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GRIHA– India's National Rating System on Green Buildings

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Abstract: India's National Rating System on Green Buildings - GRIHA (Green Rating for Integrated Habitat Assessment) has been certified by the MNRE, Govt. of India which is suitable for all kinds of building in different climatic zones of India. Many building rating systems exist at the international levels which are active in the field of creating knowledge and familiarizing the concept of green design. National Rating System like GRIHA has been adapted to suit the specific requirements of the building industry of the country in which they have been developed. Like the LEED rating system is based on the energy efficiency measures mainly in air conditioned buildings. There needs to be a different rating system for a country like India, having hot climate, less air conditioned buildings and more agricultural activities.
GRIHA is able to assess a building on the level of its greenness. by its qualitative and quantitative assessment criteria .This rating is valid for new as well as existing buildings, may be of any nature – residential, commercial or institutional. This Article reviews an overall concept of green buildings in context to the Indian Rating System – GRIHA.
Keywords: Green building, familiarizing, energy efficient, environment, rating system, integrated

I. INTRODUCTION

GRIHA means 'A house as containing several rooms'. It is taken from an ancient Indian document which is among the oldest extant texts of any language in the world –the Rig Veda.
It is India's National Rating System for Green buildings. GRIHA is an acronym for Green Rating for Integrated Habitat Assessment. It has been developed by TERI and is certified by the MNRE. The system was in the beginning conceived and developed by TERI as TERI-GRIHA which was further modified to GRIHA as National Rating System after incorporating various modifications suggested by a group of architects and experts. It is based on nationally accepted energy and environmental principles, and seeks to strike a balance between established practices and emerging concepts, both national and international. GRIHA takes into account the provisions of the National Building Code 2005; the Energy Conservation Building Code 2007 announced by Bureau of Energy Efficiency and other IS codes, local bye-laws, other local standards and laws.
GRIHA attempts to minimize a building's resource consumption, waste generation, and overall environmental impact by comparing them to certain nationally acceptable limits. This is achieved by adopting the five 'R' philosophy of sustainable development, namely

1) Refuse to blindly adopt international trends, materials, technologies, products, etc. especially in areas where local equivalents are available
2) Reduce the dependence on high energy products, systems, processes, etc.
3) Reuse materials, products, traditional technologies, so as to reduce the costs incurred in designing buildings as well as in operating them
4) Recycle all possible wastes generated from the building site, during construction, operation and demolition
5) Reinvent engineering systems, designs, and practices such that India creates global examples that the world can follow rather than us following international examples

II. REQUIREMENT OF GRIHA

India faces the environmental challenges of the construction sector Buildings are major consumers of water during construction and operation. In terms of water supply convenience, adequacy, equitable distribution and per-capita provision, India is far behind the other developed countries of the world. As per TERI estimates, there is an increased demand of about 5.4 billion units (kWh) of electricity annually for meeting end-use energy requirement for residential and commercial buildings. The issue of water supply is critical not only for day to day needs of drinking water but also for agriculture and allied activities. While we struggle with water shortage, there is a huge potential of meeting the resource gap through treatment of waste water and reuse of the same for various applications.

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At macro level, broad urbanization is leading to uncontrolled 'heat island' effect. Vegetation and tree cover give way to urban areas with large expanses of pavements, buildings, and other structures, thus eliminating cooling provided by vegetation through both shade and evapo-transpiration. This contributes to the formation of ground-level ozone, which is harmful to human health. Urban heat island impacts give rise to increased temperatures by up to ten degrees Fahrenheit. This also results in increased demand for air conditioning. Increased air conditioning demands increased generation of electricity which again contributes to the emission of greenhouse gases.

India generates approximately 1,50,000 to 2,00,000 tons of waste per day. This waste has now become unmanageable and requires a lot of energy and land to get rid of, through toxic processes such as incineration or land filling. Additionally, since most municipal solid waste in not segregated at source, it becomes tougher to introduce it into the recycling stream and thus the contamination from the same is worse still. Today, the cities are cesspools of disease and epidemic. The waste materials are contaminating our ground-water, farm lands, forests, and the air we breathe.

We have to turn the situation around before it is too late. As we chart our developmental path, it is important for us to keep our eyes on the environmental damage that we create. It is extremely important to pause for a moment and carry out necessary course correction for the benefit of the Mother Earth and our future generations. It is a well established fact that green buildings offer immense potential to reduce consumption and regenerate resources from waste and renewable sources and offer win-win solution for user, owner and the environment.

III. GREEN BUILDING CONCEPT AND DESIGN

Apart from the basic function as a shelter, a building should provide two fundamental physiological 'comforts' to its occupants; they are:

A. Visual comfort
B. Thermal comfort

To provide these comforts, a building needs to consume resources for construction and operation. In our country, a well designed building is built out of concrete and bricks, and may have a design life of up to one hundred years. During such a period, a building consumes unimaginable quantities of resources, as indicated below:

Land	:	Farms, forests, fertile land, marshes
Soil	:	Earth, clay, stone, lime, sand, silica
Trees	:	Wood, ply, board, shuttering
Metals	:	Steel, iron, aluminium, copper, lead
Plastics	:	PVC, UPVC, PU (Polyurethane)
Water	:	Construction, landscape, cooling, washing, drinking, flushing
Electricity	:	Cooling, heating, lighting, pumping, entertainment, working

Apart from consuming the above resources, the buildings generate a huge quantity of wastes also during their construction and life period, as indicated below:

Site waste	:	Cut trees, vegetation, excavated soil, blasted stone, rubble
Construction waste	:	Metals, boxes/cans, broken bricks, shuttering oils
Sewage	:	Black water, grey water
Organic waste	:	Peels, vegetables, fruits
Recyclable waste	:	Paper, glass, metals
Non-recyclable waste	:	Demolition debris, all plastics, synthetic fibres
E waste	:	CDs, electronics, hardware
Chemical waste	:	Adhesives, paints

Thus, the buildings have major environmental impacts over their entire life cycle. The aspire 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 use of renewable resources. A green building destroys the natural resources to the minimum

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during its construction and operation. It maximizes the use of efficient building materials and construction practices; optimizes the use of on-site sources; 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 clean indoor working conditions.

IV. MERITS OF GREEN BUILDING

A green building has lower resource consumption as compared to conventional buildings. The following are the percentage reductions of various resources in green buildings:

A. It consumes about 40% to 60% lesser electricity as compared to conventional buildings. This is primarily because they depend on passive architectural interventions in the building design, and high efficiency materials and technologies in the engineering design of the building.

B. It also attempt to work towards on-site energy generation through renewable energy utilization to cater to its energy needs. For instance, solar thermal systems can help generate hot-water and replace the conventional electrical geyser in buildings. Solar PV panels can help generate electricity which can reduce the buildings dependence on grid power.

C. It consumes 40% to 80% lesser water as compared to conventional buildings. By using ultra low-flow fixtures, dual plumbing systems, waste-water recycling systems and rain-water harvesting, green buildings not only reduce their demand for water use but also look at on-site supply options to cater to its internal and external water demands.

D. It creates lesser waste by employing waste management techniques on site. They may also employ waste to energy or waste to resources techniques on site, to minimize their burden on municipal waste management facilities and landfills.

E. It also produces lesser pollution both during construction as well as while in use. Through best-practices such as proper storage of construction materials, barricading of the site to prevent air and noise pollution during construction, proper storage and disposal of waste during construction and operation, and so on, ensures reduced impact on the surrounding environment.

All of these can be achieved at a minimal incremental cost with estimated payback period of about 3–5 years (except renewable energy for power generation). Therefore, in nutshell, the following advantages of a green building can be enlisted:

1) Reduced energy consumption without sacrificing the comfort levels
2) Reduction in water consumption
3) Reduction in system sizes for optimal performance at local conditions
4) Reduction in lifecycle cost
5) Reduced destruction of natural areas, habitats, biodiversity, reduced soil loss from erosion etc.
6) Reduced air and water pollution with direct health benefits
7) Limited waste generation due to recycling and reuse
8) Reduction in pollution loads
9) Increment in user productivity
10) It improved image and marketability

V. BENEFITS OF GRIHA

GRIHA evaluates the environmental performance of a building holistically over its entire life cycle, thereby providing a perfect 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 assessment may be revised every three years to take into account the latest scientific developments during this period.

On a broader scale, this system, along with the activities and processes that lead up to it, will benefit the community at large with the improvement in the environment by reducing Green House Gas emissions, improving energy security, and reducing the stress on natural resources.

VI. GUIIDLINES OF GRIHA

GRIHA evaluate a building out of 34 criteria and awards points on a scale of 100. In order to qualify for GRIHA certification, a project must achieve at least 50 points. It is a guiding and performance-oriented system where points are earned for meeting the design and performance intent of the criteria. Each criterion has a number of points assigned to it. It means that a project intending to meet the criterion would qualify for the points. Compliances, as specified in the relevant criterion, have to be submitted in the prescribed format. The points related to these criteria are awarded provisionally while certifying and are converted to firm points

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through monitoring, validation, and documents to support the award of point. It 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 new points are available over and above the 100 point system.

This means that a project can theoretically 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.

Points Scored	Rating
50 – 60	One Star
61 –70	Two Stars
71 – 80	Three Stars
81 – 90	Four Stars
91 – 100	Five Stars

The guidelines and appraisal norms are revised every three years or sooner to take into account the latest best practices happening during the period.

VII. PROCEDURE OF GRIHA RATING

A. Eligibility

Except for industrial complexes, all buildings – offices, retail malls, institutions, hotels, hospitals, health-care facilities, residences, and multi-family high-rise buildings in the pre-design stage are eligible for certification under GRIHA. ADARSH (Association for Development and Research of Sustainable Habitats) officials will examine the project documents to help establish whether our project is eligible for GRIHA rating and render requisite assistance for registration.

B. Registration

The project related to buildings may be registered through the GRIHA website (http://www.grihaindia.org)

C. Evaluation

Project evaluation happens at two broad categories: -

1) Pre documentation stage – a team from ADARSH along with the client's Integrated Design Team meets and determines the points being targeted by the project, as soon as the building project is registered, during the orientation workshop.

2) Post documentation stage – all necessary proof through documents for the points targeted under various criteria is submitted and then evaluated by third party regional evaluators, to find out final rating that shall be awarded to the project.

D. Rating

The final score is presented to the National Advisory Committee comprising eminent personalities and renowned professionals in the field, for approval and award of the final rating. The final GRIHA rating is awarded after receipt and evaluation of the post occupancy performance audit reports. The audit is conducted after 1 year of building occupancy. The rating awarded is valid for a period of five years from the commissioning of the building.

VIII. CONCLUSION

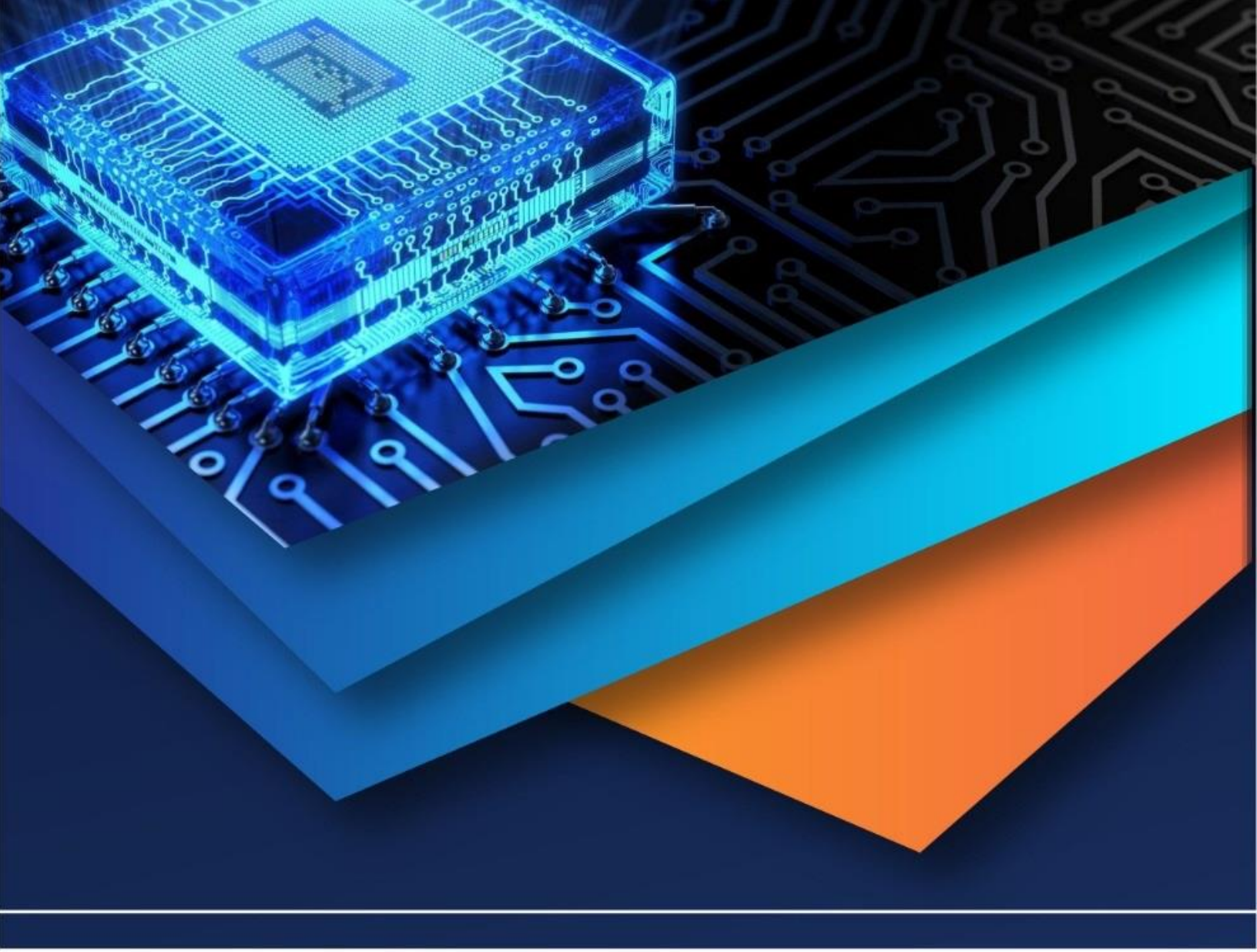
India is witnessing rapid urbanization which will lead to a remarkable increase in energy demand in urban areas. Energy efficient buildings or green buildings have a ability to reduce energy demand by as much as 40%. Therefore, the time has come where we can no longer ignore the benefits of green building practices that have a major impact on our environment. The Government of India is taking right steps to ensure that green building practices are mainstreamed through a mix of regulations and controlled schemes. It has been mandated minimum GRIHA 3 star rating for all upcoming Central Government and Public Sector Undertaking buildings. Now we have to go beyond the buildings and ensure that the concept of 'green' is adopted in every aspect of life to save our Mother Earth and the environment.

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