

Performance Evolution of AAC Concrete blocks

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Abstract

The developments of new and innovative materials are contributing significantly to the large scale such as automotive industry. Smart materials are highly efficient materials and their performance comes at high costs associated with the high level of Research & Development involved.

The main aim of this paper is to study in detail about AAC concrete blocks, its performance, advantages and compared AAC blocks with red clay bricks hence recommendation given for using AAC blocks.

Keywords- Aac Blocks, Autoclaved Aerated Concrete, Comparison of Aac Blocks, Aac Block Strength, Block Analysis.

1. Introduction

The AAC block (Autoclaved Aerated Concrete) material was introduced in 1924 in Sweden. It has become one of the most used building materials in Europe and is speedily growing in many other countries everywhere the world. Aerated block machine/arc machinery/automatic block machine is existing in the whole world.

Autoclaved Aerated Concrete (AAC Blocks), is a lightweight, load-bearing, high-insulating, durable building product, which is produced in a wide range of sizes and strengths.

Autoclaved aerated concrete (AAC Blocks) offers incredible opportunities to increase building quality and at the same time reduce costs at the construction site. AAC is produced out of a mix of quartz sand and or pulverized fly ash brick plant (PFA), lime, cement, gypsum/anhydrite, water and Aluminum and is hardened by steam-curing in autoclaves.

As a result of its excellent properties, AAC is used in many building constructions, for example in residential homes, commercial and industrial buildings, schools, hospitals, hotels and many other applications.

2. AAC CONCRETE BLOCKS

In 1972, the Swedish Radiation Safety Authority pointed out the unsuitability of a radon-emitting construction material, and the use of alum slate in the production of Ytong ceased in 1975

The production of this white autoclaved aerated concrete is now state of the art and similar formulations are used by all producers around the world.

2.1. Analysis of AAC Blocks

It is a systematic tool to reduce the wastage of money and to give good quality and performance. Through value analysis, wastages in site, duplication of work, unnecessary expenditure can be reduced.

- By giving innovative ideas
- By finding out unnecessary cost
- By applying innovation and creativity
- By saving money and time
- By applying easy methods and procedures
- By removing or eliminating unnecessary items

2.2. AAC Blocks Concept in Building Construction

By applying value engineering concepts or value management process in the project, it can be used to

- Reduce cost of construction
- Makes profit in the project
- Attain project objectives
- Selecting best alternatives
- Project can be finished with estimated time
- Planning to save a time of project
- Align resource efficient and effective

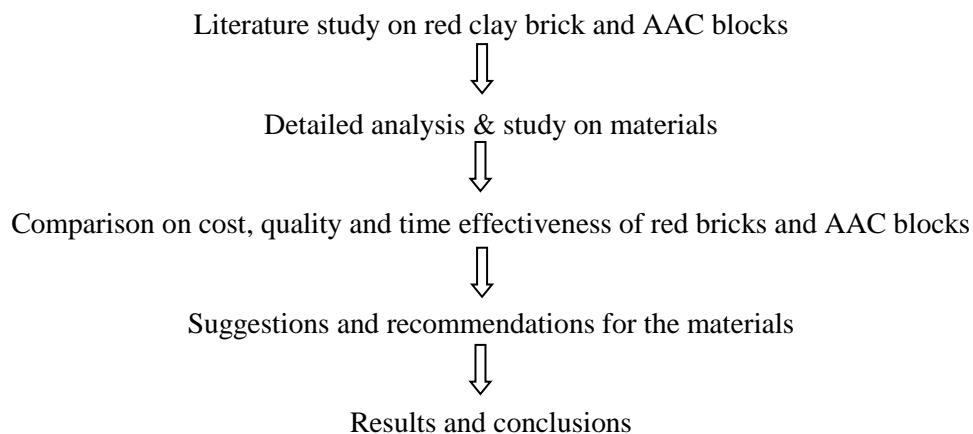
3. AIM OF THE PROJECT

- To study in-depth about AAC concrete blocks in construction industry.
- To suggest using AAC blocks to reduce the cost and easy structure of construction.
- To find out the cheap cost, quality & cost materials that can be used for the project.

4. SCOPE

- Autoclaved aerated concrete block is a non-combustible, lime based, cementitious material expanding into worldwide markets.
- Now a days AAC blocks are increased due to lower cost and easy structure of construction
- Instead of using clay bricks AAC blocks are used to reduce costs and saving time.
- AAC blocks are light weight in nature and most economical.
- Larger size blocks lead to faster masonry work.
- To reduces project cost.
- To improve thermal efficiency reduces the heating and cooling load in buildings.
- Light weight saves cost and energy in transportation, labor expenses, and increases chances of survival during seismic activity.

5. METHODOLOGY



5.1. Literature Study

AAC stands for Autoclaved Aerated Concrete. It was invented in early 1920s by a Swedish architect named Dr. Johan Axel Eriksson. AAC is manufactured by a process that involves slurry preparation, foaming /rising, cutting, and steam curing (autoclaving).

W. Y. Vivian in his publication “Cost Effectiveness of using Low Cost Housing Technologies in Construction”, proves us on the cost difference by between using conventional brick and AAC blocks. T.M. Prakash, Dr.B.G. Naresh Kumar and Dr. Karisiddappa conclude us about the physical and elastic property of AAC in their publication “Strength and Elastic Properties of Aerated Concrete Blocks”. Also P. Gautam and N. Saxena compare AAC Blocks with red bricks and their results show a substantial advantage of AAC to red brick.

The raw materials of the AAC block is fly ash, cement, aluminum powder, gypsum, lime. and water. Bigger size leads to faster laying at site. Reduced weight translates to reduced dead-weight on structure and higher thermal insulation.

5.2. Detailed Analysis of Blocks

The comparison between AAC blocks and clay bricks is shown in table

Sr. No.	Parameters	AAC Blocks	Clay Bricks
1.	Sizes	60x20x7.5, 10, 12.5, 15, 17.5, 20, 22.5 cm	19x9x9 cm(modular), 23x11x7 cm(non-modular) .
2.	Fuel Consumption	One sq. ft of carpet area with AAC blocks will consume 1 kg of coal.	One sq. ft of carpet area with clay bricks will consume 8 kg of coal.
3.	CO ₂ Emission	One sq. ft of carpet area will emit 1.62 kg of CO ₂	One sq. ft of carpet area will emit 125kg of CO ₂
4.	Dry Density	3 551-600 kg/m	3 1920 Kg/m
5.	Compressive Strength	2 Should not be less than 3 N/mm	2 Should not be less than 3 N/mm
6.	Usage Of Material	A block wall requires 10 blocks per square metre.	A one brick wide wall requires 160 bricks per square metre.
7.	Consumption of Cement Mortar	0.77 bags of cement / Cu. m	1.44 bags of cement/ Cu. m
8.	Cost Variation	A block wall will cost 800rs per sq. m	A one brick wall will cost 1280rs per sq. m

5.3. Comparison on Cost, Quality and Time Effectiveness of Red Bricks and AAC Blocks

1) AAC blocks are 7 times bigger than the size of the conventional bricks. Bigger size means less number of joints. Less joints results in lesser amount of mortar for building. There is overall 60% reduction in use of mortar.

2) AAC blocks have uniform shape and texture, which gives even surface to the walls. There is overall 35% reduction in the cost of plastering.

3) Breakage in AAC block is negligible as compared to ordinary brick. It reduces wastage of the block and increases the percentage utilization. If any breakage in the blocks, it can be utilized in masonry as "brick bat".

4) AAC blocks are resistant to thermal variations. It reduces the total load of refrigeration and air-conditioning. Though initial installation cost may remain same but AAC blocks reduces operation and maintenance cost drastically. There is over all 25% saving in operation cost.

5) Due to lesser HVAC load, cost of power infrastructure i.e. reduced capacity of transformer, DG set, and cable etc. also reduces considerably which in form results in savings in electrical charges

5.4. Suggestions and Recommendations for the Material

1) *Eco - friendly*: AAC helps to reduce at least 35% of ecological waste as compared to traditional concrete. There is a decrease of 50% of greenhouse gas emissions.

2) *Lightweight*: It is 4 times lighter than traditional bricks and hence, easier and cheaper to transport.

3) *Energy Saver*: It has an excellent property that makes it an excellent insulator.

4) *Countless Acoustics*: AAC has excellent acoustic performance. It is able to be used as a very effective sound barrier.

5) *Fire Resistant*: Just like the regular concrete, AAC is fire resistant. This material is completely inorganic and not combustible.

6) *Little Maintenance*: AAC reduces the operating cost by 30% to 40%. It also reduces overall construction cost by 2.5% as it requires less jointing and reduces the quantity of cement and steel.

7) *Earlier Construction*: It cuts construction time by 20%. As these blocks are lighter, it makes construction easier and faster.

6. CONCLUSION

Hence in the conclusion, AAC block brings development through price lessening and to get better excellence performance for the customer. This can be applied in the architectural, structural and material components of the building. Conclusion says that AAC blocks are good for construction than red clay bricks. Hence cost, quality, labor and time has been compared and suggestion from this paper is to use AAC blocks for construction.

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