

# Planning and Designing of Residential Building by using Sustainable Material with Green Building Concept

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**Abstract** - The term "Green building" is used to describe the buildings that are designed, constructed and operated to have a minimum impact on the environment both indoor and outdoor. Most discussions of green buildings refer to the importance of providing an acceptable, if not exceptional, indoor environment for the building occupants. However, these discussions of indoor environment quality have not included many specific recommendations or criteria for building design, construction or operation. Building projects described as green building demonstrations often make reference to indoor air quality, but these references are often general and qualitative. In addition, rating systems that have been developed to assess the "greenness" of a building are based largely on design features and are not particularly specific with respect to indoor air quality. This paper reviews the features of indoor air quality that are considered in green building discussions, demonstration projects, and rating systems. These green building features are discussed in terms of their completeness and specificity, and are compared to other guidance on building design, construction, and operation for good indoor air quality.

**Key Words:** Green building, Filler Slab, Stabilized Mud Block, Engineered Wood, Mud Plaster, Mosaic Flooring

## 1. INTRODUCTION

The renovation of an existing building or construction of a new one includes different choices. These choices have a big impact on the health and comfort of the occupants using the building, construction costs, community and environment. The healthier and sustainable choices, especially in the way building uses energy, water, materials and its site is achieved by green building.

The project deals with the sustainable materials used for the planning and designing of residential building by green building concepts. Green materials are locally available and renewable materials. Local materials often are unique to the place and connect whatever people make within an area or region. Materials from the ground such as clay, sand and stone are green materials as they are found underfoot. Plant materials such as grasses, wood and bamboo are also materials that have been used by humans since they started buildings. Plant materials that grow quickly are for the most part renewable. Reclaimed materials are materials that can be reused in their existing form for new purposes. Reclaimed

materials are green in the sense that they can be repurposed and reused. Recyclable materials are materials that can move from being waste materials to being reused through reprocessing or repurposing.

Green materials today are defined as materials that are non-toxic, improve occupancy health, conserve energy and water use and waste products. Non-toxic materials do not cause harm to environment, to the users of the materials or to the producers of the material. Green materials are also the materials that have low embedded energy in their harvesting or collection, production, transportation and use. Green building brings together a vast array of practices, techniques and skills to reduce and ultimately eliminate the impacts of buildings on the environment and human health. It often emphasizes taking an advantage of renewable resources, e.g., using sunlight through passive solar, active solar and photo voltaic equipment and using plants and trees through green roofs, rain gardens and reduction of rain water runoff.

### 1.1 Objectives

The aim of sustainable buildings is to develop an interdisciplinary platform for the dissemination of knowledge and practice on the engineering and technical issues concerning all aspects of building design, technology, energy and environmental performance.

The main objectives of this project are:

- Identify the design technique for Green Buildings.
- Modify the structure and make it environmental friendly.
- Using water, energy and other resources efficiently.
- Reduces waste, pollution, and environmental degradation.
- Reduction of heat island effects.
- Increase indoor air quality.

## 2 LITERATURE REVIEW

**Patel Jatin** and **Neetu Yadav**, in their research paper "Design techniques of green building". They identify the design technique for green building and gives design techniques for green building via case study on centre for Environmental science and Engineering Building IIT, Kanpur, India. Their concern to attempt it in the direction to make

people, communities and general for creating awareness of GRIHA. The MNRE formed a GRIHA secretaries. They were assigned with a task of performing training sessions and awareness programs throughout the country. In one of the scheme launched by MNRE the GRIHA registration fee for first 100 government buildings where relinquish. MNRE also provide subsidies for building which adopted the renewable energy technologies, because of which the awareness of GRIHA has risen in the building sectors since 2007.

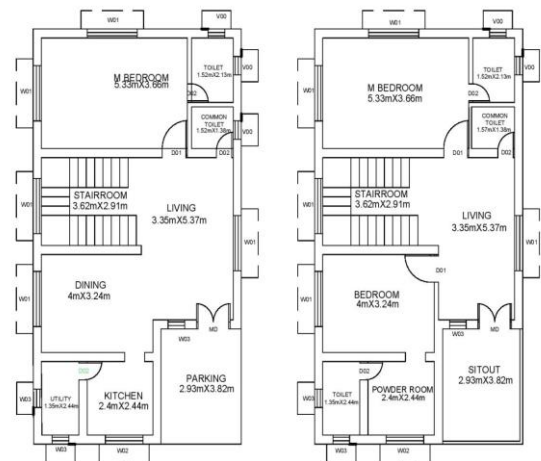
**Ries et al. (2006)** in their study of economic benefits of green building pointed, "One technique that is still developing is the conservation of clean hot or cold air. The California Academy of Sciences building has vents that open on the domes to let out hot air as well as motorized windows to let in cool air (Green building incorporates). While this can control the temperature in a building efficiently, air quality is just as important, since, on average, people spend 80-90% of their time in buildings. There is a constant battle between keeping a constant temperature while using the least amount of energy and keeping the air fresh". Most home heating and air conditioning systems advertise providing accurate temperature control as well as filtering mould, moisture, dust, and pollen. There is not yet technology that can meet the same standards while using much less energy.

According to **Ali and Al Nsairat (2009)**, green building is deemed necessary to fulfill the fundamental building code terms and reduce its life cycle environmental impact. The decision in selecting an appropriate green building rating tool is highly important and the selection has to lean on the climate and various characteristics of that particular country's agenda.

**Centre of Environmental Sciences & Engineering Building (CESE), IIT, Kanpur, India.** The CESE is a 5 star green rating building by GRIHA(India) & Research facility at IIT, Kanpur on a plot area of 175,000 Sqm. It has been designed in an environmentally friendly manner and constructed as "building in the garden" that is sustainable. Buildings account for more than 40% of all global carbon emission, one of the main culprits implicated in the phenomenon of global warming in which India comes on 144th position (1.4 metric ton) in carbon emission rating in the world. Green Building is the practice of constructing or modifying structures to be environmentally responsible, Sustainable & resource-efficient throughout their life cycle. This includes efficiently using energy, water and other natural resources, protecting occupant health, improving employee productivity reducing waste, pollution and environmental degradation.

### 3 PROPOSED PLAN OF GREEN HOUSE BUILDING

The proposed building is located in Bhatkal and it is well planned to fit the climatic characteristics of this region. The above planning shows different units of green building and it is planned for a total of six residents. The building has two floors with different units.

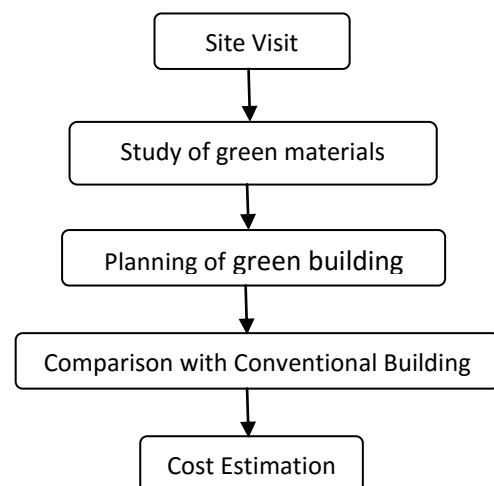


**Fig -1: Ground Floor and First Floor Plan**

Planning, designing and execution are the three main steps included in building projects. Planning is the most important aspects of construction management, it means "looking ahead". This is the mental process requiring the use of intellectual facilities, imagination, foresight and sound judgments to decide in advance as what is to be done, how and where is to be done, who will do it and how the results are evaluated. Planning is therefore a course of action to achieve the design results. Past, present and future failures are taken into consideration. The present needs and future utilities are given due weight ages in the planning process.

### 4. METHODOLOGY

The systematic approach followed during the project consisted of the following steps:



**Fig -2: Process Flowchart**

#### 4.1 Materials used

The following materials are adopted for the construction of green building

- Mosaic Flooring
- Stabilized Mud Blocks
- Low-Emittance glazed windows
- FRP frames for windows and doors
- Bison Panels for doors
- Filler Slab as a roofing material
- Mud Plaster

**5. ADVANTAGES**

- It aims to minimize the environmental impact associated with all life-cycles
- Shading the roof with trees offers an eco-friendly alternative to air conditioning
- Lower operating cost by 30-40%
- It helps in reducing power consumption
- It improves occupant health
- It reduces environmental pollution
- It also reduces water usage
- It is probable to reuse resources.

**6. RESULTS AND DISCUSSIONS**

**6.1 Energy consumption**

**Table-1: Energy consumption for Conventional building**

| Sl.no | Particulars  | Units | Quantity | Energy required in MJ |
|-------|--------------|-------|----------|-----------------------|
| 01    | Cement       | Bags  | 547      | 159998                |
| 02    | Burnt bricks | No's  | 5859     | 24901                 |

**Table-2: Energy consumption for green building**

| Sl.no | Particulars | Units | Quantity | Energy required in MJ |
|-------|-------------|-------|----------|-----------------------|
| 01    | Cement      | Bags  | 349      | 102083                |
| 02    | SMB         | No's  | 9374     | 24372                 |

Energy saved by using SMB = 24901-24372  
= 529 MJ

Energy saved in cement consumption  
= 159998-102083  
= 57915 MJ

**6.2 Cost comparison**

**Table-3: cost comparison**

| Sl.no | Type of building      | Amount in INR |
|-------|-----------------------|---------------|
| 01    | Green building        | 2076000       |
| 01    | Conventional building | 2581000       |

Total cost saved = 2581000-2076000  
= 505000 Rs

**7. CONCLUSION**

With the convergence of urbanization, globalization and rapidly changing and expanding economy, using these energy materials will help the world as well as India in satisfying the shortage of building materials and also environmental degradation. Green building will also provide tangible and significant return on investment to contractors, architects and building owners.

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