Comparative and Spatial Analysis of THELEED-India and GRIHA Rating Systems

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Abstract— New Construction is developing at a rapid pace. It has led to the emergence of Green Building Rating System worldwide. Various rating system of the world has provided unique guidelines for each and every category of building just like, Schools, Hotels, Core & Shell, etc. Green building rating (GBR) systems are developed to provide independent assessment standards that evaluate in a very few categories about the performance and sustainability of buildings. However, same category might weight differently in each of the GBR systems. Mumbai as one of the other cities is in need for this system, especially with poor resources and inefficient use. Therefore, this research studied international green building assessment tools such as such as LEED and GRIHA. The common aspect of all the rating system is to create a sustainable architecture in all respect so as to minimize negative environmental impact upon the environment. And the comparison is done in this paper with the help of some case studies and for the saving the energy so as to enhancing efficiency in the use of materials, energy, and space.

Key words: Construction, Green Building Rating System, Sustainable Development, Energy Efficiency

I. INTRODUCTION

The aim of a green building design is to minimize the demand on non-renewable resources, maximize the utilization efficiency of these resources, when in use, and maximize the reuse, recycling, and utilization of renewable resources. It maximizes the use of efficient building materials and construction practices; optimizes the use of on-site sources and sinks by bio-climatic architectural practices; uses minimum energy to power itself; uses efficient equipment to meet its lighting, air-conditioning, and other needs; maximizes the use of renewable sources of energy; uses efficient waste and water management practices; and provides comfortable and hygienic indoor working conditions. In sum, the following aspects of the building design are looked into in an integrated way in a green building. It is critical to make the decision to build a green building early in the design process in order to maximize the green potential, minimize redesign, and assure the overall success and economic viability of the green elements of the building project. It will also boost the construction in fewer amounts of time; and to get the benefits of the green building within the campus.

The construction industry in India is one of the largest economic activities and is growing at an average rate of 9.5% as compared to the global average of 5%. As the sector is growing rapidly, preserving the environment poses a host of challenges. To enable the construction industry environmentally sensitive, CII - Sohrabji Godrej Green Business Centre has established the Indian Green Building Council (IGBC). IGBC is a consensus driven not-for profit Council representing the building industry, consisting of more than 1,900 committed members. The Council encourages, builders, developers, owners, architects and consultants to design & construct green buildings thereby enhancing the economic and environmental performance of buildings.

II. STUDY AREA

About Kabra metro one, near Versova metro station, Andheri (west), G+21 building, currently under construction by Kabra Group, IGBC Registration No: GH 16 0963. It got the rating as Platinum from IGBC. It has a great team of Engineers and Developers who has worked hard for making this project a huge success by scoring 90 points in the precertification by following all the norms of rating system. The team is aimed to provide a good quality indoor air for maintaining health of human beings living in the rooms of the building. The on-site and off-site management is so good that even on-site waste generated was taken care of in a proper manner. These are the main key factors which we see as a construction manager.

III. OBJECTIVES

1) To study the two rating systems
2) To enhance the site management.
3) Reduced energy consumption without sacrificing the comfort zone.
4) Reduce water usage.
5) To give suggestion and some guide line for better management.

IV. THEORETICAL CONTENTS

A. About Study

A unified green design movement did not begin to emerge until the 1970s, when design and building practices first became a focus of environmental advocates. Once the decision to build green has been made, one of the first steps in the green design process is to establish firm environmental goals for the project. It is important to set specific measurable goals for things like energy efficiency, water conservation, on-site treatment of rain water and storm water, material and resource management, construction waste management, and to assign responsibility for meeting these goals to specific members of the design team which also helps in increasing developer's profit.

1) GRIHA

The National Rating System will evaluate the environmental performance of a building holistically over its entire life cycle, thereby providing a definite standard for what constitutes a 'green building'. The rating system, based on

accepted energy and environmental principles, will seek to strike a balance between the established practices and emerging concepts, both national and international. The guidelines/criteria appraisal may be revised every three years to take into account the latest scientific developments during this period.

2) LEED (Leadership in Energy and Environmental Design)

India is associated with the internationally known LEED program, which is administered in India by the IGBC. Started in 2001 as an offshoot of the United States Green Building Council (USGBC) LEED program, the India Green Building Council currently boasts more than 1600 IGBC members spread across 13 local chapters. The vision of the IGBC is "To enable a sustainable built environment for all and facilitate India to be one of the global leaders in sustainable built environment by 2025". The rating system addresses specific environmental building related impacts using a whole building environmental performance approach. LEED certification offers third party validation of a project's green features and verifies that the building is operating exactly the way it was designed to and it's the nationally accepted benchmark for the design, construction and operation of high performance green buildings.

B. Criteria for rating:

1) Water Conservation:

Most of the Asian countries are water stressed and in countries like India, the water table has reduced drastically over the last decade. IGBC Green Campus rating system encourages use of water in a self-sustainable manner through reducing, recycling and reusing strategies. By adopting this rating program, green campus can save potable water to an extent of 30 – 50%. This is a revolution in the saving water at both on-site and off-site.

2) Handling of Construction Waste:

Handling of waste in campuses is extremely difficult as most of the waste generated is not segregated at source and has a high probability of going to land-fills. This continues to be a challenge to the municipalities which needs to be addressed. IGBC intends to address this by encouraging buildings to segregate the waste generated in the campus.

3) Energy Efficiency:

The Buildings sector is a large consumer of electrical energy. Through IGBC Green Campus rating system, campuses can reduce energy consumption through energy efficient – exterior lighting, air conditioning systems, etc. Also, alternative resources or energy are encouraged. The energy savings that can be realized by adopting this rating program can be to the tune of 20 – 30%.

4) Reduced Use of Fossil Fuels:

Fossil fuel is a slowly depleting resource, world over. The use of fossil fuel for transportation has been a major source of pollution. The rating system encourages the use of alternate fuels for transportation.

5) Health and Well-being of Occupants:

Health and well-being of occupants is the most important aspect of IGBC Green Campus rating system. The rating system ensures facilities to enhance health and occupant well-being which are critical in a campus.

C. Scoring Points

GRIHA has a 100 point system consisting of some core points, which are mandatory to be met while the rest are optional points, which can be earned by complying with the commitment of the criterion for which the point is allocated. The innovation points are available over and above the 100 point system. This means that a project can hypothetically apply for a maximum of 104 points. But the final scoring shall be done out of 100 points. Different levels of certification (one star to five stars) are awarded based on the number of points earned. The minimum points required for certification is 50. Buildings scoring 50 to 60 points, 61 to 70 points, 71 to 80 points, and 81 to 90 points shall get one star, 'two stars', 'three stars' and 'four stars' respectively. A building scoring 91 to 100 points will get the maximum rating viz. five stars.

LEED serves as a tool for buildings of all types and sizes. LEED certification is available for all building types including new construction and major renovation; existing buildings; commercial interiors; core and shell; schools and homes. LEED systems for neighborhood development, retail and healthcare are currently pilot testing. Projects must be awarded a minimum number of points in outlined in the LEED rating system as follows: total possible points are 69 in that if a green campus gets 26-32, 33-38, and 39-51 points shall get 'certified', 'silver' and 'gold' certification respectively. A project scores 52 and above points gets the maximum rating viz. 'platinum'.

D. Benefits of rating systems

Some of the benefits of a green design to a building owner, user, and the society as a whole are as follows:

- Reduced energy consumption without sacrificing the comfort zones
- Reduced destruction of natural areas, habitats, and biodiversity, and reduced soil loss from erosion, etc.
- Reduced air and water pollution (with direct health benefits)
- Reduced water usage
- Limited waste generation due to recycling and reuse
- Reduced pollution loads
- Increased user productivity
- Enhanced image and marketability

E. Characteristics and spatial distribution of LEED-India and GRIHA projects

Numerous green projects have been submitted for certification or have been certified in India under the LEED umbrella or through the GRIHA system. These projects go from individual residential developments to large developments upwards of 50 hectares (123 acres). Understand that while the two programs have similar goals, they cannot always be compared equivalently due to differences in terminology and criteria. In sum, 810 projects are under review or have been certified by two rating systems in India according to data collected from the respective organizations. LEED-India had 445 projects registered for certification, while GRIHA has 365 projects under consideration for certification. LEED-India's larger total number of projects (22%) is not surprising given the name recognition that is clearly associated with the LEED product

and its earlier implementation date. Now the development is increased to 35% (using both LEED and GRIHA)

Rating system	Development type					
	Green homes	Green buildings	Green factories	Green SEZ		Total number of projects
LEED-India	199	229	16	1		445
	Residential	Commercial		Mixed use	Institutional	
GRIHA[a]	89	52		53	109	365

[a]62 GRIHA projects were not officially designated in the data reviewed for this analysis.

1) Site Design and Planning

a) Water conservation:

Complex, sophisticated, and environmentally responsive, novel building designs also show how to contribute to regional water supply and habitat protection, not just how to reduce usage levels. Natural resources are limited and that future generations will be impacted by today's design decisions is the main driver of water conservation. The use of water in landscaping alone can determine up to 20% of a facility's overall usage. Compost or riprap can also be used in the bios wale for leading the rainwater to get accumulated in the retention ponds. Water flows from the bios wale to a retention pond, where it settles and will be stored for gray water reuse in the building. A permeable paving surface should be constructed at the parking area which helps stormwater to get collected in retention pond. Manitoulin Island limestone helps neutralize the residual acidity of stormwater, which is why this material should be used at the time of construction. For good amount of water collection Landscaping should be done properly which also helps to provide some natural space within the green campus. Landscaping should design in a manner that most effectively reduces runoff. For larger sites and suburban locations, a mix of green roofs, natural site features, and enhanced filtration and retention through green infrastructure can contribute to the site's inherent water effectiveness. During the construction process and in the operations phase, rainwater can be collected for use in portable toilets, hand washing, even for washing tools. Using nylon screen fence will help to keep dust down and reduce the use of water to clean its driveway during a long construction phase. At site on the time of construction there should be a provision of a silt fence to prevent soil erosion and dirt from entering the storm drainage system. Where it is not possible to provide wetland, retention pond may use of a combination of underground water storage, permeable paving systems, and exterior materials that can neutralize any harmful aspects of the runoff, such as residual acidity. First-flush devices such as simple mechanical devices, gauges, sensors, and actuators, can be use the initial runoff from roofs and gutters to clean those surfaces and direct contaminants away from collection pipes and cisterns. Some simple fixes, such as repairing leaky pipes, can be applied to save water. Indoors or outdoors, building systems should be constructed and operated carefully to reduce accidental water losses. Leak detection and correction should be a way of life in building design, construction, and operations. Use efficient design to reduce the potential for leaks like designing of the shortest runs with the least amount of fittings and elbows possible in order to reduce possible leak locations.

b) Site Waste Management:

Use of modular design; will enable greater control over costs, waste arising and supply chain certification. Methods should be applied to reduce the arising of waste. Recycled material should use in order to achieve good material management. Exemplar waste management on-site will reduce greater amount of waste management. Ensuring design decisions not only prevent waste from being produced in the first place, but also positively enhance the recycled content and future recyclability of a project. Designing for waste-efficient procurement, designing for materials optimization, designing for off-site construction, designing for re-use and recovery and designing for deconstruction and flexibility these are the five keys to focus on waste designing. Reduction in the amount of waste create will help by using waste prevention measures, Re-use materials to avoid waste being created, Recycle materials from site where materials cannot be re-used. Contractual agreements should set up between the client, designers, main contractors and sub-contractors working on the project can impact on the production of waste. Using Site Waste Management Plans in a construction project is best practice and provides with a powerful process to improve waste management. This will help in improving the resource efficiency and profitability of projects, increasing the waste and materials awareness of staff (both site based and management) and helping to discharge duty of care obligations. Attempts are being made to utilize marble wastes in different applications like road construction, concrete and asphalt aggregates, cement, and other building materials [9]

c) Site Safety:

Construction accidents on jobsites are incredibly common, but also completely avoidable. Unfortunately, construction sites are littered with different safety hazards and are the cause of numerous serious injuries, and in the most severe cases, fatalities. Daily safety meetings of Employees about the different safety measures when it comes to specific job area. Reduce the amount of night work. Some basic safety precautions include hardhats, eye protection, hearing protection and harnesses. Slip-resistant boots, heavy duty gloves and masks, goggles are also standard safety apparel that must be worn on all jobsites. Reflective or highly-visible clothing are a must in order to reduce vehicle-related accidents. Enforcing regular breaks are crucial in not only productivity, but safety as well. This helps them to remain focused, alert and avoids fatigue and mistakes which can occur due to exhaustion. Clear signage to warn of danger at wires and high voltage areas. Avoid sunlight to minimize fatigue.

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