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Original Paper

The New Development Trend about Passive Buildings

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Abstract

In this paper, the possibility that is to develop large-scale passive buildings is analyzed under the background of world energy crisis. The related building concept is distinguished. The development process of the passive buildings is reviewed. And some cases of passive buildings in China are introduced. At last, the conclusion is that the future of passive buildings in China is highly thought of.

Keywords

passive buildings, relevant concepts, development history, actual case

1. Introduction

With the rapid development of material civilization, mankind's excessive exploitation and utilization to the resource in the earth has brought about environmental degradation, energy crisis and other serious consequences. Harmonious coexistence of human survival and the natural ecological problem has become the major problem, which should be faced by society today. In front of the grim reality, we need to review the development of our cities. The buildings as the main markers in the city are also the important items of energy consumption. And it has aroused the widespread attention. Passive building is a leading technology in the field of low carbon and energy saving buildings in the world. It has advanced concepts, scientific principles, mature technology and rich practice. It's systematic and complete. Therefore, the passive building has more advantage of technology and cost than other kinds of energy saving buildings in the current world.

2. Analysis of Related Concepts

2.1 Energy-Efficient Building

Energy-efficient building refers to the design and construction of buildings that are made of energy-efficient structures, materials, appliances and products. In some or all of the energy-efficient buildings, renewable energy is used. The main indicators include that architectural planning and plane

layout of the buildings will be helpful for natural ventilation. The green area of the buildings is no less than 35%. And the building interval shall ensure that per family has at least one living space obtain 2 hours of sunlight in the severe cold day.

2.2 Passive Building

Passive house (or passive building) originated in Germany. It refers to the building, which uses the sealing structure and heat preservation material. The passive building does not need the traditional heating and air system. It can keep our bodies comfortable at a suitable temperature in four seasons with very low energy consumption. It represents a healthy and comfortable way of life. It also represents a building standard of low energy consumption.

Energy-efficient building has developed for decades in China. And its building code specification is also relatively complete and mature through decades of practice. Generalizing energy-efficient building really plays a significant effect on energy saving. Compared with the passive buildings, which are introduced into China from Germany in recent years, energy-efficient building does not have a mandatory requirement for the energy consumption. And there is no specific requirement for energy conservation. So the passive building bases on its own strict requirement and the environment of building energy conservation. It is the new trend of the times, new options and new measures. It will become the new direction for urban construction in the future.

3. The Development Process of Passive Buildings

The concept of passive houses originated from Bo Adxmscm professor in Sweden and an institution in Germany. And through a series of research and the funding of Hesse government in German, the concept of passive houses was gradually established.

In 1990 the first passive standard building was located in the German city. It was a three-story common residential building. In 1991 it was put into use after Energy saving reconstruction. And the terminal energy consumption decreased about 78%. In addition to the higher temperature of the wall in 1992, the building fell to the standard parameters of passive law in the rest of years.

In 1996 the passive housing association was founded. It was dedicated to promoting and standardizing the standards of passive houses.

In Germany the cost of a passive house is just higher 5 percent to 7 percent than traditional one. Because the passive house uses a sophisticated central ventilation system, which is placed side by side with the air intake and exhaust pipes. While the warm air drain out, the clean air come in. So the heat exchange efficiency is up to 90%.

By 2010 there have been more than 13000 passive houses put into use in Germany such as apartments, schools, office buildings and so on. It is worth mentioned that 116 hectares of development projects will adopt the standards of passive buildings in the new urban area in Heidelberg Germany. The construction began in 2005. And the period of project development is about 20 years. Currently it is the

largest passive buildings in Europe. Its slogans are core community, energy efficient and natural green.

4. The Development of Passive Buildings in China

In the context of the world energy crisis, the technologies of passive construction have been constantly optimized with the improvement of Chinese building energy efficiency level. With the urgent demand of domestic market, passive buildings in China will be largely adopted in the residential buildings and public buildings in the next few years. Up to now passive buildings have been designed and built in the economically developed areas in China.

4.1 The Center of Technology Research and Development in Hebei Province

The building area of the center of technology research and development in Hebei province is about 15000 m^2. It is designed according to the German passive and low energy consumption building standards and the Chinese three-star green building evaluation standards. It uses palisade structure heat preservation technology, energy-saving windows and doors, adjustable shading technology, solar-thermal conversion technology and so on. It includes more than 30 green energy-saving technologies. It is expected to achieve 90.5% energy saving. It can save 224 tons of coal and reduce 506 tons of carbon dioxide emissions every year.

4.2 The Residential Area in the Water Side in Qinhuangdao

The residential area in the waterside is located in Qinhuangdao. Its building area is about 1500000 m^2. The apartment building 12 in the residential area is an international science and technology cooperation project. It is also representative of passive buildings in China. The construction area of the passive building is about 28050 m^2. It has 18 floors and uses the reinforced concrete shear wall structure. If we calculate the heating period of five months in Qinhuangdao, compared with traditional heating methods, it can save 321 tons of coal, reduce 866.7 tons of carbon dioxide emissions and save about 453000 yuan on the cost of heating.

5. Summarize

Now the problem of energy shortage is becoming more and more serious. Buildings should meet the needs of energy conservation and reduce the consumption of one-off energy. In the future passive buildings will use the advantage of the value and become the new development trend in China.

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