International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 07 Issue: 02 | February - 2023 Impact Factor: 7.185 ISSN: 2582-3930

Analysis and Study of credits for IGBC Green New Building

Mr. Pravin B. Sonavane[1], Ar. Smita A. Mane[2]

[1]U.G. Student, Shri S.D. Patil College of Architecture.Islampur
[2]Prof. and Principal-in-Charge, Department of Architecture, Shri S.D. Patil college of Architecture, Islampur

---

Abstract – The green building movement in India has gained significant momentum with over 8,669 registered projects under the Indian Green Building Council. The LEED standards influence the design and construction of environmentally sustainable structures with a focus on resource conservation, waste reduction, and creating healthy spaces. The IGBC criteria encompasses aspects such as sustainable architecture and design, site selection, energy and water conservation, building materials, indoor environmental quality, and innovation. Energy efficiency and water conservation are emphasized through eco-friendly refrigerants, renewable energy sources, and water-wise practices. The use of certified green building materials, products, and equipment helps reduce environmental impact. Indoor environmental quality is maintained through adequate ventilation, low-emitting materials, and indoor air quality testing. Building owners and contractors can employ various strategies to improve the well-being of occupants.

Key Words: Green building, Sustainable, Conservation, Environment, Eco-friendly, Renewable

1. INTRODUCTION

"A green building (also known as green construction or sustainable structure) is one which uses lower water, optimizes energy effectiveness, conserves natural coffers, generates lower waste and provides healthier spaces for inhabitants, as compared to a conventional structure."

Green structure also refers to saving coffers to the maximum extent, including energy saving, land saving, water saving, material saving, etc., during the whole life cycle of the structure, guarding the terrain and reducing pollution, furnishing people with healthy, comfortable and effective use of space, and being in harmony with nature structures that live in harmony. Green erecting technology focuses on low consumption, high effectiveness, frugality, environmental protection, integration and optimization. Leadership in Energy and Environmental Design (LEED) is a set of standing systems for the design, construction, operation, and conservation of green structures which was developed by the U.S. Green Building Council.

2. GREEN BUILDING MOVEMENT IN INDIA

Green Building Movement in India the Green Building movement in India was touched off when CII- Sohrabji Godrej Green Business Centre structure in Hyderabad was awarded with the first and the prestigious Platinum rated green structure standing in India. Since also, Green Building movement in India has gained tremendous motivation over the times. With a modest morning of 20,000sq.ft. Green erected-up area in the country in the time 2003, moment (as on 30th September 2022) further than 8,669 Green structures projects coming up with a footmark of over 9.75 Billion sq.ft. Are registered with the Indian Green Building Council (IGBC), out of which 3,088 Green Building systems are certified and completely functional in India.

This growth has been possible with the participation of all stakeholders in the green structure movement. moment all types of structures are going the Green way- Government, IT premises, services, Domestic, Banks, airfields, Convention Centre, Institutions, Hospitals, hospices, Manufactories, SEZs, Townships, seminaries, Metros etc.

3. NEW GREEN BUILDING CRITERIA (IGBC)

There are two types of points are available 'Owner occupied building and Tenet occupied building'. New Green Buildings criteria or green features under the following categories:

- Sustainable Architecture and Design
- Site Selection and Planning
- Water Conservation
- Energy Efficiency
- Building Materials and Resources
- Indoor Environmental Quality
- Innovation and Development

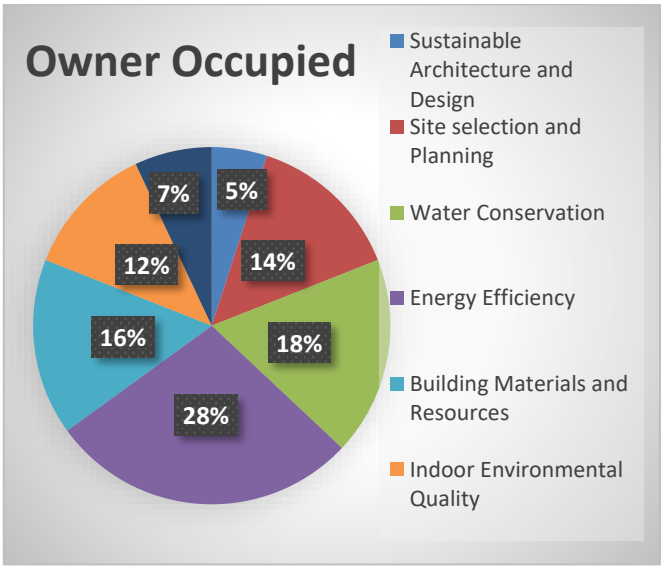

Chart 1: Owner occupied

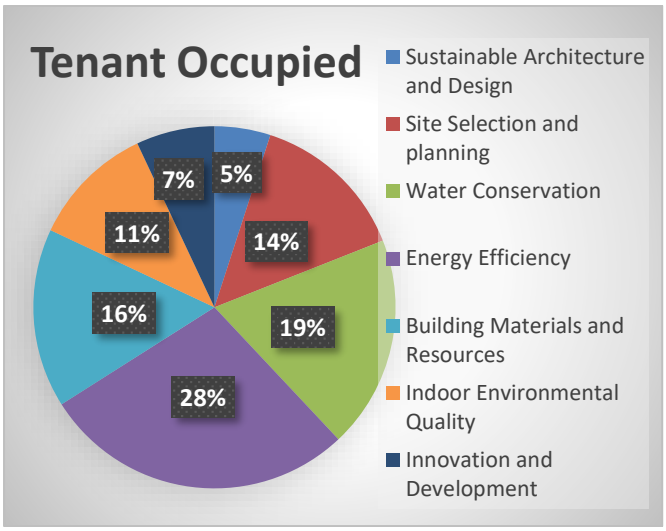

Chart 2: Tenant occupied

- **SUSTAINABLE ARCHITECTURE AND DESIGN**

Sustainable architecture and design under the integrated design approach considers environmental, social, and economic aspects in the design and construction process. Integrated design approach brings together multiple stakeholders, such as architects, engineers, contractors, and owners, to collaborate and make decisions throughout the design process. And the site preservation refers to the practice of designing and constructing buildings and structures in a way that minimizes their impact on the natural environmental while also preserving the cultural and historical significance of the site. The goal is to create sustainable and harmonious built environments that respect and protect the natural and cultural heritage of the site for future generation.

- **SITE SELECTION AND PLANNING**

Building regulations for site selection and planning typically dictate where a building can be located and how it must be designed and constructed to ensure safety and functionality. These regulations vary from place to place, but common factors include Zoning, Setback, Height restrictions, Building codes, and Environmental regulations. Soil erosion control is an important consideration for site selection and planning, as it can have a significant impact on the stability and productivity of the site. To prevent soil erosion, the following measures are typically taken during site selection and planning Site Assessment, Slope Stabilization, Drainage control, Vegetation Establishment, and Maintenance.

Site selection and planning under the basic amenities refers to the process of choosing and preparing a location for development while ensuring that the basic necessities for human life are provided for this includes access to clean water, sanitation facilities, electricity, transportation, and healthcare facilities. And the process of choosing a location for development that is close to and well connected to public transportation system. Tis helps to reduce reliance on private vehicles, increase access to job opportunities, and improve the overall sustainability of the development. That encourages the use of low-emitting vehicles, such as electric or hybrid vehicles. This helps to reduce air pollution and improve the overall sustainability of the development. The natural topography and vegetation play a significant role in site selection and planning, as they affect various aspects of a project including Accessibility, Drainage, Soil quality, Biodiversity, Aesthetics.

Preservation or transplantation of tress are an important factor for site selection, preservation existing trees can provide numerous benefits, including improve air quality, reduce carbon emission, and increased wildlife habitat. In some case, it may be necessary to transplant trees to another location within the site or to another site area.in the site selection and planning, non-roof heat island reduction strategies can play a critical role in creating a more sustainable and livable environment achieve Reduce energy consumption, Improve air quality, Enhance livability, Increase sustainability also roof heat island reduction strategies are an important they can significantly impact the energy efficiency and overall sustainability of a building or development. Outdoor light pollution reduction is a critical consideration in site selection and planning, as it can impact the environment, human health, and wildlife.

Incorporating universal design principles into site selection and planning can help to create more accessible, inclusive, and user-friendly environments, also improving overall quality of life. Basic facilities for the construction workforce, it can impact the health, safety, and well-being of workers, as well as the productivity and success of the project.

- **WATER CONSERVATION**

Landscape design for water conservation aims to reduce water usage and promote water-wise practices in outdoor environments. Some common strategies are native and drought-tolerant plants, rain gardens and water harvesting, xeriscaping, efficient irrigation system, mulching, grouping plants with similar water needs. Effective management of irrigation system is essential for water conservation. Some strategies are precision irrigation, water auditing, roper scheduling, crop selection, and maintenance. The benefits of rain water harvesting, both roof and non-roof, for water conservation are reduction demand on municipal water supplies, increased water security, cost savings, improved water quality, water sustainability, flood control, improved soil health, increased self-sufficiency, environmental protection.

The use of water efficient plumbing fixtures is important for water conservation and is recognized by the Indian Green Building Council (IGBC) through its green building rating system. They can helps reduce water consumption by 30% to 50% compared to traditional fixtures. Water waste treatment refers to the process of removing pollutants and contaminants from wastewater so it can be reused or returned to the environment safely. A water metering system is technology used to measure the amount of water consumed by individual household or buildings. By accurately measuring water usages, it helps in promoting water conservation and reducing waste.

- **ENERGY EFFICENCY**

Ozone depleting substances (ODS) are not directly related to energy efficiency, but their impact on the environment can have indirect effects on energy use. Minimum energy efficiency refers to the minimum level of energy performance that is required by law or regulation for a particular product, device, building, or system. Examples of minimum energy efficiency standards include the Energy Star program for household appliances and electronics, building codes that require a minimum level of insulation and efficient heating and cooling systems, and the Minimum Energy Performance Standards (MEPS) for industrial equipment.

A Commissioning Plan for Building Equipment & Systems is a comprehensive document that outlines the process of verifying and documenting that a building's systems and equipment are designed, installed, and functioning according to the project's requirements and specifications. And the elements are purpose, scope, commissioning team, commission process, documentation, schedule, budget, and training. Eco-friendly refrigerants can play a significant role in increasing the energy efficiency of refrigeration and air conditioning systems. These refrigerants are typically designed to have a lower global warming potential (GWP) compared to traditional refrigerants, which means they have a lower impact on the environment.

Enhanced energy efficiency refers to the process of improving the efficiency of energy usage in various applications, such as buildings, transportation, manufacturing, and power generation. The goal of enhanced energy efficiency is to reduce the amount of energy required to perform a given task while maintaining or improving the quality of the output. On-site renewable energy can play an important role in enhancing energy efficiency. By integrating on-site renewable energy into energy-efficient building designs and energy management systems, building owners and operators can achieve even greater energy savings. For example, a building that uses a combination of energy-efficient appliances and lighting and on-site solar photovoltaic panels to generate electricity can reduce its overall energy consumption and lower its carbon footprint.

Off-site renewable energy refers to the generation of electricity or heat from renewable sources that are located at a different site from where it is used. Off-site renewable energy can also play a role in enhancing energy efficiency, by reducing the overall demand for energy from non-renewable sources and increasing the availability of clean, renewable energy. By purchasing renewable energy from off-site sources, building owners and operators can reduce their carbon footprint and improve their overall energy efficiency.

Commissioning, post-installation of equipment and systems is a critical step in ensuring the effective and efficient operation of energy-efficient building systems. It is the process of verifying that all systems and equipment are installed and operating as intended, and that they meet the design specifications, performance criteria, and energy efficiency goals. Energy metering and management is a critical aspect of enhancing energy efficiency in buildings. It involves measuring, tracking, and managing the use of energy in a building, and using this information to identify opportunities for energy savings and to monitor the performance of energy-efficient systems. In addition to reducing energy consumption and costs, energy metering and management can also help to improve the overall comfort and indoor air quality of buildings.

- **BUILDING MATERIAL AND RESOURCES**

Sustainable building materials generally considered' green' include timber(that has been certified to a third- party standard), fleetly renewable factory accoutrements (like bamboo and straw), dimension gravestone, recycled gravestone, hemp Crete, recycled essence and other non-toxic, applicable, renewable, and/ or recyclable products. Segregation of waste and post-occupancy management of building materials and resources are important elements of enhancing energy efficiency and reducing the environmental impact of buildings. Segregation of waste involves separating different types of waste materials, such as wood, metal, and concrete, and properly disposing of each type in a manner that reduces the environmental impact and conserves resources.

Organic waste management is an important aspect of post-occupancy building operations that involves the proper handling, collection, and disposal of organic waste generated by a building's occupants. Building owners and operators can implement a number of strategies to effectively manage organic waste, including – Composting, Anaerobic, Recycling and reuse.

Proper handling of waste materials during construction is an important aspect of sustainable building practices that can help to reduce the environmental impact of construction activities and enhance energy efficiency. Building owners and contractors can implement a number of strategies to effectively handle waste materials during construction, including – Reduction, Reuse, Recycling, Proper disposal, etc.

The use of certified green building materials, products, and equipment is an important aspect of sustainable building practices that can help to reduce the environmental impact of the built environment and enhance energy efficiency. Certified green building materials, products, and equipment are those that have been certified by independent third-party organizations to meet specific environmental and performance criteria. These certifications can include certifications for materials that are made from sustainable and renewable resources, certifications for products that are manufactured with minimal environmental impact, and certifications for equipment that is energy efficient and reduces energy consumption.

- **INDOOR AND ENVIRONMENTAL QUALITY**

Acceptable ventilation is pivotal for maintaining good inner air quality and icing a healthy inner terrain. Fresh air ventilation refers to the process of introducing fresh, out-of-

door air into a structure to ameliorate inner air quality and reduce the figure- up of adulterants. And structure possessors and contractors can use a number of strategies to insure minimal fresh air ventilation, like a Mechanical ventilation system, Natural ventilation, Air filtration, Proper air exchange, etc. Tobacco bank control is an important aspect of inner air quality operation, as exposure to alternate- hand bank can have serious health impacts, including increased threat of respiratory conditions, cancer, and heart complaint.

To control tobacco bank in a structure we can use a combination of design strategies in structure design like a Designated smoking areas, ventilation system, bank-free polices, etc.as well as CO2 monitoring is an important aspect of inner air quality operation, as elevated situations of carbon dioxide (CO2) can have negative impacts on inner air quality and the health of erecting inhabitants. To cover CO2 situations in a structure, structure possessors and contractors can use a number of tools, are CO2 detectors, movable CO2 measures, and Air quality monitoring system.

Daylighting is the practice of using natural light to illuminate inner spaces. It's an important aspect of inner environmental quality, as daylight can help to ameliorate the visual comfort and well- being of erecting inhabitants, while also reducing energy costs associated with artificial lighting. To incorporate daylighting into a structure, we can use a variety of design strategies and erecting systems, like a large windows and skylights, Light shelves, automated shading system, Light- reflecting shells, etc.

Out-of-door views can play an important part in enhancing inner environmental quality by furnishing structure inhabitants with a connection to the natural terrain and perfecting their overall well- being. These are the strategies to incorporate out-of-door views to structure design large windows and glazing system, sundecks, sundecks, and roof auditoriums, green walls, integrated inner and out-of-door spaces.

To minimize inner and out-of-door adulterants simple way-

- Inner adulterants-

1. Keep your home well- voiced
2. Use natural or low- VOC(unpredictable organic factors) product
3. Minimize the use of synthetic spices
4. avaricious smoking inside
5. Clean regularly

- Outdoor adulterants-

1. Reduce emigrations from vehicles
2. Support environmentally-friendly enterprise
3. Reduce energy operation
4. Use environmentally-friendly product
5. Support green spaces

Low- emitting accoutrements are accoutrements that release smaller adulterants into the inner terrain, contributing to better inner air quality using low- VOC (unpredictable organic composites) maquillages and coating, formaldehyde-free wood product, natural fibers, non-toxic cleaning and particular care products, low- emitting flooring accoutrements.

Inhabitant well- being installations relate to design and technology features in a structure that ameliorate the inner environmental quality and contribute to the overall health and comfort of the structure inhabitants. Then are some exemplifications of installations for inhabitant well- being in inner surroundings- ventilation system, lighting system, thermal comfort system, inner shops, aural system, access to natural light. Inner air quality testing after construction and before residency is an important step in icing that a recently erected or repaired structure is safe and healthy for its inhabitants. The testing process involves measuring the situations of colorful adulterants and substances in the air inside the structure to determine if they meet safe situations as established by nonsupervisory agencies similar as the US Environmental Protection Agency (EPA) and the Occupational Safety and Health Administration (OSHA). The most common pollution tested for inner air quality testing Ares- carbon monoxide (CO), unpredictable organic composites (VOC), Particulate matter, Radon, Asbestos.

Inner air quality operation during construction is an important aspect of icing that a recently erected or repaired structure will have good air quality once it's enthralled. There are several way Ventilation, Material selection, Dust control, Storage of chemicals and other dangerous material, Use of particular defensive outfit's, and Regular cleaning.

- **INNOVATION AND DEVELOPMENT**

Innovation in the design process is crucial for the development of green buildings, which are designed to be environmentally responsible and resource-efficient. There are several ways in which innovation can be incorporated into the design process to promote the development of green buildings- Integrated design, Use of computer-aided design (CAD) and building information modelling (BIM), Energy-efficient design, water management, Material selection, Building commissioning.

The goal of optimization in structural design is to minimize the use of materials, reduce construction time and costs, and improve the overall performance and safety of the building. The several techniques are Finite element analysis (FEA), Genetic algorithms (GA), Multi-objective optimization, Life cycle assessment (LCA).

Reducing water usage in construction is an important aspect of sustainable building design and innovation. There are several strategies that can be employed to reduce water use in construction, including Rainwater harvesting, Grey water reuse, Efficient plumbing fixture, Water efficient landscaping, Recycling of construction water.

In recent years, there has been a significant increase in innovation and development in green building practices. Some examples included –

- The use of green roof and walls to reduce heat absorption, improve air quality, and provide habitats for wildlife.

- The use of rainwater harvesting and grey water system to conserve water and reduce demand on local water resources.
- The use of geothermal system for the heating and cooling.
- The use of sustainable and renewable material in construction, such as bamboo, rammed earth, and straw bale.

The Indian Green Building Council (IGBC) Accredited Professional (AP) is a certification program offered by the IGBC, which is a part of the Confederation of Indian Industry (CII). The IGBC AP certification is designed for professionals who work in the field of green building design, construction, and management.

4. CONCLUSION

A green building is one of most important part of environment control and life of the building will increase with the increase in the building efficiency. Environmental benefits of green buildings are well recognized. The rating system like Sustainable Architecture and Design, Site Selection and Planning, Water Conservation, Energy Efficiency, Building Materials and Resources, Indoor Environmental Quality reduction in consumption of energy and use of appropriate renewable energy source can helps to meet all the requirements of energy.

REFERENCES

1. "Green Building Defined." US Green Building Council, www.usgbc.org/articles/green-building-defined.
2. "Leadership in Energy and Environmental Design (LEED)." US Green Building Council, www.usgbc.org/leed.
3. "Green Building Movement in India." Indian Green Building Council, www.igbc.in/green-building-movement-in-india.
4. "Green Building Rating Systems in India." Indian Green Building Council, www.igbc.in/rating-systems.
5. "Green Building Criteria (IGBC)." Indian Green Building Council, www.igbc.in/criteria.
6. "Sustainable Architecture and Design." US Green Building Council, www.usgbc.org/resources/sustainable-architecture-and-design.
7. "Site Selection and Planning." US Green Building Council, www.usgbc.org/resources/site-selection-and-planning.
8. "Water Conservation in Green Building." US Green Building Council, www.usgbc.org/resources/water-conservation-green-building.
9. "Energy Efficiency in Green Building." US Green Building Council, www.usgbc.org/resources/energy-efficiency-green-building.
10. "Building Materials and Resources." US Green Building Council, www.usgbc.org/resources/building-materials-and-resources.
11. "Indoor Environmental Quality." US Green Building Council, www.usgbc.org/resources/indoor-environmental-quality.
12. "Innovation in Green Building." US Green Building Council, www.usgbc.org/resources/innovation-green-building.
13. "The Landscape Architecture of Infrastructure" by Charles Waldheim
14. "Ecosystem Services in Landscape Planning" by Carsten Herzog and Karsten Runge
15. "Green Infrastructure: A Landscape Approach" edited by Cynthia Rosenzweig and Daniel Hillel
16. Indian Green Building Council. (n.d.). Water efficiency. Retrieved from https://www.igbc.in/rating-systems/green-residential-buildings/prerequisites/water-efficiency
17. The Benefits of Rainwater Harvesting. (n.d.). Retrieved from https://www.rainharvest.co.za/the-benefits-of-rainwater-harvesting/
18. Water Harvesting and Xeriscaping. (n.d.). Retrieved from https://extension.usu.edu/waterquality/water-harvesting-and-xeriscaping
19. Energy Star. (n.d.). Retrieved from https://www.energystar.gov/
20. Commissioning Plan for Building Equipment & Systems. (n.d.). Retrieved from https://www.energy.gov/eere/buildings/commissioning-plan-building-equipment-systems
21. Eco-Friendly Refrigerants. (n.d.). Retrieved from https://www.carrier.com/residential/en/in/products/air-conditioners/refrigerants/
22. "Sustainable Building Materials and Resources." (n.d.). Retrieved February 11, 2023, from https://www.sustainablebuild.co.uk/information-hub/sustainable-building-materials-resources/.
23. "Green Building Materials." (n.d.). Retrieved February 11, 2023, from https://www.energy.gov/eere/buildings/green-building-materials.
24. "Indoor Air Quality in Green Buildings." (n.d.). Retrieved February 11, 2023, from https://www.epa.gov/indoor-air-quality-iaq/indoor-air-quality-green-buildings.
25. "Building Environmental Quality: Indoor Air Quality and Lighting." (n.d.). Retrieved February 11, 2023, from https://www.usgbc.org/resources/building-environmental-quality-indoor-air-quality-and-lighting.

26. "Low-Emitting Materials." (n.d.). Retrieved February 11, 2023, from https://www.epa.gov/indoor-air-quality-iaq/low-emitting-materials.

27. "Occupant Well-Being in the Built Environment." (n.d.). Retrieved February 11, 2023, from https://www.wbdg.org/resources/occupant-well-being-built-environment.

28. "Indoor Air Quality Testing." (n.d.). Retrieved February 11, 2023, from https://www.epa.gov/indoor-air-quality-iaq/indoor-air-quality-testing.

BIOGRAPHIES

Mr. Pravin Bhagwan Sonavane.
U.G. Student, Shri S.D. Patil College of Architecture.

Ar. Smita Amol Mane.
(M.Arch Architectural construction and Project management)
Prof. and Principal-in-Charge, Department of Architecture, Shri S.D. Patil college of Architecture, Islampur