

A Review of GRIHA Certification with Real Life Project

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Abstract - Due to rapid Industrialization and Urbanization there is an increase in environmental problems. One of the major problems among this is safe and sound disposal of solid wastes. To develop new methods that introduce the building to a new path for developing a green building at more economic cost indulged with new researches and technologies working on different green ratings will lead to increase the focus on rating system of green building and attract more researchers from different countries. Different countries have different green rating systems such as LEED, BREEM, AGBR, IGBC, GRIHA etc. Establishment of new research institutes leading to the researches in field of green buildings will attract more builders and stake holders, putting footsteps towards greener habitat which may also enhance country's infrastructure.

In this paper by considering GRIHA points we have made a review on The Polite Precisa Building, Pune, Maharashtra, India. This will help the developers for applying GRIHA on their new upcoming projects.

Key Words: GRIHA, RATING SYSTEM, GREEN BUILDING, LEED, GHg

1. INTRODUCTION

There is increase in demand in construction sector and real estate development in our country. The construction industry contributes around 10% of India's GDP and is growing about 9%. Urban areas as one of the major contribution to Green house Gas (GHG) emission, with buildings along contributing around 40% of total GHG emission. In India there are two green building rating systems which are: LEED India (Leadership in Energy and Environmental Design) administered by the Indian Green building Council (IGBC) and GRIHA-Green Rating for Integrated Habitat Assessment developed by TERI (The Energy and Research Institute). TERI's green building rating system GRIHA has been developed on instrumental tool to rate the environmental performance of a building. GRIHA is a guiding tool system where points are earned for meeting the design and performance of the criteria. Each criterion has a number of points assigned to it. To meet the criterion, the project would

qualify for the points. GRIHA has total 100 point system consisting of some mandatory points to be met while the rest are optional points. Innovation points are also available for project over and above the 100 point system. This means that a project can apply for a maximum of 104 points. But the final scoring is done out of 100 points. There are Different levels of certification (one star to five stars) awarded based on the number of points earned. The minimum points required for certification is 51. According to scoring point 50 to 60 points, 61 to 70 points, 71 to 80 points, and 81 to 90 points building project shall get one star, 'two stars', 'three stars' and 'four stars' respectively. The maximum rating viz. five stars will get to building scoring 91 to 100 points. There are in total of 34 criteria's in the GRIHA methodology.

2. Case study - The Polite Precisa Building, Pune, Maharashtra, India

The Polite group has constructed residential building in a plot area 2250sqm at survey no 181, Ravet. This building has been provided 4 star GRIHA rating (Pre certification) by Association for Development and Research Of Sustainable Habitats (ADaRSH). The building has 12 floor with total built up area of 4252.63sqm

The building has been constructed keeping in mind the existing feature of site so that the nature is least affecting the nature. It is Develop taking into consideration of building layout for adequate solar orientation and proper ventilation. By applying these features it will result into lower temperature during summer. The energy consumption in this building is estimated to be about 44.18 kW hr/m²/year in comparison to the consumption of about 100 kW hr/m² /year for other air conditioned buildings. No municipal water supply is required after the first monsoon with lit of underground tank that has been optimized rainwater harvesting and consumption pattern of the building.



Fig -1: polite precisa building

The organic waste generated and segregated is less than 100kg, However, project is intent to treat the waste generated on site. Hence, it shall be applied under innovation point. Total organic waste to be generated in the project = 50.23 kg/day. The organic waste is be generated by vermi-composting treatment system.

GRIHA evaluation report mentioned that The Polite Precisa was evaluated according to the benchmarks and guidelines of GRIHA Rating System. The project has been awarded 81 points out of 84 applicable points by the evaluation committee of ADaRSH on providing necessary documentation and demonstrating compliance with mandatory criterion under GRIHA. Therefore, precertification rated 4 star (81-90 Points).

3. RESULTS AND DISCUSSION

After adopting the methodology of GRIHA-TERI, the following results were observed for Polite Precisa building. Out of total 34 criteria only some criteria have been discussed which could be observed and calculated.

- **Criterion 1 – Sustainable site planning (1 point):**
To attempt the GRIHA rating , selected site should be in conformity with the development plan/master plan/UDPFI (Urban Development Plans Formulation and Implementation) guidelines (mandatory). Site should be located within ½ km radius of an existing

bus stop, commuter rail, light rail or metro station thereby reducing pressure on undeveloped land.

Results: The site is located at newly upcoming development area of Ravet village which is on the way to Mumbai Pune Express Highway. The site is accessible through 15 m wide road and 1.25 km away from Ravet village road. The site is under the local jurisdiction of Pimpri-Chinchwad Municipal Corporation (PCMC).Basic amenities are available at Ravet village which is 1.25 km away from site location. Therefore, location is satisfying the criterion.

- **Criterion 4 - Design to include existing site feature (4 points):**

To attempt the GRIHA rating, selected site should not harm natural resources (like solar energy, wind, and water) and the qualities of the landforms that could contribute to making different areas of the site visually and thermally more comfortable for users.

Results: The building should support the site condition such that there is minimum disturbance to natural site features. All the apartments are provided with terraces and balconies for longer facades towards all the directions that entail external shading for the building facade and windows mitigating summer heat gain. Window to wall ratio of each building type for residential building is: Orientation WWR (%) North 28.60%, South 15.79%, East 14.54%, West 21% and Gross WWR% 19% which is satisfies the GRIHA.

- **Criterion 14 - Optimize energy performance of building within specified comforts limits (16 points):**

To achieve 16 point (8 mandatory and 8 optional), project must energy a specified indoor climate conducive to the functional requirements of the building. Also it should follow compliance measures (for all applicable buildings) as recommended in the Energy Conservation building Code 2007 of the BEE, Government of India and must achieve the benchmark of EPI. In addition GRIHA gives compliance for every 10% reduction in EPI of the building fetch additional two points and maximum of 8 points for 40% reduction in EPI from the benchmark.

Result: The project compliance with all mandatory requirement of ECBC (Energy Conservation Building Code) to get maximum attempted points. The analysis

of features of building is conducted with the mandatory requirement of criterion 14. The features are appliances like air conditioning, refrigerator having higher star rating has been installed which efficiency meets ECBC requirements; Power transformers meet ECBC requirement and allow minimum losses. As per the calculation the average benchmark EPI and average design EPI are shown below:

- Residential (3230.00 sq. m)
 - a. The Benchmark EPI- 100kWh/sq m/yr
 - b. The design EPI- 44.18Wh/sq m/yr

The project achieves energy reduction around 66% energy reduction then the benchmark, as per air conditioned and non- air conditioned area of project.

➤ **Criterion 19 - Renewable energy based hot water system (3 points):**

The objective of this criterion is to utilization of renewable energy such as sun to, meet the hot water requirement of the building.

Result : To meet the hot water demand the building is provided with solar water heater with 12 solar panels with solar collector area per panel of 6.4 m². Renewable energy for hot water is calculated manually. Hot Water demand for residential units has been calculated based on following standard requirements:

Solar panel for hot water system of 500 L/day capacity

Total flat no. = 45

Hot water demand at 125 per flat = 5.525 KLD

Proposed hot water using solar = 5.525 KLD

Provided = 5.525KLD

40 Kcal/litre is assumed as the standard energy consumption rate.

Table -1: Annual energy demand for water heating

Total Daily Hot Water Requirement (L/Day)	Standard energy consumption rate (kCal/L)	Energy required to heat water (kCal/day)	Energy required to heat water (kW/year)	Annual energy demand for water heating (kW/year)
5525	40	225000	261.67	95510.8

The table above shows the annual energy demand for water heating which meet the demand of GRIHA.

Criterion 21 - Water recycle and reuse (including rainwater) (5 points):

The intent of criterion 21 is to utilize and to recycle water from rain water harvesting and water treatment plant, to reduce the load on both municipal supply as well as sewerage system and to improve the ground water level.

Result: The building will have roughly 73.90 cum/hr of runoff at pre construction stage on the basis of site area and peak hourly rainfall while it will increase to 100.36 cum/hr at the post construction stage which can result in roughly 3 month of water supply to building post monsoon which reduces overall water supply demand in the city.

Table -2: PRE CONSTRUCTION

Surface	Area (sq. m.)	Run-off coefficient	Peak hourly rainfall(m/hr)	Runoff (cum/hr)
Total site area	2240	0.60	0.055	73.90

Table 2 and table 3 showing the runoff for pre and post construction stage which shows there is increase in ground water level and satisfies points for GRIHA. In above table building footprint, driveways, service area, jogging track, pathways and play area are considered Impervious while grass pavers, lawns, shrubs and tree bed area are considered pervious. The peak hour rainfall factor for all surface is considered as 0.055.

Table -3: POST CONSTRUCTION

Surface	Area (sq.m.)	Run off coefficient	Run off (cum/hr)
Building footprint	425.97	0.95	22.26
Driveways	943.68	0.95	49.31
Service areas	104	0.95	5.43
Grass Pavers	331.15	0.75	13.66
Jogging Track	56.27	0.95	2.94
Lawns	80	0.25	1.10
Shrubs	101.86	0.1	0.56
Tree bed area	110.25	0.1	0.61
Pathways	40.19	0.95	2.10
Play area	45.88	0.95	2.40
Total area	2239.25	Total volume	100.36

➤ **Criterion26–use of low-VOC paints/adhesives/sealants (3 points):**

The objective of this criterion is to use of low voc (volatile organic compound).typical household paint contains up to 10,000 chemicals, of which 300 are known toxins and 150 have been linked to cancer. VOCs are unstable and causes problems to health

Result: Internal paints provided for the building are either water based or acrylic based paints. The shortlisted manufactures are: Sherwin Williams, Nippon paints , Asian paints.

Adhesive and sealants used for the building are within permissible VOC limits. Primarily the adhesive and sealants are required for wood works and weather sealing for glazed areas. The shortlisted companies providing low VOC are Pidilite and 3M

3. CONCLUSIONS

Immense efforts have been taken to know more about buildings growing more nature friendly have made us to this point. Inclusion of many new technologies and homeful methods that can maintain sustainability and environment’s green motive along with footsteps in this growing era of complex infrastructure. An objective to mark the interest of people and also to grow awareness among them in this field can help them by this project. Use of environment friendly (less sound, land and air pollution) and low energy consuming machineries that could help in reducing the burden on environment’s gift for humans, in any manner, technologies using more renewable sources of energy such as sunlight, wind, waves, gravity, etc., low carbon emitting methodologies and much based on motive of **Reduce, Reduce and Refuse**, can prove to be a subject supporting slogan. Also an initiative to meet people working and making efforts since very long time in maintaining eco-friendly buildings have proved be a new experience to all of us.

“प्रकृति कल्याण संग विकास हो सारा, हर कदम बढे देश हमारा”

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