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TO STUDY ALTERNATE LOW COST CONSTRUCTION MATERIAL AND TECHNIQUES

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ABSTRACT

This paper investigated how low-cost housing approaches are adopted in India. There is a popular misconception that low-cost housing is only feasible for substandard construction and uses building materials. The fact is that low-cost housing is still only achievable with good resource management. Low-cost building materials have many advantages, such as pollution prevention, reduced energy consumption, and the usage of natural building materials. One of most basic building materials for house construction are traditional clay bricks. Fly ash is a form of industrial waste that we can obtain at a low cost or even for free from industries to utilise in the manufacturing of fly ash bricks.The use of low-cost construction materials in the construction of small houses increases low-income people's access to construction. Pollution prevention, energy composition and use of natural materials conservation, and reuse of building materials all are advantages of low-cost building materials. The evaluation process was done on the basis of various materials, costs, tensile strength, durability, advantages, and disadvantages. In low-cost building, efficiency gains are achieved by the use of more efficient material or better design. As a result of the need for cost-effective building technology and materials, low-cost housing materials and techniques that are durable and low-maintenance are now being invented.

Keywords: Fly Ash Brick,Compressed Earth Block, Low Cost Materials, Low Maintainance.

I. INTRODUCTION

If a family can obtain a home for up to 30% of their annual income, low-cost housing is considered reasonable for low and moderate-income earners. In developing countries like India, only 20% of the population has high-income earners who can afford typical housing units.

Low-cost housing can be achieved by effective project management and planning, low-cost materials, cost-effective construction techniques, and the use of alternative construction methods. Profits from such techniques can be used to reduce construction expenses and higher the availability of low-cost housing for all. The use of low-cost alternative building materials also serves to maintain construction costs down by preventing the use of rare building materials, which would otherwise increase the project's cost. Some alternative building materials are formed from natural resources, while others can assist the occupants save money on their energy bills once they're constructed. Regardless of the builder's goal, use of such alternative building materials is on the rise. It's important to mention that low-cost housing does not indicate buildings built of low-quality materials. In terms of foundation and strength properties, a low-cost housing system was designed and developed in the same way as any other building. The cost savings are achieved by utilising locally available building materials and techniques that are long-lasting, cost-effective, and user-accepted, and do not require massive maintenance. It is also feasible to save money via developing, finishing, and deploying low-cost housing techniques in stages.

II. LITERATURE REVIEW

Tam (2011) explained that utilizing low-cost housing techniques in construction is cost-effective. In compared to conventional building techniques, it was found that adopting low-cost housing technologies can save 26.11 % and 22.68 % of building costs. Glass fibre reinforcement is a new precast technology, as per Fei and Dale. Glass fibre reinforced hollow wall panels with or without structural concrete are widely used in Australia, and when examined, such buildings have a high axial and shear carrying capacity.

Choudhary and Roy (2013) discussed the prospects of low-cost housing in India, observing that alternative construction materials, mainly natural materials such as straw and bamboo, as well as manmade aspects such as fly ash and cement, may have been used to build low-cost housing.

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According to Caponetto and Francis (2013), the high recyclability of natural materials that can be used in low-cost buildings, in combined effect with construction techniques ability to utilize the principle of bioclimatic architecture for living needs, allows us to create environmentally conscious and responsible buildings.

Bredenoord (2016) discussed low-income housing and building materials, concluding that long-term goals for low-cost housing and uses are feasible. Indicators on neighbourhood physical development, such as urban density and accessibility, are just as significant as community development indicators.

Tapkir et al. (2016) give an outline of low-cost housing research and analysis. Time, materials used, and methodology were three factors that influence the cost of a project, as per study. According to Salem (2000), reinforced concrete is a relatively frequent building material. However, when exposed to the maritime environment, these steels oxidise. As a result, new materials are created.

According to Ugochukwu (2015), who discussed local building materials, the problem of insufficient housing is a key obstacle to sustainable urban expansion and city development. The widespread use of recycled materials aids in the conservation, restoration, and prevention of the ecosystem. Waste management in green buildings ensures resource conservation and energy efficiency. The proximity of resources saves money and reduces pollution caused by transportation.

In a study on the sustainable use of low-cost building materials in rural areas, Jasvi and Bera (2015) found that the main challenge is to use materials in structural constituents for low-cost housing and adapting to influences such as technical, social, ecological, and physical through various products.

Taur and Devi (2009) discussed what low-cost housing is. The different components of prefabricated construction procedures for low-cost housing are highlighted by showing several prefabrication techniques and the cost savings achieved via their use. In the construction process, the foundation wall, flooring, column, and slab are all important components. Structural block walls, mortar-less block walls, precast RC planks, and ferro cement panels are the most frequent building systems.

The aggregate binder ratio of fly ash bricks was determined to be 1:4 by Huma Yun and Pasha (2015). The fly ash brick was generally 230*110*75mm in size, with a 10 to 12 m mortar joint. With a 250KN actuator and uniaxial monotonic compressive displacement loading, it was put to the test.

III. FLY ASH BRICK

Clay bricks do have poor grade than fly bricks. It reduces the dead load on the structure as it is lightweighted. They are much more eco friendly than clay bricks because the majority of the contents are ash and flies, and they are stronger.

1. Fly ash bricks are lighter than clay bricks, which make them suitable for multi-story structures. Less weight means less strain on the structure, which improves safety.

2. As fly ash bricks absorb less heat than conventional bricks, they keep your building cool even when it's warm outside, making them ideal for the Indian climate.

Fig: Fly Ash Brick

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FERRO CEMENT

Ferro-cement is a thin-walled, versatile, high-strength cement-based composite material composed of cement mortar and one or more layers of wire mesh that are closely bonded together to form a stiff structure unit with high quality, lightness, and strength. Fer ro-Cement.

CEMENT CONCRETE BLOCKS

Cement Concrete Block is a concrete masonry unit which has recently been constructed. It utilizes the concept of densification to convert a lean concrete mix into a regular-shaped, consistent, high-performance masonry unit. Cement concrete blocks are cost-effective and better replacement to burnt clay bricks because of their good durability, fire resistance, sound resistance, thermal insulation, reduction in dead load, and rapid construction speed.

COMPRESSED EARTH BRICKS:

These mud bricks have been manufactured with a lime-cement mixture. They're also known as adobe bricks, so they're light, non-toxic, and fire-resistant. Compressed earth bricks are dense, frequently used for exterior work and one of the most cost-effective building materials.

TECHNIQUES

RAT TRAP BOND

The rat trap bond is a brickwork method that uses bricks to construct a rat trap. While having the same wall thickness as a conventional brick, a hollow within the wall can be constructed. a masonry structure In a traditional English or Flemish bond, bricks are placed on the floor, but not in this one. In a Rat trap bond, they are arranged on edge to form the inner and outer surfaces of the wall. Cross bricks connect the two faces together. The major benefit of a Rat-trap relationship is that it reduces down on the number it takes to complete a task. A hole developed in the wall due to the difference in the numbers of bricks and mortar required when compared to English/Flemish bond.

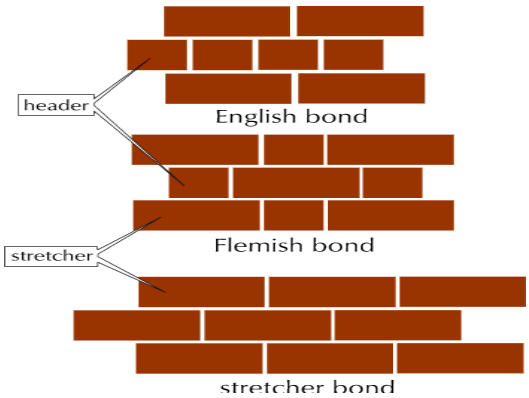

Fig. English Bond

SOLID CONCRETE AND STONE BLOCKS

This technique works well in places where cheaper stones and aggregates for the blocks are widely available. Innovative solid block techniques using both lean concrete and stones have been created for walls. The gang-mould was developed for semi-automated, rapid block production. In the manual process, single block moulds are being used, and the concrete is crushed with such a plate vibrator. With the help of a portable power screw driven egg laying type equipment, solid concrete blocks can be produced at a lower cost. At a rate of 120-150 per hour, six 30 x 20 x 5 cm blocks are cast in a single operation.

FILLER SLAB TECHNOLOGY

A filler slab is a type of reinforced cement concrete slab in which a portion of the concrete is replaced with a filler material, which can be waste, save the money compared to an RCC slab. The fundamental idea of a filler slab is that the concrete in the bottom half of an RCC slab of a certain thickness is just dead weight and does not contribute to the compression load that is usually carried by concrete in an RCC slab. As a result, this concrete can be replaced in the slab's bottom half with a suitable lightweight filler material.

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ADVANTAGES

1.Waste materials reduction.

2. This housing is ecologically friendly.

3. Affordability.

4. A temperature difference of about 5-6 degrees Celsius is present.

5. Use of cement mortar is reduced.

6. Use of bricks is reduced.

7. There are fewer beams, columns, and steel bars.

IV. CONCLUSION

1. In this basic study, as per the cost effectiveness of using low-cost housing technologies vs traditional construction methods was compared.
2. This shows the advantages and trends of implementing low-cost housing technology.
3. In order to construct affordable, innovative, and environment effective housing, it is required to consider effective cost, innovative, and environmental friendly housing technologies.
4. Low-cost technologies have many advantages like it only saves money, but also reduces CO2 emissions, saves time, and speeds up production.

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