

Study on the Application of Green Building Technology in Public Buildings

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Abstract. The concept of green building has a long history, which began to appear in the 1960s. At first, Italian architect Paolo combined the concepts of ecology and architecture to get "the concept of ecological architecture". Since the 1970s, in order to deal with the energy problem, solar energy, wind energy and other new energy have been gradually applied. Next, the concept and system of green building are gradually improved and promoted. Green building, a new type of building, refers to environment-friendly building, which adapts to the surrounding environment and makes the best use of resources on the basis of ensuring the ecological balance around the building. In 1992, the "United Nations Conference on environment and development" was put forward for the first time in Brazil. Then, Branda will and Robert will's more detailed concept of green building, which explains the comprehensive consideration of energy, environment, climate, household and other situations, and forms the book: *Green Building: Design for sustainable development*. In his article, Amory B. Lowens also points out that green building is not only the creation of material, but also the content of culture, economy and spirit. Now, the concept of green building has been widely valued and strongly supported by the academic community, and also more and more welcomed by the general public.

Keywords: *green building, energy saving technology, construction engineering, effective application*

1. Current Situation and Problems of Green Building Technology Application

1.1 Scope of Green Building

With the popularization of renewable energy, green concept, sustainable development and other concepts, the concept of green building and low-carbon life concept has been deeply rooted in people's minds. Green building is developing at a very fast speed, and the society's expectation of green building is also rising gradually, which will greatly promote the development of green building. Although the concept of green building has been put forward for many years, its development level and speed are not the same all over the world. Europe is currently the region with the highest level of green building development in the world, while Asia is the region with the fastest development of green building. The survey shows that in the next five years, the number of enterprises engaged in green building design and construction in Asia will increase from% to%. It is expected that in the next five years, the proportion of renewable energy mainly composed of solar energy, wind energy and geothermal energy will be greatly increased.

Green building industry is developing rapidly at home and abroad. From the experimental design of green sustainable housing in the UK to the real estate market, from the green transformation and reorientation design of various old industrial areas in Germany, from the attention and execution of domestic government and social organizations to green building design, we can see that green building design is experiencing a process of quantitative change and qualitative change. It can be predicted that green building will gradually become the mainstream of the global construction industry in the next few years, and green building design principles will become the basic design principles that almost all buildings must follow. All these efforts and practices, in turn, will promote the rapid development of green building in design, construction, construction and later maintenance.

1.2 Problems in Green Building

The design and construction of green building is to ultimately save energy and resources in the operation stage of the building, and provide users with better indoor and outdoor environment. Many green building technologies play a good role in building operation, but not all of them. Some

green building technologies are not put into use in the actual operation of buildings, especially those new and immature technologies. For example, the operation effect of ground source heat pump in some areas is not ideal, it can not achieve the designed operation conditions, can not meet the residential demand, and the operation cost is also high.

There are obvious regional differences in green building technology, so it is necessary to consider the application conditions of technology, and some technologies are not suitable in some areas. For example, in Chengdu, Chongqing and other places in hot summer and cold winter areas, the application of solar energy technology in these places can not achieve good results, and such areas are not suitable to promote solar energy technology. The sunshine in the hot summer and cold winter area belongs to four kinds of areas in China, which are lack of sunshine. The average percentage of sunshine in the whole year is generally as follows: the area in the south of Sichuan is lack of sunshine, and the area in the north is the lowest in China. The application of solar energy technology in these areas is inefficient and uneconomical. There are also some houses, which adopt various high-tech means to maintain the indoor environment of "constant temperature and humidity", and boast that they are ecological houses. However, it is not the original intention of the application of green building technology to keep people away from nature without opening windows for ventilation, that is, to waste resources and to have no real healthy living environment.

2. Application of Green Building Technology in Public Buildings

2.1 Heat Preservation and Energy Conservation of External Wall

In the building envelope, although the proportion of external windows is only $1/3 \sim 1/5$, its heat loss accounts for about 40% of the heat loss of the envelope. The heat transfer coefficient, air tightness, window orientation and window wall ratio are all important factors that affect the heat loss of windows. The green building technology that can be considered preferentially in exterior wall reconstruction mainly includes heat preservation and insulation technology.

The external wall insulation technology includes internal insulation, external insulation and self insulation. The comparison and application of the three insulation technologies are shown in the table.

2.2 Heat Preservation and Energy Conservation of External Windows

The use of energy-saving windows is an effective way to improve the quality of indoor thermal environment and the level of building energy saving. The energy-saving window is a window with high-efficiency glass and window frame profile with good thermal insulation performance. Its thermal performance is mainly related to the type of glass, the number of glass layers, window frame profile, sealing materials, etc. In the reconstruction of public buildings, for the windows with long service life, poor thermal performance and damage, priority should be given to the external windows with good air tightness and low heat transfer coefficient, such as low radiation hollow glass windows and double-layer windows, as shown in the table.

Table 1. The comparison and application of the three insulation technologies

Practice	Shortcoming	Advantage
External insulation of external wall	<ul style="list-style-type: none"> ① Wide range of application, applicable to different building thermal zones ② The phenomenon of thermal bridge is basically eliminated and the heat preservation effect is obvious. ③ Improve the durability of the structure and reduce the damage of the external environment to the retaining structure. ④ Little impact on indoor use area ⑤ It is beneficial to the reconstruction of the existing buildings and has little interference on the activities of indoor personnel. 	<ul style="list-style-type: none"> ① The insulation layer is exposed outdoors, which is easy to fall and damage, resulting in the decrease of the durability of the material ② It is difficult in the construction of high-rise buildings Compared with the external wall internal insulation, the material quality requirements are higher and the cost is greater.
External wall internal insulation	<ul style="list-style-type: none"> ① The insulation layer has good durability, effectively avoiding the damage of external environment to the insulation layer ② The construction is convenient, and there is no need to set up scaffold Frame, indoor construction is OK ③ The strength requirements of thermal insulation materials are low, the cost is saved, and the fire performance is good. 	<ul style="list-style-type: none"> ① It is easy to crack the thermal insulation layer due to the shadow direction of high temperature stress on the surface of external wall structure layer ② The phenomenon of thermal bridge can hardly be avoided, and the insulation effect is poor ③ Occupied indoor use area
External wall self insulation (sandwich insulation)	<ul style="list-style-type: none"> ① The requirements for strength and durability of thermal insulation materials are not high. ② Relatively low requirements for construction season and construction conditions ③ The thermal insulation performance is better than that of the external wall. 	<ul style="list-style-type: none"> ① The inner and outer walls need to be connected by connecting pieces, with relatively complex structure and high construction technology requirements. ② It is easy to form thermal bridge with ring beam, structural column and other components, which affects the thermal insulation performance of materials ③ The thickness is thicker than the traditional wall, reducing the effective use area ④ Affect the seismic performance of the structure

Table 2. Low radiation hollow glass windows and double-layer windows

Type	Principle	Characteristic
Stained glass (heat absorbing glass)	In general oxide, reduce the light transmittance of tinted through glass	Provide certain sunshade effect
Heat reflecting glass	The glass surface is coated with metal or metal oxide film to improve the reflection performance of the glass to the solar radiation	Strong solar radiation shielding ability in summer
Low radiation glass (Low-E glass)	Multilayer metal or other compound film is plated on the glass surface to reduce the emissivity of the glass surface	Can selectively control the transmission or reflection of visible and short wave infrared rays
Hollow glass	Fill two or more pieces of glass with air or other inert gas, and form glass components through sealing and bonding	The coefficient of heat conduction is very small and can be determined according to For different needs, select the above three kinds of glass Original film

2.3 Solar Energy Utilization

At present, there are mainly solar thermal system, solar photovoltaic system and other renewable energy forms used in buildings. In the existing public buildings, appropriate renewable energy system can be used according to the specific situation of the project. The demand for domestic hot water in public buildings is less, which can be solved by solar hot water system and air source heat pump hot water system. Solar heating and cooling system can be used to solve the demand for heating and air conditioning in combination with the reconstruction of enclosure structure, and photovoltaic can also be considered. Power generation technology: there are suitable underground water, surface water or available underground space around the project, so the ground source heat pump system can be considered to solve the heating and air conditioning needs. In addition, pay attention to the optimization of thermal parameters. In order to reduce the energy consumption of buildings, we should pay attention to the optimization of thermal parameters, especially the indoor thermal parameters of buildings, which are easy to control, so we should take relevant measures to optimize. The optimization should be carried out under the conditions of meeting people's production and living requirements and ensuring human health. The principle of "taking low in winter and high in summer" should be followed to set reasonable air conditioning operation parameters. It is found that the energy consumption can be reduced by 5-10% when the indoor temperature is reduced by 1 °C. Under the cooling condition, the indoor energy consumption can be reduced by 8-10% every 1 °C rise. Therefore, the air conditioning temperature should be set above 18 °C in winter and 28 °C in summer.

2.4 Water Utilization and Conservation

Reclaimed water reuse technology refers to the treatment of sewage to get reclaimed water that meets certain water quality standards, and then use it. The utilization of reclaimed water can be divided into self built reclaimed water and non self built reclaimed water. Self built reclaimed water refers to that the building sets up reclaimed water treatment station within its own red line to collect the drainage of buildings within or outside the red line and replace the tap water after treatment to meet the demand of building miscellaneous water (non drinking water). Reclaimed water treatment process is an efficient integration of several or more unit sewage treatment processes, including pretreatment unit, main treatment unit and advanced treatment unit. The correct selection and reasonable combination of unit treatment process is of great significance for the normal operation and treatment effect of reclaimed water system. Non self built reclaimed water refers to the reclaimed water provided by municipal water plant or regional reclaimed water treatment station.

3. Guarantee Measures for Energy Saving Application of Green Building Technology

Strengthen the supervision and inspection of the construction process. In order to discover and deal with the bad problems in the application of energy-saving technology in time, the construction unit shall assign technical personnel to supervise the construction process and urge the construction personnel to construct in strict accordance with the specification requirements.

On the one hand, do a good job of supervision during construction. The supervisor can take random inspection, special inspection and other methods to go deep into the construction site to understand whether the construction process of the construction personnel is correct, whether the construction parameter control is reasonable, and ask the construction personnel to rectify in time in case of any adverse problem. In addition, if necessary, give construction guidance to construction personnel to ensure that all construction details are carefully implemented. On the other hand, check the quality of the completed links. For example, when checking the doors and windows of the building, each inspection lot should be spot checked by 5%. If it is a high-rise building, the external window experience batch shall reach 10%. 50% of each inspection lot of special doors shall be spot

checked. The inspection contents include the leakage point, thermal insulation performance and air tightness of the insulating glass to ensure that it meets the design requirements.

In addition, during the installation of air conditioning system, lighting system and solar photovoltaic system, in order to ensure the construction quality, on the one hand, clarify the installation process, cooperate with other construction departments, and ensure that the reserved installation location is reasonable and the parameters are correct. On the other hand, after the completion of the installation work, the installation effect shall be inspected, and trial operation can be carried out. If problems are found, commissioning shall be carried out in time to ensure its normal operation and better achieve the energy saving goal.

4. Conclusion

Green building is the development direction of the future construction industry. The main research and design personnel actively apply energy-saving technology, and constantly develop and improve various energy-saving technologies. However, green building is a complex system engineering, which can not meet the requirements by simply applying several energy-saving technologies. For example, efforts should be made in material selection, full consideration of the surrounding environment, improvement of the quality of personnel in the building, and extensive publicity of the design concept of green building. At present, China vigorously advocates the sustainable development strategy. With the continuous efforts of all parties, the theory and technology of green building continue to improve and expand. The application of green building technology in public buildings can replace the traditional mode, effectively realize the energy saving, water saving, material saving of buildings, improve the quality of indoor environment, reduce energy consumption, and maintain the sustainable development of ecological environment.

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