Research on Local Building Suitability and Energy Saving Design

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Abstract: At present, the hottest topic in the construction industry is non-building energy conservation. With the development of globalization, building energy conservation is constantly being implemented worldwide. Under the trend of environmental degradation and economic development, the construction industry is also constantly developing and improving, and building energy-saving technologies are also constantly applying innovation. However, in China, due to the large economic differences between regions, the development of construction technology between different regions is not balanced. This has led to that the implementation of building energy-saving technology in China must be adapted to local conditions, to consider the specific technology's pertinence and feasibility combined with the actual situation. Based on this, this paper firstly analyzes the current building energy-saving design, and then discusses the problems existing in modern building energy-saving design and the basic characteristics of suitable energy-saving design. At the same time, it analyzes the suitability of traditional local buildings and considers the suitability of local buildings. The environmental principles of the design, the technical principles of suitable energy-saving design in local buildings.

1. Introduction
Environmental issues are an important issue in the current construction industry, and building energy-saving design is to develop a reasonable architectural design method in accordance with environmental requirements, to achieve energy conservation and reduce pollution by creating a good building physical environment combined with the natural environment.

2. Analysis of Current Status of Building Energy Conservation

2.1 Development Status
Due to two world energy crises erupted during the 1970s, the objective development led to the development of building energy efficiency, while promoting the development of low energy consumption buildings, green ecological buildings, solar houses and regional local architecture. Nowadays, these areas are still the main direction of current building energy-saving environment design. It is understood that under the development of the global economy, the ecological crisis and resource pressure caused by the rapid development of the population will be further expanded, which has led to the formulation of relevant policies. Including the "Kyoto Protocol" which enacted by the United Nations in Kyoto, Japan in December 1997.

2.2 Specific Process of Building Energy Consumption
China is currently at the peak of rapid economic development, and the progress of urban construction has led to the rapid development of industries such as construction, building and materials. However, in the development of these industries, the problem of energy consumption has increased dramatically,
and the production, use, construction and damage of building-related materials have accelerated energy consumption. According to reports, the energy consumption of construction-related industries accounts for 20-30% of China's commodity energy consumption. The energy consumption of the building generated during the use of the building will also increase with the use of the building. Generally speaking, half of the building has a 50-70-year life cycle, in which the energy consumed by the building only accounts for 20% of the total energy consumption of the building. In the specific use of the building, energy consumption is the focus.

2.3 Suitability and Energy Saving Design Theory

With the current environmental awareness, the energy conservation requirements of the construction industry are constantly being emphasized. In the construction and use of buildings, the energy consumption is huge, and the energy consumption of buildings can significantly reduce the energy consumption. Under the application of various technologies, building energy conservation has developed into a considerable scale industry, including solar energy technology and wind energy technology, roof insulation and insulation technology. China has a vast territory, and the country has a large population and different nationalities. Different national cultures in different regions have nurtured different architectural forms and characteristics. However, the unification of the current standardized building energy-saving mode will certainly subvert the traditional architectural tradition. Although the application of a large number of energy-saving technologies can significantly reduce energy consumption, it also brings a huge economic burden to the construction project. Therefore, to avoid the drawbacks of building energy-saving design development, we should formulate appropriate energy-saving designs based on different economic and cultural factors in each region, and propose a reasonable energy-saving design concept.

3. Building Suitability and Energy Saving Design

3.1 Problems in the Energy-Saving Design of Modern Buildings

With the development of science and technology, modern energy-saving technologies are also inseparable from high-tech technology. The application of high-tech technology in construction projects is the trend of the current construction industry. Although high-tech applications can save a certain amount of energy and cost in the application process, due to that complex conversion problems will cause a lot of energy waste. For example, in 2008, China’s bid to host the Beijing Olympic Games, in which the main venue “Bird’s Nest” was built on the theme of “Green Olympics”, claiming that the main venue not only has the requirements of the Olympic Games, but also uses renewable energy such as solar energy, combined with natural ventilation and lighting. Green venues built by energy-saving technologies. However, in fact, the design and construction of the "Bird's Nest" cost 3.13 billion yuan. The construction process used 94,000 tons of steel. Although it was reduced from the original estimate of 136,000 tons, the cost of later use and maintenance was huge. Not worth mentioning than the energy consumed.

Under the guidance of commercial interests, building energy-saving design is getting closer to standardization, and building construction is like a production line, producing the same building under the same standards. The construction projects thus constructed are too close to “standardization”, resulting in a large number of similar buildings, and the geographical location, cultural characteristics, and climate performance of the buildings have not been considered, which is useless for energy conservation change.

3.2 Basic Characteristics of Suitability and Energy Saving Design

3.2.1 Economical

The same energy-saving technology should be used in the same way when it is applied to different regions, but in practical applications, the actual benefits are quite different. When advanced
energy-saving technologies are applied to economically underdeveloped regions, the original energy-saving technologies cannot guarantee the reduction of energy consumption because of the backwardness of relevant technical levels, professional talents, and supporting industries. The suitability design method is based on the energy-saving design of building energy measured by economic benefits, which meets the different economic conditions of different regions, thus maximizing energy-saving benefits.

3.2.2 Regionality
China has a wide range of territories, and the climate varies greatly from region to region. Therefore, when designing building energy-saving, it is necessary to consider the specific climate of the specific area, so as to select the appropriate local energy-saving reality and exert energy-saving effects on the basis of climatic conditions. For example, the southern part of China is a warm zone, and it is hot and humid. In this climatic condition, the choice of the enclosed space of the building and the wall can facilitate the ventilation effect. Another example is that the northern region is mostly dry and hot, and the use of solar energy technology in this area is sufficient to provide electricity, heat, etc., which can significantly reduce energy consumption.

4. Analysis of the Suitability of Traditional Local Architecture

4.1 Contemporary Interpretation of Local Architecture
When a building is built at any location, it only contacts the site, but it does not indicate that it has certain local characteristics, so it is not local. The buildings built with the geographical features of the fusion site are local. In the long-term development of traditional buildings, combined with local climate and humanities, it is more in line with local climatic conditions and geographical features, and can also meet the basic requirements of building construction. Therefore, the development of contemporary architecture should also meet the conditions of such "adapted to local conditions", the inheritance of local architectural culture, and the requirements of the times.

4.2 Suitability Characteristics in Traditional Local Architecture
China's traditional local architecture is an ecological building built on the concept of nature, recycling and regeneration. Such buildings are not excessively pursuing the form of building energy conservation, but in the development of architecture, the influence of culture and natural conditions promotes the continuous change and development of architectural forms. In the traditional cultural concept of our country, the law of harmony between man and nature based on the concept of "harmony between man and nature" is the inherent concept of the Chinese people. This concept has created the characteristics of traditional architecture according to local conditions and mountains. For example, in the southeastern part of China, the shacks of the dwelling houses generally conform to nature, as shown in Figure 1.
4.3 Enlightenment from the Energy-saving Design of Local Buildings in the New Period

The design of modern architecture is inseparable from the characteristics of local traditional architecture, and the building energy-saving design should fully demonstrate the ecological design concept of circulation and regeneration in traditional buildings, and use natural lighting, natural ventilation and other conditions to avoid energy loss. Suitability and energy-saving design should be based on the natural environment, to meet the natural conditions, and to save energy and reduce emissions. The actual energy-saving of local buildings should be in line with the high-tech and energy-saving equipment in the new era, avoiding the excessive application of such technologies, but should be based on the natural conditions of natural conditions, using natural conditions to adapt to local conditions, and saving corresponding resources with less investment in order to reduce the occurrence of pollution.

5. Environmental Principles for Suitability and Energy Saving Design in Local Buildings

5.1 Differences Between Energy-saving Design and Local Environment

The development of building energy conservation is based on the combination and utilization of people and nature, and adapts to the development and innovation of building energy-saving technologies under limited transformation. At present, advanced energy-saving technologies are constantly being applied to the development of buildings, but the energy-saving effects of energy-saving technologies are not satisfactory. Not only that, but the energy waste can not be underestimated without energy saving. For example, in the design of the Beijing National Grand Theatre, an open-air large lake with an area of up to 35,000 square meters is located outside the Grand Theatre, as shown in Figure 2. Beijing is a heavily water-scarce city. The “central liquid cooling source environment system” applied by the Great Lakes around the National Centre for the Performing Arts actually creates a number of deep water wells around the theater. It uses 80m of underground geothermal heat to provide heat to the theater through heat exchangers. The surrounding lake water prevents the lake from freezing because it is too cold. In the process of utilizing this kind of energy, although the heat energy of geothermal energy is effectively used, under local conditions, the consumption of other energy sources is huge, which does not conform to the local natural laws,
resulting in an inconsistency between the building and the environment.

5.2 Suitability of Energy-saving Design and Integration of Local Environment

The integration of building energy-saving design and local environment is actually the fusion of people and nature, using the natural environment to create ecological buildings. The suitability and energy-saving design standard refers to the energy conservation and emission reduction in response to natural conditions. It is not a large-scale application of modern high-tech technology, but through the use of natural conditions to create a suitable construction environment for human beings, while combining modern energy-saving technologies to meet building conditions. Renewable energy in the use of natural environment is conducive to reducing energy consumption and environmental pollution, and also meets the requirements of sustainable building development. On the other hand, the protection of the natural environment by suitable energy-saving technologies cannot be ignored. This protection is reflected in the ability to preserve the natural environment and development needs. The building itself is a man-made material, and the integration of the natural environment to minimize damage to nature is the fundamental protection of the building's ecological environment.

5.3 Environmental Principles for Suitability and Energy Efficiency Design

Suitability for energy efficient design requires consideration of different characteristics of different environments. Today, with the development of contemporary architecture, different climatic characteristics are less restrictive to local architectural forms, but they cannot be ignored in building energy-saving design. (Table 1 shows the characteristics of building climate in some parts of China.) Because the building is based on the environment, all kinds of materials in the natural environment can provide certain energy for the building. Suitability and energy-saving design is to use sufficient natural environment capacity to create a construction environment that conforms to a specific geographical location, and to achieve building requirements while minimizing damage to the environment, thereby realizing the effective use of resources and achieving the best energy-saving effect.

| Climate | building style | Typical location |
|---------|----------------|-----------------|

Table 1 Characteristics of building climate in parts of China
characteristics

| Characteristic       | Description                                      | Location         |
|----------------------|--------------------------------------------------|------------------|
| Dry heat             | Raw soil structure, small patio, narrow alley    | Hetian Xinjiang  |
| Heat                 | Raw soil structure, cave dwelling                | Lanzhou Gansu    |
| No                   | Earth-going structure, steady dwelling house     | Xining, Qinghai  |
| Dry heat             | Strive for sunshine and have a gallery           | North China      |
| rainy                | Patio, promenade, high base, earthen wall        | Chengdu, Sichuan |

6. Technical Principles for Suitability and Energy Saving Design in Local Buildings

6.1 Modern Energy-saving Technology and Traditional Local Technology
The specific problem of energy-saving design of local buildings lies in the different economic conditions in different regions, while the regions with relatively poor economy have greatly restricted the development of technology. Under different human and natural conditions, the construction methods and energy-saving design requirements are also different. In the local building suitability and energy-saving design, fully reflecting the different regional characteristics and combining local resource conditions is the practical and appropriate energy-saving design.

6.2 Local Suitability of Energy-Saving Technologies
The local suitability of energy-saving technologies should be in line with regional characteristics, and design inspiration from local technology. China's vast land and resources, and for the design and development of energy-saving technologies they must meet the different technical levels of different regions in order to play the actual effect. The local suitability of energy-saving design is inseparable from the use of resources and the application of local technology, not measured by the advanced technology of building technology. Energy-saving technologies that meet local conditions can maximize construction cost savings, ensure energy-saving and emission reduction effects, protect the environment, and promote building energy efficiency.

7. Conclusion:
China is a developing country. Under the rapid development of the economy, the waste of natural resources and the destruction of the environment are intensifying. Therefore, the requirements for building energy conservation are higher than those of the general countries. To meet the specific needs of building energy conservation, it is necessary to meet the conditions of sustainable development and select appropriate energy-saving design methods according to the natural environment and geographical characteristics of different regions. In addition, the principles of energy-efficient design must be consistent with the requirements of integrity, sustainability and suitability. It is the development trend that meets the current energy-saving requirements by designing energy-saving design from both environmental and technical aspects according to the natural conditions and humanistic foundations of different regions.

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