AKSHAY URJA BHAWAN

New and Renewable Energy Department, Haryana

Haryana Renewable Energy Development Agency (HAREDA)

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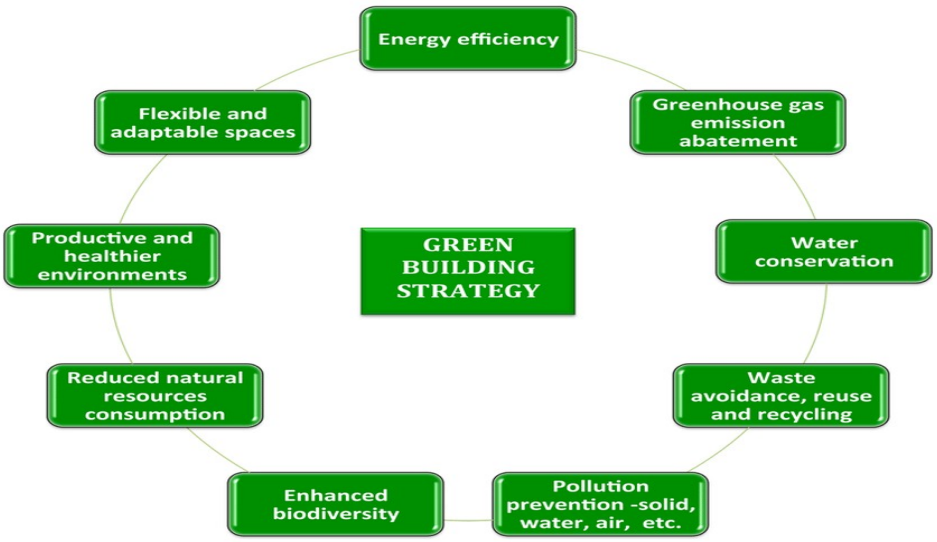
WHAT IS A GREEN BUILDING

Buildings have major environmental impacts over their entire life cycle. Resources such as ground cover, forests, water, and energy are depleted to give way to buildings.

A green building depletes the natural resources to the minimum during its construction and operation. The aim 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 utilization of renewable resources. It maximizes the use of efficient building materials and construction practices; optimizes the use of on-site sources and sinks by bio-climatic architectural practices; 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 hygienic indoor working conditions. In sum, the following aspects of the building design are looked into in an integrated way in a green building.

- Site planning
- Building envelope design
- Building system design (HVAC) heating ventilation and air conditioning, lighting, electrical, and water heating)
- Integration of renewable energy sources to generate energy onsite.
- Water and waste management
- Selection of ecologically sustainable materials (with high recycled content, rapidly renewable resources with low emission potential, etc.).
- Indoor environmental quality (maintain indoor thermal and visual comfort, and air quality)



The green building concept helps to achieve the following -:

- Optimize demand for electricity, water and other naturalresources (in construction, operation and demolition)
- Generate all its electricity on site through renewablemeans
- Cater to all its water demands through sustainable processes such as rain water harvesting
- Grow its own food on site
- Recycle and reuse all its waste on site and burden theenvironment to the minimum.

LEGEND:
1. SHADED CAR PARKING
2. GRASS PAVED CAR PARKING
3. TREES SHADING THE CAR PARK AS WELL AS THE BUILDING
4. BICYCLE PARKING
5. OUTDOOR LIGHTING ON RENEWABLE ENERGY
6. NATIVE SHRUBS
7. ECBC COMPLAINT GLAZING
8. SHADING DEVICES FOR COMPLIANCE WITH ECBC SHADING COEFFICIENT FOR GLASS
9. CONSOLIDATED PEDESTRIAN WALKWAY AND UTLITY CORRIDORS
10. PERGOLA SHADING HARD PAVED SURFACES
11. SOLAR WATER HEATER
12. SOLAR PHOTOVOLTAIC

Highlights of green building features

Benefits of Green building-:

A green building has lower resource consumption as compared to conventional buildings. The following is the percentage reduction of various resources in a building and their respective reasons.

- Green buildings consume 40% to 60% (depending on the range of measures adopted) lesser electricity as compared to conventional buildings. This is primarily because they rely on passive architectural interventions in the building design, and high efficiency materials and technologies in the engineering design of the building.
- Green Buildings 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.
- Green buildings consume 40% to 80% (depending on the range of measures adopted) lesser water as compared to conventional buildings. By utilizing 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 (landscape) water demands.
- Green buildings generate lesser waste by employing waste management strategies on site. They may also employ waste to energy or waste to resource (like manure, or compost) strategies on site, to minimize their burden on municipal waste management facilities and land fills.
- Green buildings generate 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.
- Green buildings ensure proper safety, health and sanitation facilities for the labourers (during construction) and the occupants (while in use).
- Green buildings restrict the use of high ODP (ozone depleting potential) substances in their systems as well as in finishes.
- Green buildings offer higher image and marketability.

GREEN BUILDINGS RATING SYSTEMS IN INDIA

Green rating systems for buildings measure and quantify the environmental performance of a given building. India currently has the below green rating systems for buildings.

a) Green rating for integrated habitat assessment (GRIHA)
b) Leadership in energy and environment design (LEED)
c) IGBC rating systems
d) GEM rating

These green rating systems aim to quantify the environmental, economic and socio-economic benefits of green building design with an emphasis on sustainable site planning, optimized energy performance, efficient materials, and construction practices, water, and waste management strategies; and indoor environmental quality

a) GREEN RATING FOR INTEGRATED HABITAT ASSESSMENT (GRIHA):

Green Rating for Integrated Habitat Assessment (GRIHA) is the national rating system of India for any completed construction, endorsed by the Ministry of New & Renewable Energy (MNRE), Government of India and TERI. It is an assessment tool to measure and rate a building's environmental performance.

b) LEADERSHIP IN ENERGY AND ENVIRONMENT DESIGN (LEED):

LEED (Leadership in Energy and Environmental Design) is the most widely used green building rating system in the world. It was the Indian Green Business Center (IGBC), under the Confederation of Indian Industries (CII) that facilitated the LEED rating of the United States Green Building Council (USGBC).

At present, to strengthen the global consistency of the LEED rating system, effective June 5, 2014, GBCI (Green Business Certification Inc.) began managing the certification process for all LEED rating systems in India, which was previously managed by the Indian Green Building Council (IGBC).

LEED India encompasses rating systems for:

- Existing Buildings (EB)
- New Construction (NC)
- Core and Shell (C&S)
- Green Homes

These represent the measurable indicators for global and local concerns in the Indian scenario. Based on the points achieved, the building may be eligible for LEED-certified, Silver, Gold or Platinum Rating.

Many buildings in India register for a LEED Green Building Rating. Some of the major structures that register for a LEED rating are IT Parks, Offices, Banks, Airports, Convention centers, Educational institutions, Hotels, and Residential complexes. LEED-INDIA is, therefore, one of the chief councils to give a green rating to a structure, whether an apartment, independent home or office.

c) INDIAN GREEN BUILDING COUNCIL (IGBC) RATING SYSTEM:

IGBC Rating System is a voluntary and consensus-based programme. This rating system would facilitate the development of energy-efficient, water-efficient, healthy, more productive, environmentally friendly factories. Below is the list of rating systems by IGBC:

Source: IGBC

d) GEM Rating

In order to complement in India's Sustainability Movement and take it to the next level, ASSOCHAM has launched the "GEM Sustainability (Green) Certification Program" with the objective to promote environment friendly green building design and construction. GEM Sustainability Certification Rating Program is based upon BEE ECBC 2017 and NBC 2016. Through this initiative, ASSOCHAM do award the Sustainability Certification Rating to Housing, Urban Developments, Residential, Commercial, Hotels, College, Universities, Schools, Factory buildings and related developments. All existing, new and upcoming buildings can participate in this program.

GEM Sustainability Certification Rating levels -

GEM Sustainability Certification Rating is organized into **Thirty Principles** that are fundamental to a more sustainable development. There are some Essential and Suggested requirements of each Principle. Points are awarded for each Suggested requirement achieved.

There is a 0-135 point scale. Project will achieve **GEM 1 to GEM 5** rating levels as per the requirements fulfilled and scores achieved by the project. This depends upon the project design which includes building architectural and elevation design, materials used during construction, HVAC, lighting and plumbing system designs, water and energy consumption of the building.

To achieve a GEM Sustainability Certification Rating, all Essential Principle requirements must be fulfilled along with a minimum number of Principle points. GEM 5 will be the highest achievable rating level in this program.

S. No.	Point Scored	GEM Levels	GEM
1	All essential requirements and 40 - 49 points	GEM 1	
2	All essential requirements and 50 - 64 points	GEM 2	
3	All essential requirements and 65 - 84 points	GEM 3	
4	All essential requirements and 85 - 104 points	GEM 4	
5	All essential requirements and 105 points or above	GEM 5	

INTRODUCTION TO ADARSH GRIHA RATING SYSTEM-:

ABOUT ADARSH: ADARSH, Association for Development and Research of Sustainable Habitats, is mandated to promote development of buildings and habitats in India through GRIHA (Green Rating for Integrated Habitat Assessment). ADaRSH an independent platform for the interaction on scientific and administrative issues related to sustainable habitats in the Indian subcontinent. It was founded by TERI (The Energy and Resources Institute, New Delhi) with support from MNRE (Ministry of New and Renewable Energy, Government of India) along with a handful of experts in the sustainability of built environment from across the country.

ABOUT GRIHA: GRIHA is an acronym for Green Rating for Integrated Habitat Assessment. GRIHA is a Sanskrit word meaning – 'Abode'. Human Habitats (buildings) interact with the environment in various ways. Throughout their life cycles, from construction to operation and then demolition, they consume resources in the form of energy, water, materials, etc. and emit wastes either directly in the form of municipal wastes or indirectly as emissions from electricity generation. GRIHA attempts to minimize a building's resource consumption, waste generation, and overall ecological impact to within certain nationally acceptable limits / benchmarks. Going by the old adage 'what gets measured, gets managed', GRIHA attempts to quantify aspects such as energy consumption, waste generation, renewable energy adoption, etc. so as to manage, control and reduce the same to the best possible extent GRIHA is a rating tool that helps people assesses the performance of their building against certain nationally acceptable benchmarks. It evaluates 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.

9 Steps to get a building evaluated under GRIHA

1. Registration
2. Submission of documentation
3. Preliminary evaluation by ADaRSH Technical team
4. Evaluation by panel of experts
5. Preliminary rating with comments sent to project team
6. Final submission of documents
7. Final evaluation by panel of experts
8. Approval of rating by advisory committee
9. Award of rating

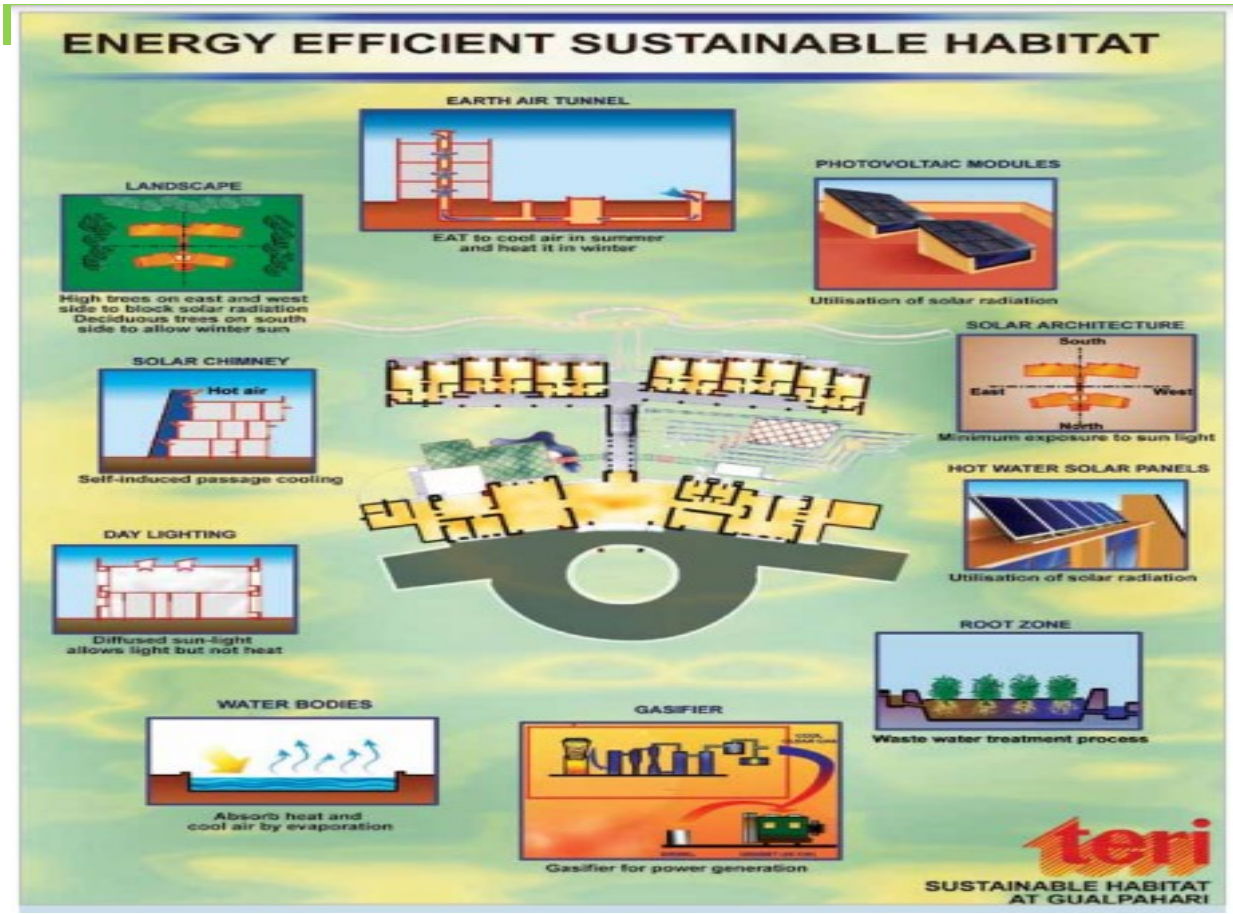
The final GRIHA rating is awarded after receipt and evaluation of the post occupancy performance audit reports. The audit is conducted after 1 year of building occupancy. The rating awarded is valid for a period of five years from the commissioning of the building. Currently the system has been developed 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 pre-construction, 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).

Building rating categories

CATEGORY	CATEGORY
1 Star	50-60%
2 Star	61-70%
3 Star	71-80%
4 Star	81-90%
5 Star	91-100%



MAIN FEATURES OF AKSHAY URJA BHAWAN

Location :	Sector 17, Institutional Plot Number 1, Panchkula, Haryana
Geographical Coordinates:	30^{O} N, 76^{O} E
Site area:	3,900 m2
Built-up area:	5,111 m2
Air-conditioned area:	1,208 m2
Non Air-conditioned area:	3,903 m2
Energy consumption reduction:	61% reduction in energy consumption compared to GRIHA benchmark
EPI :	17 KWh/ m2/year Renewable Energy :
Rated capacity of solar PV on site:	42.5 KW
GRIHA provisional rating:	5 Stars
Year of completion:	2012

The following strategies were adopted to reduce the building impact on the natural environment:

- **Sustainable site planning:**
  - The building is placed on north– south axis (+7°) in order to receive Sun from the southern side.
  - Most windows are placed on north-south facade of building. This helps to keep the building naturally daylight. East and west windows are oriented towards south to have easier sun control through shading devices.
  - The south area at site has a wide spread landscaped area.
  - The building has 3 floors + Basement. The height of the building is such that the shadow on neighboring buildings is minimized.
  - The south face has solar chimneys to aid ventilation in some of the non a/c spaces
- **Reducing water consumption:**
  - Annual reduction in water consumption with respect to GRIHA benchmark is 70% by using efficient fixtures.
  - A 6.25 lakh litre rainwater storage tank has been designed in the basement to collect water from the roof and courtyard. Percolation pits designed along the driveway to

collect rainwater from the driveway, the overflow of which has been directed to the municipal sewer.

- Collected rainwater is treated by pressure sand filter and activated carbon filter and further used for potable use, HVAC plant, and horticulture.
- ETP plant is installed to treat grey water collected from kitchen and toilet, the treated water is reused for horticulture. Solid waste is directed towards municipal sewer line.

❖ **Reducing energy consumption (compared to GRIHA benchmarks) while maintaining occupant comfort:**

➢ For achieving visual comfort:

- East and West windows are oriented south; these windows help the office spaces on those faces receive day light.
- Central court and single loaded corridor help provide visual comfort by natural light.

➢ For achieving thermal comfort:

- The south face has solar chimneys to aid ventilation in some of the non a/c spaces.
- Misting is done in the courtyard to cool the ambient air which is circulated into the building through solar chimneys. The achieved internal air relative humidity ranges from 60–75 per cent.
- THERMATEK roofing tiles have been used to reflect maximum solar radiation back to the sky, which reduces the heat ingress from the roof.
- Cavity walls with XPS foam insulation have been constructed in the east and west facade of the building

❖ **Renewable energy technologies installed on site:**

- A 42.5 KW SPV plant (with 5 KW BIPV installed above the courtyard) has been installed.
- A Solar water heater of 600 litre capacity has been installed for cooking and bathing purpose.

❖ **Use of low energy materials:**

- Door/window frames are made of aluminium and UPVC.
- Low energy armstrong mineral type false ceiling is done to minimize the use of hardwood.
- Bamboo flooring is done in director's office, chairperson's room, and the conference room.
- AAC block masonry along with XPS foam insulation is done in east and west facade of the building and fly ash brick masonry done in north and south facade of the building

Snapshots of Akshay Urja Bhawan provisional GRIHA rating

Akshay Urja Bhawan HAREDA,
Panchkula

July 14th, 2017
Final Rating, GRIHA v2

List of points awarded during GRIHA Provisional Rating

Criterion	Appraisal		Points	Awarded
Criterion 1	Site Selection	Mandatory	1	1
Criterion 2	Preserve and protect landscape during construction/compensatory depository forestation.	Partly Mandatory	3	3
Criterion 3	Soil conservation (post construction)		Not Applicable	
Criterion 4	Design to include existing site features		4	4
Criterion 5	Reduce hard paving on site	Partly Mandatory	2	2
Criterion 6	Enhance outdoor lighting system efficiency		3	3
Criterion 7	Plan utilities efficiently and optimize on-site circulation efficiency		3	3
Criterion 8	Provide minimum level of sanitation/safety facilities for construction workers	Mandatory	2	2
Criterion 9	Reduce air pollution during construction	Mandatory	2	2
Criterion 10	Reduce landscape water demand		3	3
Criterion 11	Reduce building water use		2	2
Criterion 12	Efficient water use during construction		1	1
Criterion 13	Optimize building design to reduce conventional energy demand	Partly Mandatory	8	6
Criterion 14	Optimize energy performance of building within specified comfort limits	Partly Mandatory	16	16
Criterion 15	Utilization of fly-ash in building structures		6	6
Criterion 16	Reduce embodied energy of construction is reduced by adopting material efficient technologies and/or low-energy materials		4	2
Criterion 17	Use low-energy materials in Interiors		4	4
Criterion 18	Renewable energy utilization	Partly Mandatory	5	5
Criterion 19	Renewable energy based hot water system		3	3
Criterion 20	Waste water treatment		Not Applicable	
Criterion 21	Water recycle and reuse (including rainwater)		5	4
Criterion 22	Reduction in waste during construction		1	1
Criterion 23	Efficient Waste segregation		1	1
Criterion 24	Storage and disposal of wastes		1	1
Criterion 25	Resource recovery from waste		Not Applicable	
Criterion 26	Use of low-VOC paints/adhesives/sealants		3	3
Criterion 27	Minimize ozone depleting substances	Mandatory	1	1
Criterion 28	Ensure water quality	Mandatory	2	2
Criterion 29	Acceptable outdoor and indoor noise levels		2	2
Criterion 30	Tobacco and smoke control	Mandatory	1	1
Criterion 31	Provide at least the minimum level of accessibility for persons with disabilities	Mandatory	1	1
Criterion 32	Energy audit and validation	Mandatory	-	-
Criterion 33	Operation and Maintenance	Mandatory	2	2
			92	87
Criterion 34	Innovation Points		4	3
Total			92	90
Score Percentile			97.82%	

GRIHA COUNCIL NEW DELHI

Prepared on behalf of GRIHA Council

Report of Akshay Urja Bhawan on GRIHA Criterion

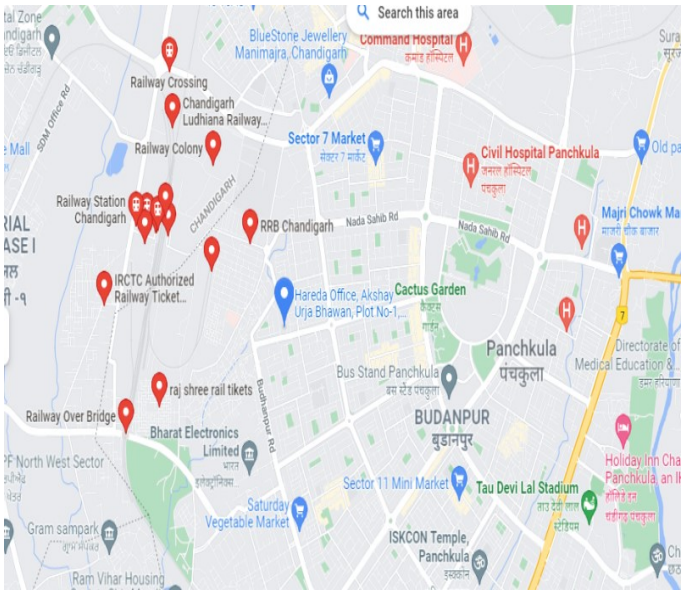
Criterion 1: Site Selection (1 Point)

Intent: The site plan must be in conformity with the development plan/master plan/UDPFI guidelines (mandatory). This should comply with the provisions of eco-sensitive zone regulations, coastal zone regulations, heritage areas (identified in the master plan or issued separately as specific guidelines), water body zones (in such zones, no construction is permitted in the water-spread and buffer belt of 30 metre minimum around the FTL), various hazard prone area regulations, and others if the site falls under any such area (mandatory with no point allocation).

The site should be located within ½ km radius of an existing bus stop, commuter rail, light rail or metro station and/or the proposed site must be a Brownfield site (to rehabilitate damaged sites where development is hindered by environmental contamination, thereby reducing pressure on undeveloped land)

HAREDA Building provisions (Point Scored 1)

The project is located in Sector 17, Panchkula, Haryana, India, which is a satellite town of Chandigarh. It is at a distance of 8 kms from the Chandigarh airport and lies in the Institutional zone of Panchkula. Necessary infrastructure and services like market place, ATM, banks, medical facilities and bus stand are located within 2 kms from site boundary. Therefore, location characteristics are satisfying the intent of the criterion.



Criterion 2: Preserve and protect landscape during construction/compensatory depository forestation : 3 Points

Intent: Construction has been planned in a way that excavation/basement work, up to plinth level is not coinciding with rainy season and the site disruption is restricted to pre-designated areas.Proper staging, spill prevention plan, sedimentation and erosion control systems in place. Trees are preserved and protected properly. Compensatory forestation is applied on site.

HAREDA Building provisions (Point Scored 3)

Construction was planned as per GRIHA guidelines

Criterion 3: Soil conservation (post construction) Not Applicable

Intent: Top soil is fertile and properly laid for vegetative growth. Measures taken for proper stabilization of soil.

Akshay Urja Bhawan was constructed on barren land. Post construction soil fertility of available land is being maintained. However, this point is not applicable to this office building.

Criterion 4: Design to include existing site features 4 Points

Intent: To achieve points in criterion 4, the design of the building should complement the existing site conditions such that there is minimum disruption to natural site features. A detail site analysis is required to ensure sustainable site development.

HAREDA Building provisions (Point Scored 4)

The design of the building complement the existing site conditions such that there is minimum disruption to natural site features. The features justifying the awarded points are:

a) North- South orientation of the building. Maximum openings have been designed along the North and South facade limiting windows on the East and West facade thus leading to minimum solar heat gain inside the building.
b) Vertical and horizontal shading devices have been used on all four facades to minimize direct solar heart gain and glare inside the building.
c) The building is planned around a central courtyard to channelize natural ventilation inside the building.
d) Thermal comfort is maintained inside the building during peak summer season by a unique process of misting. Misting is planned and designed in the courtyard. During hot summer days the cool water from misters is released in the courtyard and the hot air inside the building is channelized to the roof through solar chimneys thus maintaining comfortable thermal conditions inside the building.
e) Grass pavers have been used for paving around the building to reduce Urban Heat Island Effect (UHIE) and allow maximum percolation of water into the ground.

SUSTAINABLE SITE PLANNING

The building is placed on north– south axis (+7°) in order to receive Sun from the southern side.

Most windows are placed on north-south facade of building. This helps to keep the building naturally daylit. East and west windows are oriented towards south to have easier sun control through shading devices.

The south area at site has a wide spread landscaped area. The building has 3 floors + Basement. The height of the building is such that the shadow on neighboring buildings is minimized.

The south face has solar chimneys to aid ventilation in some of the non a/c spaces.

INSULATED GLASS UNIT ON SOUTH SIDE

GRASS PAVER USED IN CAMPUS

XPS FOAM USED IN CAVITY WALL

Criterion 5: Reduce hard paving on site — 2 Points

Intent: Minimize storm water run-off from site by reducing hard paving on site. As a mandatory requirement of criterion 5, the total surface parking must not exceed as permitted by the local bye-laws. To achieve 2 points (optional) in criterion 5, net paved area of the site under parking, roads, paths or any other use should not exceed 25% of the site area or net imperviousness of site cannot exceed the imperviousness factor as prescribed by National Building Code and 50% of paved area must have pervious paving/open grid pavements/grass pavers; or shaded by vegetative roof/pergola; or topped with a material with solar reflectance of 0.5 or higher.

HAREDA Building provisions (Point Scored 2)

Parking has been provided in the basement and as well as on the surface. Also, few calculations have been done to check the fulfilment of this criterion. For this purpose data regarding the various parts of site area are mentioned below:

Total site area is 3900 m^2, ground coverage is 1590 m^2, total paved area is 1040 m^2 out of which 520 m^2 is pervious paved area and 520 m^2 is impervious paved area.
Calculations to support design commitment:

Net Paved area (%) = Net impervious area on ground (m^2) X 100 = 520/ (3900-1590) X 100
Total site area minus building footprint (m^2) = 22.5%

Therefore, total paved area on site is 22.5% which is as per the GRIHA requirement. Hence, awarded points are justified.

Criterion 6: Enhance outdoor lighting system efficiency — 3 Points

Intent:-Luminous efficacy of 100% of lamps used in outdoor lighting to meet the corresponding lamp luminous efficacy as mentioned in Table 6.1, as per GRIHA. Automatic controls to be installed for 100% of outdoor lights.

HAREDA Building provisions (Point Scored 3)

LED lighting fixtures has been used for outdoor applications. Automatic controls have been used wherein these are required.

Criterion 7: Plan utilities efficiently and optimize on-site circulation efficiency — 3 Points

Intent: Various transportation and service corridors shall be minimized and consolidated and the pedestrian walkways to be shaded. Aggregate utility corridors shall be used. Utility corridors shall be consolidated along the previously disturbed areas or along new roads in order to minimize unnecessary cutting and trenching and ensure easy maintenance.

HAREDA Building provisions (Point Scored 3)

Minimize road and pedestrian walkway length by appropriate planning and aggregate corridors for utility lines used.

Criterion 8: Provide minimum level of sanitation/safety facilities for construction workers 2 Points

Intent:-Ensure compliance with the NBC (2005) safety norms for providing the necessary safety equipment and measures for construction workers. Provisions for drinking water, healthy and clean living conditions and sanitation facilities shall be provided for the workers.

HAREDA Building provisions (Point Scored 2)

Cleanliness of workplace was ensured with regard to the disposal of waste and effluent, Clean drinking water and latrines & urinals provided as per applicable standard.

Criterion 9: Reduce air pollution during construction 2 Points

Intent: Necessary measures to be taken on site to reduce air pollution for example providing site barricading to a height of 3 m on the site perimeter, carry out wheel washing of vehicles entering/exiting the site, sprinkle water on roads with loose dust etc.

HAREDA Building provisions (Point Scored 2)

Ensured proper screening, covering stockpiles, covering brick and loads of dusty materials, wheel-washing facility, water spraying.

Criterion 10: Reduce landscape water demand 3 Points

Intent:-If landscape water demand is reduced by up to 30%.If landscape water demand is reduced by up to 40%.landscape water demand is reduced by up to 50%.

HAREDA Building provisions (Point Scored 3)

Landscape using native species and reduced water requirement for landscaping purposes. Drip Irrigation for plants used.

Criterion 11: Reduce building water use 2 Points

Intent:- Non Applicability condition: All faucets, which are installed in spaces with water head heights less than 15 feet (4.6 m), in a gravity fed systems, can be exempt for calculations in Criterion 11. If building water demand is reduced by up to 25%. If building water demand is reduced by up to 50%

HAREDA Building provisions (Point Scored 2)

Reduced building water use by applying low-flow fixtures etc.

Criterion 12: Efficient water use during construction **1 Points**

Intent:- Efforts to be taken to reduce the use of potable water during construction for example use waste jute bags to cover columns and beams during curing, add admixtures to concrete which cause a reduction in the water required for curing etc.

HAREDA Building provisions (Point Scored 1)

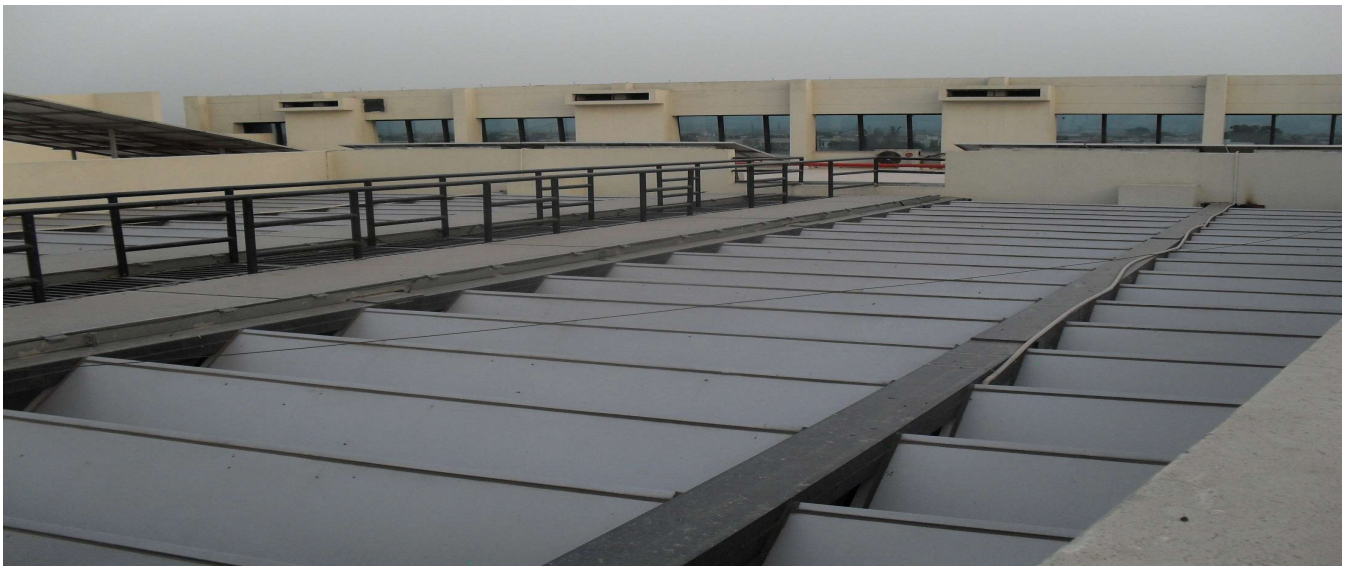
Used materials such as pre-mixed concrete for preventing loss during mixing. Used recycled treated water and control the waste of curing water.

Criterion 13: Optimize building design to reduce conventional energy demand **8 Points**

Intent: The WWR and/or SSR shall be limited to the prescribed levels as per Table13.1 (GRIHA Manual Introduction Volume-I) and all fenestration shall meet the SHGC requirements of ECBC 2007OR shading requirements as suggested in 13.1.4 OR 13.1.5, as per clause 13.2.3 to 13.2.5. Minimum 25% of the living area shall be day lighted and shall meet the level of daylight prescribed in NBC 2005 (reference Table 13.2 GRIHA Manual Introduction Volume-I). If the total day lighted area>50% of the total living area and meets the prescribed level of daylight. Over-design of artificial lighting system shall be avoided and the lighting levels in indoor spaces shall be maintained as recommended in NBC 2005.

HAREDA Building provisions (Point Scored 6)

SOLAR PASSIVE DESIGN
(TAPERED WINDOWS)



LOUVERS AT 45^0 OVER OPEN COURTYARD TO CUT SUMMER SUN

Planed appropriately to reflect climate responsiveness, Adequate comfort range with less air-conditioned areas, daylighting, avoid over-design of the lighting and air-conditioning systems.

Criterion 14: Optimize energy performance of building within specified comfort limits 16 Points

Intent: Ensure that energy consumption in building under a specified category is 10%–40% less than that benchmarked through a simulation exercise. Ensure that thermal comfort in non air conditioned spaces are within specified limits.

HAREDA Building provisions (Point Scored 16)

The project has demonstrated compliance with all mandatory requirement of ECBC (Energy Conservation Building Code) to get maximum attempted points. The analysis of features of building is conducted to contemplate their compliance with the mandatory requirement of criterion 14. The features incorporated are VRV air conditioning system has been installed; Equipment (Chiller &Compressor) efficiency meets ECBC requirements; Power transformers meet ECBC requirement and allow minimum losses.

The GRIHA benchmarked EPI for the project is 35.60 kWh/m2/year and actual EPI of the building is 13 kWh/m2/year. This implies a reduction of 46.16% from GRIHA benchmark. Hence 16 points has been awarded.

Criterion 15: Utilization of fly-ash in building structures **6 Points**

Intent: Use of fly ash for RCC (reinforced cement concrete) structures with in-fill walls and load bearing structures, mortar, and binders.

HAREDA Building provisions (Point Scored 6)

Fly Ash Bricks has been used for all the partitions and AAC blocks for main block constructions.

Criterion 16: Reduce embodied energy of construction is reduced by adopting material efficient technologies and/or low-energy materials **4 Points**

Intent: 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.

HAREDA Building provisions (Point Scored 2)

Less Energy intensive material like Low VOC paints and energy efficient technologies like LED lights etc have been used.

Criterion 17: Use low-energy materials in Interiors **4 Points**

Intent: Minimum 70% of the total quantity of materials used for sub-assembly/internal partitions/panelling/false-ceiling/in-built furniture shall be low-energy materials.Minimum 70% of the total quantity of materials used for flooring shall be low-energy materials.Minimum 70% of the total quantity of materials used for door, windows and frames shall be low-energy materials.

HAREDA Building provisions (Point Scored 4)

Recycled Partitions, furniture etc have been used.

Recycled Cellulose Fibre sheets

BAMBOO FLOORING

HEAT RESISTANT ROOF INSULATION TILES USED

Criterion 18: Renewable energy utilization **5 Points**

Intent: Mandatory provide renewable energy system with capacity equivalent to 1% of connected load for lighting and space conditioning. Meet energy requirements for a minimum of 5% 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.

HAREDA Building provisions (Point Scored 5)

Installed capacity of the Renewable energy system installed on the site is 42.25 kWp which meets GRIHA requirement of minimum 1% capacity of connected load for internal artificial lighting and airconditioning. Total energy generated from solar PV is 83520 kWh which is more than 30% of the internal artificial lighting requirement. Also, electricity from the solar plant has been supplied to the grid during the weekend days when office is closed.

Solar Photovoltic Cells (Panels) Capacity -180 KWH per day

Criterion 19: Renewable energy based hot water system	**3 Points**

Intent: Meet 20% or more of the annual energy required for heating water through renewable energy based water-heating systems.

HAREDA Building provisions	(Point Scored 3)

The Installed capacity of the solar hot water system is 7 KLPD. 100% of annual hot water demand isbeing met by solar power. Therefore, compliance is confirmed and signifying no change in the points awarded.

Criterion 20: Waste water treatment — Not Applicable

Intent: Provide necessary treatment of water for achieving the desired concentration of effluents.

Though this criteria is not applicable, However waste water treatment unit has been installed in the premises.

Criterion 21: Water recycle and reuse (including rainwater) — 5 Points

Intent: 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.

HAREDA Building provisions (Point Scored 4)

As per GRIHA, since criterion 20 is non-applicable to the project, re-use of treated water and rainwater to meet annual water demand is non-applicable to the project. However, as per the officials collected data the building demonstrated exemplary performance by meeting 66.83 % annual water demand by using 1117 KL of rainwater on the site and thus the project is being evaluated for the same. Total annual water demand on site is 1803 KL/year. Quantity of treated water and rain water collected from roof is 88 KL/year and 1117 KL/year respectively. Also the surplus rain water (from soft and paved surfaces) is recharged into the aquifer by appropriate filtrations technique. Hence points awarded are justified in relation to the intent of criterion.

RAIN WATER TREATMENT

GREY WATER TREATMENT AND DRIP IRRIGATION SYSTEM

Criterion 22: Reduction in waste during construction **1 Points**

Intent: Hazardous and inert waste shall be segregated during construction. The segregated waste shall be recycled and/or safely disposed.

HAREDA Building provisions (Point Scored 1)

No Hazardous waste emitted during construction and other waste was segregated and recycled.

Criterion 23: Efficient Waste segregation **1 Points**

Intent: Multi-coloured bins shall be provided to segregate waste at source.

HAREDA Building provisions (Point Scored 1)

Multi-coloured bins provided. Waste collected for all the areas is segregated as dry waste and wet waste at specific locations at each floor and is being transferred to central location at building level.

Criterion 24: Storage and disposal of wastes **1 Points**

Intent: Separate space shall be allocated for collection of waste before transfer for recycling

HAREDA Building provisions (Point Scored 1)

There is a provision of storage space for waste. However quantity is so small, same is taken to te waste disposal area of municipal corporation on daily basis.

Criterion 25: Resource recovery from waste	**Not Applicable**

Intent: 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.

HAREDA Building provisions	Not applicable

Criterion 26: Use of low-VOC paints/adhesives/sealants	**3 Points**

Intent: Use only low VOC paints in the interior of the building. Use water – based rather than solvent based sealants and adhesives.

HAREDA Building provisions	(Point Scored 3)

Low VOC paints used in the building

Criterion 27: Minimize ozone depleting substances	**1 Points**

Intent: All insulation to be used in the building shall be CFC and HCFC free. All HVAC and refrigeration equipment shall be CFC free. The fire-suppression systems and fire extinguishers shall be halon free.

HAREDA Building provisions	(Point Scored 1)

Latest Technology based VRV system has been used. At few placed BEE five star rated ACS has been used.

Criterion 28: Ensure water quality	**2 Points**

Intent: Water used for various purposes like drinking, irrigation etc. shall conform to the BIS standards (Table 28.3, GRIHA Manual).

HAREDA Building provisions	(Point Scored 2)

Water is purified by the water treatment plant and then by Reverse osmosis purifier installed in the building. Therefore, complying the intent of criterion. Drinking water test report was also submitted to demonstrate the compliance.

Criterion 29: Acceptable outdoor and indoor noise levels 2 Points

Intent: The measured outdoor noise levels on site conform to the standard set by the CPCB, Table 29.1, GRIHA. The measured indoor noise levels inside the building meet the noise levels recommended by NBC 2005 (Table 29.2, GRIHA Manual).

HAREDA Building provisions (Point Scored 2)

Indoor and outdoor noise audit report has been submitted. As per the report, the maximum indoor noise level is within NBC threshold and the maximum outdoor noise level is 57 dB which is within CPBC threshold.

The following measures have been adopted to control noise levels-

- High foliage trees planted along the boundary to reduce noise from the main road traffic.
- Sufficient distance of the main building block from the main road.
- Green belt along the built up area to improve its acoustical performance.
- Double glazed windows with UPVC (Unplasticized polyvinyl chloride) frame.
- Dow corning sealants used in south façade (side along the main road) of the building.
- Armstrong acoustic tile used in ceiling of conference room, meeting room, chairperson's room and training room.

Criterion 30: Tobacco and smoke control **1 Points**

Intent: Zero exposure to tobacco smoke for non-smokers, and exclusive ventilation for smoking rooms.

HAREDA Building provisions (Point Scored 1)

Zero exposure to tobacco smoke for non-smokers.

Criterion 31: Provide at least the minimum level of accessibility for persons with disabilities **1 Points**

Intent: Buildings shall be designed in compliance with the NBC code in order to be disabled friendly.

HAREDA Building provisions (Point Scored 1)

Provision of Ramp and lift has been made wherein it is required

Criterion 32: Energy audit and validation **0 Points**

Intent: A mandatory energy audit shall be conducted by a BEE certified energy auditor.

HAREDA Building provisions (Point Scored 0)

Energy Audit was conducted in 2016.

Criterion 33: Operation and Maintenance **2 Points**

Intent: Metering and sub-metering of energy as well as water will be carried out as per GRIHA clause .An O & M protocol to be specified for operation and maintenance of the various systems in the building.

HAREDA Building provisions (Point Scored 2)

Metering and sub-metering of energy as well as water will be carried out as per GRIHA clause. The building is also ISO 9001 certified.

Criterion 34: Innovation Points **4 Points**

Intent:

HAREDA Building provisions (Point Scored 3)

Use of Misting system, Solar Passive louvers, Building Integrated SPV, Use of Occupancy sensors, Use of Drip Irrigation, Student visits etc.

Web http://www.grihaindia.org/

GRIHA Council

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Secretary
GRIHA Council

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July 25, 2017

Smt Neerja Sekhar, IAS
Director General
Department of Renewable Energy,
Govt. of Haryana & HAREDA
Akshay Urja Bhawan
Institutional Plot No.1, Sector 17
Panchkula Pin: 134109

Dear Ma'am,

It is my proud privilege to inform you that the **Akshay Urja Bhawan HAREDA, Panchkula** has been awarded the **Five Star GRIHA rating (final)**. Please accept my heartiest congratulations on this achievement.

The evaluation committee has awarded a final score of **90/92 (97.8%)** to the building. The final rating tag is enclosed to be placed on the plaque which was awarded to the team.

GRIHA Council reserves the right to undertake a random audit of any of the criteria for which points have been awarded. The rating shall be valid for a period of five years from the date of final rating of the building.

My congratulations once again to the **HAREDA team** for achieving the "**Five Star**" rating.

With kind regards

Yours sincerely,

Shabnam Bassi


AKSHAY URJA BHAWAN, HAREDA
PANCHKULA
has been provisionally certified with a
'Five Star'
rating under
GRIHA
(Green Rating for Integrated Habitat Assessment)
The Indigenous Rating System for green buildings in India
GRIHA
An initiative of
The Ministry of New and Renewable Energy
Government of India
and
The Energy and Resources Institute


HAREDA
अक्षय ऊर्जा भवन