

Green Buildings for Environmental Protection

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Abstract— *Promotion of green building construction is required to reduce the greenhouse gas emissions and to tackle global warming. The construction of green building is done by incorporating environmental considerations into every stage of the building construction. It deals with construction, operation and maintenance phases of building. The aim of a green building design is to save energy and water by adopting green techniques. The design of building also play an important role in the construction of green buildings. This paper is dealt with the concepts involved in the construction of green buildings.*

Keywords— *construction, design, energy, green building, techniques.*

I. INTRODUCTION

The idea of sustainable construction is gaining popularity in India and a lot of initiatives for green buildings are coming up. The term “Green Building” applies to construction strategies, construction practices, building design and promotes health and well-being of the family. Building construction uses 40% of natural resources and consumes virtually 70% of electricity and 12% of potable water and produces waste 45% and 65% to be disposed in our landfills. They are also responsible for a 30% of greenhouse gas emissions due to their operation, and an additional 18% induced indirectly by materials. Hence efficiency is reduced due to the bad quality of indoor environments which result in health issues to employees in residential and office buildings (C S Singh, 2018).

Green buildings are known as sustainable buildings or high performance building. Sustainable constructions refer to the methods followed for the design and development of a project which will give very less negative impacts on the environment as possible. As per EPA,2014, green building also deals with establishing and employing healthier and more resource-efficient prototypes of construction, renovation, operation, maintenance, and demolition. Hence sustainable construction is gaining popularity throughout the world. Green buildings are intended to be sustainable and reduce the environment impacts of the construction activities (H M Abualrejal, 2017).

Green urban area infrastructure leads to multi dimensional and functional benefits in terms of ideal ecosystems and healthy environment along with providing wide range of environmental, social, climate change adaptation and mitigation, and biodiversity benefits.

Benefits of Green New Buildings are both tangible and intangible. The most tangible benefits are the reduction in water and energy consumption right from day one of occupancy. The energy savings could range from 20 - 30 % and water savings around 30 - 50%. The intangible benefits of green new buildings include protection of biodiversity, improvement in air and water quality, health & well-being of the occupants, safety benefits and conservation of scarce national resources. The intangible social benefits include occupant comfort, health and consequent productivity, and improvement of overall quality of life (D Tathaghat & R D Dod, 2015).

The following parameters are concentrated in green building construction.

Energy efficiency

Energy efficiency can be achieved by reducing heating, cooling, and lighting requirements through orientation of the building site and climate attributes. A careful window selection, building envelope air sealing, duct sealing, use of solar powered heating/cooling systems will contribute towards an energy efficient building. To achieve energy efficiency, renewable energy sources can be used. Also incorporate day lighting, solar thermal (hot water) and photo volts, and geothermal heating and cooling. Employing sensors which can control loads based on occupancy can increase energy efficiency (C S Singh, 2018). Lighting accounts for 4% of energy consumption in houses and up to 30% of energy use in commercial buildings. Smart meters consisting of sensors which can turn off lights when there are no people around are being promoted as good practice to reduce energy use in buildings. Proper insulation can be done to avoid leaks thus increasing energy efficiency. LED and CFL lamps can be used which consume less energy and last longer.

Water efficiency

Implementing more efficient water delivery system indoors and water retaining and drought resistant landscaping selections outdoors can aid preventing unnecessary waste of valuable water resources. Rain water harvesting systems can be installed to achieve water efficiency.

Green building materials

Building materials have to be selected appropriately based on the environmental impacts, life cycle cost and waste reduction (H M Abualrejal, 2017). Also, these materials should not cause much destruction to the environment. The materials should be selected which are available in the locality, having minimum environmental impact and which can be

reused or recycled at a later stage. Reducing the number of material components in products as well as separating natural from synthetic material allows higher rates of recyclability and reuse [M Y Laeeq et.al,2017). It would be desirable to use material for construction which are ecofriendly and environmentally compatible along with materials from recycled and reuse of waste like the waste from old plumbing, doors etc.

Sustainable building design

The building design has to be done in such a way that ventilation is controlled, which allows air movement in and out of the buildings to provide fresh air and maintain the indoor temperature in comfortable surroundings (H M Abualrejal, 2017). Sustainable building methods include incorporation of small connected sensors can integrate with automated building systems to improve the sustainability of operations.

The green techniques normally used to reduce building impact are given in Table.1.

Table.1. Green Techniques and their advantages

Sl.No	Techniques	Advantages
1	Insulated wall	Reduces the energy usage
2	Cool Roof	The reflection of sunlight by the roof decreases energy usage
3	Energy efficient windows	Prevents energy loss
4	Green cement	Environment friendly and reduces the carbon footprint of cement production.
5	Sustainable concrete	Reduce the emission of carbon dioxide
6	Fly ash bricks	Eco friendly having low energy consumption
7	Transparent roof	Optimum use of natural light can cut down energy usage.
8	Green roof	Acts as a natural insulation
9	Solar Cell	Alternate energy source
10	Grey water management	Reduced use of fresh water
11	Sustainable building materials	Usage of fly ash, recycled materials, green roofing products, porous pavement blocks.
12	Replacement of lamps	Usage of LED, CFL etc can cut down energy usage
13	Sustainable waste disposal	Protection of environment and health of people.

ENERGY AUDITS

Energy audits of buildings are the most effective tool to promote energy retrofitting measures for existing buildings, which are major consumers of energy in cities. Energy audits have multiple goals, including reducing energy consumption, managing costs, and environmental impact. An energy audit is a comprehensive evaluation and analysis of a building's current energy use. The audit gives an idea to identify the most economical and energy-saving opportunities. It consists of an inspection, energy survey and analysis. A proper audit can give the benefits of financial and energy savings and increased occupant comfort. It contributes to improve the building sustainability and more environment efficient.

RATING SYSTEM IN INDIA

To check whether a building is green is based on rating systems. In India, three rating systems are commonly adopted.

- a) Green Rating for Integrated Habitat Assessment (GRIHA)- Introduced by TERI and adopted by the Govt. of India as the National Green Building Rating System for the country. The aim of GRIHA is to convert all kinds of buildings into green buildings. It gives emphasis on local and traditional construction knowledge.
- b) Bureau of Energy Efficiency (BEE) - The Indian Bureau of Energy Efficiency (BEE) had launched the Energy conservation Building Code (ECBC) on February 2007. The code is set for energy efficiency standards for design and construction with any building of minimum conditioned area of 1000 m² and a connected demand of power of 500 KW or 600 KVA. Accordingly, any buildings that fall under the energy performance index from 90 KWh/m²/year to 200 KWh/m²/year where can be termed as "ECBC Compliant Building"(A S Pawar, 2012).
- c) The Indian Green Building Council (IGBC) -It has launched 'IGBC Green New Buildings rating system to address the national priorities. This rating programme is a tool which enables the designer to apply green concepts and reduce environmental impacts that are measurable. The rating programme covers methodologies to cover diverse climatic zones and changing lifestyles

By adopting this rating programme, green new buildings can save potable water to an extent of 30 - 50%. The rating system intends to address this by encouraging buildings to segregate the building waste. The energy savings that can be realised by adopting this rating programme can be to the tune of 20 - 30%. The rating system encourages the use of alternate fuel vehicles for transportation. The rating system encourages projects to use recycled & reused material and discourages the use of virgin materials. The rating system ensures adequate ventilation, daylight and occupant well-being facilities which are essential in a building. The rating system also recognizes measures to minimize indoor air pollutants. The rating system consists of Sustainable site planning, Water management, Energy optimization, Sustainable building materials, Waste management, Health and well being and Innovation (H Kumar & V Sahu, 2015).

CONCLUSION

Green buildings are becoming increasingly popular worldwide because it is environmental friendly and saves energy, water and reduces pollution. Green buildings are ways to sustainable future. Careful selection of eco-friendly sustainable building materials having minimum environmental burdens is useful for the construction of green buildings. More research need to be done for finding new designs for saving water and energy and also in terms of eco friendly construction materials. Practicing policies/ regulations for approval of plan of buildings can lead to green building construction.

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