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SVAGRIHA Rating System, a Smart and Convenient Green Rating Design Tool for Small Scale Building Footprints

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Abstract - *For developing countries like India, urban population ingress enhances the demand for housing further adding stress on limited resources causing a negative impact on the environment. Research indicated that the demand for residential construction and associates infrastructure including resources is always high. A strong need to reduce these impacts has risen due to its negative global effects and sustainability approach seems to be a solution.*

The largest portion in the city is of building structure which is smaller in scale and gives maximum negative impact to environment. So, to minimize these negative impacts to environment and increase resource efficiency of this small scale building foot prints, GRIHA (Green Rating for Integrated Habitat Assessment) council has made a design-cum-rating tool called SVAGRIHA (Simple Versatile Affordable GRIHA).

The paper aims to analyze feasibility of SVAGRIHA norms and give green rating as same. Recommendation of practical implementation of each criterion is discussed.

***Key Words*: Green building, Feasibility, SVAGRIHA, Rating system, GRIHA, Resource efficiency, Recommendations.**

1. INTRODUCTION

Green building when compared to conventional building seems same externally and in building use but difference in operational design so that it enhance the nature, required less energy, low cost of living & use maximum environmental conditions. Green building enjoys the benefits of saving about minimum 20-30% water by using rainwater harvesting or grey water reuse technique.

Today, green building is the practice of designing, construction and operational building to:

- Minimize resource use
- Reduce waste & negative environmental impacts
- Minimize occupant health and productivity
- Decrease life cycle cost

For a given study we select the site location at Badlapur region, Badlapur is a fastest growing city in Mumbai metropolitan region. In Badlapur 97% of RCC construction is mainly used for residential purpose. Due to smaller building foot-print of given project (i.e. Build-up area 1700 sqm) SVAGRIHA is applicable.

Most of the local construction is having smaller building foot prints in order to reduce the impact on resource we have to focus on base level construction. SVAGRIHA is developed in such a way that it minimizes resource demand and environmental impacts for smaller buildings. SVAGRIHA gives flexibility to project so that can achieves maximum rating without losing comfort level.

2. SVAGRIHA Rating system

SVAGRIHA (Simple Versatile Affordable GRIHA) was jointly developed by GRIHA Council & TERI team. SVAGRIHA is a design-cum-rating tool being developed for small stand along buildings like residence, commercial offices, hotels, dispensaries, schools etc. and/or set of buildings with accumulative build-up area of 2500 sq. m or less. SVAGRIHA system is for those construction or focus on small building construction which is quickly developing instead of large constructions.

SVAGRIHA rating system having a total 14 criterion with maximum 50 points & minimum points is 25 to certified building as green building. The rating will be given in the range of 1-5 star, as per the gained points & maximum criterion has been fulfilled the star rating is given to building by SVAGRIHA. The criterion is sub divided in five groups that is landscape, architecture & energy, water & waste, materials and lifestyle. The rating is small, easy, affordable, convenient & smart for all smaller construction in India.

In order to get a rating, it is mandatory for each project to achieve a certain number of minimum points in each category as mentioned below.

Table -1: Classification of rating in SVAGRIHA

Sub group	Maximum points	Minimum points to be achieved
landscape	6	3
Architecture & energy	21	11
Water & Waste	11	6
Materials	8	4
Lifestyle	4	1

The construction project should have all necessary clearances as per the local building bye-laws and municipal authorities. Project must follow the coastal zone, eco-sensitive zone, green zone, water body zone, heritage area and potential hazard area regulations. All the required documents for the project will be clear. This is the mandatory clause in SVAGRIHA panel.

Table -2: SVAGRIHA star rating

Points achieved	SVAGRIHA Rating
25-29	*
30-34	**
35-39	***
40-44	****
45-50	*****

Table -3: Criteria for SVAGRIHA rating

Cr. No.	Criterion name	Points
1	Reduce exposed, hard paved surface on site and maintain native vegetation cover on site	6
2	Passive architectural design and systems	4
3	Good fenestration design for reducing direct heat gain and glare while maximizing daylight penetration	6
4	Efficient artificial lighting system	2
5	Thermal efficiency of building envelope	2
6	Use of energy efficient appliances	3
7	Use of renewable energy on site	4
8	Reduction in building and landscape water demand	5
9	Rainwater harvesting	4
10	Generate resource from waste	2
11	Reduce embodied energy of building	4
12	Use of low-energy materials in interiors	4
13	Adoption of green lifestyle	4
14	Innovation	2

3. Analysis of SVAGRIHA criterion for building

3.1 Project details:

Project name: Ameyya co-op housing society

Location: Badlapur, Thane.

Name of builder: Shree Group Builder & Developers.

Total Build-up area: 1700 sq. m

Status: Under construction

No. of person: 5

The proposed under construction project is G+4 residential building with basement. The given RERA approved project added with earthquake resistance R.C.C structure, attractive elevation, French windows, rainwater harvesting system, solar system, 24×7 surveillance camera, video door phone, senior citizen sitting area, stilt and open parking and many more amenities. Ground floor is used for commercial and parking purpose.

Location features:

- 5 min walk able distance from railway station
- 3 min walk able distance from school & hospital
- 3 min walk able distance from banks & ATM
- Well connected with highway

3.2 Feasibility of criterion.

The SVAGRIHA criteria's are followed in different stages of construction i.e. before, during and after construction. Feasibility of norms is important to identify the criteria's which may followed or implement before and during construction. The following feasibility gives direction to project with respect to rating system & one can easily analyze the each criterion and give suggestion on it. Feasibility will show maximum achievable points for green rating certification.

By following the feasibility the given project achieved 42 points out of 50. According to this result points in between 40-45 the project will be rated 4-star rating in SVAGRIHA certification.

Table -4: Feasibility analysis of SVAGRIHA criterion

cr. no.	Criterion name	Points	Feasible points
1	Reduce exposed, hard paved surface on site and maintain native vegetation cover on site	6	6
2	Passive architectural design and systems	4	3
3	Good fenestration design for reducing direct heat gain and glare while maximizing daylight penetration	6	5
4	Efficient artificial lighting system	2	2
5	Thermal efficiency of building envelope	2	0
6	Use of energy efficient appliances	3	2
7	Use of renewable energy on site	4	4
8	Reduction in building and landscape water demand	5	4
9	Rainwater harvesting	4	4
10	Generate resource from waste	2	2
11	Reduce embodied energy of building	4	2
12	Use of low-energy materials in interiors	4	2
13	Adoption of green lifestyle	4	4
14	Innovation	2	2
Total		50	**42**

4. Recommendation for site

For practical implementation of each criterion recommendation and observation is given to the building, so that maximum points can be achieve.

Table -5: Recommendations

Cr. no.	Max. pts.	Observation	Achieved pts.	Final points
1	6	It is observed from site area calculation that more than 70% area is grass paved & under shade.	3	6
		According to site area 7 tress will be planted and it should be native	3	
2	4	Adopt passive strategies like green roof, orientation of building as per wind flow and ventilators	3	4
		Adopt active low energy cooling system like desert coolers & fans	1	
3	6	Fenestration design has been done such that overall insolation reduces by 60% over the base case	3	5
		More than 70% of the daylight area falls under a daylight zone	2	
4	2	Overall LPD of the building is come out around 7 W/sq. m which is less than ECBC recommendable LPD level.	2	2
5	2	The thermal efficiency of the building envelope meets not the threshold as prescribed in SVAGRIHA	0	0

6	3	Provide all energy efficient applications with 4-star BEE labelled.	2	2
7	4	Provide 3 kw solar panel	2	4
		Provide solar heater system which will produce hot water of 900 lit/day.	2	
8	5	Reduce the total water requirement in the building by 50% by using Water Closets (Flush Valves Dual Flow), Kitchen Faucets and low flow fixtures.	2	4
		Reduce the landscape water demand by planting native trees and water supply by drip irrigation.	2	
9	4	Along with the recharge pit project need to provide minimum 14400 lit of rain water harvesting tank	4	4
10	2	Convert organic waste into compost either by using vermicomposting technology or OWC machine.	2	2
11	4	During construction it is observed that 100% PPC is replaced by OPC.	2	2
12	4	more than 50% of in-build furniture/ panel & frames/ false ceiling are low energy	1	2
		All interior are painted low-VOC white and lead-free paints	1	
13	4	Built up area assigned for per capita is between 15-20 sq. m is in threshold range of 12.5-50 sq. m	1	4
		According to location features 8 basic amenities are easily available and reachable.	1	
		One common dedicated toilet is provided for non-residential people	1	
		Environmental awareness is created through panels/ brochures/ printouts and seminars	1	
14	2	Suggestions: 1) Reduction in finishing materials by using gypsum. 2) Use neem based fertilizer 3) Smoking to be banned from all common Ares & no smoking signs. 4)24x7 surveillance camera.	2	2

5. RESULT

By providing above recommendations 42 points can be achieve for project building and project will get 4 stars SVAGRIHA rating.

6. CONCLUSIONS

The systems recommended for the building if installed will help building to reduce 30-40% in operational cost, 50-70% energy consumption and 40-65% water consumption. It is shows that most of the building which adopted SVAGRIHA will conveniently maintained resource efficiency, energy

consumption, protecting human health and improving productivity over a large period.

The motto of this research is to represent the green building is a sustainable building for tomorrow as this system includes the eco-construction criterion, proper energy and waste & water consumption. Thus green building plays the tremendous role in making our planet pollution free and to make it greener.

Table -6: Criterion analysis

Sub group	Maximum points	Minimum points to be achieved	Achieved points
landscape	6	3	6
Architecture & energy	21	11	16
Water & Waste	11	6	10
Materials	8	4	4
Lifestyle	4	1	4

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