

A Survey Paper on Advanced Construction Techniques for Smart Eco- Building

Mr. Abhijit Sopan Mehetre

Lecturer in Civil Engineering Department, GES's Sir Dr. M. S. Gosavi Polytechnic Institute, Nashik

Abstract- Eco building is also sometimes known as "sustainable building" or "Bioclimatic building or green building, although there are minor differences in the definitions. The practice of Eco building have some merits including reduced operating costs by increasing productivity and using less energy and water, improved public and occupant health due to improved indoor air quality, and reduced environmental impacts. Bioclimatic building is an essential component of the related concepts of sustainable design, sustainable development. Low cost housing involves the construction using special type of bond like rat trap bond for brick masonry and filler slab techniques for roof slabs. The methods give a difference of 20-30 % of cost variation between the low cost house and the traditional building. Other than these methods many such new technologies are adopted to make the building rich in all aspect and economical cost wise. This paper discusses some environment friendly and low cost building techniques. The concept of bioclimatic building deals with the maximum usage of the naturally available resource in the building which will make the construction of building economical. Introducing low cost construction techniques for bioclimatic building is to provide the required durability which are available in traditional building in an economical way. The paper concludes by emphasizing the importance of low cost construction methods and consideration of the environmental aspects which leads to an economical and effective construction of a building with full efficiency.

Index terms- Eco-Building, Rat Trap Bond, Cavity Wall, Thermal insulation, Eco friendly wall, Green Roof & Greenhouse, Filler Slab

INTRODUCTION

Eco Building is the practice of growing the performance with which buildings and their web sites use and harvest energy, water, and materials, and reducing building influences on human fitness and the environment, through better sitting, design,

construction, operation, maintenance, and removal the complete constructing life cycle. Green constructing is also from time to time acknowledged as "environmental building", despite the fact that there are moderate differences within the definitions. The practice of Eco building have some merits including reduced operating costs by increasing productivity and using less energy and water, improved public and occupant health due to improved indoor air quality, and reduced environmental impacts for example, by lessening storm water runoff and the heat island effect. Low cost housing involves the construction using special type of bond like rat trap bond for brick masonry and filler slab techniques for roof slabs. The methods give a difference of 20-30 % of cost variation between the low cost house and the traditional building. Other than these methods many such new technologies are adopted to make the building rich in all aspect and economical cost wise.

OBJECTIVE

The main points to be considered while designing a bioclimatic building are

- To minimize the operating cost by increasing the productivity and using less Energy and water.
- To reduce the environmental impact on the building.
- To minimize heat gained in day time and maximize the heat loss in night time in hot season and reverse in cold season.
- To minimize the internal heat
- To select the site, according to the climatic criteria.
- To optimize the building structure.
- To control solar radiation.
- To regulate air circulation.

TECHNOLOGY FEATURES

Brick wall with 'rat-trap bond'

- Strength is equal to standard 230mm brick wall, but consumes 20% less bricks.
- The air medium this is created by the bond enables maintaining a good thermal comfort within the building.
- As the construction is appealing to the eye from both internally & externally, plastering is not necessary.
- 100 square feet (9.3 sq m) of this wall will cost only Rs. 6500/- as against the traditional 230mm wall that costs Rs. 8800/- approximately.
- The overall saving on cost of this wall compared to the traditional 230mm wall is about 26%.



Fig .1



Fig.2

ROOFING TECHNOLOGY – 'FILLER SLAB'

Consumes much less concrete and steel due to the reduced weight of the slab by way of the creation of a less-heavy, low-cost filler fabric inclusive of rejected Calicut tiles, clay pots, damaged portions of cement blocks and brick bats.

- This has stronger the thermal comfort in the building due to warmth resistant features of the filler materials.
- A best mechanism for the congested low-profits communities wherein Land is scarce, but

constructing a widespread up-stair house isn't always a financially possible option.

- The roof can serve many other purposes by using provision of space for Livelihood tasks such as drying of incense sticks, crackers, lay fish and Fishing nets which needs space can be completed in this roof.
- It completely cuts off the usage of timber for roofing, contributing to solve one of the most important environmental issues – slicing trees.
- Reduction on using concrete too saves cement & metal approximately 40%.The soffit of this slab offers an attractive look and therefore, a ceiling isn't needed. If it's far 100mm thick, 100 square feet (9.3 sq m) of this slab will cost Only Rs.15000/- as in opposition to the conventional slab that charges Rs.19000/-.
- The saving on value of this slab in comparison to the conventional slab is ready 21%.



Fig.3Tile Showing the Air Gap Used For Thermal Insulation

PASSIVE HOUSE

The term Passive house refers to the rigorous, voluntary, passive house standard for energy use in buildings. It ends up in ultra-low energy building that needs little energy for space heating. an identical standard, MINERGIE-P, is employed in Switzerland. the primary Passive house buildings were in-built Darmstadt, Germany, in 1990, and occupied the subsequent year. In September 1996 the Passive house-Institute was founded in Darmstadt to push and control the quality. Since then quite 6,000 Passive house buildings are constructed in Europe, most of them in Germany and Austria, with others in various countries world-wide. Despite the name, the quality isn't confined only to houses.

THE PASSIVE STANDARD

The Passive house standard requires that the building is within the subsequent limits:

- The building must not use quite (\leq) 15 kWh/m²a in heating Energy. the particular heat load for the heating source at design temperature must be but 10 W/m².
- With the building pressurized to 50Pa by a blower door, the building must not Leak more air than 0.6 times the house volume per hour ($n_{50} \leq 0.6/h$).
- Total primary energy consumption (primary energy for heating, quandary and Electricity) must not be quite 120 kWh/(m²a) These standards are much on top of houses built to most conventional building codes. For comparisons, see the international comparisons section below. National companions within the 'consortium for the Promotion of European Passive Houses' (PEP) is believed to possess some flexibility to conform those limits locally.

CONSTRUCTION COSTS

In Passive residence buildings, the fee savings from shelling out with the conventional heating device may be used to fund the enhance of the building envelope and the heat recovery air flow system. Evaluations have indicated that while it's far technically possible, the expenses of meeting the Passive residence standard boom notably when building in northern Scandinavia above 60° latitude.

DESIGN AND CONSTRUCTION

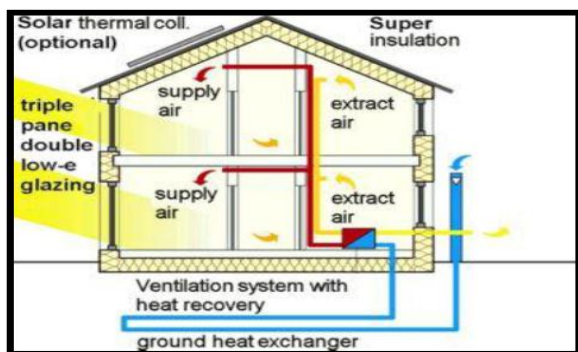


Fig.4

The Passive houses use an aggregate of low-strength building techniques and technologies. Achieving the vital lower in heating power intake required by the

same old involves a shift in technique to constructing layout and production. Design is finished with the aid of the 'Passive house Planning Package', and makes use of mainly designed pc simulations.

Passive Solar Design:

Passive homes can be made from dense or lightweight materials, but some inner thermal mass is normally incorporated to lessen summer peak temperatures, keep stable wintry climate temperatures, and save you feasible over heating in spring or autumn before ordinary sun shading turns into effective

Ventilation:

Mechanical heat restoration air flow systems, with a heat recuperation rate of over 80% and high performance ECM motors are hired to preserve air quality. Since the building is essentially airtight, the price of air change may be optimized and carefully managed at approximately 0.4 air-changes in keeping with hour. All air flow ducts are insulated and sealed for air tightness.

Superinsulation:

Passive house buildings appoint superinsulation to noticeably lessen the warmth leakage through the walls, roof and floor compared to conventional buildings. A wide variety of thermal insulation materials can be used to offer the required excessive R-values Special attention is given to getting rid of thermal bridges.

Airtightness:

The trendy calls for the constructing to achieve very high stages of air tightness, much better than are usually achieved in conventional production. Air barriers, cautious sealing of each creation joint in the constructing envelope, and sealing of all carrier penetrations thru it are all used to attain this.

CONCLUSION

- The building constructed using low cost techniques full fills the maximum efficiency which traditional building gives.
- Not only the aspect of strength and efficiency is fulfilled both the aesthetic appearance is also done economically.

- By the adoption of bio climatic building technique the healthy environment is provided for human to live safely.
- A sustainable environment will be created because of this bio climatic building.

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