Green Architecture: Introduction To Its Basics

Ankit Ranadive[1], Ashwin Mallah[2] Shilpi Singh[3]
[1, 2, 3] Dept of B. ARCH
[1, 2, 3] Tulsiramji Gaikwad -Patil college of architecture.

Abstract- *In recent years, green architecture has become the common interest of various countries. There as on for this popularity is to achieve the sustainable development. Green Architecture, also known as "sustainable architecture" or "green building," is the theory, science and style of buildings designed and built in accordance with environmentally friendly principles. Green architecture helps to minimize the number of resources consumed in the building's construction, use and operation, as well as curtailing the harm done to the environment through the emission, pollution and waste of its components.*

To design, construct, operate and maintain buildings energy, water and new materials are utilized as well as amounts of waste causing negative effects to health and environment is generated. In order to reduce these effects and design environmentally friendly and resource efficient buildings green architecture or sustainable architecture must be introduced, clarified, understood and practiced.

This paper frames the basics that need to be understand while proceeding for practice of green architecture.

Keywords- green architecture, energy efficiency, ecofriendly, sustainability.

I. WHAT IS GREEN ARCHITECTURE?

Green architecture is a green building design technique. The designs are created focusing on the larger construction implications of environmental sustainability. Green architecture provides careful consideration in designing energy-efficient and eco-friendly spaces. The natural ecosystem is a key concept in green architecture providing the basis for the construction model. The main aim of green architecture is to create models that safeguard the natural environment and are adapted to integrate well with the existing environment in terms of space and energy, water, and resource use.

II. PRINCIPLES OF GREEN ARCHITECTURE

As the world is moving towards a more sustainable future, architects are challenged with an important goal of design models that reduces the negative impacts on our environment due to construction. To make this possible, the designs are guided by the principles of green architecture. Here are the principles.

1. Energy Efficiency

The principles of green architecture include various measures that encourage energy efficiency. It is done through designs that reduce energy consumption including the energy requirements for energy use and the exploitation of alternative and sustainable energy sources such as wind and solar. For instance, green architecture takes care of natural air flow patterns and natural lighting to reduce the needs for heating, ventilating, and air conditioning; and artificial daytime lighting respectively. The designs simply insist on reducing the lifetime costs of heating, lighting, air condition and other electric power usage requirements.

2. Water Efficiency

Green architecture works with the inspiration of ecological surrounding to protect water quality and reduce water consumption or wastage. It is part of the sustainable principles in green construction which encourage the efficient use of water. This green architecture principle makes certain that water is harvested, used, purified and re-used during the entire construction period. At the same time, the architectural design ensures that in the entire life cycle of the building not only supports efficient water use but also preserves the quality of surrounding water systems and makes use of water recycling mechanisms.

3. Land Efficiency

Land use efficiency pertains to architectural designs that encourage suitable site development in terms of preservation of the surrounding environment and reuse of existing local materials. It advocates for the incorporation of roof gardens, earth shelters and extensive landscaping around and throughout the building.

4. Low environmental impact and conservation of natural characteristics

Construction projects are proven to be responsible for more than 50% of environmental impacts and the destruction of natural eco- systems. Construction projects also contribute to about 10% of the total global carbon emissions every year. One of the principles of green architecture is to therefore use green designs to reduce these environmental impacts. Particularly, this green principle is all about preventing degradation of the site during construction, sprawl management, and the controlled use of resources as well as ensuring energy-efficient buildings lessen the overall impacts on the environment. The design aids in the conservation of natural resources, improved water and air quality, and the protection of ecosystems and biodiversity.

5. Material Efficiency

The proper management and use of materials in construction is also another huge concern. Proper construction techniques have to be employed and this is where green architecture comes in. As such, material efficiency is one of the green architecture principles as it creates designs that inspire sustainable construction by optimizing the construction operations. Material efficiency as a green architectural principle sees to it that the lifetime of the building enhances efficiency in terms of maintenance and operations. Energy efficiency and resource conservation are the aspects incorporated in the designs to guarantee overall material efficiency.

6. Low maintenance cost

As stated earlier, the operational and construction costs associated with the conventional construction mechanisms prove quite high and are equally material demanding. Green architectural design facilitates the use of materials and construction techniques that help in cutting back the operational and construction costs by more than half, all attributed to their cost-effectiveness. This green architecture principle necessitates the need of using renewable plant products, recycled metal and recycled stone among other non-toxic products. Renewable and reusable products ensure high performance while at the same time reducing the long-term maintenance costs.

7. Waste Reduction

Green architecture advances the demand for reducing the wastage of water, energy, and materials during and even after construction. On this basis, the green architectural design offer easier ways of reducing the amount of consumer product wastage generated by the building occupants through the integration of on-site solutions like compost bins and eco-friendly waste management system. The design also takes care of water recycling and energy saving approaches in construction to reduce water and energy wastage respectively.

8. Use of renewable energy

Among the green architecture principles is the use of renewable energy. This principle ideally works to make renewable energy part of the architectural design or a highly recommended feature. The use of wind power, solar energy and biogas are examples of renewable energy technologies which are often included in the green architecture designs. The architects are keen at tailoring the designs based on the geographical locations to take full advantage of the available renewable energy. For instance, green oriented architects design buildings to fully utilize the seasonal changes in the sun's position and other regional renewable energy sources such as wind and biomass.

9. Indoor environmental quality

Indoor environmental quality is also part of the green architecture principles. The designing of a house or commercial building based on the green principles involves the features of comfortable interior space with an emphasis on natural temperature control, proper ventilation and the use of products that do not give off toxic compounds or gases. The purpose of the principle is to assure the quality of indoor environments.

III. CHARACTERISTICS OF GREEN ARCHITECTURE

a) Ventilation systems designed for efficient heating and cooling
b) Energy-efficient lighting and appliances
c) Water-saving plumbing fixtures
d) Landscapes planned to maximize passive solar energy
e) Minimal harm to the natural habitat
f) Alternate power sources such as solar power or wind power
g) Non-synthetic, non-toxic materials
h) Locally-obtained woods and stone
i) Responsibly harvested woods
j) Adaptive reuse of older buildings
k) Use of recycled architectural salvage
l) Efficient use of space while most green buildings do not have all of these features, the highest goal of green architecture is to be fully sustainable. Also Known As: Sustainable development, eco-design, ecofriendly architecture, earth-friendly architecture, environmental architecture, natural architecture.

IV. MATERIALS USED IN GREEN ARCHITECTURE

The materials used in green architecture are those that encourage good thermal performance, energy efficiency, water efficiency, resource management and save general construction costs. The materials long-term effects on the environment are a key criterion for selection. The following list provides a guide to the types of materials which are suitable for green building. The best materials are those which combine several of these features, materials likebamboo, straw bales, grass Crete. Materials like these are the mainstay of the most ecological builds and their use helps towards obtaining certification for green building.

1. Recycled products

Recycled products are used in green architecture because of their resource efficiency. Examples of recycled products include paper insulation from recycled newspapers and cardboards, cotton insulation from recycled denim, recycled stone and recycled steel. They are effective because they use less chemicals and energy to process.

2. Materials manufactured with resource efficient processes

These materials are preferred in green construction because they not only require less energy to produce but also minimize resource wastage and greenhouse gas emissions. An example is sustainable concrete made from crushed glass and wood chips or slag.

3. Natural, abundant or renewable materials

These materials can be obtained from sustainably managed and naturally occurring sources. They must also be renewable and adequately abundant in nature. Examples are certified wood and solar tiles.

4. Refurbished, salvaged or remanufactured

As the name suggests, these are the materials that are refurbished, salvaged or remanufactured. Their essentiality includes their inherent capacity to create value and saving materials from disposal or generating landfill waste. The materials are renovated, repaired or improved in performance, functionality or quality. Examples include plastic ceilings.

5. Reusable and recyclable materials

These are the materials that were previously used, but are still in good condition and can be used in new construction. Examples include old plumbing and old doors.

6. Durable materials

Materials that last longer are more environmentally friendly because they eliminate the need for frequent replacements and maintenance. They also reduce the overall costs of dependence of new upgrades in an already constructed building or house. Besides, durable materials have high reusable and recyclable value.

7. Locally available

The use of locally available materials is also part of green architecture since it minimizes transportation costs, greenhouse gas emission during transportation, and the interference with the local ecology.

8. Non-toxic materials

Non-toxic materials are highly recommended in green architecture. They promote IAQ and they are substantially low in carcinogen elements, irritants or reproductive toxicants.

9. Moisture resistant products

Moisture resistant materials are the ones that hinder the growth of biological contaminants in buildings. They are 100% moisture resistant and thus highly preferred in green architecture in terms of improving IAQ.

10. Low VOC products

Products with low VOCs are a greatly desired in green architecture designs. They improve IAQ since they are non-toxic and less hazardous to the occupant's health.

11. Water and energy conserving materials

Water conserving materials help in reducing the overall water requirements during construction and also in the lifecycle of the building or house. The materials are designed to reduce water wastage and enhance water quality in the landscape areas and within the building. Energy conserving materials, on the other hand, capitalize on scaling down energy costs and improving energy efficiency of the buildings. Examples of energy efficient materials are solar tiles and smart insulators.

Rating systems for Green buildings in India

Whether Green buildings are green is to be decided as per the rating systems. There are three primary Rating systems in India.

1. GRIHA
2. IGBC
3. BEE

Green Rating for Integrated Habitat Assessment (GRIHA) is India's own rating system jointly developed by TERI and the Ministry of New and Renewable Energy, Government of India. It is a green building design evaluation system where buildings are rated in a three-tier process. The process initiates with the online submission of documents as per the prescribed criteria followed by on site visit and evaluation of the building by a team of professionals and experts from GRIHA Secretariat. GRIHA rating system consists of 34 criteria categorized in four different sections. Some of them are as follows: -

(1) selection of site and site planning,
(2) Conservation and efficient utilization of resources,
(3) Building operation and maintenance, and
(4) Innovation.

Indian Green Building Council (IGBC)

Indian Green Building Council (IGBC) has licensed the LEED Green Building Standard from the USGBC. IGBC facilitates Indian green structures to become one of the green buildings.

IGBC has developed the green building rating systems for different types of building in line and conformity with US Green Building Council. Following Green Building rating systems are available under IGBC.

1. LEED India for New Construction
2. LEED India for Core and Shell
3. IGBC Green Homes
4. IGBC Green Factory Building
5. IGBC Green SEZ
6. IGBC Green Townships

Bureau of Energy Efficiency (BEE)

BEE developed its own rating system for the buildings based on a 1 to 5-star scale. More stars mean more energy efficiency. BEE has developed the Energy Performance Index (EPI). The unit of Kilo watt hours per square meter per year is considered for rating the building and especially targets air conditioned and non-air-conditioned office buildings.

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