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Comparative study of different building material to enhance thermal comfort

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ABSTRACT:

According to International Energy Agency it is reported that worldwide buildings consume almost 40% of energy. With growing population and improvement in living standards this energy consumption may further increase. Therefore it is important to design buildings with enhanced thermal comfort with minimum use of fossil fuel based energy. Providing thermal comfort without increasing the cost is primary requirement in building construction. Present work is a small step in this direction, presenting the study of traditional and modern building design and materials.

Present work reports the comparison of old traditional building (1960) and modern day building (2008) material. During the study observation have been taken for outside environment temperature, inside temperatures, humidity etc. Understanding heat transfer and temperature distribution through building material.

Comparative study of old Indian traditional materials such as limestone, cow dung, soil, soil pot and currently used material i.e. cement has been done. Study about these materials and climatic effect on these materials has been experimentally conducted through six cubicles constructed with size is 2.9 feet by 2.9 feet by 2.5 feet. Materials such as limestone, cement, cow-dung and soil pots were studied on the cubicles and it was found that limestone was able to give more cooling.

This study is useful from the point of view of better designing of new residential buildings and for improving the energy efficiency of the buildings. Further for future it is important to develop multilayer insulating walls which can enhance thermal comfort without increasing the size and cost of construction.

The fundamental purpose of buildings is to provide man with a comfortable working and living space, protected from the extremes of climate. In these days of fuel crisis it is important that such comforts be provided with as little expenditure of energy as possible. Traditional architecture with hundreds of years of experience behind it, has evolved appropriate building methods for each type of climate. In most cases such buildings create a very comfortable living environment without any mechanical cooling or heating. In


contrast with these, modern buildings provide a much lower degree of thermal comfort and many of these are not usable without mechanical cooling and heating. In India only a small percentage of population can afford the cost of air-conditioning, the majority lives in uncomfortable structures. The purpose of this paper is to suggest methods for ensuring thermal comfort in buildings by natural means. Many of the methods have been used in traditional buildings in India but there are some which are based on recent scientific research. Natural heating is not discussed here because the heating requirements in most parts of India are minimal.

Passive solar heating has been found to be popular in the U.S.A. and other countries because it can provide temperatures comparable to those provided by fuel based heating systems. In harsher climates solar heating reduces the need for conventional heating systems and thus saves large amount of energy. Natural cooling, on the other hand, can seldom provide the low temperatures that are possible with mechanical air-conditioning . In some cases it is necessary to supplement natural cooling with conventional air- conditioning.

The coolness of an old building on a hot summer afternoon never fails to impress the visitor and makes one wonder how the builders could creates comfortable buildings without the aid of modern scientific knowledge. Spurred on by the energy crisis, we are today accumulating a vast body of technical literature on "passive cooling systems" and yet our present-day buildings tend to be poor performers compared to the well tempered buildings. When architects talk of passive cooling, it is as if the maintenance of certain specified temperatures in a building is an end in itself. On the other hand, the indigenous builder could not care less if the building was cool or warm so long as people could be comfortable within or without the building.

And in this, the builder's task was simplified by the willingness of the building users to put up with minor inconveniences.

The indigenous buildings were either humble dwellings or monumental palaces and temples. In either case, devoted workers in adequate numbers were available to maintain the buildings. The task of the modern architect who designs not only residences but factories, offices, hotels, hospitals, commercial centers, educational institutions and places of entertainment, is a lot more complicated. Some of these new buildings have more exacting requirements than those of the older ones, while the use is strictly impersonal. However, the tools, materials and techniques available today are more than what the indigenous builders had access to. The theory of passive cooled or naturally cooled buildings is well- developed. Various techniques suggested for environmental control in modern buildings are:.

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