1:1:4, A3= 1:1:4.5 A4= 1:1:5, B1= 1:1.5:3.5, B2= 1:1.5:4, B3= 1:1.5:4.5 and B4= 1:1.5:5

In all the above mention sample we have added shredded plastic as 10% of weight of the cement of each sample.

The 7days, 14days and 28days compressive strength test result shown below –

Table No.2 TEST RESULTS OF FLY ASH CEMENT PLASTIC BOTTLE BRICKS

Sample No.	Ratio	7 days (MPa)	14 days (MPa)	28 days (MPa)
A1	1:1:3.5	5	7.5	10
A2	1:1:4	2.05	5.5	8
A3	1:1:4.5	2.5	4.5	7.2
A4	1:1:5	2.6	3.5	7
B1	1:1.5:3.5	3.15	4.75	9.4
B2	1:1.5:4	3.5	5.5	7.3
B3	1:1.5:4.5	3.6	5.25	6.5
B4	1:1.5:5	3.6	4.9	5.8



Graph No.1 Comparison between Different Ratios of Compressive Strength

Water Absorption test

Procedure

1. After 28 days curing and drying under the shed for 7-8 days, sample are weight i.e. "B" then immersed in water at room temperature for 24 hour.
2. Specimens shall be removed from water tank and cleaning the surface of specimen using damp cloth. Again specimen is weighted i.e. "A".
   Now using the formula,

Water Absorption (%) = A-B/B*100

Where, A = Wet mass of unit, in Kg
B = Dry mass of unit, in Kg

Table No.3 TEST RESULTS OF WATER ABSORPTION

RATIO (Cement: Sand: Fly Ash) (10% Plastic of cement)	**WATER ABSORPTION (%)**
A1=1:1:3.5	8.02%
A2=1:1:4	15%
A3=1:1:4.5	12.67%
A4=1:1:5	14.15%
B1=1:1.5:3.5	9.9%
B2=1:1.5:4	22%
B3=1:1.5:4.5	11.1%
B4=1:1.5:5	11.2%

CONCLUSION

Based on compression test results of sample prepared and water absorption test results. We have come to following conclusion.

1. The sample A1 having ratio (1:1:3.5) have the highest compressive strength i.e; 10 MPa.
2. The sample B4 having ratio (1:1.5:5) have the lowest compressive strength. i.e; 5.8 MPa.
3. The sample B2 having ratio (1:1.5:4) have the highest water absorption. i.e; 22%.
4. The sample A1 having ratio (1:1:3.5) have the lowest water absorption. i.e; 8%.
5. Considering the compressive strength and water absorption. It is being concluded that out of eight type of samples prepared. The sample A1 is best. In terms of compressive strength and water absorption capacity

REFERENCES

[1] Aakash Suresh Pawar "Engineering Properties of Clay Bricks with Use Of Fly Ash" IJRET Vol. 03 Special Issue: 09, June – 2014.

[2] AnubhavRai, MukeshKumar "Effect of Fly Ash and other ingredients to the Strength of Fly Ash. Lime, gypsum, cement stone dust) brick", IJETR Vol-2, Issue-5 May 2014.

[3] A. Sumathi-2015 "Compressive Strength of Fly Ash Brick with Addition of Lime, Gypsum and Quarry Dust", IJCRGG, Vol-7, No. 01, pp 28-36, May-2015

[4] Nitin S. Naik "Strength and Durability of Fly Ash, Cement and Gypsum Bricks", IJCER, Vol. 04 Issue, 5 May 2014.

[5] Ravi Kumar "STUDY OF PROPERTIES OF LIGHT WEIGHT FLY ASH BRICK" IJERA AET- 29th March 2014

[6] Yogesh D Gowda "An Approach for Alternative Solution in Brick Manufacturing" IJSET, Vol. 3, No 3, June 2014.

[7] Concrete Technology book by "M.S.Shetty", "M.S.Gambhir".

[8] IS Code 269: 2013"For OPC 33 grade of cement".

[9]IS Code 8112: 1989 "For OPC 43 grade of cement".

[10]IS Code 12269 "For OPC 53 grade of cement".

[11]Burnt Clay Brick test Codes: "3495 1 to 4 (1992) & 1077 (1992)".

[12]IS Code 3495 (Part-2) 1992- "Determination of water absorption".

[13]Pulverized fuel ash, Code: "IS 3812(Part1): 2013.

[14] IS Code 383:1970 "Specification of course and fine aggregate".

[15] IS Code 10262:2019 "Concrete mix proportioning".