Journal of Advances and Scholarly Researches in Allied Education
Vol. 18, Issue No. 3, April-2021, ISSN 2230-7540

Importance of Green Building Rating System on Modify Green Building

Sarang Satishrao Ingle*

Junior Engineer, Education- BE Civil

Abstract – In India, over 65% populations are living in village. Comparing the overall population of India this number is large. Also they make their own houses either by own methods or by some persons who are experts from Construction Industry. There houses have some period to sustain on earth, after the completion of that period, either they are not feasible to live in or they get demolished by us. But if proper restoration is applied on them then they are ready to sustain more year on earth. Here we have to recycle the material to reduce overall building cost. For Eco Friendly Construction, in India, there are 2 rating systems. In GRIHA, all parameters which related to Green Building Construction are considered and which indicating the saving and reutilization of building material product, Energy saving etc. In LEED also almost same part is considered. There are some changes in parameter and final rating system is slightly different but that rating systems does not rate the restored structure. Restored structure is completely based on previous building part and addition of some new part using some old as well as new techniques. In both rating system they give some points and guidance related to recycle of material but main part is that building should be newly constructed or new construction should be there. There is no any a single clause related to the restored building, so we can't identify our restored structure is Green Building or not. So this paper focus on restored structure in village area and why that structure is Green Building and which clauses should introduce in Green Building Rating System for Restoration of Structure.

Key Words: - Green Building, LEED, GRIHA, Rating System, Restoration

----------X----------

1. INTRODUCTION

Buildings have a significant and continuously increasing impact on the environment since they are responsible for a large portion of carbon emissions and also uses considerable number of resources[1][2]. Buildings account for one-sixth of the world's fresh water withdrawals, one quarter of its wood harvest, and two-fifths of its material and energy flows[3]. The Construction of Buildings and their operation contribute a large number of energy usages. In building construction activity, many types of material are used, modified and sometimes building materials produces another materials. All material production requires raw material and then we can produce them according to standards. These raw materials require proper treatment to produce further product. Now main question remains regarding consideration of this production of each and every material with raw material. This paper relates with solution of above question through application of green building to existing one or foe new one. All production of material requires large number of energy, this energy have many forms but usage of various types of energy requires money and budget to furnish our dreams by construction/conversion of building in green building.

When we consider about village areas, Gandhiji told that "an ideal Indian village will be so constructed as to lend itself to perfect sanitation. It will have cottages with sufficient light and ventilation, built of a material obtainable within a radius of five miles of it" [4]. Normally all old houses were built by using locally available material only. But recently, in village areas some or most of the owners, they have started to demolish there old structure and built a new structure using new construction materials and new techniques. I am not apposes this progress but, old structure have some reusable part, it can be fit in any new construction work but normally that cannot be used in new construction. So that demolished material either used in land feeling or kept as it is but not used in new construction.

If that material is used in construction then cost may get reduced, and automatically overall construction cost of project gets reduced. In India there are two Green Building Rating System, first Leadership in Energy and Environmental Design (LEED) and Green Rating for Integrated Habitat Assessment (GRIHA). Both systems gives rating criteria for residential building but there is no any consideration regarding restoration of Structure. Now it is must to

investigate and establish their relation with Green Building.

The term "Green" refer to environmentally friendly practices from building design to the landscaping choices. It also optimist & Economic Energy use, Water use, Storm water and waste water reuse. The terms "Green Building" apply not just to products, but to construction strategies, building design and orientation, landscaping, building operations, maintenance and more. The less impact a building has on human health and environment, the more green it is. In short Green Building is a design and construction practices that promotes the economic health and well being of our family, the community & the environment [5].

2. LEADERSHIP IN ENERGY AND ENVIRONMENTAL DESIGN (LEED)

The first LEED India rating program, referred to as LEED India Version 1.0, was launched during the Green Building Congress Conference in October 2006. There are four specific LEED India Programs[6].

2.1 LEED India for New Construction (LEED India NC):

The LEED 2011 for India – New Commercial Construction and Major Renovation (LEED 2011 for India-NC) provides a set of performance standards for certifying the design and construction phases of commercial and institutional buildings and high-rise residential buildings. The specific credits in the rating system provide guidelines for the design and construction of buildings of all sizes in both the public and private sectors. The intent of LEED 2011 for India is to assist in the creation of high performance, healthful, durable, affordable and environmentally sound commercial and institutional buildings[7]. (Refer table no 1 for criterion and table no 2 for level of certification)

Table 1: Criterion and there Points

Sr. No	Particulars	NC	CS
1	Sustainable Sites (SS)	26	28
2	Water Efficiency (WE)	10	10
3	Energy & Atmosphere (EA)	35	37
4	Materials & Resources (MR)	14	14
5	Indoor Environmental Quality (IEQ)	15	15
6	Innovation in Design (ID)	6	6
7	Regional Priority (RP)	4	4
	Total	110	112

Table 2: Levels of Certification

Sr. No.	Levels of Certification	Points
1	Certified	40 – 49
2	Silver	50 – 59
3	Gold	60 – 79
4	Platinum	80 and above

2.2 LEED India for Core and Shell (LEED India CS):

The LEED 2011 for India – Core and Shell rating system provides a set of performance standards for certifying the design and construction phases of core and shell buildings in the country. The specific credits in the rating system provide guidelines for the design and construction of core and shell buildings of all sizes, in both the public and private sectors. The intent is to assist in the creation of high performance, healthful, durable, affordable and environmentally sound core and shell buildings. LEED 2011 for India – Core & Shell can be used for projects in which the developer controls the design and construction of the entire core and shell base building (e.g., mechanical, electrical, plumbing, and fire protection systems) but has no control over the design and construction of the tenant fit out. Examples of this type of project can be a commercial office buildings, IT-parks, medical office buildings, retail centers, warehouses, and lab facilities.[8]

2.3 LEED India for SEZ (LEED India SEZ):

The LEED India for SEZ Rating System is a voluntary and consensus based program. The rating system has been developed based on materials and technologies that are presently available. The objective of LEED India SEZ is to facilitate the creation of energy efficient, water efficient, healthy, comfortable and environmentally friendly SEZ. The rating system evaluates certain credit points using a prescriptive approach and other credits on a performance based approach. The rating system is evolved so as to be comprehensive and at the same time user-friendly. The rating program uses well accepted national standards and wherever local or national standards are not available, appropriate international benchmarks have been considered[9]. (Refer table no 3 for criterion and table no 4 for level of certification)

Table 3: Criterion and there Points

Sr. No.	Particulars	Points
1	Site Preservation & Restoration	16
2	Site Planning & Design	25
3	Water Efficiency	15
4	Energy Efficiency	30
5	Materials & Resources	10
6	Innovation & Design Process	4
	Total	100

Table 4: Levels of Certification:

Sr. No.	Levels of Certification	Points
1	Certified	51 – 60
2	Silver	61 – 70
3	Gold	71 – 80
4	Platinum	81 – 100

2.4 LEED India for Home (LEED India H):

This Rating System is a voluntary and consensus based program. The rating system has been developed based on materials and technologies that are presently available. The objective of this rating system is to facilitate the creation of water efficiency, handling of house-hold waste, energy efficiency, healthy, comfortable and environmentally friendly houses. The rating system evaluates certain mandatory requirements & credit points using a prescriptive approach and others on a performance based approach. The rating system is evolved so as to be comprehensive and at the same time user-friendly. The program is fundamentally designed to address national priorities and quality of life for occupants. The rating program uses well accepted National standards and wherever local or National standards are not available, appropriate international benchmarks have been considered.[10]

Table 5: Criterion and there Points

Sr. No.	Particulars	Individual Residential Unit	Multi-dwelling Residential Unit
1	Site Selection and Planning	09	19
2	Water Efficiency	11	18
3	Energy Efficiency	22	25
4	Material & Resources	13	18
5	Indoor Environmental Quality	15	15
6	Innovation & Design Process	05	05
	Total	75	100

Table 6: Levels of Certification

Sr. No.	Levels of Certification	Individual Residential Unit	Multi-dwelling Residential Unit
1	Certified	38 – 44	50 – 59
2	Silver	45 – 51	60 – 69
3	Gold	52 - 59	70 – 79
4	Platinum	60 - 75	80 – 100

3. GREEN RATING FOR INTEGRATED HABITAT ASSESSMENT (GRIHA)

Endorsed by the Ministry of New and Renewable Energy, Government of India as of November 1 2007, GRIHA is a five star rating system for green buildings which emphasizes on passive solar techniques for optimizing indoor visual and thermal comfort. In order to address energy efficiency, GRIHA encourages optimization of building design to reduce conventional energy demand and further optimize energy performance of the building within specified comfort limits. A building is assessed on its predicted performance over its entire life cycle from inception through operation. GRIHA was developed as an indigenous building rating system, particularly to address and assess non-air conditioned or partially air conditioned buildings. GRIHA has been developed to rate commercial, institutional and residential buildings in India emphasizing national environmental concerns, regional climatic conditions, and indigenous solutions[11].

Table 7: Criterion and there points

Sr. No.	Particulars	Points
1	Sustainable Site Planning	16
2	Building Envelop Design	10
3	Building System Design	8
4	Energy & Atmosphere	26
5	Water & Waste Management	13
6	Indoor Environmental Quality	17
7	Sustainable Materials	4
8	Innovation Points	6
	Total	100

Table 8: Levels of Certification

Sr. No.	Level of Certification	Points
1	One Star	50 – 60
2	Two Star	61 – 70
3	Three Star	71 – 80
4	Four Star	81 – 90
5	Five Star	91 – 100

In forth part of LEED Home it related to a residential house. Also GRIHA is related to the residential house. But not a single word or criteria is given in both rating systems which related to Restoration of Building.

4. RESTORATION IN INDIA

Building restoration refers to the process of correctly revealing the state of a historic building, as it looked in the past and recovering the same by various measures while respecting its heritage value [12]. Restoration involves returning the existing fabric of a place to a known earlier state by removing accretions or by reassembling existing components without introducing new materials. Conservation means the process of retaining structures historical, architectural, aesthetic, cultural significance. Preservation stands for maintaining the fabric of a place in its existing state and retarding deterioration whereas reconstruction implies returning a place as nearly as possible to a known earlier state and distinguished by the introduction of materials into the fabric.[13] Restoration is defined as the act or process of accurately depicting the form, features, and character of a property as it appeared at a particular period of time by means of the removal of features from other periods in its history and reconstruction of missing features from the restoration period. Most old cities have some monuments which represent the religious, military, political or economic powers of the past.[14] The condition of such monuments is determined largely by their present function and use.

Monuments which have no further utilization tend to decay rapidly, while monuments which are still in use have a better chance of being maintained. The extent of maintenance varies from structure to structure leading to deterioration of the structure. Restoration increases the total expected life of the structure by strengthening it to withstand all imposed loads. If the structure is not timely restored, its condition may worsen to an extent such that it becomes very difficult to regain its original condition. This relates that in India or in any country the Historical Monuments should be restored properly. But what about the houses? In India, so much old houses are there in Rural as well as in Urban areas. In Urban, Old houses are going to demolish and new buildings are constructed. Same in Rural area, old buildings are going to demolish completely and new construction started there. But some cases, people try to save some old part of building in Rural area. So we can get some restored structure of houses in Rural region. [15]

5. CASE STUDY

In this paper, we have considered a residential building which is situated in Ninam Dhamni village in Sangli District. The old house was constructed in 1975. Due to some problem in that old construction, in 2007 the owner had decided to demolish all structure. But there was one person, Arch. Pravin Mali, he told to owners that do not demolish the all structure. Keep some part of previous structure as it is and make some new construction on the old one. Due to this one part of foundation which was completely load bearing structure foundation, get utilized. After that one side of old structure, the Rubble masonry wall also kept as it is.

5.1 Building Plan

Fig. No. 1 Plan

In the Plan of the building, (Ref. fig no 1) you can see the old part and new part of the residential building. Here to words Left hand side, old wall and foundation is kept as it is. And in right hand side new construction is there. Also keeping in view of wind flow in the house, openings are provided. So all round year, the house is keep as cool and maintaining the room temperature properly. If room temperature maintained in summer season, then there is no need of extra arrangement on cooling work. Here are some salient features of this residential building,(Ref fig no 2)

- Use of existing stone wall to take upper load
- Use of brick vault, rat trap cavity wall, filler slab will resists the heat gain
- Cross ventilation for each room
- Single bay vault with two sky light slits helps hot air to exhaust & allows cool air to entre from lower level windows.
- Deep planting with existing mango, coconut trees sheds the west and south side
- The overhang for balcony, acts as a shedding device.

5.2 *Photograph of Actual Building: -*

Fig. No. 2 Actual Building

5.3 Shadow Analysis: -

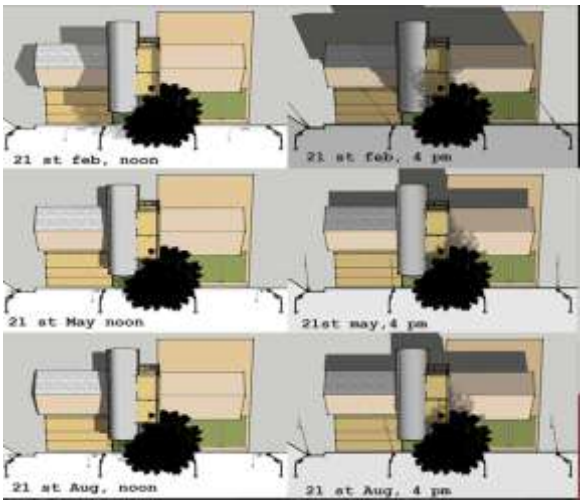

Fig No. 3 Shadow Analysis

In this fig. (ref. fig no 3) the shadow analysis is according to various position of the sunlight on six different days at same time in a single year. At entrance, plantation is there. So no direct entry of sunlight in the house and it will keep proper temperature.

5.4 Cross Ventilation: -

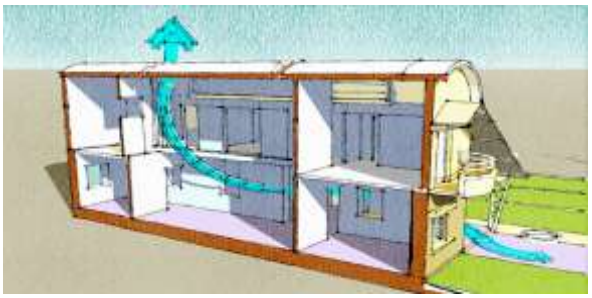

Fig No. 4 schematic view of cross Ventilation

This is schematic view of cross ventilation of the building. It helps the maintaining the building internal temperature at proper level.

5.5 Rat Trap Bonded Brick masonry: -

Fig. No 5 Rat trap Brick Masonry

This type of masonry is used to build walls. The bricks are placed on their edges in 1:6 cement mortar & after the first layer of bricks has been laid, a gap is left between the bricks in the remaining courses. This means that compared to a 230 mm thick solid brick wall, the amount of bricks required to build the wall is reduced by 25% and consequently the amount of cement mortar needed is also reduced. The gap in the bricks helps to create thermal insulation.

5.6 Brick Vault

Brick Masonry vaulting is concept of an integral roof. Such roof requires very little steel and can provide good performance over long period of time.

Fig. No. 6 before finishing

Fig. No. 7 after finishing

Brick vaulted roofs spanning up to 10 m. In this residential building, brick vaults are used to construct one part of slab which covers 35% roof area of overall building.

5.7 Cost Comparison: -

In case study, the residential building is restored. Some part of old structure is keep as it is. Some part of demolished material is also utilized in the construction of building. Following table gives the cost comparison of Restored structure and complete construction of new structure. Here the structure is Load bearing Structure. Here in cost comparison of each material, the labor cost is not considered.

Table No. 7 Cost Comparison

Sr. No.	Particulars	Restored Structure Cost	New Structure Cost	Remark
1	Earthwork (Excavation)	3928.00	4900.00	
2	Cement Concrete in Foundation	35777.00	41239.00	
3	Rubble Masonry	26931.00	33550.00	
4	Plinth Wall (Above Footing)	12506.00	15576.00	
5	Stone Wall	(-)84619.00	0.00	Already Present
6	Brick Work	147510.00	207309.00	
7	Brick Vault	38800	0.00	
8	Parapet Wall	8190	8190	
9	RCC (Excluding Steel)	106270	141598	
10	Reinforcement	136917	138171	
	Total	**432210**	**590533**	

In cost comparison, finishing and labor wages are not considered. After considering the above parameters, construction, and converting the structure in to green building, the overall cost saving is up to Rs. 158323.

6. DISCUSSION

In rating system of LEED INDIA one system is related to Home i.e. LEED INDIA H. The rating system is designed to suit Indian climate and construction practices. The objective of this rating system is to facilitate the creation of water efficiency, handling of house-hold waste, energy efficiency, and healthy, comfortable and environmentally friendly houses. Considering this system, it is related to new construction and major renovations. It looks like as first you have to construct building and if you feel that your construction is not a green building then make some renovations. And then make your building as green building as per LEED H. But if there is a house and the life of that house is over, then maintaining some part of that house as it is and using the material for construction of new part of house then that construction is also termed as a green building. But in this system, no such part is considered. Second thing, one part is On site renewable energy. In rural region, if the money is required for the construction of building utilized in this part, can it feasible? It may be feasible, if owner of that building is ready to keep that energy source for further use when construction gets over. But the repair and maintenance part of that system is quite costlier. So these systems have some updating and it should be related to lowering the cost of construction.

In GRIHA, no such part is considered which relates to restoration of structure. So there should be a system which will give some criteria to rate the restored structure of residential building.

Considering the case study, the construction of residential building is restoration. Here the part of old structure is maintained. One part of stone wall is kept as it is. Due to this the cost of foundation and construction of one wall get reduced. The required material is also gets reduced. Considering the new techniques of cavity wall and brick vault reduces the use of concrete and steel. And last the overall cost of building gets reduce.

Finally, if we consider all rating system, they focus each and every point which will tend to your structure as green building but they can't compromise on cost of the structure. Here in our case study we have consider the cost of the construction also and using some simple techniques, we have tried to construct a green building.

7. CONCLUSION

After all consideration we can conclude that, using local material and using some simple and new techniques we can easily make our restored structure as a green building keeping the low cost of construction. Also recycling the material, making plantation and following some guidelines given in rating system and considering a low cost housing approach we can construct a green building.

8. REFERENCES

[1,2] "M. Montoya", "Green Building Fundamentals: A Practical Guide to understanding and applying fundamental sustainable Construction Practices and LEED Green building rating system" Pearson Education Publisher Edition 2009 Page no 3

[3] "D. M. Roodman & N. Lenssen", "A building revolution: How Ecology & Health Concerns are Transforming Construction", "World watch Paper 124", World Watch Institute, Washington DC, 1995 Page 5

[4] "M. K. Gandhi", "India My Dreams" Page no. 95

[5] "Jignesh C Sailor, Himanshu A. Naik, ViralKumar I Makwana" "Green Building" National Conference on "Recent Advances in Electrical Engineering & Energy Systems" (2010) Page 1

[6] "Indian Green Building Council", "LEED INDIA" manual 2011

[7] "Indian Green Building Council", "LEED INDIA for New Construction" (LEED INDIA NC)

[8] "Indian Green Building Council", "LEED INDIA for Core and Shell" (LEED INDIA CS)

[9] "Indian Green Building Council", "LEED INDIA for SEZ" (LEED INDIA SEZ)

[10] "Indian Green Building Council", "LEED INDIA for Home" (LEED INDIA H)

[11] "GRIHA Manual"

[12] Chapter -8, Conservation of heritage sites including heritage building, heritage precincts & natural features areas. Model Building bye laws

[13] Sanghamitra Basu, Preservation of Heritage Structures and earthquake issues, guideline & lessons from the past Chapter – 27 'Repair & Straightening guide for earthquake damaged building in Gujrat' NPCBEEMRM MHA (DM) Govt. of India

[14] Prabhat Kumar, Ashish K Singh (2008). Preservation of Heritage buildings & monuments, NBMCW Feb 2008

[15] "A systematic approach to words restoration of Heritage buildings – A case study" "Sayli Sandbhor, Rohan Botre", "IJRET March 2013 (Page no 229 – 238)

Corresponding Author

Sarang Satishrao Ingle*

Junior Engineer, Education- BE Civil