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Green Building Approach-Case Study

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Abstract: *In recent years, the green building movement has seen significant growth worldwide, and India has also embraced this trend. Green building rating systems have been introduced to set standards for incorporating eco-friendly practices in the construction and operation of buildings. These systems help reduce environmental damage and promote sustainability.[1]*

Buildings are evaluated based on the environmental practices they implement, earning points for each green feature. After assigning appropriate weights, a final score is calculated to determine the building's green rating. This scoring system reflects how extensively sustainable methods have been applied during construction.[2]

Green buildings are designed to minimize water usage, enhance energy efficiency, conserve resources, reduce waste, and provide healthier indoor environments compared to traditional buildings. They make use of renewable energy, eco-friendly materials, and smart design practices to ensure a safe and sustainable living or working space.[3]

Although the upfront cost of building green structures is around 7% higher than conventional ones, the benefits in terms of environmental protection and occupant well-being make the investment worthwhile. Such practices play a vital role in making the construction industry more sustainable and in evaluating buildings through green rating systems.[4]

This study specifically examines the IGBC (Indian Green Building Council) rating framework, which is well-suited to Indian conditions. A case study focused on the pre-construction stage is used to explore how the rating system is applied in practice.[2].

Keywords: Green Building, Rating System, sustainable development, Criteria.[2]

I. INTRODUCTION

A **Green Building** is a structure that is environmentally responsible and resource-efficient throughout its life cycle from design and construction to operation, maintenance, and demolition. The main goals of a green building are to:

- Use less water and energy
- Reduce greenhouse gas emissions
- Minimize waste
- Use sustainable or recycled materials
- Improve indoor air quality and occupant health
- Preserve the natural environment

Compared to conventional buildings, green buildings aim to have a lower negative impact on the environment and offer long-term economic and health benefits.[5]

There are several internationally and nationally recognized green building rating systems. Each one has its own criteria and certification process. Major rating systems include:

International Rating Systems:

- **LEED (Leadership in Energy and Environmental Design)** – U.S.-based, widely used globally.[6]
- **BREEAM (Building Research Establishment Environmental Assessment Method)** – UK-based.
- **WELL Building Standard** – Focuses on occupant health and well-being.

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- **EDGE (Excellence in Design for Greater Efficiencies)** – Developed by IFC/World Bank for developing countries.

Indian Rating Systems:

- **IGBC (Indian Green Building Council)** – Tailored to Indian climate and regulations.
- **GRIHA (Green Rating for Integrated Habitat Assessment)** – Developed by TERI and endorsed by the Indian government.[7]
- **BEE Star Rating (Bureau of Energy Efficiency)** – Focuses on energy performance in buildings.

The **IGBC Green Homes Rating System** is specifically designed for residential buildings in India. It provides guidelines for constructing eco-friendly homes. The key focus areas and guidelines include:

Site Selection and Planning

- Avoid building on ecologically sensitive land
- Maximize natural daylight and ventilation
- Provide accessible green spaces

Water Efficiency

- Use low-flow fixtures
- Install rainwater harvesting systems
- Reuse treated greywater for landscaping and flushing

Energy Efficiency

- Use energy-efficient lighting (e.g., LEDs)
- Install solar panels or other renewable energy systems
- Design for natural cooling and heating

Material and Resource Conservation

- Use locally available and recycled materials
- Reduce construction waste
- Prefer materials with low embodied energy

Indoor Environmental Quality

- Ensure good air quality and ventilation
- Use non-toxic paints and adhesives
- Provide natural light and temperature control

Waste Management

- Segregate waste at source
- Provide composting and recycling systems

Innovation and Design Process

- Encourage innovative techniques that go beyond standard practices
- Promote awareness and training on green practices

Certification Levels in IGBC are:

- **Certified**
- **Silver**
- **Gold**
- **Platinum**

Each level depends on the number of points earned out of a total (typically 100 or more, depending on the version).[2]

II. METHODOLOGY

The IGBC has constituted a technical committee to develop a rating system for green residential societies for existing multi-dwelling residential buildings. Through various discussions, the committee has formulated a pilot rating system to

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set benchmarks for sustainable design in residential societies. This has been framed in the context of India and its National goals.[2]

The "45 Shashwat Heights" project, located in Pune, offers 1 BHK, 2 BHK, 2.5 BHK, and 3 BHK homes for sale. It consists of one block/single building with an approximate total of 68 dwelling units. The total occupancy as per IGBC is estimated to be 396 people using the IGBC calculation method. The total site area of the project is about 1,806 sq.m, while the built-up area without parking is approximately 8,937 sq.m.

The site is located in a highly connected part of Pune, making it accessible to a variety of amenities within walking distance. Thus far, the project is in the construction phase, and I am optimistic it will do well during the precertification stage. The project is voluntarily targeting GOLD rating with 71 points under the IGBC Green Homes Version 3 rating system. So far, this project is one of the best projects, and we expect the same or a better rating during the final certification stage. To maintain or improve the rating, this report is issued to check the compliance accomplished at each stage of the project.

The total points counted in pre-certification level:

Sr. No.	Rating	Credit Points	Obtained Points
1	Certified	50-59	**71**
2	Silver	60-69	
3	Gold	70-79	
4	Platinum	80-100	

For the present case study by refering IGBC Guideline we propose the respective building with PLATINUM Rating Level. The points distribution are as follows:

The **IGBC Green New Buildings Rating System** comprises a total of **100 points** for both Owner-Occupied and Tenant-Occupied buildings, across several environmental performance modules. Each module includes a mix of mandatory requirements and credits with associated points.[2]

1. Sustainable Architecture and Design (Total: 5 points)

This module includes three credits:

- **Integrated Design Approach (SA Credit 1)** provides **1 point** for both owner and tenant-occupied buildings.
- **Site Preservation (SA Credit 2)** offers **2 points** in both cases.
- **Passive Architecture (SA Credit 3)** carries **2 points** for both building types. In the summarized column, a total of **3 points** is allocated.[2]

2. Site Selection and Planning (Total: 14 points)

There are two **mandatory requirements** under this category:

- **Compliance with Local Building Regulations**
- **Soi-Erosion-Control**

  Both are **required** for certification.

The credit-based components include:

- **Basic Amenities (SSP Credit 1)** – 1 point
- **Proximity to Public Transport (SSP Credit 2)** – 1 point
- **Low-emitting Vehicles (SSP Credit 3)** – 1 point for owner-occupied, **0 for tenant-occupied**
- **Natural Topography or Vegetation (SSP Credit 4)** – 2 points
- **Preservation/Transportation of Trees (SSP Credit 5)** – 2 points
- **Heat Island Reduction, Non-roof (SSP Credit 6)** – 2 points
- **Heat Island Reduction, Roof (SSP Credit 7)** – 2 points
- **Outdoor Light Pollution Reduction (SSP Credit 8)** – 1 point
- **Universal Design (SSP Credit 9)** – 1 point
- **Basic Facilities for Construction Workforce (SSP Credit 10)** – 1 point
- **Green Building Guidelines (SSP Credit 11)** – 1 point

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This results in a total of **14 points available**, with **11 points each** accounted in the summarized column for both owner and tenant-occupied buildings.[2]

3. Water Conservation (Total: 19 points)

There are two mandatory requirements:

- **Rainwater Harvesting (Roof & Non-roof areas)** – Required
- **Water Efficient Plumbing Fixtures** – Required

Credit-based elements include:

- **Landscape Design (WC Credit 1)** – 2 points
- **Management of Irrigation Systems (WC Credit 2)** – 1 point
- **Rainwater Harvesting, Roof & Non-roof (WC Credit 3)** – 5 points
- **Water Efficient Plumbing Fixtures (WC Credit 4)** – 5 points
- **Wastewater Treatment and Reuse (WC Credit 5)** – 5 points
- **Water Metering (WC Credit 6)** – 2 points for owner-occupied, **1 point for tenant-occupied.** [2]

4. Energy Efficiency (Total: 28 Points)

There are **three mandatory requirements** under this module:

- **Avoidance of Ozone Depleting Substances**
- **Minimum Energy Efficiency Compliance**
- **Commissioning Plan for Building Equipment and Systems**

These are all **required** for both owner-occupied and tenant-occupied buildings.

The credits under this category include:

- **Eco-friendly Refrigerants (EE Credit 1)** – 1 point
- **Enhanced Energy Efficiency (EE Credit 2)** – 15 points for owner-occupied and 14 for tenant-occupied
- **On-site Renewable Energy (EE Credit 3)** – 6 points
- **Off-site Renewable Energy (EE Credit 4)** – 2 points
- **Commissioning & Post-installation of Equipment & Systems (EE Credit 5)** – 2 points
- **Energy Metering & Management (EE Credit 6)** – 2 points
- This brings the **total available points** for this module to **28**, with **27 points summarized** for both owner-occupied and tenant-occupied buildings. [2]

5. Building Materials and Resources (Total: 16 Points)

There is **one mandatory requirement**:

- **Segregation of Waste (Post-occupancy)** – Required for all project types.

Credits under this section include:

- **Sustainable Building Materials (BMR Credit 1)** – 8 points
- **Organic Waste Management, Post-occupancy (BMR Credit 2)** – 2 points
- **Handling of Waste Materials During Construction (BMR Credit 3)** – 1 point
- **Use of Certified Green Building Materials, Products & Equipment (BMR Credit 4)** – 5 points
- The total points available are **16**, and both owner and tenant-occupied buildings show **16 points summarized** in this module. [2]

6. Indoor Environmental Quality (Total: 12 Points)

There are **two mandatory requirements**:

- **Minimum Fresh Air Ventilation**
- **Tobacco Smoke Control**

Both are **required** for owner and tenant-occupied buildings.

Credits include:

- **CO_2 Monitoring (IEQ Credit 1)** – 2 points
- **Daylighting (IEQ Credit 2)** – 2 points

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- **Outdoor views (IEQ Credit 3)** – 1 point
- The total points available are 11, and both owner and tenant-occupied buildings show **11 points summarized** in this module. [2]

7. Indoor Environmental Quality (continued)

Further credits in this category include:

- **Outdoor Views (IEQ Credit 3)** – 1 point for both owner and tenant-occupied buildings.
- **Minimize Indoor & Outdoor Pollutants (IEQ Credit 4)** – 1 point for both.
- **Low-emitting Materials (IEQ Credit 5)** – 3 points for both.
- **Occupant Well-being Facilities (IEQ Credit 6)** – 1 point for owner-occupied buildings; not applicable for tenant-occupied.
- **Indoor Air Quality Testing, After Construction & Before Occupancy (IEQ Credit 7)** – 2 points for both.
- **Indoor Air Quality Management, During Construction (IEQ Credit 8)** – 1 point for both.
- This brings the total points for Indoor Environmental Quality to **12**, with **11 summarized** for owner-occupied buildings and **10** for tenant-occupied buildings. [2]

8. Innovation & Development (Total: 7 Points)

This module encourages creative and performance-driven strategies through the following credits:

- **Innovation in Design Process (ID Credit 1)** – 4 points for owner-occupied, 3 points for tenant-occupied.
- **Optimization in Structural Design (ID Credit 2)** – 1 point for both.
- **Wastewater Reuse During Construction (ID Credit 3)** – 1 point for both.
- **IGBC Accredited Professional (ID Credit 4)** – 1 point for both.
- The total available points under this module are **7**, with **6 summarized points** each for both building types. [2]

Total Points Summary:

- **Owner-Occupied Buildings**: 89 points available
- **Tenant-Occupied Buildings**: 88 points available

The threshold criteria for certification levels are as under:

Certification Level	Owner-Occupied Buildings	Tenant-Occupied Buildings	Recognition
Certified	50-59	50-59	Good Practices
Silver	60-69	60-69	Best Practices
Gold	70-79	70-79	Outstanding Performance
Platinum	80-89	80-89	National Excellence
Super Platinum	90-100	90-100	Global Leadership

III. CONCLUSION

With case study Observations building reduced operation cost and achieve energy efficiency. To achieve Sustainability goal Water Conservation Practices can help to reduce the depletion of natural resources

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