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A Review Paper on Study of Low Cost Housing

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Abstract: *This study investigates cost-efficient construction materials and methods in civil engineering to tackle the growing challenge of housing affordability. While widely used, traditional materials like fired bricks and cement concrete raise environmental concerns due to high energy consumption during production and soil depletion. By analysing existing research and practical applications, this project assesses the potential of alternative materials like Autoclaved Aerated Concrete (AAC) blocks and fly ash concrete for building design. We compare construction costs for a 2BHKhouse using both conventional and alternative materials to quantify potential cost savings from adopting these alternatives. By evaluating the economic viability of these options, this research contributes to the ongoing discussion on sustainable construction practices. Our findings offer valuable insights into reducing the environmental and financial burdens associated with traditional building materials..*

Keywords: Cost-effective, AAC blocks, Conventional bricks, Fly ash concrete, Cost estimation.

I. INTRODUCTION

Recent years have seen a notable increase in the demand for affordable building materials as builders and homeowners alike seek innovative construction methods that not only lower costs but also reduce energy consumption. A critical focus area in this pursuit is low-cost housing, which holds the potential to significantly enhance access to adequate shelter for underprivileged communities.

To achieve the goal of affordable housing, several key factors must be addressed. Efficient planning plays a pivotal role in optimizing resources and streamlining processes. Skilled project management ensures that timelines and budgets are adhered to, maximizing the efficiency of every construction project. Additionally, the choice of economical materials is essential. Utilizing cost-effective yet durable materials can substantially lower overall construction expenses without compromising structural integrity or safety standards.

Exploring alternative construction techniques is another crucial aspect of this endeavor. Innovations such as prefabrication, modular construction, and sustainable building practices can contribute significantly to cost reduction and energy efficiency. By embracing these approaches, the construction industry can realize substantial cost savings, ultimately making housing more affordable and accessible to a broader demographic.

Furthermore, the adoption of low-cost alternatives helps counteract the impact of escalating construction costs attributed to resource depletion and market fluctuations. These materials encompass a spectrum of options, ranging from natural resources like bamboo and rammed earth to engineered products such as recycled materials and advanced composites. Many of these materials are chosen not only for their affordability but also for their ability to minimize energy consumption during building occupancy, contributing to long-term sustainability and environmental responsibility.

In summary, the pursuit of affordable building materials and construction methods is multifaceted, requiring a comprehensive approach that integrates efficient planning, skilled project management, the use of economical materials, and the exploration of innovative construction techniques. By embracing these strategies, the construction industry can play a pivotal role in addressing housing affordability challenges and promoting sustainable development.

II. LITERAETURE REVIEW

Building Design and Codes:

In 2007, at NIT Rourkela, Bedabrata Bhattacharjee and A.S.V. Nagender worked on a project involving the design of a G+21 multi-storey building. They utilized STAAD Pro software for analyzing and designing the structure. They

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manually calculated the dead loads on the slab, while live load, seismic load, and wind load were input based on relevant Indian standards. Their design followed the limit state method outlined in IS 456:2000.

Their project demonstrated how efficiently and quickly a tall building could be designed using modern tools and adhering to building codes.

Sustainable Materials and Community Development:

Bredenoord J.: This research emphasizes the concept of sustainable housing that extends beyond just materials. It highlights the importance of employing sustainable building materials alongside community development measures. This holistic approach fosters long-term success by considering the social and environmental needs of residents.

Environmental Benefits of Earth Construction

Pachecotorgal's research: This study explores earth construction as a sustainable building approach. It highlights the environmental benefits of using earth materials compared to conventional techniques. These benefits include reduced resource consumption, improved indoor air quality, and potentially lower embodied energy (energy used to manufacture and transport materials).

Project Management in Developing Countries

John M. Hutcheson: This work underscores the crucial role of project management in achieving successful low-cost housing projects, particularly in developing countries. Hutcheson emphasizes the need for detailed planning, considering factors like budget, materials, and labor availability. Additionally, interdisciplinary collaboration between architects, engineers, and social workers is crucial for creating housing solutions that meet the needs of the community.

Cost-Effective Construction Methods

Preetpal Singh: This research addresses the rising construction costs in India, a problem faced by many developing nations. Singh advocates for the adoption of cost-effective construction methods to mitigate affordability challenges. This could involve exploring alternative materials, optimizing construction processes, and potentially utilizing prefabricated components.

Alternative Materials and Technologies

R. Caponetto: This study explores the potential of ecological materials (recyclable and natural) and technologies in low-cost building systems. Caponetto emphasizes the environmental benefits of using recyclable materials, reducing the demand for virgin resources and promoting sustainability.

Swaptik chowdhury: This research investigates alternative construction materials for low-cost housing in India. It explores both natural materials (e.g., bamboo) and man-made materials (e.g., recycled plastic) as potential cost-effective alternatives to traditional materials like fired bricks and concrete.

Sengupta Nilanjan: This study focuses on identifying appropriate cost-effective building construction technologies. Nilanjan utilizes field surveys and technical calculations to evaluate various options. This approach provides a data-driven basis for selecting the most suitable cost-effective technologies for a specific project.

Specific Material Studies

J.M. Khatib and R. Siddique: This research explores self-compacting cement fly ash concrete, a material with potential benefits for low-cost construction. The study highlights its strength and workability, making it easier to place and potentially reducing labour costs. Additionally, fly ash is a by-product of coal combustion, offering a more sustainable alternative to traditional cement.

III. METHODOLOGY

3.1 Details of the project

Theprojectoccupies a plot measuring25'x 35'.(7.6m x 10.7m) To maximize usable space, the building is positioned centrally, allowing ample room on all sides for landscaping, car paths, and parking. A detailed layout is provided in Table 1

Area of plot	25' x 35'
Plot details	Front – Main road Left & Right side -private residential building Rear-Private residential building

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Number of floor	1 (Ground Floor Only)
Building Type	Single Story

Table 1 Plot Details

3.2 Cost effective material use for building

The cost effective building material use for the house in place of conventional building material are shown in table 2

Table 2 material used for house

Conventional building materials	**Cost effective building materials**
Cement concrete	Flyash based concrete
Burntclay bricks	AAC Blocks
River sand	Msand
Cements and mortar for masonry	Polymer based cement adhesive
Granite flooring	Vitrified tile flooring

3.3 Abstract Of Cost Using coventional Building Material

SI.NO	Description of Work	Qty	Rate/ unit	Amount
1	Earthwork in excavation	50.94 m^3	348	Rs17727.12
2	Sand filling below plinth	63.61 m^3	577	Rs36702.97
3	Total RCC work	83.13 m^3	12194	Rs1013700
4	Brickwork below plinth	10.62 m^3	7393	Rs78513.66
5	AAC block wall0.2m	337.91 m^2	1342	Rs453475.22
6	AAC block wall0.1m	192.99 m^2	768	Rs148216.32
7	Plaster Work	559.86 m^2	199	Rs111412.14
8	Flooring work	341.43 m^2	1100	Rs375573.00
9	Wall putty work	1592.6 m^2	132	Rs210232.44
	Sub Total			Rs2445552.8
	Add5%forContingencies	Rs122277.64		Rs122277.64
	TOTAL	**Rs2567830.5**		Rs2567830.5
	Roundoff	-0.5		-0.5
	GRANDTOTAL	**Rs2567830**		Rs2567830

3.4 Abstract Of Cost Uding Cost Effective Building Materials

Sr. NO	Description of Work	Qty	Rate/ unit	Amount
1	Earthwork in excavation	74.43 m^3	348	Rs25901.64
2	Sandfilling below plinth	63.61 m^3	577	Rs36702.97
3	TotalRCC work	90.17 m^3	13276	Rs1197120
4	Brickwalls	86.27	7393	Rs637794.11

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	0.23m	m^3		
5	Halfbrick masonry	189.04 m^2	773	Rs146127.92
6	Plaster Work	1592.6 m^2	199	Rs316941.33
7	Flooring work	341.43 m^2	2190	Rs747731.7
8	Wallputty work	1592.6 m^2	132	Rs210232.44
	SubTotal			Rs3318552.11
	Add5%forContingencies			Rs165927.60
	TOTAL			Rs3484479.72
	Roundoff			0.28
	GRANDTOTAL			Rs3484480

Total reduction in cost

The total reduction in cost by using cost effective building material is **Rs 916650**

Project Objectives

This research project aims to:

- Analyse cost-effective construction materials and techniques in civil engineering, leveraging research findings and existing literature.
- Address housing scarcity by exploring sustainable alternatives to conventional materials like fired bricks and cement concrete.
- Conduct a cost comparison between constructing a 2BHK with conventional and alternative materials to quantify potential cost savings
- Evaluate the feasibility and effectiveness of low-cost housing construction methods through efficient planning, project management, and economical technologies.
- Promote affordable housing accessibility for low-income communities by identifying and implementing alternative materials and methods.
- Mitigate rising construction costs due to resource depletion through cost-effective alternatives.
- Explore the use of natural materials and energy-efficient construction techniques to minimize costs and building energy consumption.
- Utilize industry-standard Civil Engineering software (AutoCAD, Microsoft Excel) for design, analysis, and cost estimation of the 2BHK project.
- This revised version combines similar objectives and removes unnecessary phrases, resulting in a clearer and more concise summary of the project goals.

IV. CONCLUSION

Our analysis of various construction materials and techniques revealed several key findings:

- Fly ash concrete: Including fly ash in concrete improves workability, leading to smoother construction processes. While initial strength of a concrete mix with 50% fly ash might be 20% lower than a standard mix at 7 days, it reaches comparable or even higher strength by 28 days and beyond. This indicates that fly ash can effectively replace a portion of cement without compromising long-term strength.
- AAC blocks: Compared to traditional clay bricks, AAC blocks offer significant advantagesTheir lightweight nature reduces dead loads on structures and facilitates faster construction.

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- Cost-effectiveness: Utilizing AAC blocks, high volume fly ash concrete (HVFAC), and vitrified tiles can lead to a substantial total project cost reduction of 26.03%. This demonstrates the significant cost-effectiveness of alternative construction materials and techniques.

Our findings highlight the potential of incorporating alternative materials like fly ash and AAC blocks in construction. These materials not only enhance structural performance but also lead to cost reductions and improved construction efficiency. This research underscores the importance of continuous exploration and innovation for achieving sustainable and cost-effective building solutions in the future.

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