

Materials Efficiency

- **Buildings materials should be renewable materials , recycle and friendly to the environment.**
- **Examples are lumber from forest, renewable plant materials like bamboo and straw and other products that are non-toxic, reusable, etc.**

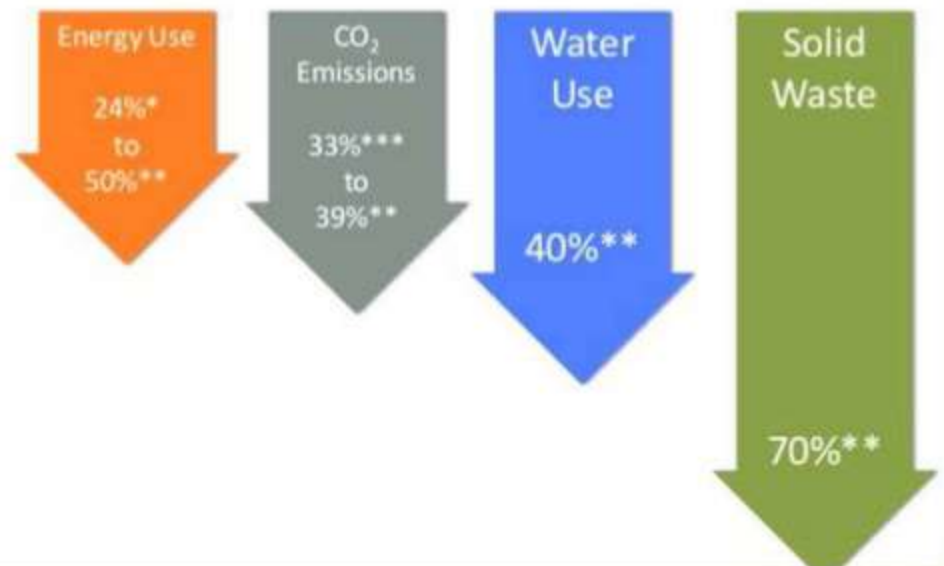


Waste And Toxic Reduction

- **To Reuse Resources.**
- **To Recycle The Resources**



Green Buildings can potentially reduce...



Green Building Rating Systems

- **The objective of green building rating systems is to evaluate the performance of green buildings.**
- **The performance of the building is evaluated based on following parameters**
- *Site planning*
- *Building envelope design*
- *Building system design (HVAC)*
- *Integration of renewable energy sources to generate energy on site*
- *Planning designing, construction and operation.*

Green Building Rating Systems



Green Building Rating Systems Used Around The World

COUNTRY	RATING SYSTEM
USA	LEED/ LIVING BUILDING CHALLENGES/ GREEN GLOBES/ NAHB/ BUILD IT GREEN
AUSTRALIA	NABARS/ GREEN STAR
CANADA	LEED CANADA/ GREEN GLOBES
SWITZERLAND	MINERGIE
UK	BREEAM
UAE	ESTIDMA
FINLAND	PROMISE
ITALY	PROTOCOLLO ITACA/ GREEN BUILDING COUNCIL ITALIA
BRAZIL	AQUA/ LEED BRASIL
INDIA	LEED INDIA/ TERI GRIHA

Green Building Rating Systems In INDIA

- **LEED INDIA:** An Indian adaptation of LEED USA, by Indian green building council
- **TERI- GRIHA:**
- **A National Rating System for Green Buildings** developed by MN RE in association with TERI.



IGBC GREEN Buildings

- **The Indian Green Building Council (IGBC) provides LEED ratings to structures in India**
- **Each rating system divided into different level of certification is as follows:**
- **‘Certified’ to recognise best practices.**
- **‘Silver’ to recognise outstanding performances.**
- **‘Gold’ to recognise national excellence.**
- **‘Platinum’ to recognise global leadership.**

Different Levels Of Green Building Certification

The various levels of rating awarded are;

‘certified’ to recognize best practices

- (30-36 Pts)

‘Silver’ to recognize outstanding performance

- (37- 44 Pts)

‘gold’ to recognize national excellence

- (45- 55 Pts)

‘platinum’ to recognize global leadership

- (56-75 Pts)

Different Levels Of Green Building Certification

- **IGBC Green Buildings addresses green features under following categories:**
 - *Site selection and planning*
 - *Water efficiency*
 - *Energy efficiency*
 - *Indoor environmental quality*
 - *Innovation & design process*

IGBC Green Buildings



IGBC Green Homes

IGBC Green Homes Rating System
For Individual & Multi-Dwelling Residential Units



Version 3.0
Detailed Reference Guide
October 2013

Indian Green Building Council
Covering India Since 2004

PERFORMANCE

*Student's performance
&
Building's performance*

- Fresh air, daylight, improved indoor environment enhances the performance of students
- Water efficiency, energy efficiency and post monitoring improves building performance

PEDAGOGY

*Science
&
Art of education*

- Eco-sensitivity is both a passion and science. Children get sensitised to environmental aspects

COMMUNITY

*Help to educate the greater
community*

- Knowledge sharing within the school helps in reaching out to parents and nearby communities.

RESPONSIBILITY

Towards environment

- Children learn to take responsibility for their own actions that concerns the environment

TERI - GRIHA

GRIHA- GREEN RATING FOR INTEGRATED HABITAT ASSESSMENT

- GRIHA rating system consists of 34 criteria categorized under various sections such as Site Selection and Site Planning, Conservation and efficient utilization of resources, Building operation and maintenance, and Innovation points. Eight of these 34 criteria are mandatory, four are partly mandatory, while the rest are optional.**
- 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. Different levels of certification (one star to five stars) are awarded based on the number of points earned.**

TERI - GRIHA



**Green Rating for Integrated Habitat
Assessment
(GRIHA)
National Rating System
for
Green Building**



**Ministry of New & Renewable Energy
Government of India**

Teri - Griha

TERI GRIHA HAS 100 POINT SYSTEM

- **The minimum points required for certification is 50.**
- Building scoring
- 50-60 points- one star
- 61-70- two stars
- 71- 80 -three stars
- 81-90 -four stars
- 91- 100 Five stars

Points achieved	GRIHA Rating
50-60	★
61-70	★★
71-80	★★★
81-90	★★★★
91-100	★★★★★

FUNDAMENTAL PRINCIPLES OF GREEN BUILDING

- Sustainable Site Design
- Indoor Environmental Quality
- Energy and Environment
- Materials and Resources
- Water Quality and Conservation

Site Selection And Planning

1.SUSTAINABLE SITE DESIGN

- Evaluate each site in terms of the location and orientation of buildings in order to optimize the use of passive solar energy, natural day lighting, and natural breezes and ventilation.
- Help to reduce the urban heat island effect by maximizing the use of pervious surfaces, and using light colored roofs, paving, and roof gardens.
- Provide natural shading to buildings and paved areas with trees and other landscape features.
- Help reduce night-time light pollution by avoiding over-illumination of the site and use low cut-off exterior lighting fixtures which direct light downward, not upward and outward

Site Selection And Planning

- Site selection is environmentally responsible
- Building orientation is optimized
- Impervious surfaces are minimized
- Site disturbance is minimized
- Stormwater quantity and quality is considered
- Landscaping is water efficient and active

Indoor Environmental Quality

2. Indoor Environmental Quality

- Use building materials, adhesives, sealants, finishes and furnishings which do not contain, generate or release any particulate or gaseous contaminants including volatile organic compounds (VOCs).
- Maximize the use of natural day lighting. Optimize solar orientation to maximize penetration of natural daylight into interior spaces.
- Ventilation systems should be capable of effectively removing or indoor contaminants while providing adequate amounts of fresh air to all regions of the building.

Indoor Environmental Quality



Indoor Environmental Quality

- Low-emitting paints, sealants and adhesives used
 - Zero or low volatile organic compounds (VOCs)
- No smoking (including restaurants) – before GA became non-smoking
- Increased ventilation – 30% over ASHRAE 62



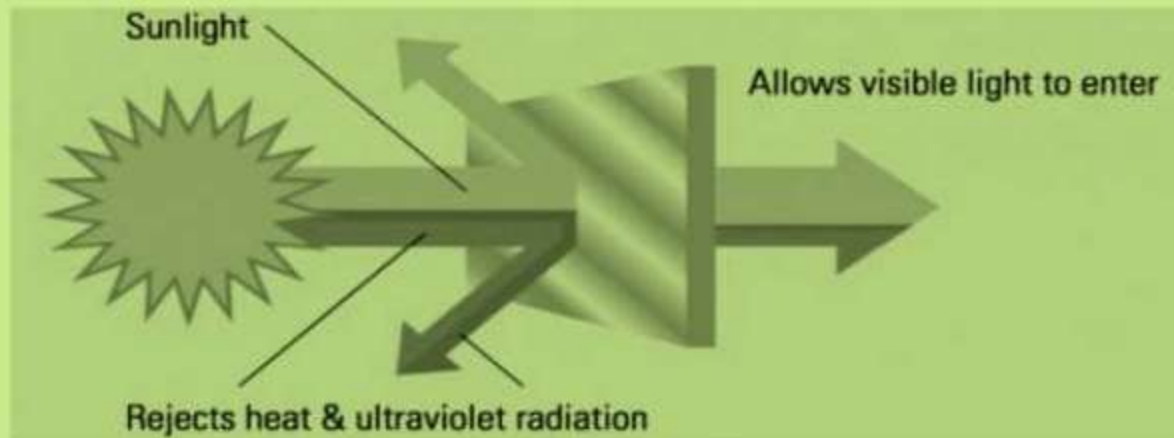
No Smoking



Energy Efficiency

Energy and Environment

- Use high performance low-e glazing, which can result in significant year round energy savings.



Low-emissivity glass- also known as low-E glass, uses a microscopically thin and virtually invisible metal or metallic oxide layer incorporated in the glazing surface to control heat transfer reducing energy loss by 30% to 50%.

Energy Efficiency



Water Efficiency

Water Quality and Conservation

- Reducing the overall water usages
- Rainwater harvesting
- Recycling of wastewater
- Water efficient landscaping

Water Efficiency



Innovation & Design Process

Materials and Resources

- Minimize the use of non-renewable construction materials.
- Maximize the use of recycled materials, modern efficient engineered materials.
- Sustainably managed, bio-based materials.

Innovation & Design Process

GREEN BUILDING MATERIAL



Water Permeable Brick



Wood Mineralized Board



Lightweight Bubble Brick



Energy Efficiency In Indian Building

- The benefits of energy efficiency in building are compelling, cost effective and can help consumers to save money in the long term. It helps to meet energy targets and resource energy shortage.**
- There is an urgent need to improve the energy efficiency of the Indian economy. About 70% of the infrastructure in 2030, such as buildings, will be added in next two decades**
- The projections for energy demand in 2032 imply a fourfold increase in requirements.**

Green Building In India

- **Suzlon Energy Limited (SEL),Pune**
- **Suzlon Energy Limited (SEL), India's largest wind turbine manufacturer, received LEED Platinum award for their new corporate headquarters in Pune, Maharashtra, India.**
- **Biodiversity Conservation India Ltd (BCIL) - Bangalore**
BCIL's TZed homes in Whitefield, Bangalore has been certified as the first residential apartment in the world to be rated 'Platinum' under LEED.
- **Olympia Technology Park - Chennai**
- **The world's largest LEED 'Gold' rated green building.. Built on an area of 1.8 million sq. ft., this futuristic masterpiece features three mighty towers on 8.4 acre greenery**

Suzlon Energy Limited (SEL),Pune

LEED Platinum



Biodiversity Conservation India Ltd (BCIL) Bangalore LEED Platinum



Olympia Technology Park – Chennai

LEED ‘Gold’



Green Building In India

- **ITC Green Centre - Gurgaon**
- **The ITC Green Centre was the first 'Platinum' rated building in India and has endeavoured to adopt green practices that go beyond recycled waste and day-lit offices.**
- **The Druk White Lotus School - Ladakh**
- **A modest school that is adjudged as an outstanding example of sustainable, green, cost effective building development.** This multi-award winning structure is the recipient of the Best Asian Building, Best Education Building and Best Green Building awards.