

ENERGY-SAVING POTENTIAL OF PREFABRICATED STRAW BALE CONSTRUCTION (PSBC) FOR BUILDINGS IN INDIAN CONTEXT

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ABSTRACT

In India, straw is a very common building material. It is still in use in traditional buildings mostly found in rural part of India. Structural straw bale buildings are yet to gain any visibility in India. Straw-bale building is a method of construction that uses bales of straw as structural elements. Straw bales are environment friendly and low cost due to the availability in abundance as agricultural residues. In rural areas, availability of building materials is always an issue. Under the Pradhan Mantri Awas Yojana – Gramin (PMAY-G, or Housing for All), the world's largest housing programming for the rural poor, India aims to build 30 million houses for the rural poor for 2022—which means building five million houses every year in rural areas. Strawbales can be a viable option and can be very effectively used in building construction in rural areas due to its easy availability. The cost of conventional construction is generally quite high and thus ensuring a sizeable, habitable housing unit for the beneficiaries often becomes a challenge towards designers/policy makers. Further, a typical construction method involves lot of energy intensive materials which is neither beneficial to the environment nor acceptable to the occupants living in rural context. Thus a search for an appropriate material and techniques is always there to satisfy the local needs. In this study, a comparative analysis w.r.t cost and energy aspects is done for a model ICDS centre between conventional and strawbale structures so as to understand the effectiveness of strawbale construction.

With the increase in population and technological advancement, the energy consumption and demand of resources has gradually increased. The construction industry, by direct or indirect actions, consumes over 50% of the energy produced, is responsible for 30% of the carbon emissions, and consumes more raw material than any other industrial activity. Architecture alone cannot solve global environmental problems, but it can contribute significantly. A high recyclability rate can be achieved through the management of renewable natural materials or waste. The application of prefabricated building system can be an economical solution, saving energy and reducing waste. This paper discusses prefabricated compressed straw panels (PSBC) as part of a paradigm shift towards sustainable architecture, which offers the opportunity to use new materials and construction systems taking local and specific circumstances into account.

This paper aims to explore the possibilities of designing, estimating a typical habitable unit with strawbale and thus comparing the same with a conventional unit design in Indian context. The study will explore whether the use of straw bales in the construction in rural India is possible in order to provide low cost alternative option, environment- friendly and help in achieving sustainable development. This paper is based on the idea of a low-energy building design, this study provides an optimal combination of renewable energy sources and energy efficiency measures into the building design.

KEYWORDS: *Strawbale Buildings, PSBC, Energy Efficiency, Low-Energy Building, Cost Analysis*