Parameters of Green Building Design

Anshul Bissa, Rangoli Jiwankar, Abolee Lokhande

Civil engineering department, KDKCE, Nagpur, Maharashtra

Abstract:-This study aims to discuss the various design parameters of GREEN BUILDING. The main aim is to construct eco friendly and low energy building. This also helps to reduce the carbon foot print and reduce the energy consumption throughout the life cycle i.e. from construction to its demolition. The various parameters use in Green construction are life cycle assessment Sitting and structure design efficiency, Energy efficiency, Water efficiency, Materials efficiency, Indoor environmental quality enhancement, Operations and maintenance optimization, Waste reduction. This helps to safe guard the tenant or owner to reduce the energy cost which are going to increase in near future.

Keyword:- Green Building, carbon foot print, parameters

I. Introduction:-

As there is increase in the industrialization the population in cities also increased. Due to the increase in industries the numbers of tenants are also increasing which gives boost in construction. Due to construction the amount of carbon footprint is also increasing. Real estate development uses about 40% of the energy and it is one of the prime contributors to global warming due to the emission of Green House Gas caused by the energy used. Buildings in our country consume about 20% of the country's total electricity and have a significant impact on the environment and resources. To reduce the amount of carbon the smart way is to go GREEN. A Green Building is one which uses less water, optimizes energy efficiently, conserves natural resources, generates less waste and provides healthier spaces for occupants as compared to a conventional building. India depends on coal to supply 70 percent of its electricity and this contributes to the air pollution. Adoption of Green concept is the need of India. In the next 3-4 years about 200 million sq ft of commercial space and 45 million of retail space is expected to be constructed across the major cities of India which indicates that there is a great opportunity for developers and occupiers to promote green buildings. India is expected to develop about 110 million sq ft of green space in the next few years.

The first green building was built about 9000 year's backs in MEHRGHAR (part of Harappa) which now is situated in Pakistan. The first Green Building in world is **Commerzbank Tower** which is situated in Frankfurt (Germany). The construction of this building was completed in 1997.

The **Sohrabji Godrej Green Business Centre in Hyderabad** was first in India which was completed in 2004**.** The Green Building movement started in 1990 with the establishment of the first Green Building rating system in the UK. This was followed by the formation of the US Green Building Council in 1993. The Indian Green Building Council was instituted in 2001.

II. Goals of Green Building:-

The concept of Green Building can be traced to the energy (especially fossil) crisis and environmental pollution concerns of the society. Green Building brings the vast array of practice, technique and skill to reduce and ultimately to eliminate the effect of building on pollution and human health. It generally emphasis the use of renewable energy in building i.e. solar energy, wind energy, etc… It also empowers the use of trees on green roof, rain garden and to reduce the runoff of water by using permeable concrete.

This practice may change from region to region and also on the rate of change of climate. It not only helps the environment but also to the human health due to the decrease in UV radiation and also in the reduction of use of low chemical emitting materials likes paints having low Volatile organic compound (VOC) which may cause serious health problem if used in excess. VOC is generally found in paints, carpet, solvent, cleaning products and in some of the household appliance.

There are several key steps to design Green Building which are state below

- Life cycle assessment
- Sitting and structure design efficiency
- Energy efficiency
- Water efficiency
- Materials efficiency
- Indoor environmental quality enhancement
- Operations and maintenance optimization
- Waste reduction

1. Life cycle assessment:-

A life cycle assessment (LCA) can help avoid a narrow outlook on environmental, social and economic concerns by assessing a full range of impacts associated with all cradle-to-grave stages of a process: from extraction of raw materials through materials processing, manufacture, distribution, use, repair and maintenance, and disposal or recycling. Impacts taken into account include embodied energy, global warming potential, resource use, air pollution, water pollution, and waste.

2. Sitting and structure design efficiency

The foundation of any construction project is rooted in the concept and design stages. The concept stage, in fact, is one of the major steps in a project life cycle, as it has the largest impact on cost and performance. In designing environmentally optimal buildings, the objective is to minimize the total environmental impact associated with all life-cycle stages of the building project. However, building as a process is not as streamlined as an industrial process, and varies from one building to the other, never repeating itself identically. In addition, buildings are much more complex products, composed of a multitude of materials and components each constituting various design variables to be decided at the design stage. A variation of every design variable may affect the environment during all the building's relevant life-cycle stages.

3. Energy efficiency

Green buildings often include measures to reduce energy consumption – both the embodied energy required to extract, process, transport and install building materials and operating energy to provide services such as heating and power for equipment .As high-performance buildings use less operating energy, embodied energy has assumed much greater importance – and may make up as much as 30% of the overall life cycle energy consumption.

4. Water efficiency

Reducing water consumption and protecting water quality are key objectives in sustainable building. One critical issue of water consumption is that in many areas, the demands on the supplying aquifer exceed its ability to replenish itself. To the maximum extent feasible, facilities should increase their dependence on water that is collected, used, purified, and reused on-site. The protection and conservation of water throughout the life of a building may be accomplished by designing for dual plumbing that recycles water in toilet flushing or by using water for washing of the cars. Waste-water may be minimized by utilizing water conserving fixtures such as ultra-low flush toilets and low-flow shower heads. Bidets help eliminate the use of toilet paper, reducing sewer traffic and increasing possibilities of re-using water on-site. Point of use water treatment and heating improves both water quality and energy efficiency while reducing the amount of water in circulation. The use of non-sewage and grey water for on-site use such as site-irrigation will minimize demands on the local aquifer.

5. Material efficiency

Building materials typically considered to be 'green' include lumber from forests that have been certified to a third-party forest standard,

rapidly renewable plant materials like bamboo and straw, dimension stone, recycled stone, recycled metal, and other products that are non-toxic, reusable, renewable, and/or recyclable. For concrete a high performance or Roman self-healing concrete is available. The EPA (Environmental Protection Agency) also suggests using recycled industrial goods, such as coal combustion products, foundry sand, and demolition debris in construction projects. Energy efficient building materials and appliances are promoted in the United States through energy rebate programs.

6. Indoor environmental quality enhancement

The Indoor Environmental Quality (IEQ) category in LEED standards, one of the five environmental categories, was created to provide comfort, well-being, and productivity of occupants. The LEED IEQ category addresses design and construction guidelines especially: indoor air quality (IAQ), thermal quality, and lighting quality Indoor Air Quality seeks to reduce volatile organic compounds, or VOCs, and other air impurities such as microbial contaminants. Buildings rely on a properly designed ventilation system (passively/naturally or mechanically powered) to provide adequate ventilation of cleaner air from outdoors or re circulated, filtered air as well as isolated operations (kitchens, dry cleaners, etc.) from other occupancies. During the design and construction process choosing construction materials and interior finish products with zero or low VOC emissions will improve IAQ. Most building materials and cleaning/maintenance products emit gases, some of them toxic, such as many VOCs including formaldehyde.

7. Operations and maintenance optimization

No matter how sustainable a building may have been in its design and construction, it can only remain so if it is operated responsibly and maintained properly. Ensuring operations and maintenance (O&M) personnel are part of the project's planning and development process will help retain the green criteria designed at the onset of the project. Every aspect of green building is integrated into the O&M phase of a building's life. The addition of new green technologies also falls on the O&M staff. Although the goal of waste reduction may be applied during the design, construction and demolition phases of a building's life-cycle, it is in the O&M phase that green practices such as recycling and air quality enhancement take place

8. Waste reduction

Green architecture also seeks to reduce waste of energy, water and materials used during construction. For example, in California nearly 60% of the state's waste comes from commercial buildings. During the construction phase, one goal should be to reduce the amount of material going to landfills. Well-designed buildings also help reduce the amount of waste generated by the occupants as well, by providing on-site solutions such as compost bins to reduce matter going to landfills.

III. Cost and Pay off:-

The most criticized issue about constructing Green buildings is the price. Photo-voltaic, new appliances and modern technologies tend to cost more money. Most green buildings cost a premium of <2%, but yield 10 times as much over the entire life of the building. In broader benefits it reduce the Green house gas and its effect on environment and also inside the structure. In US people spend 90% of their time inside the house. According to Environmental Protection Agency (EPA) studies indicate indoor levels of pollutants may be up to ten times higher than outdoor levels. Therefore the indoor environment quality has to be enhanced.

IV. Regulation and operation:-

As a result of the increased interest in green building concepts and practices, a number of organizations have developed standards, codes and rating systems that let government regulators, building professionals and consumers embrace green building with confidence. Some of the rating systems in India are LEED, GRIHA, IGBC, BEE, etc…

V. Benefits

- Reduction in green house gas emission
- Improves outdoor as well as indoor environment

- It also reduce both consumption of embodied and operating energy consumption
- Reduce the use of non renewable material
- The maintenance cost of it is very less
- Its demolition does not affect nature when compared with conventional building
- Use of waste material also decrease the cost on construction of building

VI.Conclusion

Due to the increasing interest of the consumers in Green building the pollution in the nature can be controlled. Also the cost can be reduced and the houses can be provided on low cost and low maintenance. The burden on virgin materials can be reduced effectively. By adopting Green building the problem related to waste and its disposal can be reduced.

VII.Reference

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