GREEN BUILDING: AN INNOVATION OVER THE CONVENTIONAL CONSTRUCTION PRACTICES

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ABSTRACT

A green building is an outcome of a design philosophy which focuses on increasing the efficiency of resource use i.e. energy, water and materials. Many countries have developed their own standards for green building or energy efficiency for buildings. A recent survey by the World Business Council for sustainable development finds that green costs are overestimated by 300 percent, as key players in real estate and construction estimate the additional cost at 17 percent above conventional construction, more than triple the true average cost difference of about 5 percent. Green building is interpreted in many different ways, a common opinion is that they bring together a vast array of practice and techniques to reduce and ultimately eliminate the impacts of buildings on human health and the natural environment. This Paper Describe some concepts of green building which should be used as construction practices to make building green.

KEYWORDS: Green Building, Effectiveness, Efficiency, Energy.

Green building (also known as green construction or sustainable building) refers to a structure and using process that is environmentally responsible and resource-efficient throughout a building's life-cycle: from siting to design, construction, operation, maintenance, renovation, and demolition. This requires close cooperation of the design team, the architects, the engineers, and the client at all project stages. The Green Building practice expands and complements the classical building design concerns of economy, utility, durability, and comfort.

Although new technologies are constantly being developed to complement current practices in creating greener structures, the common objective is that green buildings are designed to reduce the overall impact of the built environment on human health and the natural environment by:

- Efficiently using energy, water, and other resources.
- Protecting occupant health and improving employee productivity
- Reducing waste, pollution and environmental degradation

A similar concept is natural building, which is usually on a smaller scale and tends to focus on the use of natural materials that are available locally. Other related topics include sustainable design and green architecture. Sustainability may be defined as meeting the needs of present generations without compromising the ability of future generations to meet their needs. Although some green building programs don't address the issue of the retrofitting existing homes, others do. Green construction principles can easily be applied to retrofit work as well as new construction.

A 2009 report by the U.S. General Services Administration found 12 sustainably designed buildings cost less to operate and have excellent energy performance. In addition, occupants were more satisfied with the overall building than those in typical commercial buildings.

OBJECTIVES & SCOPES OF GREEN BUILDINGS

The concept of sustainable development can be traced to the energy (especially fossil oil) crisis and the environment pollution concern in the 1970s. The green building movement in the U.S. originated from the need and desire for more energy efficient and environmentally friendly construction practices. There are a number of motives for building green, including environmental, economic, and social benefits. However, modern sustainability initiatives call for an integrated and synergistic design to both new construction and in the retrofitting of existing structures. Also known as sustainable design, this approach integrates the building life-cycle with each green practice employed with a design-purpose to create a synergy among the practices used.

There are several key steps in designing sustainable buildings. The practices, or technologies, employed in green building are constantly evolving and may differ from region to region, fundamental principles persist from which the method is derived:

1. Life cycle assessment (LCA)

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2. Siting and structure design efficiency
3. Energy efficiency
4. Water efficiency
5. Material efficiency
6. Indoor environment quality enhancement
7. Operation & maintenance
8. Waste reduction

Life Cycle Assessment (LCA)

A life cycle assessment (LCA) can help avoid a narrow outlook on environmental, social and economic concerns by assessing a full range of impacts associated with all cradle-to-grave stages of a process: from extraction of raw materials through materials processing, manufacture, distribution, use, repair and maintenance, and disposal or recycling. Impacts taken into account include (among others) embodied energy, global warming potential, resource use, air pollution, water pollution, and waste.

Siting and Structure Design Efficiency

The foundation of any construction project is rooted in the concept and design stages. The concept stage, in fact, is one of the major steps in a project life cycle, as it has the largest impact on cost and performance. In designing environmentally optimal buildings, the objective is to minimize the total environmental impact associated with all life-cycle stages of the building project. However, building as a process is not as streamlined as an industrial process, and varies from one building to the other, never repeating itself identically.

Energy Efficiency

Green buildings often include measures to reduce energy consumption – both the embodied energy required to extract, process, transport and install building materials and operating energy to provide services such as heating and power for equipment.

As high-performance buildings use less operating energy, embodied energy has assumed much greater importance – and may make up as much as 30% of the overall life cycle energy consumption.

Water Efficiency

Reducing water consumption and protecting water quality are key objectives in sustainable building. One critical issue of water consumption is that in many areas, the demands on the supplying aquifer exceed its ability to replenish itself. To the maximum extent feasible, facilities should increase their dependence on water that is collected, used, purified, and reused on-site.

Materials Efficiency

Building materials typically considered to be 'green' include lumber from forests that have been certified to a third-party forest standard, rapidly renewable plant materials like bamboo and straw, dimension, recycled stone, recycled metal, and other products that are non-toxic, reusable, renewable, and/or recyclable.The EPA (Environmental Protection Agency) also suggests using recycled industrial goods, such as coal combustion products, foundry sand, and demolition debris in construction projects

Indoor Environmental Quality Enhancement

The Indoor Environmental Quality (IEQ) category in LEED standards, one of the five environmental categories, was created to provide comfort, well-being, and productivity of occupants. The LEED IEQ category addresses design and construction guidelines especially: indoor air quality (IAQ), thermal quality, and lighting quality.

Operations And Maintenance Optimization

No matter how sustainable a building may have been in its design and construction, it can only remain so if it is operated responsibly and maintained properly. Ensuring operations and maintenance (O&M) personnel are part of the project's planning and development process will help retain the green criteria designed at the onset of the project.

Waste Reduction

Green architecture also seeks to reduce waste of energy, water and Construction materials used during construction. For example, in California nearly 60% of the state's waste comes from commercial buildings. During the construction phase, one goal should be to reduce the amount of material going to landfills. Well-designed buildings also help reduce the amount of waste generated by the occupants as well, by providing on-site solutions such as compost bins to reduce matter going to landfills.

METHODOLOGY

Components Of Green Building

1. Solar panels

2. Rainwater harvesting

3. Windmill

4. Glass

5. Solid waste

6. Toilet flush

7. Lights

8. Paints.

9. construction Material

Solar Panels

A solar panel is a set of solar photovoltaic modules electrically connected and mounted on a supporting structure. A photovoltaic system typically includes a panel or an array of solar modules, an inverter, and sometimes a battery and or solar tracker and interconnection wiring.

Types of Solar panel

1. Crystalline
2. Concentrating
3. Thin-film

Rainwater Harvesting

Rain water harvesting is the activity of direct collection of rainwater. The water collected can be used for direct use or recharge into ground water. Rain water can be harvested from rooftops, paved & semi paved areas & storm water drains.

Benefits: 1. Takes of pressure from municipal water supply

2. It provides a measure of independence to water users.

Wind Mill

A windmill is a machine that converts the energy of wind into rotational energy by means of vanes called sails. Originally, windmills were developed for milling grain for food production. In the course of history, the windmill machinery was adapted to many other industrial uses. An important non-milling use is to pump water, either for land drainage or to extract groundwater.

Glass

In green buildings, glass seems to be the prime material for visually appealing buildings but follows environmental friendly features in every nook and corner.

Types of glass

I. Premium Clear Glass

For orders without concerns about damage or exposure to UV radiation or a distracting reflection, use Premium Clear Glass. This is the most basic and economical glass choice.

II. UV Glass

To protect your artwork from ultraviolet radiation, use UV Glass. UV glass will filter approximately 98% of damaging UV radiation. Exposure to UV radiation will cause fading colors, yellowing, and brittleness in your art work. These effects are permanent changes.

III. Non Glare Glass

When dealing with annoying reflections, the use of Non Glare Glass is ideal. Non Glare Glass works by diffusing light. However by diffusing light, resolution is also diffused.

IV. UV Non Glare Glass

When concerned with reflection and protection from damaging ultraviolet radiation, use UV Non Glare Glass. The Non Glare will diffuse the glare, while the UV protection will filter approximately 98% of UV radiation.

V. Anti-reflective Glass

To enhance clarity of your framed work and to eliminate most reflection, use Antireflective Glass. It is preferred for large windows. Anti-reflective Glass will reduce UV radiation by approximately 75 percent.

VI. Museum Glass

The highest UV rated anti-reflective coated glass available to preserve your artwork is Museum Glass. The UV protection will filter approximately 98% of damaging UV radiation.

Solid Waste

Use composting to reduce waste & help your garden at same time, most food scraps & biodegradable material produces nutrient rich fertilizer.

Lights

Use Compact Fluorescent Light's (CFL's), LED'S & Motion detector lights can be used to reduce energy use, Energy efficient appliances reduce power use along with Natural light.

Toilet Flush

Use dual flush toilet since dual flush toilet uses two buttons or handles to flush different levels of water.

Paints

Use non-toxic paints as they use water instead of petroleum based solvent & do not produces smog producing pollutants

Construction Material

These material are generally obtained from natural or recycle products which help in making green building**.**

I. Building material from agricultural waste

Ex: Rice husk, Bagasse board

Use: carpentry, panelling & other interior works

II. Building materials from industrial waste

Ex: Fly ash bricks, Gypsum

Use: masonry blocks, cement, concrete, boards as finish for walls & ceiling

III. Materials with recycled content

Ex: Aluminium , Steel

Use: structure, finishing.

IV. Salvaged products

Ex: Bricks, Tiles

Use: masonry, paving, structures

V. Materials & products that are locally available

Ex: Laterite stone

Use: Masonry

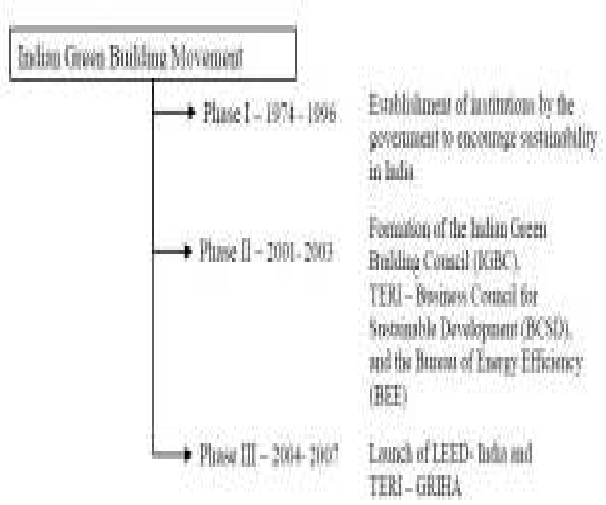
VI. Rapidly renewable materials

Ex: Bamboo

Use: flooring, scaffolding, interior.

HISTORY OF GREEN BUILDING IN INDIA

The Indian green building movement can be mainly associated with the government initiatives to encourage sustainability in the society and the acceptance of the green building guidelines by the corporate sector (Bhatnagar 1999). Unlike U.S., where the government policies were based on the public pressure through the environmental movements, major policy decisions by the Indian government were in response to the international events such as the OPEC oil embargo, the Brundtland Commission.



DATA AND RESULTS

- First 3 Platinum buildings monitored to Validate tangible benefits.
- Benefits far Exceeding the initial estimates.

Table 5.1: Benefits Experienced In Green Buildings

Building	Sq.ft	Normal Building (kWh)	Actual Building (kWh)	% Reduction	Annual Energy Savings (Rs in Lakhs)
Wipro	1,75,000	48,00,000	31,00,000	40%	102
ITC	1,70,000	35,00,000	20,00,000	45%	90
CII Godrej GBC	20,000	3,50,000	1,30,000	63%	9

❖ 1.275 Billion sq.ft so far

Table 5.2: Green Building Resulting In Significant Benefits

Environmental Benefit Category	Annual Benefits Per Million Sq.ft
Carbon dioxide reduction	12,000 Tons
Energy savings	15,000 MWh

Table 5.3 Performance Monitoring

Type of Building	Average Energy Savings over Conventional Buildings (%)	Average Water Savings over Conventional Buildings (%)
Corporate offices	47%	60%
Tech Parks	27%	50%
Hotels	35%	45%
Hospitals	33%	35%
Educational Institutions	39%	40%

Note : Data Collected from 40 IGBC Rated Green Buildings

Table 5.4 What Green Buildings Did Differently

Feature	Conventional Building	Green Building
Electrical Demand (1 Mn sq.ft)	8-10 MW	6-7 MW
Lighting Power Density (watts/sq.ft)	1.5-2.0	0.6-0.8
Equipment Power Density (watts/sq.ft)	2.5-3.0	1.5-2.0

Table 5.5 Cost of Green Buildings – Indian Experiences

Building	Year Awarded	Built-in-Area (sq.ft)	Rating Achieved	% increase in cost	Payback (Yrs)
CII-Godrej GBC, Hyderabad	2003	20,000	Platinum	18%	7 years
ITC Green Centre, Gurgaon	2004	1,70,000	Platinum	15%	6 years
Wipro,Gurgaon	2005	1,75,000	Platinum	8%	5 years
Technopolis, Kolkata	2006	72,000	Gold	6%	3 years
Spectral Services Consultants Office, Noida	2007	15,000	Platinum	8%	4 years
Kalpataru Square	2008	3,00,000	Platinum	2%	2 years
Suzlon One Earth, Pune	2010	8,00,000	Platinum	2%	2 years

PERFORMANCE OF GREEN BUILDINGS

1. Maximizes the utilization efficiency of the resources, also maximizes reuse & recycling.
2. Maximizes the use of efficient building materials & construction practices.
3. Uses efficient equipment to meet its lighting, air conditioning & other needs.
4. Maximizes the use of renewable source of energy.
5. Provides comfortable & hygienic indoor working conditions.
6. Uses efficient waste & water management practices.

CONCLUSION

Green buildings are not those buildings which are green in color but, they are buildings which are constructed with low cost and efficient use of energy available in the local surroundings. So that it may not affect the environment and the living beings in the society. Its demonstrable benefits exist in many projects. Its life cycle benefits must be considered to justify higher first costs. Expedited permits and tax incentives are straightforward and can be effective when well designed.

The need for sustainable development in construction sector has become significant in the last decade mostly due to major resource consumption and contamination buildings generate. Green building has the potential to minimize thenegative impact on the environment and offer business and occupant health related benefits.

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