

DEVELOPMENT OF BRICKS USING FLYASH AND SLUDGE AS PARTIAL REPLACEMENT OF CLAY

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Abstract – This paper reports the study the effect of partial replacement of clay with the use of composite waste mixture of flyash and paper sludge in the manufacturing of bricks has to be studied. The main objective of the study is to manufacturing the brick using different proportions of the composite mixture of waste as a partial replacement of clay and to compare the engineering properties of the composite waste bricks with the traditional bricks.

Keywords: Composite Waste, Paper Sludge, Compressive Strength, Effloroscece, Water Absorption.

I INTRODUCTION

Brick is most common building material which is widely used in construction. Clay is the most common ingredient in manufacturing of bricks. Clay is obtained from the top most layer of the soil. If clay is used for manufacturing bricks at the current rate then soon environmental challenges may arise. As India is a agricultural state, so conservation of top most fertile soil is necessary. That is why, there is a need to reduce the use of clay in the manufacturing of bricks, therefore clay is to be replaced from waste materials such as rice husk ash, fly ash, cow dung ash, sludge waste. Today brick industry use natural reserves of clay and minimal use of the additives to reduce the clay content. This method of producing bricks is cost effective, but the availability of raw material is becoming a concern to the industry. Solution to this problem is to replace the raw material from the alternatives waste materials which have the same chemical compositions as that of clay.

II. MATERIALS

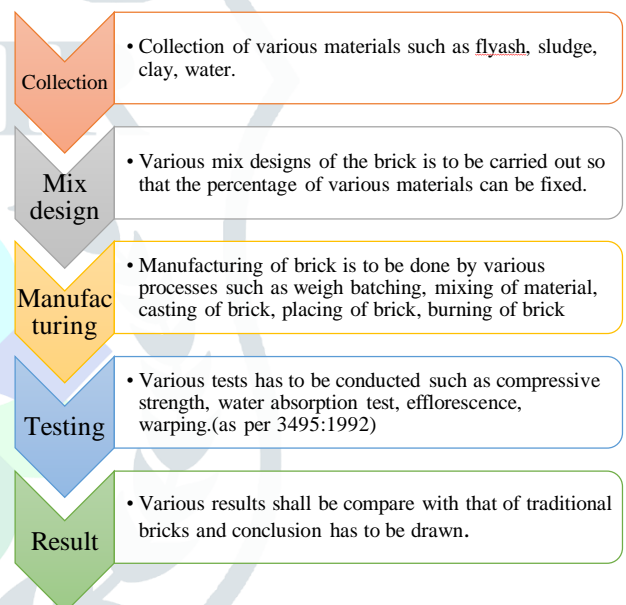
A) Fly Ash Fly ash, which is a waste material generated from thermal power plants generally contains silicon dioxide (SiO₂), aluminum oxide (Al₂O₃) and calcium oxide (CaO). Fly ash used in this research is obtained from Rajpura thermal power plant. Scanning Electron Microscope (SEM) and Energy Dispersive spectroscopy (EDS) test was performed to find out the components of flyash.

B) Paper Sludge Cement Paper sludge is a waste product generated from the paper mill Paper sludge is also known as de inking sludge. Nearly three hundred kilogram of dry sludge is generated from manufacturing of one tonne of paper. Paper sludge used in this research is obtained from Pragati Paper mill, Handesra Distt. Mohali.

C) Soil Soil used in this study is collected from local brick manufacturer in Dera bassi located near Chandigarh. Various properties of soil such as Plastic limit, water content.

Hydrometer analysis of soil is also performed to find out the clay and silt content of soil.

III. Manufacturing of Composite Waste Bricks



IV. Proportioning of Material

% Soil Replaced	%Soil (by weight)	%Fly Ash (by weight)	% Sludge (by weight)
0	100	0	0
10	90	5	5
20	80	10	10
30	70	15	15
40	60	20	20

Table 1 Proportioning of material as a soil replacement

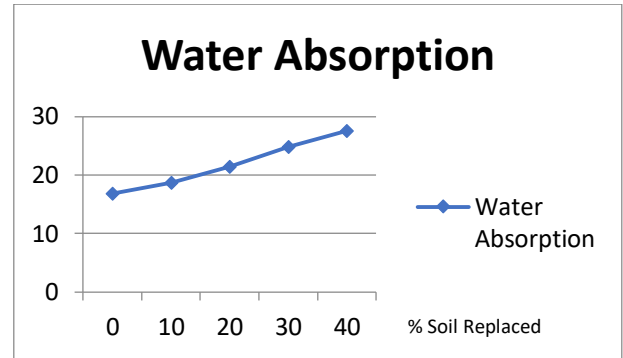
V. TEST RESULTS

A) Compressive Strength

Compressive Strength of bricks are determined according to IS 3495 (Part 1): 1992. Axial load should be applied at a rate of 14 N/mm² per minute till failure occurs.

Sr. No.	% Soil Replaced	Compressive Strength(N/mm ²)
1	0	3.60
2	10	3.46
3	20	3.24
4	30	2.95
5	40	2.81

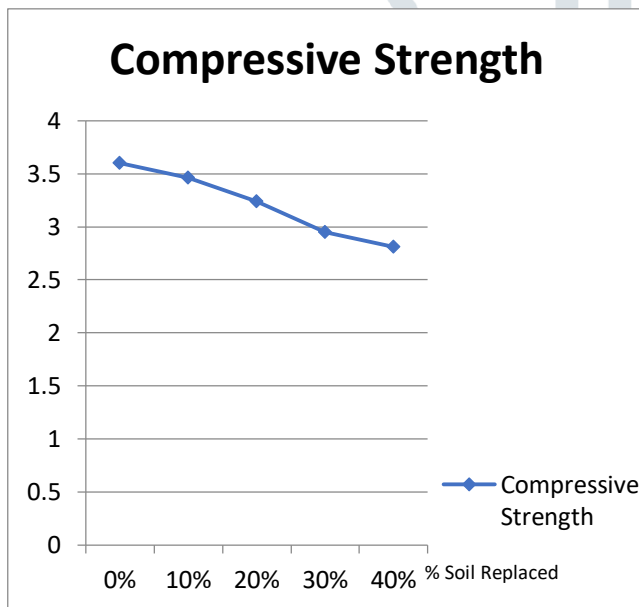
40	2.424	3.091	27.55
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C) Efflorescence test

Efflorescence test is determined according to IS 3495 (Part 2): 1992.

Sr. No.	% Soil Replaced	Efflorescence Shown
1	0	Nil
2	10	Nil
3	20	Nil
4	30	Slight
5	40	Nil



B) Water Absorption

Water absorption of bricks are determined according to IS 3495 (Part 2): 1992. In this test, bricks specimen are immersed completely in clean water at a temp. of 27^o C for 24 hours.

D) Shape and Size test of bricks

Results for shape and size test of bricks are within limits.

E) Soundness test

Bricks are not broken and clearly ringing sound is observed.

% Soil Replaced	Dry Weight (kg)	Wet Weight (kg)	% Absorption
0	2.678	3.128	16.80
10	2.541	3.014	18.73
20	2.509	3.044	21.39
30	2.483	3.099	24.81

VI CONCLUSIONS

From the given experimental work the following conclusion can be made:

1. Compressive Strength decreases as the percentage of composite mixture of sludge and fly ash increases as a partial replacement of clay.
2. Weight of the brick decreases as the percentage of composite mixture of sludge and flyash increases as a partial replacement of clay.
3. Water absorption increases with the increase in the percentage of composite waste mixture.
4. No efflorescence is seen with the increase in the replacement of clay by composite waste mixture.

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REFERENCES

- [1] Niklesh R. Murekar, Roshan S. Satpute, Manish M. Chaudhari "Using Waste Material for Making Light Weight Bricks" International Conference on Recent Trends in Engineering Science and Technology (ICRTEST 2017) ISSN: 2321-8169 Volume: 5 Issue: 1(Special Issue 21-22 January 2017) 467 – 470
- [2] DHRUV VYAS, CHETNA M VYAS & JAYESHKUMAR PITRODA "UTILIZATION OF BARLEY HUSK ASH IN CLAY BRICKS IN ASPECT OF INDIAN CONTEXT: A LITERATURE REVIEW" International Journal of Civil, Structural, Environmental and Infrastructure Engineering Research and Development (IJCSIERD) ISSN(P): 2249-6866; ISSN(E): 2249-7978 Vol. 4, Issue 1, Feb 2014, 61-68 .
- [3] V.M.Sathianarayanan "PROJECT ON INNOVATION AND IMPLEMENTATION OF COMPOSITE BRICK IN CONSTRUCTION" International Journal of Pure and Applied Mathematics Volume 119 No. 7 2018, 1145-1150
- [4] Alaa A. Shakir, Ali Ahmed Mohammed "Manufacturing of Bricks in the Past, in the Present and in the Future: A state of the Art Review" International Journal of Advances in Applied Sciences (IJAAAS) Vol. 2, No. 3, September 2013, pp. 145~156 ISSN: 2252-8814
- [5] Alaa.A.Shakir, Sivakumar Naganathan, Kamal Nasharuddin Bin Mustapha "Development Of Bricks From Waste Material: A Review Paper" Australian Journal of Basic and Applied Sciences, 7(8): 812-818, 2013 ISSN 1991-8178
- [6] Arya K.C. "A REVIEW ON GGBS, PAPER SLUDGE AND LATERITE SOIL IN BRICK MANUFACTURING" ISSN: 2230-9926 International Journal of Development Research Vol. 08, Issue, 03, pp.19598-19601, March, 2018
- [7] Manufacturing of Bricks From Sewage Sludge and Waste Materials Prof. Mayur Tanpure¹, Mr. Pratik P. Shinde², Mr. Aakash S. Borade², Mr. Ravi S. Chate², Mr. Chetan P. Kalje², Mr. Dhairyashil S. Gaikwad² 1,
- [8] Suchita Rai, Dilip H. Lataye, M. J. Chaddha, R. S. Mishra, P. Mahendiran, J. Mukhopadhyay, ChangKyoo Yoo, and Kailas L.Wasewar "An Alternative to Clay in Building Materials: Red Mud Sintering Using Fly Ash via Taguchi's Methodology"
- [9] Mohammad Ismail^{1C}, M.A. Ismail¹, S.K. Lau¹, Bala Muhammad¹, and Zaiton Majid² "Fabrication of Bricks From Paper Sludge And Palm Oil Fuel Ash", ISSR Journals, Vol. 1 (2) – June 2010
- [10] Badr El-Din E. Hegazy, Hanan A. Fouad and Ahmed M. Hassanain, " Brick Manufacturing from Water Treatment Sludge and Rice Husk Ash" Australian Journal of Basic and Applied Sciences, Vol. 6(3), 2012.
- [11] Lianyang Zhang, " Production of bricks from waste materials – A review, Construction and Building Material", Vol. 47, 2013, 643–655.
- [12] J. Sutas, A. Mana, L. Pitak, " Effect of Rice Husk and Rice Husk Ash to Properties of Bricks", Procedia Engineering, Vol. 32, 2012, 1061 – 1067.