

Utilisation of Fly Ash and Sand in Economical Bricks Construction

Sanjeev Mishra

Ex. PG Student, Dept. of Civil Engg., Maharishi University of Information Technology Lucknow, India

ABSTRACT: Low Cost Housing is all been a desirable aspect for human being, which leads to achieve the goal with effective budgeting and reduction in the cost of construction through the use of locally available materials or waste materials, one of them is fly ash. Low cost housing is done by proper management of resources and with skilled manpower. Economy is also achieved by postponing finishing works or implementing them in phases. Any building a big portion is covered by the numbers of bricks and in order to minimize the cost of bricks must reduce the total cost of construction. Also use of waste material as construction material in recycled form or as replacement of conventional materials in quantity will satisfy the need economically. Here an approach is being made by using flyash and lime in different proportion and very less amount of cement, a brick of these proportions shows the good strength as compare to the clay brick.

KEYWORDS: Flyash, Flyash bricks, Compressive strength

I. INTRODUCTION

Initially Fly ash was used in construction of hydraulic cement, mixing with OPC and to get new product named PPC. Researchers are always seeking to reusing fly ash for variety of application. The common reuse of fly ash is in cement concrete. Fly ash is freely mixable in concrete and has spherical shape. The production of cement is responsible for 5% of global greenhouse gas emission created by human activities. Therefore, it is matter of concern with respect to global temperature, amount of use of waste product and sustainability. Since cement is one of the expensive components of concrete, reducing cement content is an economical solution. In brick construction mainly the large amount the material used is clay but here an attempt is being made so that it could reduce the use of clay in brick construction. Fly ash, lime and cements are used in making bricks and to reducing waste and achieve strength in low cost. An experimental setup was done in laboratory to construct fly ash bricks and results were obtained in satisfactory manner to adopt the use fly ash in bricks construction. Pulverized fuel ash-lime bricks are made from materials consisting of fly ash in major quantity, lime and an accelerator acting as a catalyst. Pulverized fuel ash-lime bricks are manufactured by blending above raw materials and then moulded to form bricks. Crushed bottom fuel ash or sand is also used in the composition as a coarse material to control water absorption in the final product. By using fly ash and lime in different proportion and very less amount of cement, bricks of these proportions show the good strength as compare to the clay brick.

II. REVIEW OF LITERATURE

Tutunlu and Umit (2001) reported the addition of flyash upto 60% at a firing temperature of 950°C and it did not have any harmful effects on the brick quality. Also they stated that the use of flyash as a raw material for the production of building bricks was not only a viable alternative to clay but also a solution to a difficult and expensive waste disposal problem. Kayali (2005) investigated the high performance of bricks from flyash. He concluded that the flyash brick had 24 % better compressive strength and 44% higher bond strength than the good quality clay brick. Also, he reported that the tensile strength of the flyash brick was three times greater than the value for standard clay bricks. Mistry(2011) reported that the flyash bricks with conventional masonry work save 28% in cost compared with common red brick and

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Website: www.ijirset.com

Vol. 6, Issue 6, June 2017

conventional masonry work. The masonry work with new technology Rat-Trap bond in flyash brick saves 33% cost as compared to common bricks. Akhtar (2011) concluded based on their experimental work that the values of uniformity coefficient and coefficient of curvature of flyash should vary with the type of coal used. The addition of lime to the flyash increases the cementitious properties of flyash and it was found that at 1.5% of lime, dry density was maximum and optimum moisture content was minimum.

III. MATERIALS AND METHODS

Low cost bricks are basically considered as being made of most available material matrix and specially durable material. Various materials are used for making low cost brick. An overview of Flyash and Lime composition, the materials and their parameters, and properties are given in table below. In order to study the effect of flyash and lime as partial replacement of coarse and fine sand and clay on the strength of brick, 9 nos. bricks for a mix have been cast in laboratory. Cuboid (200mm×100mm×100mm) were cast using a design mix of three different proportions. An effort has been made here to get the strength of cuboid made up with different percentage of Flyash and Llime to the respective strength of conventional concrete at the end of 7, 14 and 28 days.

In this work, Pozzolana Portland Cement (P.P.C) of Prism brand obtained from single batches throughout the investigation was used. Fly ash, also known as "pulverised fuel ash" is one of the coal combustion products, composed of the fine particles that are driven out of the boiler with the flue gases. Potable water is used for mixing and curing. The water cement ratio (w/c) of 0.76 has been used. Lime is a calcium-containing inorganic material in which carbonates, oxides, and hydroxides predominate was used. Sand is a naturally occurring granular material composed of finely divided rock and mineral particles. It is defined by size, being finer than gravel and coarser than silt. Sand can also refer to a textural class of soil or soil type; i.e. a soil containing more than 85% sand-sized particles by mass.

Compressive strength of bricks will be determined as per IS 516-1959 at a loading rate of about 140 kg/cm²/min (about 30 tones per minute) on 2000 tons AIMIL compression testing machine. Two dial gauges in diametrically opposite direction were used to measure the deflection.

IV. RESULTS AND DISCUSSION

The compressive strength of referral bricks are given in in table (1) for 7days and for 14 days and for 28 days. The variation of compressive strength with different percentage of flyash, lime cement and sand for 7 days curing) and for 14 days curing and for 28 days curing. These results shows that the compressive strength of brick with as function of curing time.

1.Table : Compressive strength test results of fly ash bricks

S. No.	Proportion Mark	Compressive strength (N/mm ²)							
		7 days		14 days			28 days		
1.	P1	4.1	4.1	P1	11.6	11.4	P1	9.9	14.1
2.	P1	4		P1	10.5		P1	16.6	
3.	P1	4.2		P1	12.1		P1	15.9	
4.	P2	5.8	5.2	P2	9.6	9.2	P2	12.5	14.3
5.	P2	3.5		P2	10.9		P2	15.0	
6.	P2	6.3		P2	7.2		P2	15.5	
7.	P3	7.5	7.3	P3	9	10	P3	17.5	15.8
8.	P3	7.0		P3	10.7		P3	14.4	
9.	P3	7.5		P3	10.2		P3	15.7	
10.	P4	2.4	2.5	P4	5.4	5	P4	16	15.0
11.	P4	2.5		P4	4.9		P4	13.9	
12.	P4	2.7		P4	4.7		P4	15.2	

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Website: www.ijirset.com

Vol. 6, Issue 6, June 2017

V. CONCLUSION

- The bricks having some sand contain, gain early 7 days strength as compare to non-sand bricks.
- Sand containing bricks are more in weight as compare to non-sand containing bricks.
- The average weight of non-sand containing bricks is 3.1Kg, apart the weight of sand containing brick is 3.5Kg.

VI. FUTURE APPLICATION

1. Bricks of optimum composition were found to be 'not effloresced'. No salt was found on the tested brick surface.
2. Cellular Light Weight Bricks (CLB) can be manufactured by a process involving the mixing of flyash, cement, coarse sand and lime. The bulk density of the product varies from 400 to 1800 kg/cum. These blocks are especially useful in high rise construction reducing the dead weight of the structure. The compressive strength of these blocks depends upon the density of the blocks.

REFERENCES

1. Battelle, "Climate Change," Toward a Sustainable Cement Industry, World Business Council on Sustainable Development (WBCSD), 2002.
2. Obada K. "High performance fly ash bricks" World of coal ash (WOCA), Lexington, Kentucky, USA, 2005.
3. Er. Rinku Ku. and Er. Naveen H., "An experimental study on properties of fly ash bricks" International journal of research in aeronautical and mechanical Engineering, Vol.2 Issue.9, pg 56-67, 2014.
4. Shinde R.V., Vikhe S.D., Pawar S.N. and Tekale D.D., "Study of Engineering Properties of Fly Ash Bricks for Construction" International Journal of Innovative Research in Science, Engineering and Technology, Vol. 5, Issue 5, 2016.
5. Balaraju S.G., Palaniswamy M. and Alan S., "A Study on Structural Applicability of Flyash Bricks with Quarry Dust – an Eco-friendly Alternative for Clay Bricks" Pol. J. Environ. Stud. Vol. 24, Issue. 2 pg. 695-699, 2015.
6. Sumathi A. and Mohan K. S. R., "Compressive Strength of Fly Ash Brick with Addition of Lime, Gypsum and Quarry Dust" International Journal of ChemTech Research, Vol.7, No.01, pp 28-36, 2015.
7. Ravi K., Vandana .I, Balwinder L. and Deepankar K. A., "Study of Properties of Light Weight Fly Ash Brick" International Journal of Engineering Research and Applications (IJERA), National Conference on Advances in Engineering and Technology (AET- 29th March 2014).
8. Dhrumil S. C., Prof. Jayeshkumar P. and Ashish H. M., "A Competitive Assessment on Fly-Ash Bricks and Clay Bricks in Central Gujarat Region of India Using Chi-Square Test(χ^2) through SPSS Software" International journal of engineering sciences & research Technology, 3(5): 2014.
9. Tutunlu and Umit, "Utilization of fly ash in manufacturing of building bricks" International ash utilization symposium, center of applied energy research, Uni. of Kentucky, 2001.
10. Sameer M., Jayesh P., Prof. Samip P., Dr. Zala L. B., Prof. Bhavsarand J.J. Dr. Umrigar F.S., "Fly Ash Bricks Masonry: An Experimental Study", National Conference on Recent Trends in Engineering & Technology, B.V.M. Engineering College, V.V.Nagar, Gujarat, India, 2011.
11. Tabin R. S., Abhishek K., Duggal S. K and Mehta P. "Experimental Studies on Lime-Soil-Fly Ash Bricks" International Journal of Civil And Structural Engineering, Volume 1, No 4, 2011.
12. Javed A. and Mohammad A., "Fly ash utilization in different sectors in Indian scenario" International journal of emerging trends in Engineering and Development Issue1, Vol 1, 2011.