

Chapter 125

Comparative Study on Chinese and U.S. Evaluation Standards for Green Building

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Abstract This study addresses the applicability of the national and international evaluation standards of green buildings to the green buildings in China. The Chinese and U.S. evaluation standards of green buildings were analyzed in detail. The Vanke Center that obtained the certificates of the U.S. LEED rating system and Chinese evaluation standard of green building (GB/T50378-2006) was introduced to specify the differences of the Chinese and U.S. evaluation standards of green buildings. The problems of the Chinese evaluation standard of green building were discussed, and some improvement suggestions were put forth.

Keywords Green building • Evaluation system • Energy saving • Sustainable development

125.1 Introduction

People have paid attention to their health and have higher demands for the building quality with the continuous improvement of people's material life. The urban residents are not satisfied with the early buildings because of high energy consumption and severe pollution. The construction of the green building in developed

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countries are earlier than in China, and there is the gap in the green buildings in China and abroad.

Green buildings not only can reduce material consumption, emissions of carbon dioxide, environmental pollution, protect natural resources and ecological environment, but also provide a more comfortable, healthy and efficient living environment. The green buildings will be a preferable choice in the future. Therefore, it is necessary to work out evaluation standards to evaluate the green buildings.

Since 1990s, some Western developed countries have made a number of green building evaluation criteria. The main rating standards include BREEAM (Building Research Establishment Environmental Assessment Method) in the UK, LEEDTM (Leadership in Energy and Environment Design) in the USA, CASBEE (Comprehensive Assessment System for built Environment Efficiency) in Japan, NABERS (the National Australian Built Environment Rating System) in Australia and SB Tool (Sustainable Building Tool) as an international project. With its transparent, simple and fair evaluation process, the LEED has been globally recognized. BREEAM has also been accepted and used in the construction area all over the world because of transparent evaluation process. CASBEE is mainly used in Japan. The Australian NABERS rating system has been gradually accepted by New Zealand. However, among these rating standards, LEED rating system is most widely accepted on the world [1, 2, 3].

The evaluation standard of green building was implemented in China on June 1, 2006. About 300 public and resident buildings have been obtained the certificates of the Chinese Green Building Evaluation Level authorized according to the evaluation standard of green building (GB/T50378-2006) [4]. However, some problems such as without geographical complexity and insufficient evaluation time have been found in implementation process. As a result, many developers in China would prefer to apply LEED certificate than the Chinese Green Building Evaluation Level authorization according to the evaluation standard of green building.

In this study, the evaluation standard of green building was compared with LEED rating system to find shortcomings and advantages for better implementing the Chinese evaluation standard.

125.2 Comparative Analyses

LEED is mainly applied to assess the building performance during its life cycle. In order to cover different building types into the system, LEED has evolved into different building assessment systems. LEED NC and LEED EB are the systems which come into practice in the early stage compared to other systems. The main categories include: Sustainable Site, Water Efficiency, Energy and Atmosphere, Material Resources, Indoor Environmental Quality and Innovative Design with LEED AP. LEED CI, just after LEED NC and EB, consists of Site selection,

Water and energy saving, lighting and lighting control, building interior system and furniture, indoor environmental quality and discharge criteria. The integrated LEED system involves rating system, education, professional certification, resource support and third-party certification [2].

The evaluation standard of green building was developed based on the Chinese conditions and foreign rating standards such as LEED rating system and BREEAM. However, due to the lack of experience in the green buildings construction in China, this evaluation standard can not fully meet the needs of development of the Chinese green buildings. Compared to the LEED rating system, the evaluation standard of green building has not been widely recognized by the developers.

125.2.1 Similarity

Because LEED rating system is one of the reference standards when working out the evaluation standard of green building, two standards are similar structure and evaluation Indices such as outdoor environment, energy saving, water efficiency, materials and indoor environment.

125.2.2 Difference

125.2.2.1 Different Publishers

The evaluation standard of green building issued by the former Ministry of Construction is a recommended national standard. LEED rating system was issued by the [U.S. Green Building Council](#) which is a non-governmental agency. The U.S. federal and state governments encourage the developers to use the LEED rating system.

125.2.2.2 Different Application Procedures

The evaluation standard of green building stipulates the residential buildings and public buildings that apply the green building evaluation level authentication shall go through the quality acceptance and put the building into use over 1 year. Application of the LEED authorization is in the early stage of building life cycle, and the [U.S. Green Building Council](#) will track and understand the whole process. The application process of LEED rating system is very compact and the time for application process is clearly defined, it can greatly improve the efficiency, and each member can look at the information.

Table 125.1 Indicators of the evaluation standard of green building and LEED rating system

Evaluation standard of green building			LEED rating system		
Indicators	Score	Weight (%)	Indicator	Score	Weight (%)
Sustainable sites	14	22	Sustainable sites	14	20
Water conservation	5	8	Water efficiency	5	7
Energy and atmosphere	17	27	Energy and atmosphere	17	25
Materials and resources	13	20	Materials and resources	13	19
Indoor environmental quality	15	23	Indoor environmental quality	15	22
Operation management			Innovation and design	5	7

125.2.2.3 Different Evaluation Objects and Contents

The evaluation standard of green building is only used for evaluation of new residential buildings and public buildings. However, LEED evaluation buildings include new building, existing building, commercial interior decoration, community plan and development project.

Table 125.1 gives the indicators of the evaluation standard of green building and LEED rating system (2.2 NC). As can be seen, the former five indicators of two evaluation standards are the same or almost similar, and the weights are almost equal. Last indicator of the evaluation standard of green building is operation management, and last one of LEED rating system is innovative and design.

To classify the buildings as different grades, LEED rating system uses total score evaluation, and it does not ask the building to meet each of indicators. However, the evaluation standard of green building asks the building to meet both the necessary requirements and each indicator. Therefore, the evaluation standard of green building is strict than LEED rating system.

125.3 Case Study: Vanke Center

Vanke Center located in Yantian District, Shenzhen, Guangdong is a comprehensive building complex including function of apartment, hotel and office for Vanke Headquarters. The Vanke Center with an architectural area of 14,400 m² consists of green roof, photovoltaic power project with an installed capacity of 282.06 kW and some innovative structures [5].

Vanke Center is the first project with LEED 2.2NC Platinum certification and three stars of the Chinese green building evaluation level in China. It obtained a high score of 57 points, five points more than the score of LEED Platinum grade, the minimum standards for three stars of the Chinese green building evaluation is 46 points, Vanke Center obtained a high score of 49 points. (see Table 125.2). The Vanke center has cleared most of indicators of the evaluation standard of green building.

Table 125.2 LEED 2.2 NC score and clear indicators of evaluation standard of green building of Vanke Center

LEED 2.2 NC		Evaluation standard of green building			
Indicator	Total score	Vanke Center score	Indicator	Required items	Vanke Center items pass
Environmental management	14	13	Land conservation	6	6
Water efficiency	5	5	Water saving	6	6
Energy and atmosphere	17	16	Energy and atmosphere	10	8
Materials and resources	13	5	Materials and resources	8	7
Indoor environmental quality	15	13	Indoor environmental quality	6	5
Innovation and design	5	5	Operation management	7	7
The score for Platinum	>52		Preference	14	10
Total score	69	57	Total score	43 + 14	39 + 10

125.4 Improved Measures

The following suggestions and measures were put forth in order to better implement the evaluation standard of green building.

1. Extending the evaluation scope

The evaluation objects of the evaluation standard of green building are newly constructed resident and public buildings. The application scope of the Chinese evaluation standard should include the reforming projects of existing buildings, municipal engineering and large shopping malls.

2. Improve the operability

The operability the evaluation standard of green building is not so good. The qualitative indicators account for 70 % and quantitative indicators are 30 % in the evaluation standard of green building, while LEED rating system has 70 % quantitative indicators.

3. Policy support

The evaluation standard of green building is a recommended code, however, the governmental departments may give some policy guidance, such as requiring governmental invested projects must reach the requirements of the evaluation standard of green building, providing a degree of financial support to the green building owners and developers, dispensing with part of tax, allowing owners to benefit in the returning of the land remise fund, simplifying the approval procedures of the green building and accelerating the speed of declaration procedures.

4. Attention to operation of the market

The evaluation standard of green building was issued and implemented by the government. Non-governmental institutions and companies have not positively take part in its implementation. The governmental departments should encourage the architectural society, non-governmental institutions involve in the evaluation work.

5. Life cycle assessment

The evaluation time of the Chinese green building evaluation level is 1 year after the completion acceptance. The evaluation of the Chinese green building evaluation level does not consider the work in the early stage. The evaluation time should begin from the project start, and review construction process, operation results.

6. Open the evaluation process

The evaluation process of the Chinese green building evaluation level is not open, and the applies and citizens only know the evaluation results, and they do not know the evaluation process. The government should open the evaluation process.

7. Strengthening the professional training

Professionals are essential factor for green buildings development. The professionals are short in China, therefore the professional training should be strengthened to promote green building development.

125.5 Conclusions

The evaluation standard of green building has been implemented for 6 years, some problems have been found. The main problems were analyzed in this study, and improved suggestions were put forth in order to better implement the evaluation work in China. The Vanke Center was discussed as a case study.

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