

A Study on a Project Management and Evaluation System of Green Buildings Based on Life Cycle

Keyi Wang

Logistics University of PAP, Tianjin 300309, China

2534557176@qq.com

Abstract: With increasing pressure from current ecological environment, the development of green buildings has received widespread attention from all walks of life. During the construction and use of buildings, extremely high energy consumption will be produced. It is easy to trigger a series of pollution problems, such as light, noise and water pollution, to the surrounding environment. Therefore, it is very essential to build a project management and evaluation system of buildings based on life cycle and to incorporate evaluation indicators of green buildings into the system. In this paper, we attempt to discuss how to build a project management and evaluation system of green buildings based on life cycle.

Keywords: life cycle, project, management and evaluation system, green building

1. INTRODUCTION

Green buildings use green eco-friendly building materials and adopt green construction technology, to effectively reduce energy consumption during the production of buildings. By applying the concept of green design, people use natural resources for lighting and ventilation as far as possible. In the whole process of construction and use, the pollution of energy consumption to the surrounding environment is minimized, to conform to the current concept of sustainable development. To improve the energy conservation and environmental protection of buildings, we need to design a project management and evaluation system based on life cycle, to make green building indicators the basic indicators of building engineering.

2. A PROJECT MANAGEMENT SYSTEM OF GREEN BUILDINGS BASED ON LIFE CYCLE

2.1 Development management

The development management of green buildings mainly include three aspects: (1) project planning; (2) the feasibility of construction plans; (3) the organization and implementation of construction plans [1].

At the stage of planning, we need to investigate and analyze the environment and characteristics of projects, identify the construction goal of project according to analysis results, propose a specific implementation plan and prepare a project proposal. At the stage of planning, the focus of each step is shown in Tab. 1.

Tab. 1 The Focus of Each Step at the Stage of Planning

Working Process	Project Research	Goal Setting	To Propose an Implementation Plan	To Prepare a Project Proposal
Main Content	To collect data about green building projects and carry out on-spot investigation.	To set up an overall goal and sub-goals. Sub-goals include energy conservation goal and operation management goal, etc.	To develop a preliminary scheme for project construction, compare different schemes and verify the feasibility.	To prepare a project proposal and clarify technical indicators of green buildings

Among them, to verify the feasibility of projects, we mainly review and evaluate schemes from economy and technology, etc., including environmental benefits, economic benefits and social benefits, etc., based on relevant policies, regulations and technical standards, and finally identify an optimal scheme for project construction. At the stage of organization and implementation, we arranged staff and determined the division of labor, management system and workflow [2].

2.2 Design management

The design of green buildings has a key effect on the energy conservation and environmental protection of buildings. So design management, in particular, is very important. The design of green buildings mainly starts from resource conservation, improvement of the utilization rate

of resources, environmental protection, pollution reduction and building of a natural and harmonious living environment. The key points of design are shown in Tab. 2.

Tab. 2 Key Points of the Design of Green Buildings

Consideration	Resource Conservation	Environmental Protection	Water Conservation	Material Saving	Indoor Environment
Key Points of Design	To design the layout and orientation of a building rationally, make full use of natural conditions for daylighting and ventilation and improve the use of clean energy.	To choose construction land rationally, increase the utilization rate of land, reduce the impact of negative emissions on surrounding environment, increase landscaping and reduce heat island effect.	To strengthen the design and practice of water conservation measures, increase the utilization rate of water resources and use water recycling technology to reduce waste of water.	To strictly control building materials, increase the utilization rate of materials, choose energy-efficient and pollution-free green building materials	To design from the perspective of indoor thermal environment, acoustic environment, light environment and air quality, etc., create a comfortable living space.

2.3 Construction management

The construction management of green buildings mainly includes four aspects: (1) organization management, i.e., to build a construction management system, improve the organizational architecture, develop a strict management system and provide a guarantee for smooth construction; (2) planning management, i.e., to formulate an implementation plan for green building projects, integrate the concept of green construction, refine the overall goal and clarify the focus and specific implementation plan at each stage; (3) implementation management, i.e., to control the construction goal and manage construction sites. The main content is shown in Tab. 3. (4) Staff management, i.e., to strengthen the management of staff, including diet management and accommodation management of builders, take safety measures and realize safe production.

Tab. 3 Focuses in Construction Management

Stage	Focus of Management
Preparation	To build a base, measure on spot and introduce staff and equipment
Construction	To manage the quality, progress, technology, materials and costs, etc. in the whole process of construction
Final acceptance	To check the quality of projects, sort out relevant data, recycle and dispose waste

2.4 Operation management

Since buildings have a longer service life, energy consumption in the process of use is much higher than that in the process of construction. It is very important to handle operation management of green buildings well. The main content of operation management includes the maintenance of landscape, drainage, power, gas and other facilities and equipment in buildings, to keep the buildings energy-efficient and eco-friendly for a long term. We need to test and diagnose energy conservation in the whole process of operation. The main content is shown in Tab. 4.

Tab. 4 The Test of Energy Conservation of Green Buildings

Test Method	Test Content
Field test	A/C system, maintenance structure, heat insulation, heating system and air tightness in rooms, etc.
Laboratory test	Performance parameters, combustion performance, radiator thermal performance, wind resistance, water tightness, in-plane deformation and heat preservation, etc. of energy-efficient materials

3. AN EVALUATION SYSTEM OF GREEN BUILDINGS BASED ON LIFE CYCLE

The evaluation system of green buildings based on life cycle is built step by step. Primary indicators include resource, energy, management, economy, technology and environment. Each primary indicator contains an unequal number of secondary indicators. Their classification is shown in Tab. 5.

Tab. 5 An Indicator-targeted Evaluation System of Green Buildings

Primary Indicator	Resource	Energy	Management	Economy	Technology	Environment
Secondary indicator	The use of equipment and local materials, the effective use of materials, utilization rate of green building materials	The use of renewable energy sources, energy efficiency and energy consumption	Staff training, management involvement, information resources and staffing	Project cost control, environmental cost control	The reliability and agreeableness in the implementation process, the use of green technologies	The treatment of solid waste, harmful gas and sewage, the control of noise pollution

After identifying a basic evaluation system of green buildings, further we needed to determine the weight of each indicator, using analytic hierarchy process (AHP). Many items in the system cannot be quantified and measured. Using AHP, we can stratify its influence factors, compare their importance and obtain a judgment matrix. By calculating the matrix, we derived relative weights, calculated the total weight of each influence factor and its percentage. Using this method, we were able to evaluate projects quantitatively. The criteria are shown in Tab. 6.

Tab. 6 Grades of Weighted Evaluation

Weighted Score	0~50	50~60	60~80	80~100
Grade	Poor	Medium	Good	Excellent

4. CONCLUSION

To sum up, it is very essential to build a management and evaluation system of green buildings based on life cycle. It is an important guarantee for energy conservation and environmental protection and achieve the design goal. Only by setting up a perfect management and evaluation system will the whole construction process of green building be standardized and systematic, truly blend the concept of green design and construction and achieve the goal of energy conservation and environmental protection. In this paper, we mainly discuss how to build a green building management and evaluation system based on life cycle, to serve as a reference for the construction of green buildings.

REFERENCES

- [1] Fan L, Pang B, Zhang Y, et al. Evaluation for social and humanity demand on green residential districts in China based on SLCA [J]. *International Journal of Life Cycle Assessment*, 2016: 1-11.
- [2] Rehby L, Sarlieve P, Lepage D, et al. CLINICAL AND MAGNETIC RESONANCE IMAGING ASSESSMENT OF BRACHIAL BICEPS REINSERTION ON THE RADIAL TUBERCLE [J]. *Waste Management*, 2013, 33(11): 2568.