System and Criteria for Rating of a Green Building in India

[Extracted from "TERI-GRIHA (TERI-Green Rating for Integrated Habitat Assessment)" pp. 2 – 13 from the website: http://www.hareda.gov.in/TERI.PDF]

1.0 Introduction

The green building rating system devised by TERI is a voluntary scheme. It has derived useful inputs from the upcoming mandatory building codes/guidelines being developed by the Bureau of Energy Efficiency, the Ministry of Non-Conventional Energy Sources, MoEF (Ministry of Environment and Forests), Government of India, and the Bureau of Indian Standards. The rating system aims to achieve efficient resource utilisation, enhanced resource efficiency, and better quality of life in buildings.

1.1 The benefits

TERI's green building rating will evaluate the environmental performance of a building holistically over its entire life cycle, thereby providing a definitive 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/criteria appraisal 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 GHG (greenhouse gas) emissions, improving energy security, and reducing the stress on natural resources. Some of the benefits of a green design to a building owner, user, and the society as a whole are as follows:

- Reduced energy consumption without sacrificing the comfort levels
- Reduced destruction of natural areas, habitats, and biodiversity, and reduced soil
- loss from erosion, etc.
- Reduced air and water pollution (with direct health benefits)
- Reduced water consumption
- Limited waste generation due to recycling and reuse
- Reduced pollution loads
- Increased user productivity
- Enhanced image and marketability

1.2 The basic features

Currently the system has been developed to help 'design and evaluate' new buildings (buildings that are still at the inception stages). A building is assessed based on its predicted performance over its entire life cycle –inception through operation. The stages of the life cycle that have been identified for evaluation are the preconstruction, building design and construction, and building operation and maintenance stages. The issues that get addressed in these stages are as follows:

- Pre-construction stage (intra- and inter-site issues)
- Building planning and construction stages (issues of resource conservation and reduction in resource demand, resource utilization efficiency, resource recovery and reuse, and provisions for occupant health and well being). The prime resources that are considered in this section are land, water, energy, air, and green cover.
- Building operation and maintenance stage (issues of operation and maintenance of building systems and processes, monitoring and recording of consumption, and occupant health and well being, and also issues that affect the global and local environment).

1.3 How to get your building rated?

All buildings, except for industrial complexes and housing colonies, which are in the design stage, are eligible for certification under the TERI system. Buildings include offices, retail spaces, institutional buildings, hotels, hospital buildings, healthcare facilities, residences, and multi-family high-rise buildings. The detail guidelines are available in the above mentioned website of TERI-GRIHA.

1.4 Criteria for rating Green Building

1.4.1 Site planning

Conservation and efficient utilization of resources

Objective: To maximize the conservation and utilisation of resources (land, water, natural habitat, avi fauna, and energy) conservation and enhance efficiency of the systems and operations.

Criterion 1 Preserve and protect the landscape during construction/compensatory depository forestation.
Commitment: Proper timing of construction, preserve top soil and existing vegetation, staging and spill prevention, and erosion and sedimentation control. Replant, on-site, trees in the ratio 1:3 to those removed during construction.

Criterion 2 Soil conservation (till post-construction).
Commitment: Proper top soil laying and stabilization of the soil and maintenance of adequate fertility of the soil to support vegetative growth.

Criterion 3 Design to include existing site features.
Commitment: Minimize the disruption of natural ecosystem and design to harness maximum benefits of the prevailing micro-climate.

Criterion 4 Reduce hard paving on-site and /or provide shaded hard-paved surfaces.
Commitment: Minimize storm water run-off from site by reducing hard paving on site.

Criterion 5 Enhance outdoor lighting system efficiency.
Commitment: Meet minimum allowable luminous efficacy (as per lamp type) and make progressive use of a renewable energy-based lighting system.

Criterion 6 Plan utilities efficiently and optimize on-site circulation efficiency.
Commitment: Minimize road and pedestrian walkway length by appropriate planning and provide aggregate corridors for utility lines.

Health and well being

Objectives: To protect the health of construction workers and prevent pollution.

Criterion 7 Provide at least, the minimum level of sanitation/ safety facilities for construction workers.
Commitment: Ensure cleanliness of workplace with regard to the disposal of waste and effluent, provide clean drinking water and latrines and urinals as per applicable standard.

Criterion 8 Reduce air pollution during construction.
Commitment: Ensure proper screening, covering stockpiles, covering brick and loads of dusty materials, wheel-washing facility, water spraying.

1.4.2 Building planning and construction stage

Conservation and efficient utilization of resources

Objective: To maximize resource (water, energy, and materials) conservation and enhance efficiency of the system and operations.

Criterion 9 Reduce landscape water requirement.
Commitment: Landscape using native species and reduce lawn areas while enhancing the irrigation efficiency, reduction in water requirement for landscaping purposes.

Criterion 10 Reduce building water use.
Commi tment: Reduce building water use by applying low-flow fixtures, etc.

Criterion 11 Efficient water use during construction.
Commitment: Use materials such as pre-mixed concrete for preventing loss during mixing. Use recycled treated water and control the waste of curing water.

Energy: end use

Criterion 12 Optimise building design to reduce the conventional energy demand.
Commitment: Plan appropriately to reflect climate responsiveness, adopt an adequate comfort range, less air-conditioned areas, day lighting, avoid over-design of the lighting and air conditioning systems.

Criterion 13 Optimise the energy performance of the building within specified comfort limits.
Commitment: Ensure that energy consumption in building under a specified category is 10%-40% less than that benchmarked through a simulation exercise.

Energy: embodied and construction

Criterion 14 Utilization of fly ash in the building structure.
Commitment: Use of fly ash for RCC (reinforced cement concrete) structures with in-fill walls and load bearing structures, mortar, and binders.

Criterion 15 Reduce volume, weight, and time of construction by adopting an efficient technology (e.g. pre-cast systems, ready -mix concrete, etc.).
Commitment: Replace a part of the energy -intensive materials with less energy intensive materials and/ or utilize regionally available materials, which use low energy/ energy-efficient technologies.

Criterion 16 Use low-energy material in the interiors.
Commitment: Minimum 70% in each of the three categories of interiors (internal partitions, paneling/false ceiling/interior wood finishes/ in-built furniture door/ window frames, flooring) from low-energy materials/ finishes to minimize the usage of wood.

Energy: renewable

Criterion 17 Renewable energy utilization.
Commitment: Meet energy requirements for a minimum of 10% of the internal lighting load (for general lighting) or its equivalent from renewable energy sources

(solar, wind, biomass, fuel cells, etc). Energy requirements will be calculated based on realistic assumptions which will be subject to verification during appraisal.

Criterion 18 Renewable energy – based hot – water system.
Commitment: Meet 70% or more of the annual energy required for heating water through renewable energy based water-heating systems.

Recycle, recharge, and reuse of water

Objective: To promote the recycle and reuse of water.

Criterion 19 Waste- water treatment
Commitment: Provide necessary treatment of water for achieving the desired concentration of effluents.

Criterion 20 Water recycle and reuse (including rainwater).
Commitment: Provide wastewater treatment on-site for achieving prescribed concentration, rainwater harvesting, reuse of treated waste water and rainwater for meeting

the building's water and irrigation demand.

Waste management

Objective: To minimize waste generation, streamline waste segregation, storage, and disposal, and promote resource recovery from waste.

Criterion 21 Reduction in waste during construction.
Commitment: Ensure maximum resource recovery and safe disposal of wastes generated during construction and reduce the burden on landfill.

Criterion 22 Efficient waste segregation.
Commitment: Use different coloured bins for collecting different categories of waste from the building.

Criterion 23 Storage and disposal of waste.
Commitment: Allocate separate space for the collected waste before transferring it to the recycling/disposal stations.

Criterion 24 Resource recovery from waste.
Commitment: Employ resource recovery systems for biodegradable waste as per the

Solid Waste Management and handling Rules, 2000 of the MoEF. Make arrangements for recycling of waste through local dealers

Health and well-being

Objective: To ensure healthy indoor air quality, water quality, and noise levels, and reduce the global warming potential.

Criterion 25 Use of low-VOC (volatile organic compounds) paints/ adhesives / sealants.
Commitment: Use only low VOC paints in the interior of the building. Use water – based rather than solvent based sealants and adhesives.

Criterion 26 Minimize ozone depleting substances.
Commitment: Employ 100% zero ODP (ozone depletion potential) insulation; HCFC (hydrochloro fluorocarbon)/ and CFC (chlorofluoro carbon) free HVAC and refrigeration equipments and/halon-free fire suppression and fire extinguishing systems.

Criterion 27 Ensure water quality.
Commitment: Ensure ground water and municipal water meet the water quality norms as prescribed in the Indian Standards for various applications (Indian Standards for drinking [IS 10500-1991], irrigation applications [IS 11624-1986]. In case the water quality cannot be ensured, provide necessary treatment of raw water for achieving the desired concentration for various applications.

Criterion 28 Acceptable outdoor and indoor noise levels.
Commitment: Ensure outdoor noise level conforms to the Central Pollution Control Board-Environmental Standards-Noise (ambient standards) and indoor noise level conforms to the National Building Code of India, 2005, Bureau of Indian Standards,

Part 8-Building Services; Section 4-Acoustics, sound insulation, and noise control.

Criterion 29 Tobacco and smoke control.
Zero exposure to tobacco smoke for non-smokers, and exclusive ventilation for smoking rooms.

1.4.3 Building operation and maintenance

Objective: Validate and maintain 'green' performance levels/adopt and propagate green practices and concepts.

Criterion 30 Energy audit and validation.
Commitment: Energy audit report to be prepared by approved auditors of the Bureau of Energy Efficiency, Government of India.

Criterion 31 Operation and maintenance protocol for electrical and mechanical equipment.
Commitment: Ensure the inclusion of a specific clause in the contract document for the commissioning of all electrical and mechanical systems to be maintained by the owner, supplier, or operator. Provide a core facility/ service management group, if applicable, which will be responsible for the operation and maintenance of the building and the electrical and mechanical systems after the commissioning. Owner/builder/occupants/service or facility management group to prepare a fully documented operations and maintenance manual, CD, multimedia or an information brochure listing the best practices/do's and don'ts/maintenance requirements for the building and the electrical and mechanical systems along with the names and addresses of the manufacturers/suppliers of the respective system.

Criterion 32 Bonus points.

Four bonus points are available under the rating system for adopting criteria which enhance the green intent of a project, and the applicant can apply for the bonus points. Some of the probable points, not restricted to the ones enumerated below, could be alternative transportation, Environmental education, company policy on green supply chain, life cycle cost analysis and any other criteria proposed by applicant.

The above ratings have been customized in Indian context but there is every scope for further betterment than these criterions as specified.