LEED RATING IN BUILDINGS

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Abstract - Buildings and homes (or the "built environment") affects natural environment. Buildings, where people spend 90% of their time, adversely impact human health. Buildings also account for 40% of energy and 16% of the water used annually worldwide. Air quality inside buildings is 2 to 5 times worse than outside Green Building involves minimizing these negative environmental and human health impacts and enhancing positive results throughout the building's entire life cycle. In addition to environmental benefits, through integrated design, they can be constructed at the same or lower cost than conventional buildings.

Keywords - Green buildings, LEED, energy, eco friendly material

I. INTRODUCTION

Green is not just a colour! It is much more than the colour. Green symbolizes environment friendly practices in all facets of human Endeavour. **"Green"** is the voluntary pursuit of any activity, which encompasses concern for energy efficiency, environment, water conservation, use of recycled products and renewable energy.

What is a Green Building?
A Green Building is one, which incorporates several Green features. The appearance of a Green Building will be similar to any other building. However, the difference is in the approach, which revolves round a concern for extending the life span of natural resources; provide human comfort, safety and productivity.
This approach results in reduction in operating costs like energy and water, besides several intangible benefits.

Some of the salient features of a Green Building are:

- Minimal disturbance to landscapes and site condition
- Use of Recycled and Environmental Friendly Building Materials
- Use of Non-Toxic and recycled/recyclable Materials
- Efficient use of Water and Water Recycling
- Use of Energy Efficient and Eco-Friendly Equipment
- Use of Renewable Energy
- Quality of Indoor Air Quality for Human Safety and Comfort
- Effective Controls and Building Management Systems

'A Green building should create delight when entered, serenity and health when occupied and regret when departed' – Perhaps this is one of the most inspiring definitions of a Green building, articulated in the book 'Natural Capitalism'. The concept of green buildings is not as nascent as we think it is. For example, our own ancestors worshipped the five elements of nature - Earth as 'Prithvi, Water as "Jal', Agni as 'Energy', Air as 'Vayu', and Sky as 'Akash'. Today through the LEED (Leadership in Energy & Environmental Leadership) green building rating system, we are rediscovering the Indian ethos.

The Green building movement has gained tremendous momentum during the past 3-4 years, since the CII- Godrej GBC embarked on achieving the prestigious LEED rating for its own centre at Hyderabad. The Platinum rating awarded for this building sparked off considerable enthusiasm in the country. From a humble beginning of 20,000 sq.ft of green footprint in the country in the year 2003, to a staggering 10 million sq.ft expected by end 2008, green buildings are well poised to reach scalar heights. Today a variety of green building projects are coming up in the country – residential complexes, exhibition centers, hospitals, educational institutions, laboratories, IT parks, airports, government buildings and corporate offices

Fig 1: Growth of Green Building in India

Benefits of Green Buildings
A Green Building can have tremendous benefits, both tangible and intangible.
The immediate and most tangible benefit is in the reduction in operating energy and water costs right from day one during the entire life cycle of the building. The savings could range from 25 – 40 % depending on the extent of green specifications. Other tangible savings would be reduction in first costs and enhanced asset value. Intangible benefits of Green Buildings include increasing productivity of occupants', health, safety benefits and a green corporate image. Several Corporates are now seeing Green Building Rating as a tool to enhance marketability. The benefits to green building are manifold, and may be categorized along three fronts: environmental, economic, and social.

Environmental Benefits

- Emissions Reduction. Pollutants released by fossil fuel fired electricity contribute to global climate change, cause air quality issues such as acid rain and smog, and pose risks to human health. Green building techniques like solar powering, daylighting, and facilitation of public transport increase energy efficiency and reduce harmful emissions.
- Water Conservation. Recycling rainwater and greywater for purposes like urinal flow and irrigation can preserve potable water and yield significant water savings.
- Stormwater Management. Stormwater runoff can cause waterway erosion, flooding, and carry pollutants into water sources. Harvesting and redirecting stormwater, building surfaces with permeable materials, and using green roofs can control and utilize overflow.
- Temperature Moderation. The heat retention properties of tall buildings and urban materials such as concrete and asphalt are the primary causes of urban heat island effect. These conditions may be offset by conscientious building design and site selection, as well as planting trees to accompany new developments.
- Waste Reduction. Construction and demolition generates a huge portion of solid waste in the United States. Building deconstruction as an alternative to full-scale demolition results in massive decreases of waste production.

Economic Benefits

A common impression about green building is that the green premium is too expensive to be considered economically feasible. However, studies have shown that the costs of green buildings are not substantially higher than regular development projects. Higher construction costs can generally be avoided by the inclusion of green design from the outset of the project. Additionally, green buildings provide an assortment of economic advantages.

- Energy and Water Savings. The resource efficiency provided by green design and technology leads to drastic reductions in operation costs that quickly recoup any additional project costs and continue to offer dramatic long-term savings Money previously directed toward utility costs may be used for other purposes.
- Increased Property Values. With energy costs on the rise, the low operating costs and easy maintenance of green buildings make for lower vacancy rates and higher property values.
- Decreased Infrastructure Strain. Efficient buildings exert less demand on the local power grid and water supply, stretching the capacity of local infrastructure.
- Improved Employee Attendance. Green design emphasizes increased natural lighting and control of ventilation and temperature-attributes that improve employee health and prevent absences. The U.S. Environmental Protection Agency reports major reductions in health care costs and work losses resulting from commonly recommended improvements to indoor environments .
- Increased Employee Productivity. Employee productivity has been positively correlated to indoor environmental conditions, and shows improvements where green principles have been applied .
- Sales Improvements. Studies show better sales in stores that utilize natural light. Retailers are increasingly using daylighting in an effort to harvest the associated sales benefits.
- Development of Local Talent Pool. With increased attention being paid to global climate change and the need for renewable energy sources, the field of building design and construction is moving toward sustainability as a permanent objective. As of July 2007, 23 states and more than 80 cities have legislated green standards for municipal buildings. Building green in Bloomington is an investment in the local economy, helping to foster a local talent pool: designers and builders experienced with green projects able to accommodate the growing market demand for sustainable development.

Social Benefits

- Improved Health. Poor indoor environmental quality (IEQ) resulting from insufficient air circulation, poor lighting, mold build up, temperature variances, carpeting and furniture materials, pesticides, toxic adhesives and paints, and high concentration of pollutants (typically 10 to 100 times higher than outdoors) contribute widely to respiratory problems, allergies, nausea, headaches, and skin rashes. Green building emphasizes ventilation and non-toxic, low emitting materials that create healthier and more comfortable living and working environments.
- Healthier Lifestyles and Recreation. A key element of sustainable design is the preservation of natural environments, which afford a variety of recreation and exercise opportunities. Green buildings also seek to facilitate alternatives to driving, such as bicycling and public transport, which eases local traffic while encouraging personal health and fitness.

Green Building Council

To facilitate Green Building construction in India and steer and guide building activities, CII – Godrej GBC, has taken a “Green” step forward, and has formed a separate National level council called the “Indian Green Building Council.”

What is LEED?

The U.S. Green Building Council , a nonprofit organization composed of leaders from all sectors of the building industry, works to promote "buildings that are environmentally responsible, profitable and healthy places to live and work." The USGBC developed the Leadership in Energy and Environmental Design (LEED) system in 1999 and is the organization responsible for awarding LEED certification.

According to the USGBC website, the LEED Green Building Rating System is "the nationally accepted benchmark for the design, construction, and operation of high performance green buildings. LEED gives building owners and operators the tools they need to have an immediate and measurable impact on their buildings' performance. LEED promotes a whole-building approach to sustainability by recognizing performance in five key areas of human and environmental health: sustainable site development, water savings, energy efficiency, materials selection, and indoor environmental quality."

Specific LEED rating programs exist for the following:

- New Commercial Construction and Major Renovation projects
- Guidelines for Multiple Buildings and On-Campus Building Projects
- Existing Building Operations and Maintenance •
- Commercial Interiors projects
- Core and Shell development projects
- Homes
- Neighborhood Development
- Schools
- Retail
- LEED for Health Care is currently under development.

In the LEED certification process, projects are awarded points according to achievements within certain sustainability categories. Depending on points achieved, projects are rated one of four levels of LEED Certification:

- Certified (26-32 points)
- Silver (33-38 points)
- Gold (39-51 points)
- Platinum (52-69 points)

These categories, and examples of points available within them, follow:

1. Sustainable Sites (14 possible points)

- Construction activity pollution prevention (required)
- Development density and community connectivity
- Brownfield redevelopment
- Public transportation access
- Bicycle storage and changing rooms
- Protect or restore habitat
- Stormwater design

2. Water Efficiency (5 possible points)

- Reduce landscaping water use by 50%
- Innovative wastewater technologies
- 20% or 30% water use reduction

3. Energy and Atmosphere (17 possible points)

- Minimum energy performance (required)
- Optimize energy performance (1-10 points available)
- On-site renewable energy
- Enhanced refrigerant management
- Green power

4. Materials & Resources (13 possible points)

- Storage and collection of recyclables (required)
- Building reuse (maintain 75% or 95% of existing walls, floors, & roof)
- Construction waste management (divert 50% or 75% from disposal)
- Materials reuse (5% or 10%)
- Regional materials (10% or 20% extracted, processed and manufactured regionally)
- Certified wood

5. Indoor Environmental Quality (15 possible points)
Minimum Indoor Air Quality (IAQ) performance (required)

- Environmental Tobacco Smoke (ETS) control (required)
- Increased ventilation
- Low-emitting materials (e.g. adhesives & sealants; paints & coatings; carpet systems)
- Indoor chemical and pollutant source control
- Controllability of systems (lighting and thermal comfort)

6. Innovation & Design Process (5 possible points)

- Four points available for innovation in design
- LEED Accredited Professional

LEED rating workshops in India

To expose the Indian building community to the LEED rating system and to augment Green Building Capacities within the country, Indian Green Building Council organized LEED rating system training in Chennai on August 12, 2003. It was the first of many such training programs, which will serve as a foundation stone for many Green Buildings in India.
After considering various rating systems, the Indian Green Building Council (IGBC) decided to adopt the LEED rating system. In a major boost to the LEED rating system, General Services Administration (GSA) USA recently compared 5 rating systems and found the LEED system to be the most credible among five systems evaluated.

The five rating systems evaluated were:
1) Building Research Establishment's Environmental Assessment Method (BREEAM);
2) Comprehensive Assessment System for Building Environmental Efficiency (CASBEE);
3) GBTool;
4) Green Globes US; and
5) LEED.

CERTIFICATE LEVEL	POINTS
CERTIFIED	26-32
SILVER	33-38
GOLD	39-51
PLATINUM	52 AND MORE

Fig 2: Different LEED rating systems

LEED Rating System	Type of Building
LEED for New Construction	All new high-rise buildings
LEED for Core & Shell	Rented out commercial buildings
LEED for Commercial Interiors	Tenant or self-occupied spaces
LEED for Existing Buildings	All existing buildings

FIG 3: LEED certification level

Rating Tools
The two distinct categories of tools required for design and documentation to obtain green building rating are: (1) performance evaluation tools, and (2) integrated assessment tools. Traditionally, a number of software tools are used for energy simulation,
Day lighting, life-cycle Environmental Impact assessment and surface water run-off calculations. These routinely are used by design professionals for making design decisions, material and equipment selections and in determining the performance of a particular aspect of building design. Irrespective Of Whether a Project intends to apply for a green building rating, these tools play a significant role in the design process. Results from these tools are often required by green building rating systems to obtain credits for the design towards the overall rating. Energy performance assessment is the only credit where the design tool provides the documentation required for obtaining green building rating. This is one reason why many energy simulation tools claim to be green building design tools. Each Rating System Offers A comprehensive Spread Sheet tool, such as the LEED calculator from USGBC or the GBtool from the Green Building Challenge, that can be used as a design check List And For Keeping Track Of The Rating Points .USGBC Is in the process of developing an online tool for design teams to directly Enter Information On Projects Registered For certification. Such tools are limited in scope for performance assessment, but provide the framework for preparing the documentation needed for certification.

Perceptions and Realities
Having covered on the benefits it is also important to know that people have different perceptions on green buildings; some are correct and some are otherwise. It is important to look at these:

Perception #1: Green buildings are costlier
Reality: Considerable research and analysis has been carried out with regard to the cost impacts of a green building. The cost could be slightly higher than a conventional building. But then, this needs to be seen with a different paradigm. The question is how do we compare the costs? There needs to be a baseline cost for all comparisons to be alike. The incremental cost is always relative and depends on the extent of eco-friendly features already considered during design. The incremental cost would appear small if the baseline design is already at a certain level of good eco-design; it would appear huge if the base design has not considered green principles. The second and rather a critical paradigm are to look at the incremental cost in relation to the life cycle cost.
The table 1 captures the typical payback period in the recently constructed green buildings in India.
There is a decreasing trend in the incremental cost over the years. This trend would continue and we all look forward to the day when the cost of a green building is lower than a conventional building.

Perception # 2: Green buildings have to be air-conditioned
Reality: Green building concepts and the LEED rating can be applied for non-air conditioning buildings. It has been applied on three such buildings in India viz., IGP office, Gulbarga, the Royal Engineering College, Hyderabad and LIC office, Shimoga. While performing the energy analysis using software tools, such buildings will input the same cooling system both in the baseline and the proposed design. This ensures that the building is recognized for any of the other energy efficiency measures incorporated, for example - the envelop, lighting, roof insulation etc.

Perception # 3:Green buildings take more time
Reality: There is a general perception that going the

green way may affect the project schedules. This was perhaps the case for the CII-Godrej GBC building when it was the first time that a green building rating tool was being applied in the country. The design in this case took about one-and-half years while the construction was completed in about 9 months!

MARKET TRANSFORMATION

The construction of the CII-Godrej GBC at Hyderabad, as a green building has enabled a wonderful market transformation in the country. Building owners and developers today demand green buildings from the designers. New products like the waterless urinals were first introduced at the GBC building. Today we have other buildings also installing these urinals. These urinals which were purchased in 2003, at Rs.14000/- for the Centre are now available for Rs.6500/-. Other products introduced include fly ash bricks, recycled carpets, high Albedo roofing materials, high performance glass, certified wood, low VOC paints high COP chillers and CO2 sensors. Green building footprint worth Rs.2000 Crore would be constructed in the country by 2008, of which the market for green building materials & equipment will be Rs 1500 Crore.

CONCLUSION

The green building experiences in India have been exciting and challenging as well. Since its introduction in 2001, the LEED rating has emerged as a very useful tool in designing a green building.
The LEED rating provided opportunities to introduce new products and materials. The easy availability of most of the green materials and equipment in the country has made it easier for the designers to adopt local materials to a very large extent. Now there is an imminent need for service providers, who would be required in large numbers, not in hundreds but thousands, as the movement is heading to reach greater heights. The green building movement is here to stay for the benefit of individuals, society and the country at large.

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