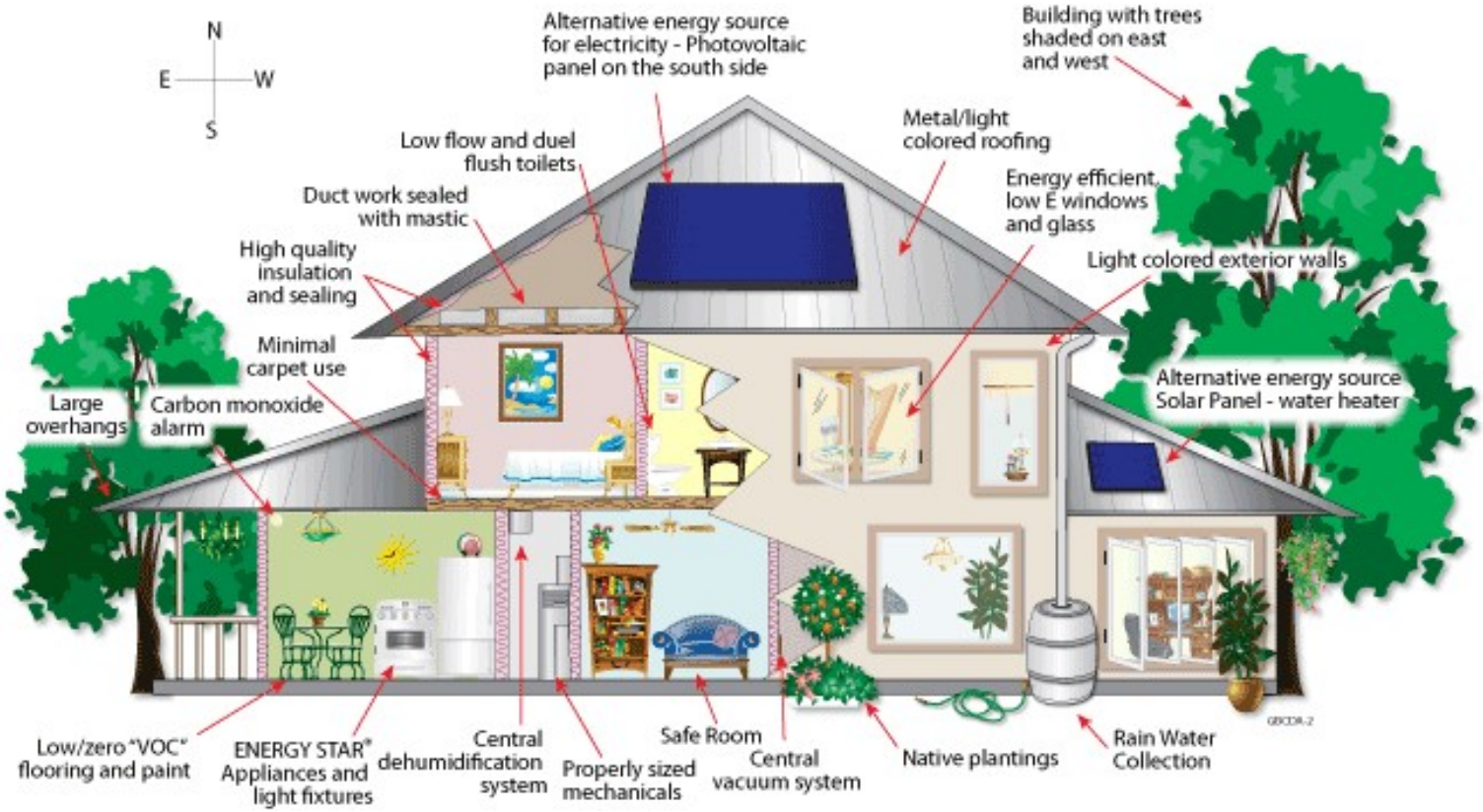
Introduction

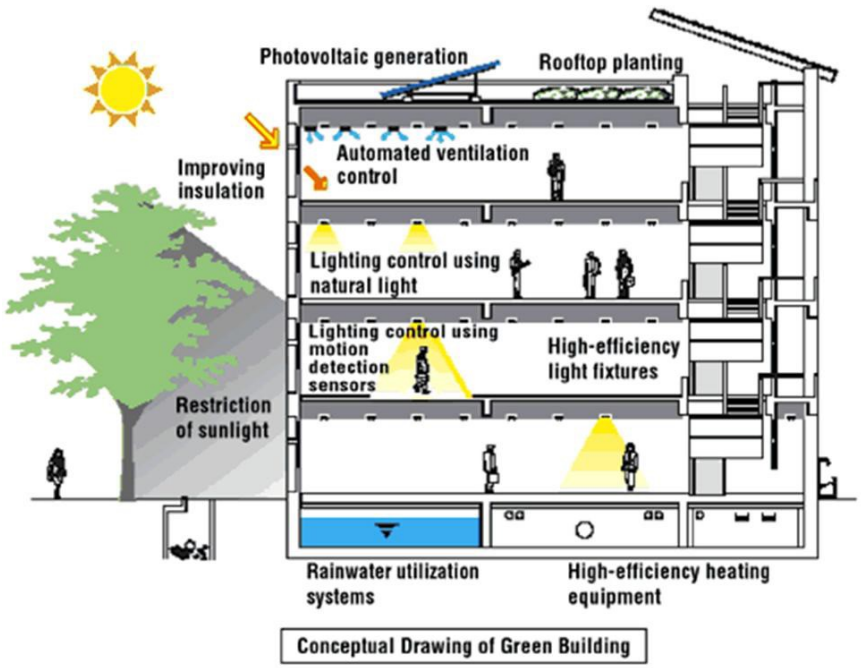
Introduction (Contd...)

- Green Building (also known as green construction or sustainable building) expands and compliments the building design concerns of economy, utility, durability and comfort.
- A Green Building is one which uses less water, optimizes energy efficiency, conserves natural resources, generates less waste and provides healthier space for occupants as compared to conventional building.
- Green buildings are designed to reduce the overall impact on human health and natural environment.
- Using energy, water and other resources efficiently.
- By reducing waste, pollution and environmental degradation.

Introduction (Contd...)



Concept of Green Building



Conceptual Drawing of Green Building

- Sustainable site planning
- Building Design Optimization
- Energy Performance Optimization
- Renewal Energy Utilization
- Water and Waste Management
- Solid Waste Management
- Sustainable Building materials and Construction Technology
- Health, well being and Environmental Quality

How to make a building Green

- Sustainable site planning with bioclimatic architectural planning
- Design energy efficient lighting and HVAC (Heating, Ventilation, and Air conditioning) system.
- Use low energy and renewable materials.
- Choose construction materials and interior finishes products with zero or low emissions to improve indoor air quality.
- Use dimensional planning and other material efficiency strategies.
- Design for gray water system that recovers rain water for site irrigation and dual plumbing system for use of recycled water for toilet flushing.

History of Green Building

- In the 1960s, American architect Paul Soleri proposed a new concept of ecological architecture.
- In 1969, American architect Ian McHarg wrote the book "Design Integrates Nature", which marked the official birth of ecological architecture.
- In the 1970s, the energy crisis caused various building energy-saving technologies such as solar energy, geothermal energy, and wind energy to emerge, and energy-saving buildings became the forerunner of building development.

History of Green Building

- In 1980, the World Conservation Organization put forward the slogan "sustainable development" for the first time. At the same time, the energy-saving building system was gradually improved, and it was widely used in developed countries such as Germany, Britain, France and Canada.

- In 1987, the United Nations Environment Program published the "Our Common Future" report, which established the idea of sustainable development.

- In 1990, the world's first green building standard was released in the UK.

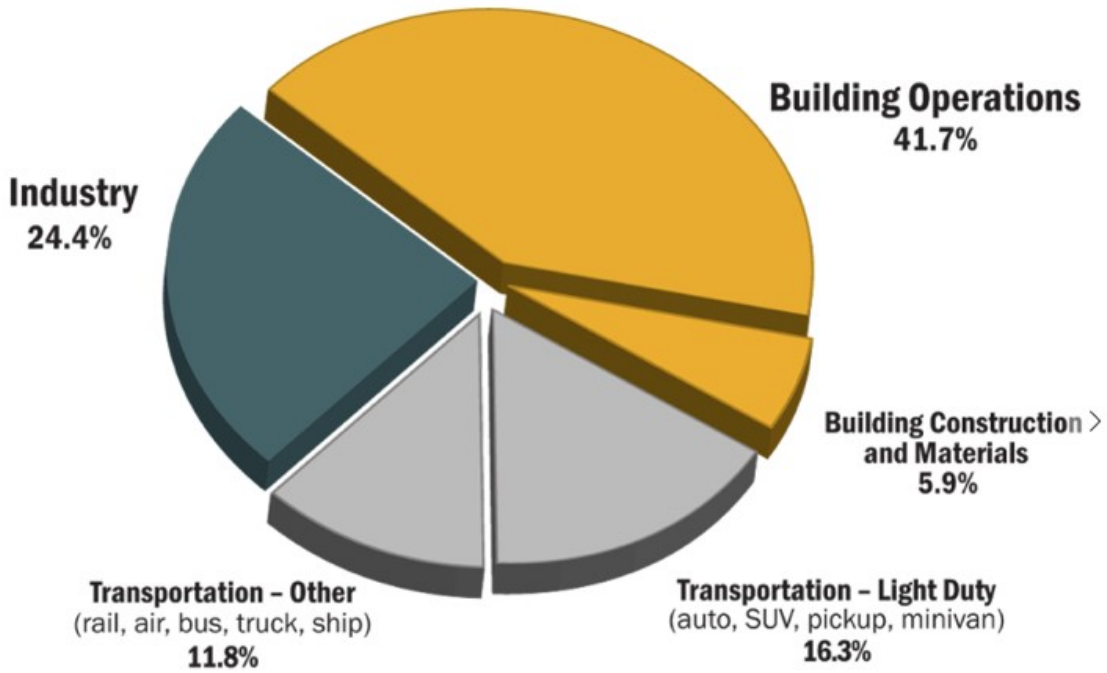
History of Green Building

- In 1992, because the "United Nations Conference on Environment and Development" promoted the idea of sustainable development, green buildings gradually became the direction of development.
- In 1993, the United States created the Green Building Association.
- In 1996, Hong Kong introduced Green Building Standards.
- In 1999, Taiwan introduced Green Building Standards.
- In 2000, Canada introduced Green Building Standards.
- In 2005, Singapore initiated the "BCA Green Building Mark"
- In 2015, China implemented the "Green Building Evaluation Standards".

Need of Green Buildings in present scenario

- Buildings are responsible for 40% of world wide energy flow and material use conventional buildings have been identified as the largest source of green house gas emissions, even more than that of the transport and industry sector.
- 8000lbs of waste are typically thrown into a landfill during the construction of a 2000sqft home.
- The buildings in the US consume more than twice as much energy as all the cars in the US.
- Buildings account for 68% of total electricity consumption in the US.
- Buildings use 80% of total drinking water consumption in the US.
- Indoor levels of pollution are commonly 2 to 5 times higher than outdoor pollution levels.

Need of Green Buildings in present scenario



U.S. Energy Consumption by Sector

Source: ©2013 2030, Inc. / Architecture 2030. All Rights Reserved.
Data Source: U.S. Energy Information Administration (2012).

Objectives of Green Building

- Protecting Occupant Health
- Improving employee productivity
- Using energy, water and other resources more efficiently
- Reducing overall impact to the environment
- Optimal environmental and economic performance
- Satisfying and Quality Indoor spaces

Importance of Green Buildings

- Nowadays we should make a way to maximize our natural resources to help our mother earth to get relief from the pollutions like global warming that we are all experiencing. Non- renewable sources are expensive and unsafe.
- Green Building concept is the practice of creating structure using processes that are environmental friendly and resources efficient during building life-cycle; selection of site, design, construction, operation, maintenance, renovation and destruction.
- The importance is to lessen the consumption of energy and pollution as well. More use of non-renewable energy leads to more pollution.
- The growth and development of our communities has a larger impact on our natural environment. The manufacturing, design , construction and operation of buildings are responsible for the consumption of our natural resources

Benefits of Green Buildings

- Buildings have large effect on environment, human health and environment.
- The successful adoption of Green Building Development can maximize both economic and environmental performance of buildings.

Environmental Benefits:

- Protect Biodiversity and ecosystems
- Improve air and water quality
- Reduce waste streams
- Conserve natural resources

Benefits of Green Buildings

➢ Economic Benefits:

- Reduce operating costs
- Create, Expand and Shape markets for green product and services
- Improve Occupant Productivity

➢ Social Benefits:

- Enhance occupant comfort and health
- Heighten aesthetic qualities
- Minimize strain on local infrastructure
- Improve overall quality of life

Features of Green Building

- Minimal disturbance to landscapes and site condition
- Use of non-toxic, recycled /recyclable materials
- Efficient use of water and water recycling
- Use of energy efficient and eco-friendly equipments
- Use of renewable energy
- Good Indoor air quality for human safety and comfort
- Effective controls and building management system

Merits of Green Building

- Efficient Technologies
- Easier Maintenance
- Return of Investment
- Improved Indoor Air Quality
- Energy Efficiency
- Water Efficiency
- Waste Reduction
- Temperature Moderation
- Water Conservation
- Economical Construction for Poor
- Healthier Lifestyles and Recreation
- Improved Health

Demerits of Green Building

- Initial Cost is High
- Availability of Materials is Less
- Need More time to Construct
- Need Skilled Workers

Green Building Rating System

- A green building rating system is an evaluation tool that measures environmental performance of a building through its life cycle
- Comprises of a set of criteria covering various parameters related to design, construction and operation of a green building
- Each criterion has pre-assigned points and sets performance benchmarks and goals that are largely quantifiable
- A project is awarded points once it fulfillsthe rating criteria. The points are added up and the final rating of a project is decided.
- Globally,green building rating systems are largely voluntary in nature and have been instrumental in raising awareness and popularizing green building design.

Green Building Rating System

- some of the rating systems are

- BREEAM: Building Research Establishment's Environmental Assessment Method was developed in UK in 1990.
- GBTool: GBTool was developed by the International Frame work Committee for the Green Building Challenge,an international project that has involved more than 25 countries since1998.
- LEED: Leadership in Energy and Environmental Design was developed in the US in1998.
- CASBEE: Comprehensive Assessment System for Building Environmental Efficiency was developed in Japan, in 2001.
- IGBC: Indian Green Building Council was formed in the year 2001.

Fundamental principles of Green Buildings

- Structure design efficiency
- Energy efficiency
- Water efficiency
- Materials efficiency
- Waste and toxic reduction

Fundamental principles of Green Buildings

➢ Structural design efficiency:

- It is the concept of sustainable building and has largest impact on cost and performance
- It aims to minimize the environment impact associated with all life-cycles

➢ Energy efficiency:

- The layout of the construction can be strategised so that natural light pours for additional wamth
- Shading the roof with trees offers an eco-friendly alternative to air conditioning

Fundamental principles of Green Buildings

➢ Water efficiency:

- To minimize water consumption one should aim to use the water which has been collected,used,purified and reused

➢ Material efficiency:

- Material should be use that can be recycled and generate surplus amount of energy
- an examples of this are solar power panels,not only they provide lightening but they are also a useful energy source

➢ Waste and toxic reduction:

- it is probable to reuse resources
- what may be waste to us may have another benefit to something else

Thank You..

Green building Materials

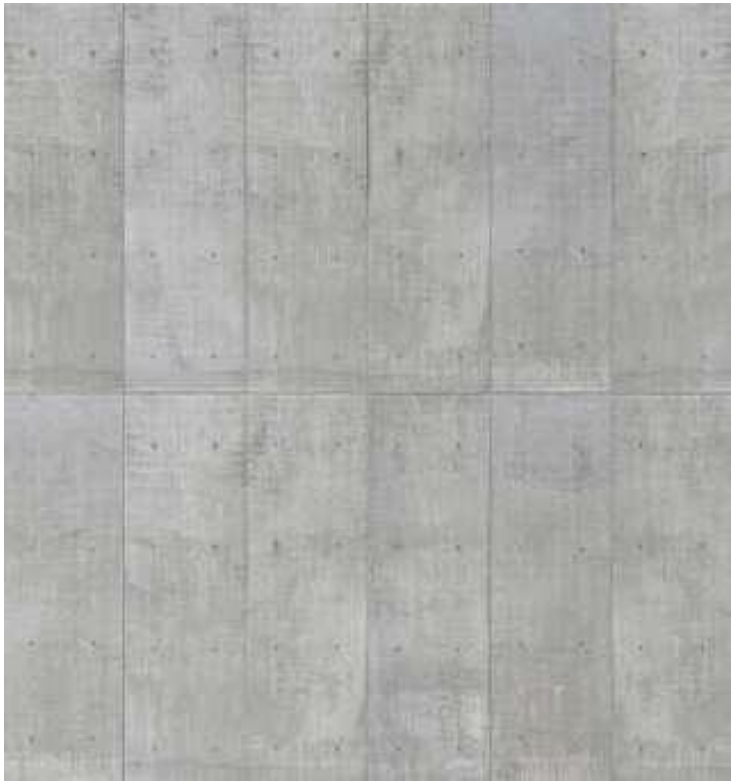
- Wool brick
- Sustainable Concrete
- Paper Insulation
- Eco Friendly
- Flooring
- Wall Fishes
- Triple-Glazed Windows
- Cabinetry
- Tile
- Typical Layout Of Green Building

Wool Brick

- Obtained by adding wool and a natural polymer found in seaweed to the clay of the brick
- 37% More strength than burnt bricks
- Resistant for cold and wet climate

Sustainable Concrete

- Crushed glass
- Wood chips or slag - a byproduct of steel manufacturing.
- Reduces the emission of CO2

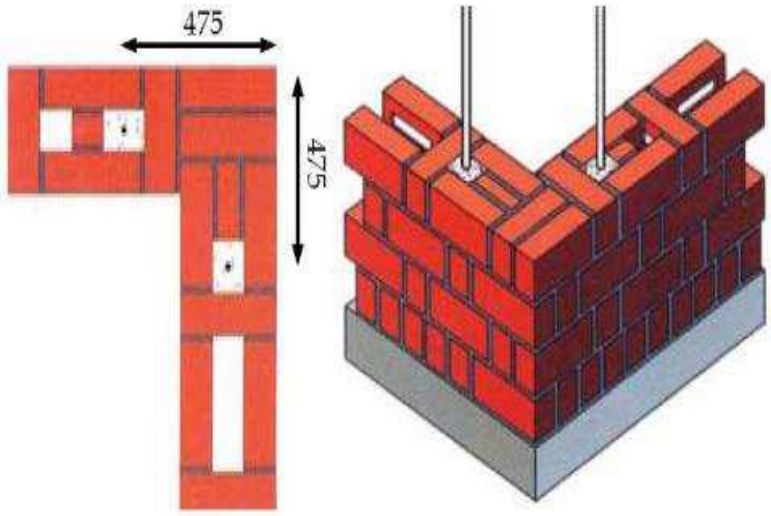


Paper Insulation

- Made from recycled newspapers and cardboard
- Then filled with chemical foam
- Insect resistant &fire retardant

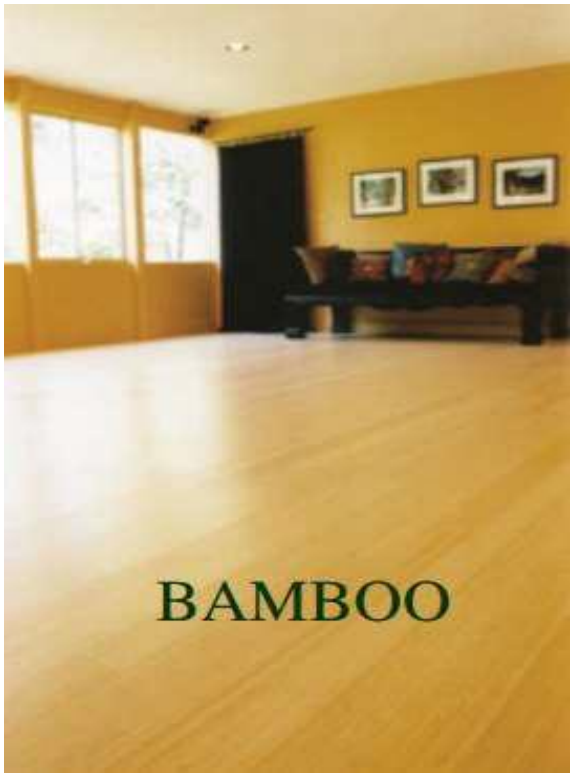
Eco Friendly

- Using Bamboo Replacing The Steel Bars



Flooring

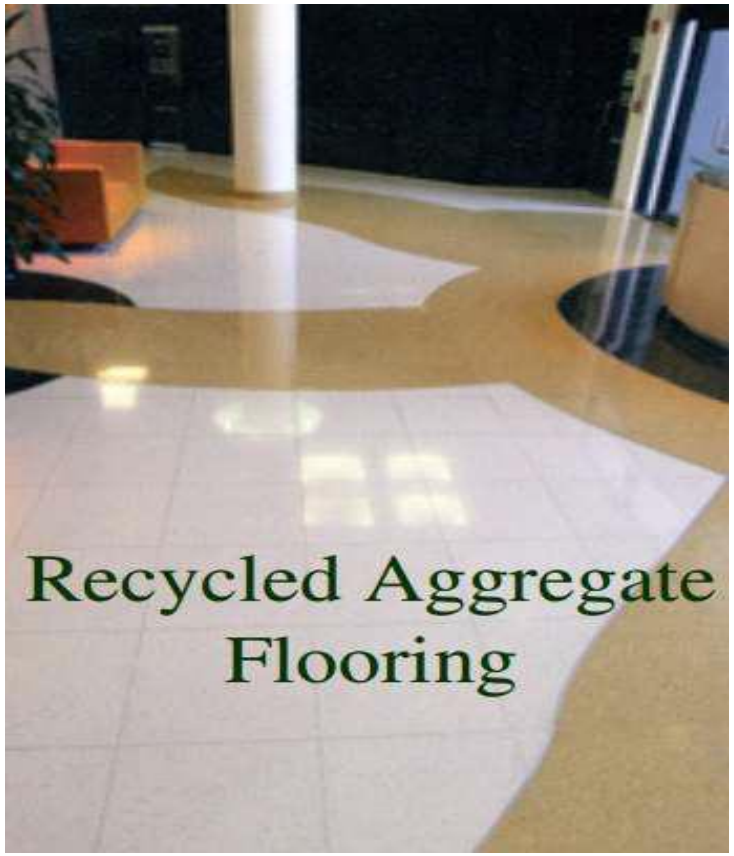
- Rapidly Renewable Flooring



Sustainable Carpeting

Flooring

- Waste Based Flooring



- FSC Certified Flooring

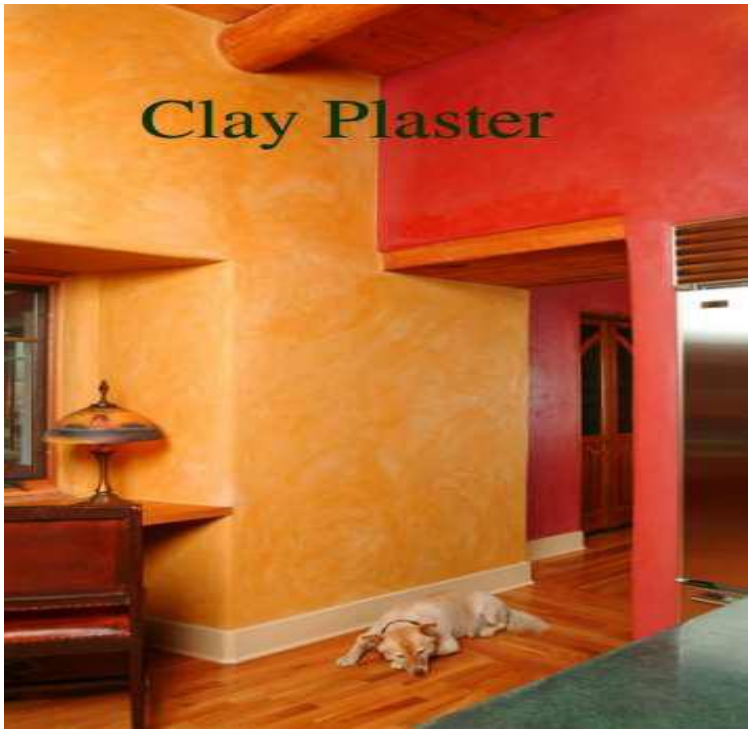
Flooring

- PRINCIPLE #1: COMPLIANCE WITH LAWS AND FSC PRINCIPLES
- PRINCIPLE #2: TENURE AND USE RIGHTS AND RESPONSIBILITIES
- PRINCIPLE #3: INDIGENOUS PEOPLES' RIGHTS
- PRINCIPLE #4: COMMUNITY RELATIONS AND WORKER'S RIGHTS
- PRINCIPLE # 5: BENEFITS FROM THE FOREST
- PRINCIPLE #6: ENVIRONMENTAL IMPACT
- PRINCIPLE #7: MANAGEMENT PLAN
- PRINCIPLE #8: MONITORING AND ASSESSMENT
- PRINCIPLE # 9: MAINTENANCE OF HIGH CONSERVATION VALUE FORESTS
- PRINCIPLE # 10: PLANTATIONS

Wall Fishes

- Low & Zero VOC Paints

- Natural plaster



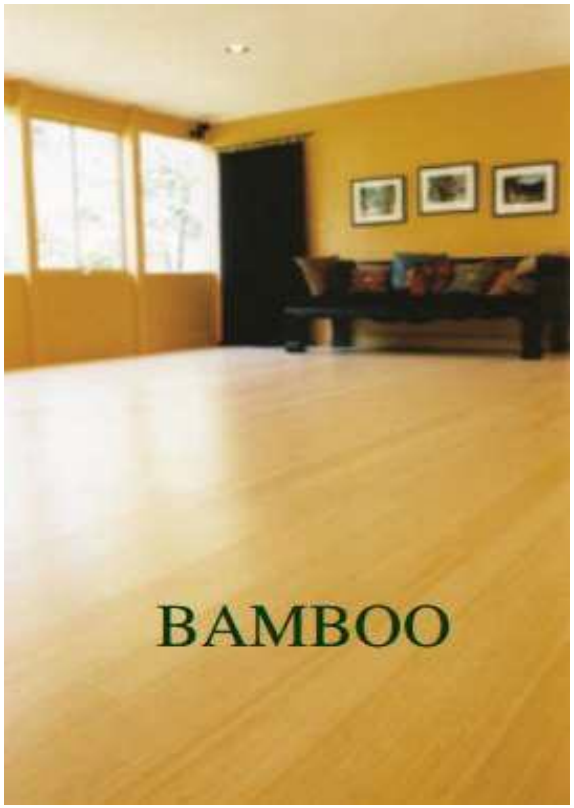
Natural paints

Triple-Glazed Windows

- Super-efficient windows.
- Stops heat to enter the building & from direct sunlight.

Cabinetry

- Alternative to Wood



- FSC Certified Wood

Recycled Stone Tile

Green Rating for Integrated Habitat Assessment (GRIHA)

'The Energy and Resources Institute' (TERI) India evolved the 'Green Rating for Integrated Habitat Assessment' (GRIHA) in 2006 to establish a system that addressed India's concerns about resource consumption in power, water sectors and on eroding biodiversity.

The system emphasises on passive solar techniques for optimal thermal comfort in using refrigeration-based air conditioning systems in case of ~~external~~ extreme discomfort.

The system is primarily focused toward large new construction buildings.

Certification is based on point system and evaluation is conducted by a secretariat.

GRIHA rating system is consisting of 34 criterions with 4 categories.

Eight of these 34 criterions are mandatory, 4 are partially mandatory and remaing 22 criterions are optional (GRIHA 2012)

Evaluation Procedure of GRIHA Criterions

Criterion No.	Name of the Criteria	Points
1.	Site selection	1 PM
2	Preserve and Protect landscape during construction/compensatory depository forestation	5 PM
3.	Soil conservation (Post construction)	4
4	Design to include existing site features	2 PM
5	Reduce hard paving on site	2 PM
6	Enhance outdoor lighting system efficiency and use RE system for meeting outdoor lighting requirements.	3
7	Plan utilities efficiently and optimize on site circulation efficiency	3
8.	Provide minimum level of sanitation/safety facilities for construction workers.	2 PM
9	Reduce air pollution during construction	2 PM
10	Reduce landscape water requirements	3
11	Reduce building wateruse	2
12	Efficient waterue during construction	1
13	Optimize building design to reduce conventional energy demand	6 M
14	Optimize energy performance of building within specified comfort	12
15	Utilization of flyash in building structure	6
		4

14	Optimize energy performance of building	6
15	Utilization of flyash in building structure	4
16	Reduce volume, weight and time of construction by adopting efficient technology (pre-cast systems, RMC, etc).	4
17	Use of low energy materials in the interiors	5 PM
18	Renewable energy utilization	3
19	" " based hot water system	2
20	Waste water treatment	5
21	Water recycle and reuse (including rainwater)	2
22	Reduction in waste during construction	2
23	Efficient waste segregation	2
24	storage and disposal of waste	2
25	Re-source recovery from waste	4
26	Use of low VOC (volatile organic compounds) paints, adhesives, sealants	3
27	Minimize ozone depleting substances	2
28	Ensure water quality	2
29	Acceptable outdoor and indoor noise levels	1
30	Tobacco and smoke control	1
31	Universal accessibility	M
32	Energy audit and validation	2 M
33	Operation and maintenance protocol for electrical and mechanical equipments	100
34	Innovation (beyond 100 points)	4
	Total points	104

Note: M = Mandatory ; PM = Partly Mandatory

The Leadership in Energy and Environmental Design

U.S. Green Building Council

- Brief history of USGBC:

- The U.S. Green Building Council (USGBC), co-founded by Mike Italiano, David Gottfried and Rick Fedrizzi in 1993, is a non-profit trade organization that promotes sustainability in how buildings are designed,built, and operated. USGBC is best known for the development of the LEED green building rating systems.

What is LEED?

- LEED (Leadership in Energy and Environmental Design) is a voluntary, market-driven program that provides third-party verification of green buildings.

- From individual buildings and homes, to entire neighbourhoods and communities, LEED is transforming the way built environments are designed, constructed, and operated. Comprehensive and flexible, LEED addresses the entire lifecycle of a building.

- It provides building owners and operators with a framework for identifying and implementing practical and measurable green building design, construction, operations and maintenance solutions.

The Leadership in Energy and Environmental Design

LEED

- Sustainable Site 26

  Site Selection – Urban Redevelopment – Alternative Transportation –

  Reduce the Site Disturbance

- Water Management 10

  Water Efficient Landscaping – Innovative Wastewater Technologies –

  Water use Reduction

- Energy and Building Skin 35

  Fundamental building system – Minimum energy performance – HVAC

  Renewable energy – Green power

LEED

- Materials Use 14

  Recycled contents – Building Reuse – Waste Management

- Indoor Environment Quality 15

  Thermal comfort – Low Emitting Materials

  Ventilation Effectiveness – Daylight and views

- •Design Innovation 6

- •Local Environment 4

LEED Rating Scale

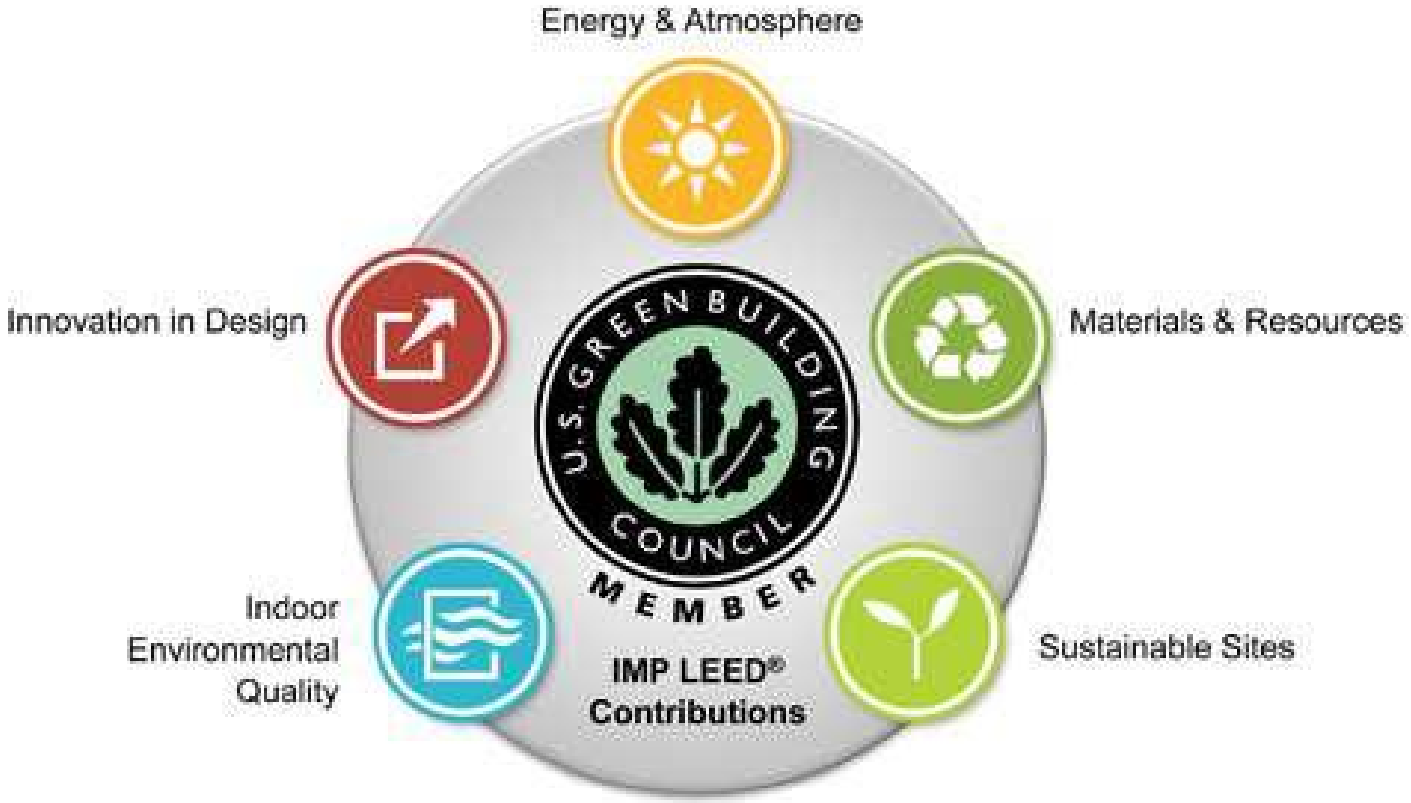
CERTIFIED	SILVER	GOLD	PLATINUM
40-49 points	50-59 points	60-79 points	80+ points

Why LEED?

- LEED-certified buildings are designed to:

- Lower operating costs and increase asset value
- Reduce waste sent to landfills
- Conserve energy and water
- Be healthier and safer for occupants
- Reduce harmful greenhouse gas emissions

MAIN CREDIT CATEGORIES:



OTHER CREDIT CATEGORIES:

LEED RATING IN INDIA

- IGBC has licensed the LEED Green Building Standard from the U.S. Green Building Council and currently is responsible for certifying LEED-New Construction and LEED-Core and Shell buildings in India. There are many energy efficient buildings in India, situated in a variety of climatic zones.

- Indian Green Building Council, is continuously striving towards wider adoption of eco-friendly / green building concepts in the Indian Industry.