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Research/Review Article

EXAMINING THE COMPONENTS OF GREEN BUILDING DESIGN AND ITS MANAGEMENT SYSTEM

Mohammad Beykzade *[1], Sepide Beykzade [2]

[1] Kharazmi University, Faculty of Engineering and Technology, Department of Civil engineering, Tehran, Iran.
e-mail:M.Beykzade@gmail.com

[2] Azad Islamic University Branch Karaj, Faculty of Management, Department of Management, Karaj, Iran.
e-mail:S.Beykzade2018@gmail.com

* Corresponding Author

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ABSTRACT
Studies have shown that the building industry has the largest share in natural resources consumption and has the greatest effect on the natural environment. Increasing human awareness of environmental issues, degradation and reduction of natural resources, global warming and rising pollution levels, along with social problems, lead to more stringent laws in this regard so that activists in the construction industry pay more attention to environmental issues. Building performance is today the most important concern of actors in the building industry. In this regard, achieving sustainable performance in line with the sustainable environmental development has been considered. Sustainable performance is based on acceptable environmental level, reasonable costs and technical feasibility of construction methods and such cases that should be in line with the comfort of the inhabitants. Today, green buildings are the leaders of sustainable development and balance among issues related to the environmental, economic and social health. It can be said that green buildings are a subset of sustainable buildings that emphasize those projects that consider the particular importance of solar energy, lighting and ventilation, reduced consumption and the use of recyclable.

Keywords: *Green Building, Environment, Management System, Energy,*

1. INTRODUCTION

In today's world, building construction is blooming, and every day we see the construction of a new building in a corner of the city, country and the world. This has continued to the extent that the total area of the buildings constructed on the planet earth is about one-sixth of the total amount of water on the planet. This is while the construction of these buildings has led to the cutting of trees and the destruction of forests. In construction of buildings, lots of energy is needed, and the increase in the rate of construction results in lots of waste that is damaging to the environment, which, with the continuation of this trend, the world is going toward the destruction of its resources and the destruction of the next generation. All research in the field of construction refer to the large amount of waste creating during construction. Sustainable construction requires the integration of environmental, social and economic considerations (Wanga el,. 2010). In the recent years, a new building has been introduced to prevent and reduce damage to human society, called green building, so that these buildings has been increasing significantly due to the demand for sustainable buildings around the world. In the construction industry, it refers to a sustainable construction which is defined during construction and in the long term without any destructive environmental effects in support of human activities in the future(Tan et al,. 2010). Current construction is very far from green construction, but in recent years a new building called Green Building has been introduced to prevent and reduce damage to human society, so that these buildings has been increasing significantly due to the demand for sustainable buildings around the world. Green building is a process consistent with the environmental and natural resources during the building life cycle of the building. The green building is considered as an effective way to resolve the contradiction between rapid construction development and saving resources with the least effect on the environment and the promotion of renewable and clean energy. Green buildings are appropriate alternatives to the construction industry in many developed countries. Green structures lead the design to prioritize using solar and wind energy. (Moharil & Kulkani,. 2009). Constructing a green or eco-friendly building can be a solution to reduce the pollution from fossil fuels and increase energy efficiency in buildings

in industrial cities. Green building is a building that is environmentally friendly and maintains land resources in the life of the building and throughout its lifecycle, it is consistent with the environment from location to design, construction, operation, renovation and destruction. Important axes in the construction of green buildings are: water productivity, waste management energy, indoor air quality, building materials, sustainable sites, education and awareness (Lindholm,. 2015).

2. METHODS

Green Building

There are various definitions for the green building, but according to the definition of the US Green Building Council, a green building is one that reduces or eliminates negative effects in designing, constructing or exploiting and can maintain natural resources and increase quality of life. Green buildings include features like: the optimal use of water and other renewable energies, good indoor air quality, the use of non-toxic and sustainable materials, consideration of environment in the design, construction, operation and optimization in the economic life cycle of the building. A triple triangle (Fig. 1) exists for the effect of the green buildings. At its top, reduction of environmental effects can be seen. Then, the high rates of profitability of such buildings, which ultimately are people, benefit from these green building benefits and values, (Bahaudin et al,. 2014)Use at most three levels of headings that correspond to chapters, sections and subsections. The first level headings for chapter titles should be in 10pt, bold, justified, and upper case font. Leave one-blank line before and after the first level headings, respectively.

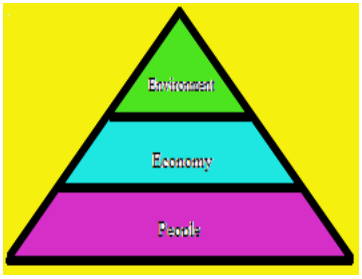

Figure 1. Triple triangle of the effect of green building

Green Roof

The building roof is the body of the building, which is always affected by atmospheric agents throughout the day. On the other hand, the energy waste from the roof due to its large area has increased the importance of the roof.

The green roof is defined as "plant roof" or "bio-roof". So that it is a lightweight engineering system allowing plant growth on the roof and protecting the roof. Green roof is one that part or whole of it is covered with vegetation and soil or with a growing medium. Making the roof green requires the plants that are carefully selected to withstand a rough environment full of erosion in water scarcity and dehydration conditions, climatic factors, frost, sea breeze, draught, etc. The type of selected plants is dependent on the type of weather and climatic conditions, and the green roof is the culmination of a combination of performance with the environment. This space is an endeavor to save the city with many benefits such as reducing heat and cooling, air conditioning, protecting sewage, reducing noise pollution and, most importantly, reducing energy consumption (Lindholm,. 2015).

The green roof absorbs sound rather than reflecting it and insulates the building up to 8 dB against sound. Green roof purifies dust particles and hazardous materials. These roofs improve ambient air as its mechanism is ventilation and oxygenation of plants. To reach a green roof, in addition to vegetation, it is necessary to use a power system with solar cells and a sewage system for the green system (Perez et al,. 2011).

Green roof can be divided into three categories (Tompson and Sorving,. 2007):

1. Extensive system

   For the extensive system, the term “Green Roof” is used. In this type of roof, the roof surface is not accessible and its view is visible from the surrounding. This type of roof has a shallow planting bed, so that the roof only includes one or two plant types and planting environment is shallow. This system is usually used for when the minimum load is considered. In particular, only maintenance and repair personnel have access to this type of roof. This type of roof is built on flat and sloping roofs like Norwegian grass. In this system, plants are usually used at a depth of 40-100 mm. The final roof load is approximately 50 to 100 kg/m^2 in saturated state. In the case of sloping roofs, 10 to 20% slope is recommended in most places. At a maximum gradient of 30%, there is a need for rim and anti-erosion tools.

2. Intensive system

   For the intensive system, the word “Roof Garden” is used. This system is also known as the deep section or the roof garden. This kind of green roof contains a variety of plants and is designed as a park. Some green roofs have large trees and waterfronts, which themselves require a major reinforcement of the structure. This system often

requires a new structure for roof, especially for those having public access. For the intensive system, the term “roof garden” is used

3. Planter box

In this system, the plant and its planting environment are kept in special boxes that cover all or most of green roofs. In an unmodular system, the planting environment is a continuous layer on the green roof. In the modular system, this environment is discontinuous.

The benefits of green roof include reducing the flow of rain and flood, preventing the release of particulate matter in the air and pollution, reducing the effect of the thermal island of the cities through cooling ambient air, providing a quiet environment for birds and animals, and improving the energy efficiency for buildings.

Green Wall

A green or living wall is one that part or whole of it is covered with vegetation. Green walls may be installed indoors or outdoors based on conditions. There are also different techniques and methods that can be used to create green walls in different dimensions to build the interior or exterior of the building. There are also green wall in addition to green roof in designing green building, which is divided into two main groups.

1. Green façade: In this system, the plant moves on the surface of the façade. A climbing plant starts to rise from the building, while it has roots in the ground (on a dirt bed). Recently, a supporting structure is also considered for the green façade.

2. Oxygen wall: It is divided into two active and passive systems.

Active system: These systems are the latest type of green wall. In this system, the air produced by the plants is used in the air conditioning system. The walls are based on a botanical-based biological purification science based on researches carried out at Waterloo Hospital. This system increases the air purification capacity.

Passive system: The effect of passive system on the air quality of buildings is scientifically not clear yet because it doesn’t use air travel from the roots into the ventilation system of the building. Some green walls are protected behind the glass to provide more predictable airflow than what's going on in the passive walls. There is no mechanism for air circulation in the passive wall. Instead, they are kept open to create a relative improvement in free air circulation as much as possible. There are various details for designing these walls, which more specifically relate to how the plant is kept on the wall and shape of the retaining system frames. (Lindholm, 2015: Tompson and Sorving, 2007).

Green Ceiling

Nowadays, various methods are used for air cooling throughout the world. One of these methods is cooling through the ceiling. This system has a very high ability. It can reduce the ambient temperature to a great extent compared to the outside temperature. This system uses a metal ceiling and a special thermal coating is placed on the outside of the ceiling. This is a very good thermal insulation system. The coating on this metal structure controls the heat of sun and cools the indoor environment from the outside, thereby reducing the energy system.

Green Basement

One way to reduce the energy consumption of buildings is to use underground heat converter. This converter uses the difference in temperature between the depth of earth and the outside air temperature for preheating and precooling of the air entering the building. To reduce the energy consumption of buildings, the amount of air change through the leakage from the building's thermal crust should be minimized. The air temperature of the earth is higher in the winter and lower in the summer than the outside air temperature. This temperature difference is used for preheating of cold winter air and for precooling of hot summer air, as well as helping to provide thermal comfort without using energy. Therefore, one of the ways to reduce energy consumption in the building is to use underground converters that enter the fresh air into the building.

Green Windows

Window orientation has a significant effect on energy efficiency of buildings. Window levels are one of the most important architectural features for increasing energy efficiency in buildings, which do not require any special construction materials or investments. Reducing the energy consumption of buildings with methods like using optimal cycle levels not only does not increase the cost of building investment, but also significantly reduces the cost of building life due to lower energy consumption and costs.

Green Theory

In March 2000, an institution in the United States called the Green Building announced the provision of a new program for building with higher efficiency and energy efficient consumption that is a strategy for optimal design and energy consumption and synchronization with the environment. The program was created to work with developers in

building more sustainable, nature-friendlier buildings different from traditional ones. It will also provide consumers and users with proper ways to help them manage their buildings more sustainably. The goal of the Leadership in Energy and Environmental Design program is to create incentives to reduce the destructive effects of buildings on the environment, and today it is one of the most well-known and most popular types of green building ratings in the world. LEED certified buildings have a much higher efficiency in energy consumption and water resources than conventional buildings. On average, these buildings consume 21-32% less energy than conventional buildings, and their indoor air quality is higher and more desirable for residents.

In the US, 42% of energy consumption is in buildings, which is used in building through heating, cooling, lighting, etc. The production and use of this energy produces carbon dioxide. Increasing the efficiency and optimizing energy consumption in the building has a profound effect on environmental health by reducing carbon dioxide production(Yellamraju,. 2011).

Standardization for the green architecture of green buildings, which is referred to as Eco-Friendly Buildings, is a structure that allows the optimal exploitation of valuable natural resources such as water, wind, solar and other energy sources along with efficient and recyclable materials. To have green building standards and be recognized as green projects, construction projects should receive LEED certification scores. The LEED certification criteria for scoring are: 27% energy consumption and environmental effect, 23% domestic air quality, 22% sustainability, 20% utilization of resources and materials, and 8% of building water quality.

Buildings with a score of 26-32% will qualify for the LEED certificate, if they gain a score of 33-38%, will be able to receive Silver, and if the score is 39-51, then the GOLD certificate will be awarded, and if it is above 52%, the building will be able to get the grade Platinum This increase in percent will lead to structural sustainability and reducing energy consumption and increasing profits for residents over the useful life of the building (Manson, 2015).

3. RESULT AND DISCUSSION

Green building advantages

Green building means design and construction practices that minimizes the negative effect of the building on the surrounding and the environment. This green building has benefits that will be examining.

In a definition by the US Project Management Institute for the economic benefits of green building, it has referred to advantages such as lower operating costs, lower life cycle energy costs, increased asset values and profit, improved employee productivity and satisfaction, lower absenteeism and increased employee productivity, lower health-related costs, lower litigation risks due to improved indoor air quality, increased economic life cycle of the facility (PMBOK® Guide).

The next benefits of the green building market are, according to the (Winch 2009) definition: the creation of market-compatible value, higher cost of housing, growth of demand by tenants, lower cost of advertising and less vacancy of building.

(Smith et al,. 2009) used a definition for the benefits of the green building industry as: employing professionals who have more competence, education and alliances, clarifying and providing green building knowledge to the rest of the world, helping other industries to benefit from other new opportunities in production of new technologies and increased job opportunities.

In a research by (Webb,. 2009), the increase in the comfort and health of tenants, minimizing the pressure on local infrastructure, contributing to the overall quality of life and moderating the community from the health, social and mental health benefits.

At the end, the environmental benefits of the green building, according to the definition are improved ecosystem protection, biodiversity and natural resources, improved air quality and reduced solid waste

4. CONCLUSION

Nowadays, with the advent of science and the availability of clean energy application technology, it can be useful for the architecture and urbanization industry, so that in addition to eliminating the effects of environmental degradation in the past, it can be renovated so that the structure can be designed in terms of structure and architecture, which is itself part of the structure of nature, while providing all the modern facilities to mankind.

In this article, the importance of using green buildings in the world today is recognized. The principles of designing and constructing these buildings include the use of natural light of day, the use of natural heat for controlling building heat, the use of non-harmful and recyclable materials to nature to increase human health and preserve the environment, as well as the use of resources that can be quickly replaced after consumption, and benefits of using such buildings include more health and comfort for human, preservation of environment, preservation of natural resources, reduction of energy consumption, resulting in economic benefits for owners and society.

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