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A COMPAIRATIVE STUDY OF AAC PANEL AND CLAY BRICK HOUSE AND COSTING

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Abstract:- The burnt clay brick is a predominant construction material used in construction. The CO2 emissions in the brick manufacturing process had been acknowledged as a significant factor to global warming. Therefore, now a days we should focus more on seeing environmental solutions for greener environment. To fulfil this objective, it is essential to find new materials with lower environmental impact and cost effective to achieve sustainable buildings. One of such material i.e. AAC panel can be used as a construction building material.The different types of tests were performed to determine various properties of AAC blocks as compared to others. In this paper, an attempt has been made to compare AAC blocks as a replacement material to red bricks.The 75mm thick panel house were planned using AutoCAD software and the cost calculation for different component parts of the building were find out using estimation. From the experimental results, it is observed that the compressive strength of AAC panel is comparatively more than traditional bricks and the density of AAC panel is comparatively less which helps in reducing the dead load of structure. It is found that up to 40 to 50% , the cost of construction can be reduced by using AAC panel.

Keywords:- Clay Bricks, AAC Panel, Light Weight, Cost Comparison ,Difference.

I. INTRODUCTION

Bricks remain one of the most important building material in the country. Brick making is a traditional industry in India, generally confined rural areas. In recent years, with expanding urbanization and increasing demand for materials, brick kilns have grown to meet the demand. At a local level, in the vicinity of a brick kiln, environmental pollution from brick making operations is injurious to human health, animals and plant life. And at a global level, environmental pollution from brick making operations contributes to the phenomenon of global warming and climate change. Extreme whether may cause degradation of the brick surface due to forest damage. Global warming and environmental pollution is now a global concern. To reduce environmental pollution and global warming, AAC panel is one of the solution for brick replacement.

Autoclaved Aerated Concrete (AAC) is one of the eco-friendly and certified green building material. AAC is porous and non toxic, renewable, reusable and recyclable. AAC also known as aircrete, is a light weight , load bearing, high insulating, durable building product which is reduced in a wide range of sizes and strength. AAC material was invented in the mid 1920 by a Sweden Architect and inventor Dr Johan Axel Eriksson, working at the Royal Institute of Technology. The process was patented in 1924. It has become one of the most used building material in Europe and is rapidly growing in many other countries. AAC is produced out of pulverised fly ash, cement, gypsum, water and foam and is hardened by steam curing in autoclaved. Due to its excellent properties, AAC is used in many building construction, such as in residential homes, commercial and industrial buildings, schools, hospital and many other applications. AAC replace clay bricks which are environmentally unsuitable. Being aerated, it contains 50 to 60% of air leading to light weight and load thermal conductivity. The characteristics of AAC is helpful in green housing and saves fertile land and solution of fly ash disposal.

II. MATERIALS AND METHEODOLOGY OF AAC PANEL

Materials:- The following raw materials are used in the manufacturing process of AAC panel,

1) Fly Ash- A bi-product of thermal power plant and is a important raw material in the manufacturing of AAC panel.
2) Quick Lime - Lime powder is obtained either by crushing lime stone to find a powder at AAC factory or by directly purchasing it from the market.
3) Cement - Portland cement is generally preferred.
4) Gypsum – Gypsum is easily available in the market and is used in the powder form. It is stored in silos.
5) Water – A portable water should be used which should confirmed with general requirement of the concrete.
6) Foam – Gillette shaving foam which are readily available in the market is used.

Methodology:- For this study, extra light AAC panel for various test were used. AAC panel is suitable for multistore structure, as it is lighter in weight than standard size brick and panel. AAC panel are manufactured through a reaction of foam (liquid foaming agent or Gillette on a proportionate blende of lime, cement, gupsum and fly ash. During this process, the hydrogen gas that escapes create million of tiny air cells. This is further strengthened by high pressure steam curing in autoclaves. The product thus formed is not only light weight but also has a higher compressive strength. AAC panels can be produced in a large variety of sizes. AAC panel are available in 600mm x 200mm x 75 to 300mm i.e. from 3" to 12." Using this material, various studies and tests was carried out. As a case study for this research work, typical building plan of institutional building is considered. To precede the study following work was carried out in sequence. AAC panel, traditional bricks and other required materials were procured from market. Various engineering properties of traditional bricks and AAC panels were tested in laboratory. Then, comparative study of AAC panel masonry with traditional brick masonry was carried out in which various aspects such as size, weight, density, workability, water absorption, moisture content, curing behaviours, mortar requirement, quantity requirement, plaster requirement, time require for construction, finishing alternatives, structural behaviour, strength and stability, etc. were compared. For such comparison, building plan was drawn in AutoCAD and was carried out in which traditional bricks were used. Again for same building plan was carried out in which AAC block was used. For quantity and cost comparison, detailed estimate was prepared for both above plan. From the data prepared in estimate, cost effectiveness of different items of work was compared.

III. TESTING AND PROPERTIES OF AAC PANEL

For carrying our comparative study of AAC panel masonry for RCC framed structure, systematic experimental study was been carried out. For this, different lab tests only clay brick, cement brick, and AAC panel was been undertaken. For finding out physical characteristics of AAC panel, lab test to determine the average value of density and moisture content of AAC panel, clay brick, and cement brick was undertaken. The experimental results are shown in Table 1,

Table 1. Average Value of Density and Moisture content

Sr. No.	Material	Size	Volume	Dry Weight	Wet Weight	Dry Density	Wet Density	Moisture Content
1	AAC PANEL	2.55x0.60x0.075	0.1147	1.117	1.230	1060.77	1168	10.10
2	CLAY BRICK	0.20X0.10X0.075	0.0015	2.977	3.627	1984.67	2418	21.83
3	CEMENT BRICK	0.20X0.10X0.075	0.0015	3.565	3.736	2376.67	2490.67	4.80

For comparing the Compressive strength of AAC panel, clay brick, and cement brick testing on compression testing machine was undertaken. Details of experimental observations are given in Table 2,

Table2. Average Value of Compressive Streng

Sr. No.	Material	Size	Average Compressive strength (Dry condition)	Average Compressive strength (Moist Condition)
		M	N/sq mm	N/sq mm
1	AAC PANEL	2.55x0.60x0.075	14.9	14.65
2	CLAY BRICK	0.20X0.10X0.075	2.4	1.98
3	CEMENT BRICK	0.20X0.10X0.075	1.7	1.3

IV.COMPARATIVE ANALYSIS

For comparative study in project building plan of ground floor house was taken. For the building, double line plan was prepared considering traditional 9" wall thick brick wall. For comparative study same building plan is used considering AAC panel for wall having 3" wall thickness. Developed plan and centre line plan for both building was prepared in AutoCAD software. From developed plan of 9 inch thick wall and 6 inch thick wall, carpet area is calculated. For comparative study, we made model taking scale of 1:5 from actual measurement. And after making panels, we realised that AAC panels are really light weight building materials while red brick is a small block made up of clay ceramic material used in masonry construction. On testing of panel, we found that, the density of AAC panels are much lesser than the red bricks masonry. AAC panels are relatively uniform in size and does not contain coarse aggregate phase while bricks are less uniform in size and texture.

AAC panels are manufactures from the mixture of fly ash, cement, lime, gypsum and foaming agent while red bricks are made from natural soil. Hence, it ultimately depends up on quality of soil. AAC panels are available in large size and hence there are less no. of joints while in brick masonry more no. of joints are available. Due to less no. of joints in panels it ultimately results in faster construction on site and less consumption of either mortar or chemicals.

Earthquake forces are proportional to the weight of building. Due to light weight of panels, there will be reduction in dead loads and hence, it can be used in high seismic zone. Use of panels can significantly construction time of the project where ass use of bricks increases the duration of project. Minimal wastage of panels due to already manufactured in standard size while in brick masonry, there is large wastage of bricks. Due to AAC panel it reduces the self weight of wall instead of red brick masonry. Water absorption of AAC should be less than 10% while in red bricks masonry water absorption is more than 10%. In construction using AAC panel less labours are required while in red brick masonry construction more labours are required. Since the AAC panels are thin, available carpet area is more where as due to more thickness of bricks available carpet area found will be less.

V. RESULT AND DISCUSSION

Table 3 Percentage decrease in Compressive strength

Materials	Dry condition(N/sq mm)	Wet condition(N/sq mm)	% Decrease
AAC PANEL	14.9	14.65	1.67
CLAY BRICK	2.42	1.98	18.18
CEMENT BRICK	1.7	1.3	23.53

Table 4 Carpet area comparison

Particular	9" thick wall building	3" thick wall building	Percentage Reduction
Unit	Sq m	Sq m	%
Total Carpet Area	22.39	23.5	4.72

Table 5 Comparison of Cost of Estimation

Type	Clay Brick (Rs.)	AAC Panel (Rs.)
Total Cost	6,81,445	3,68,569

CONCLUSION

1) There is a strict need at present in India for building cheep and affordable houses.
2) It is the key to nations development, to provide proper shelter to its citizen.
3) The growing population in urban areas have laid to a strict shortage in land, congested traffic and housing shortfall.
4) This has also laid to the hike in prices which makes it impossible for common people to have their own houses.
5) It has low maintenance, affordability, fire resistant, relatively low emissions of CO2
6) It is energy efficiency in production, excellent thermal mass, locally produced and used.
7) Thus there is immediate need for construction of cheap houses large scale.

REFERENCES

[1] W. Y. Vivian, Cost Effectiveness of using Low Cost Housing Technologies in Construction, Published by Elsevier Ltd.doi:10.1016/j.proeng.2011.07.018 1877–7058 © 2011
[2] T.M. Prakash, Dr.B.G. Naresh kumar, , Dr. Karisiddappa, Strength and Elastic Properties of Aerated Concrete Blocks (ACBs), International Journal of Chemical, Environmental & Biological Sciences (IJCEBS) Volume 1, Issue 2 (2013) ISSN 2320 –4087
[3] P. Gautam, N. Saxena, Comparison of Autoclaved Aerated Concrete Blocks with Red Bricks, International Journal of Engineering Research & Technology (IJERT) Vol. 2 Issue 10, October - 2013 IJERTIJERT ISSN: 2278- 0181

[4] A.Costa, A. Penna, G. Magenes, A. Galasco, Seismic Performance Assessment of Autoclaved Aerated Concrete (AAC) Masonry Buildings, The 14th World Conference on Earthquake Engineering October 12-17, 2008, Beijing, China

[5] U.J. Pathak, C.S. Chavan, L.V. Rathod, Cost Effective House by Using Various Construction Techniques and Materials, INDIAN JOURNAL OF APPLIED RESEARCH Volume: 4, Issue: 4, Apr 2014, ISSN - 2249-555X

[6] R. Hassan, Viability of autoclaved aerated concrete walls for the residential sector in the United Arab Emirates, 0378-7788/$ © 2011 Elsevier B.V. All rights reserved. doi:10.1016/j.enbuild.2011.04.018

[7] Siva Priya and senthamil kumar.s (2016) ' Building cost comparison of precast vs conventional construction '-International Journal of Innovative Research in Science, Engineering

[8] Vivian W.Y. Team "Cost Effectiveness of using Low cost Housing Technologies in Construction" ELSEVIER, Procedia Engineering 14, 156-160, 2011.

[9] Anurag Wahane, "Manufacturing process of AAC Block" Columbia Institute of Engineering and Technology, Raipur International Journal of Innovative Research in science, engineering and technology .