

UTILIZATION OF WASTE PLASTICS IN FLY ASH BRICKS

Lalith Prasanth.R¹, Gopalakrishnan.S², Thanigainathan .G³, Kathiravan A^{4*}

^{1,2,3} Student, Department of Civil Engineering, Vel Tech Multi Tech Dr. Rangarajan Dr.Sakunthala Engineering College, Avadi, Chennai, lalithprasanth@gmail.com, gopalrock619@gmail.com, thanigaibe9308@gmail.com

^{4*}, Assistant Professor, Department of Civil Engineering, Vel Tech Multi Tech Dr. Rangarajan Dr.Sakunthala Engineering College, Avadi, Chennai, kathiravancivil001@gmail.com, Corresponding Author

Abstract

Fly ash is created in a large amount particularly by warm power plants. Plastics are generated in large amount with increase in population. Disposal of waste materials including waste plastic bags has become a serious problem. The waste plastics in house hold is large and increases with time. Both cause severe environmental problems. The main aim of our project is to utilize those plastics and fly ash in the manufacturing of bricks. In this paper, the fly ash bricks are casted and plastics were powdered and added up to 20% with an interval of 5%. Fly ash bricks are manufactured with plastics and undergo compressive strength test, water absorption test and efflorescence test. Here the strength properties of plastic bricks comprising of waste plastics, fly ash as the constituents and the design considerations for pavement block incorporating waste plastic bags is presented. It will be definitely cost economical when compared with the normal fly ash bricks. Manufacturing of fly ash bricks and Experiments conducted on fly ash bricks for this project, strictly follows specification given under IS 12894 : 1990.

Key words: Fly ash, Lime, Water Waste Plastic Powder , Compressive Strength, Water absorption and Efflorescence.

INTRODUCTION

Fly Ash bricks are cleared of fly ash, lime, gypsum and sand. These can be effectively occupied in all building constructional activities just like the common burnt clay bricks. The fly ash bricks mostly found lighter in weight and more potential rather than common clay bricks respectively. Since fly ash is rapidly being picked up as waste material

in huge quantity near thermal power plants and producing severe environmental pollution problems, similarly waste plastics are produced in large amount due to the increase in population and also cause severe environmental problems when they are taken for disposal , the main job of the raw material in the manufacture of bricks will not only provide ample opportunities for its proper and

useful disposal but as well helps in environmental pollution control to a great extent. In expectation of superior quality and eco-friendly nature, the support of government has increased for the demand of Fly Ash Bricks. Aim of the present study is to use waste like waste plastic powder and Fly ash remains furthermore development of properties of fly ash lime bricks utilizing waste plastic powder, likewise it can fulfill the Indian Standard Provisions. The main scope of the current study is that cost of the bricks is minimized, properties of bricks can have altered furthermore by using waste plastic and fly ash.

MANUFACTURING OF FLY ASH BRICKS

The particular brick of size $190\text{ mm} \times 90\text{ mm} \times 90$ (IS: 12894-2002) were thrown in the research center utilizing the waste plastic powder in proportions of fly ash bricks. The specimen was blended with an adequate measure of water to acquire working consistency for molding. The mold was loaded with the lime, fly ash, quarry dust and waste plastic powder without permitting any air bubble. The surplus blend was expelled and top surface was pulled down. For the hand formed bricks, no weight was used to the stamp. The weight formed bricks were set up by applying of 50 KN. The formed block was put aside to dry for two

days, shielding from direct sun. The examples were drenched in water at room temperature for 24 hours and from there on, the examples were held out of water. These examples were cured by sodden jute packs for 7, 14 and 21 days. The specimens were tried following 7, 14 and 21 days individually, for compressive strength according to the provisions of Seems to be in IS 3495 (Part 1) - 1992. The water absorption of the bricks was tried according to the provisions fused in IS 3495 (Part 2) - 1992. The efflorescence test of bricks was tried according to the provisions fused in IS 3495 (Part 3) – 1992. Before testing, the frogs and voids of the example were topped off with concrete, sand mortar (1: 1). For this project test like compressive strength, water absorption and efflorescence is performed and evaluated.

RAW MATERIAL

A. Fly Ash:

Fly ash frames the significant part for Fly ash bricks. The burning of harder, older anthracite and bituminous coal typically produces Class F fly ash. This fly ash is pozzolanic in nature, and contains less than 20% lime (CaO). Possessing pozzolanic properties, the glassy silica and alumina of Class F fly ash requires a cementing agent, such as Portland cement, quicklime, or hydrated lime, with the presence of water in order to react and

produce cementitious compounds. Fly ash content extended from 60 to 80%.

B. Quarry Dust:

Quarry dust is a waste product produced during the crushing process which is used to extract stone. Crushed rock aggregate quarrying generates considerable volumes of quarry fines, often termed “quarry dust”. It is rock particles. When huge rocks break in too small parts for the construction in quarries the quarry dust are produced. It is like sand but mostly grey in color. It is also mineral particles. The density of Quarry dust is 1650 kg/m^3 . Quarry dust can be defined as residue, tailing or other non-volatile waste material after the extraction and processing of rocks to form fine particles less than 4.75mm.

C. Lime:

Pure calcium oxide is fused with coke in order to render the highest yield in the manufacture of acetylene. The quality of the resultant carbide lime is a direct result of the excellent quality raw materials. Carbide lime is finer in particle size, and physically, having a very finely divided particle size makes carbide lime better. A finer particle size means faster and more reactivity. Hydrate lime is a dry powder obtained by treating Quicklime with enough water to satisfy its chemical affinity for water. Adelaide Brighton Hydrated Lime is ground and air classified to produce a fine white powder. Typically less than 0.05% is retained on a 250

micron sieve. Air classification also removes contaminants that are normally found in quick lime. The lime must be perfectly hydrated before the bricks are pressed. Otherwise it will expand during the steam treatment and produce internal strains which are frequently sufficient to disrupt the brick. Lime content reaches from 20 to 30%.

D. Waste Plastic Powder:

Waste plastic powder is the powder which is formed by cutting waste plastic bags in factories which is collected from Chennai corporation. The source of waste plastic powder in Alamathi road, near avadi from Alamathi mixture factory. They supply plastic powder by scrapping the waste plastic bags. These plastic powder are added in an interval of 5% upto 20%.

E. Water:

Water is an important ingredient of brick as it actually used for manufacturing of brick. Since it helps to bind all the raw materials for giving proper mix. Water used for making brick should be free from impurities.

BRICK MIX DESIGN

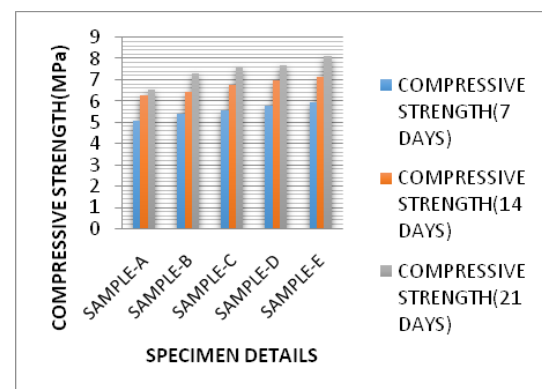
The mixing proportions generally fly ash, lime, quarry dust and water. Fly ash reacts with lime in the presence of moisture to form calcium silicate hydrate which is the binder material. After this, the mixture is completed and sent to hydraulic presses

for molding in molding machine. In this project, total 5 mix has been prepared containing lime, fly ash, quarry dust and waste plastic powder content.

S.NO	FLY ASH %	LIME %	QUARRY DUST %	WASTE PLASTIC %	SAMPLE NAME
1	50	10	40	0	A
2	50	10	35	5	B
3	50	10	30	10	C
4	50	10	25	15	D
5	50	10	20	20	E

S.NO	SAMPLE NAME	COMPRESSIVE STRENGTH (N/mm)		
		7 DAYS	14 DAYS	21 DAYS
1	A	5.1	6.25	6.55
2	B	5.41	6.46	7.32
3	C	5.57	6.78	7.57
4	D	5.8	6.97	7.71
5	E	5.93	7.15	8.1

COMPRESSION STRENGTH CHART:



TEST RESULTS AND DISCUSSION

COMPRESSION STRENGTH TEST

Place the specimen with flat faces horizontal, and mortar filled face facing upwards and carefully centered between plates of the testing machine. Apply load axially at a uniform rate per minute till failure occurs and note the maximum load at failure. The load at failure shall be the maximum load at which the specimen fails to produce any further increase in the indicator reading on the testing machine.

WATER ABSORPTION TEST

Immerse completely dried specimen in clean water at a temperature of 27 ± 2 °C for 24 hours. Remove

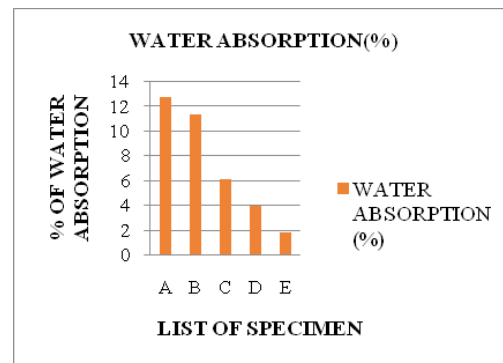
the specimen and wipe out any traces of water with a damp cloth and weigh the specimen. Complete the weighing 3 minutes after the specimen has been removed from water (W2). Water absorption, percent by mass, after 24-hour immersion in cold water is given by the following formula:

$$\frac{W_2 - W_1}{W_1} * 100$$

WATER ABSORPTION TEST TABLE

S.NO	SAMPLE NAME	DRY WEIGHT(Kg)	WET WEIGHT(Kg)	% OF WATER ABSORPTION
1	A	3.500	3.945	12.714
2	B	3.280	3.650	11.28
3	C	3.045	3.230	6.07
4	D	2.800	2.910	3.92
5	E	2.495	2.450	1.80

WATER ABSORPTION TEST CHART



EFFLORESCENCE TEST

Place the end of the bricks in the dish, the depth of immersion in water being 25 mm. Place the whole arrangement in a warm (for example, 20 to 30°C) well ventilated room until all the water in the dish is absorbed by the specimens. and the surplus water evaporates. Cover the dish containing the brick with suitable glass cylinder so that excessive evaporation from the dish may not occur. When the water has been absorbed and bricks appear to be dry, place a similar quantity of water in the dish and allow it to evaporate as before.

Examine the bricks for efflorescence after the second evaporation and report the results.

EFFLORESCENCE TEST RESULT

S.NO	SAMPLE NAME	EFFLORESCENCE
1	A	NIL
2	B	
3	C	
4	D	
5	E	

CONCLUSION

The conclusion which is derived from the current study is given below. Different composition of fly ash bricks with waste plastic is evaluated and it has been observed that

Water absorption of fly ash bricks decreases from 12.714 to 1.80% when increasing percentage of waste plastic is added in the composition of fly ash bricks. Compressive strength of fly ash brick increases from 6.55 to 8.1N/mm² when waste plastic are added to its brick composition. As per IS 12894 : 1990 , maximum allowable water absorption for fly ash bricks is 20% and from the

current study we observed that the composition of fly ash bricks gives water absorption less than 20% and satisfies IS requirement. When the bricks are immersed in water and dried, white patches are not formed, so the results for efflorescence of bricks are nil. Since plastics are used as a partial replacement of quarry dust, the bricks are economical and the cost of brick is lesser than normal fly ash bricks. Since plastics are added as a partial replacement for quarry dust , the weight of the brick decreases. From above analysis, this brick can be effectively used in construction field.

REFERENCE

1. Aeslina Abdul Kadir, Abbas Mohajerani (2011) "BRICKS: AN EXCELLENT BUILDING MATERIAL FOR RECYCLING WASTES" University Tun Hussein Onn Malaysia pg no: 108-113.
2. Tabin Rushad S, Abhishek Kumar, Duggal S.K, Mehta P.K (2011) "EXPERIMENTAL STUDIES ON LIME-SOIL-FLY ASH BRICKS" INTERNATIONAL JOURNAL OF CIVIL AND STRUCTURAL ENGINEERING Volume 1, No 4, 2011,pg no 994-1000.
3. S. Shankarananth, B. Jaivignesh (2016)"EXPERIMENTAL STUDY ON THE USE OF GLASS POWDER, GGBS, & PERLITE IN FLY ASH BRICK" International Journal of Advanced Research, Volume 4, Issue 4,pg no:1381-1386.

4. Nutan C. Patel, Prof. Jayeshkumar Pitroda (2013)“FLY ASH BRICK: GLASS FIBRE THE INNOVATIVE CONCEPT FOR GETTING HIGHER STRENGTH BRICK” International Journal of Innovative Research in Science, Engineering and Technology Vol. 2, Issue 3,pg no:1-8.
5. Er. Rinku Kumar, Er. Naveen Hooda (2014) “AN EXPERIMENTAL STUDY ON PROPERTIES OF FLY ASH BRICKS” issn (online): 2321-3051, Vol.2 Issue.9, pg no: 56-66.
6. Nayansi Jain, Dr. Pramod Sharma (2016) “UTILIZATION OF GLASS POWDER IN FLY ASH BRICKS” International Journal for Scientific Research & Development, Vol. 4, Issue 05,pg no: 482-485.
7. M. Angeline Swarna, R. Venkatakrishnaiah (2014) “MANUFACTURING OF BRICKS USING TANNERY EFFLUENT SLUDGE” International Journal of Recent Development in Engineering and Technology,vol. 3,issue 4,pg no:33-36.

