Understanding and Practice of Room Temperature Control Method Based on Energy Saving Reconstruction of Public Buildings

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Abstract: In order to respond to national energy conservation and environmental protection policies, green building development strategies should be implemented in urban public buildings construction, and large-scale project energy-saving renovation plans should be implemented from the perspective of energy conservation. Different projects can adopt different energy-saving control methods according to actual conditions and adopt different control strategies, but the ultimate goal is to change the current situation of large energy consumption, high utilization efficiency, noise pollution, water pollution and air pollution emissions. Building energy-saving renovation and technical control, effectively improves the building energy-saving level, achieves energy-saving and consumption-reduction goals, and gives full play to the value of various resources. At the same time, the energy-saving renovation project can also help enterprises to obtain the maximum economic and social benefits and promote the sustainable development of the construction industry. In view of this, this paper will talk about how to achieve energy-saving goals in the energy-saving renovation of public buildings from the aspects of energy-saving design of indoor supporting facilities, energy-saving design of walls, energy-saving design of doors and windows and roofing energy-saving design, and how to achieve reasonable control of room temperature.

1. Energy-saving Renovation of Building Facade Structure

The rational design of the building facade wall is the key to achieving indoor temperature control goals, and is also the focus of building energy-saving renovation. For example, rock wool and glass wool are better choices. The combination of such high-efficiency thermal insulation materials and composite walls can reduce the heat transfer coefficient of the wall and improve the energy-saving effect of external wall insulation. In addition, materials such as concrete, sand and brick are mainly used in the construction of wall load-bearing walls. These materials are heavier, but the heat storage performance is relatively good. When selecting external wall insulation materials, it must be used according to the construction quality acceptance criteria, materials and components used for wall insulation engineering, and its varieties, specifications, parameters, etc. must meet specific engineering construction design requirements, such as thermal conductivity, Density, compressive capacity and combustion performance, compressive strength, bond strength of bonded materials, mechanical properties of the reinforcing mesh, corrosion resistance, etc. must comply with the design specifications [2]. Therefore, it is necessary to do a good job in quality inspection and control, and repeatedly check before entering the site, and at the same time sample and send inspections to form a verification test report.

In addition, before the external wall insulation construction, the construction drawings should be reviewed, the structure of each part of the wall should be mastered, and the size, specific position and

elevation of the doors, windows, openings and expansion joints should be clarified. Secondly, the right external wall insulation material is selected, and the material can be tested and passed before entering the construction site. Since the EPS insulation material is easily affected by the external environment, measures such as waterproof, rainproof, moistureproof and fireproof should be taken during transportation and storage to ensure the smoothness and good ventilation conditions of the storage site, and it should not be exposed for a long time. Take care when handling. In addition, in the external wall insulation construction, in addition to the corresponding special equipment for plastering, it is necessary to prepare external power supply and other mechanical equipment, and then check the surface of the base layer to ensure that the surface is clean and free of oil and other attachments, The hollow drum and the loose parts are chiseled and leveled, and then the wall and the leveling layer are firmly bonded, and defects such as peeling, hollowing, cracks and the like are formed on the surface layer. The base layer construction is completed, and the insulation material EPS is bonded and installed according to the design requirements. The installation follows the order from top to bottom, and the paste is applied from the corner of the wall to pay attention to the treatment of the pasting seam. The protective layer construction can be carried out 24 hours after the construction of the thermal insulation layer, and the bonding ability at the corner can be strengthened by adding a standard net.

2. Doors, Windows, Roofs and Others Energy-saving Renovation

In the energy-saving design of doors and windows, try to increase the number of layers of window glass, put a transparent polyester film on the window, install the door and window seals, use low-radiation glass materials and plastic windows with heat-insulating energy consumption. These measures can effectively improve the insulation performance of doors and windows and block the heat conduction of outdoor air. In the roof energy-saving design, first select high-efficiency insulation materials, and set up energy-saving roofs such as overhead insulation roofs or inverted insulation roofs. When selecting the insulation material, pay special attention to the material between the roof panel and the waterproof layer. It is required to meet not only the design and construction technical requirements, but also the strict inspection of various performance parameters. In addition, the construction technology should be reasonably selected in accordance with the local climate characteristics. For example, in the southern part of China, the roof can adopt the shading and heat insulation technology to achieve building energy conservation.

3. Energy-saving Renovation of Indoor Supporting Facilities

The building indoor facilities include electrical systems, water supply and drainage systems, and HVAC systems. To achieve the goal of energy saving and consumption reduction, we must first select new energy-saving facilities and energy-saving measures, such as the use of energy-saving sanitary appliances, energy-saving lamps and solar water heaters. Make full use of renewable clean energy and high-tech achievements. Secondly, for the energy-saving design in the electrical system, the appropriate energy-saving facilities should be selected on the basis of understanding the power, overall layout and load capacity of the electrical equipment. In particular, attention should be paid to the selection of the maximum energy-consuming facilities of the transformer and the energy-saving design on the line. For the design of the ventilation system, the power demand should be taken as the standard, and the equipment configuration should be considered to select high-efficiency products. When setting up the air conditioning system, all construction data should be analyzed and researched, and the appropriate indoor space assessment should be selected. Air conditioning, to minimize the number of air conditioners, but also to ensure the quality and operating efficiency of air conditioning, to solve the serious problem of energy consumption in air conditioning systems. For the energy-saving design of the water supply and drainage system, it is preferred to select the non-negative pressure water supply equipment, and at the same time achieve the effect of energy saving, environmental protection and water purification. In the energy-saving design of lighting systems, we must pay attention to the use of natural light to achieve intelligent lighting systems. First, it is required to make full use of sensing

devices such as sound sensing devices and light sensing devices in design, and realize effective control of the lighting system by sensing the natural light intensity and sound decibel, thereby achieving energy saving. Second, when installing lighting electrical equipment, we must pay attention to optimizing the design of related equipment, and choose high-efficiency lighting equipment to ensure the application efficiency and application quality of the lighting system. In addition, due to the large differences in economic development in different regions of China, the architectural design styles vary greatly. In the design of intelligent building lighting systems, reasonable standards should be determined, and the standard value of lighting can be selected according to the lighting requirements [1]. When designing the architectural lighting system, it is necessary to strictly abide by the national lighting design related standards, determine a reasonable design plan based on in-depth research, and set the lighting type according to the actual situation of the building house. For example, the walls and floors of the building houses are made of light-colored building materials, which can use sunlight to improve the illumination of the building. The building air-conditioned room uses a combination of lighting and air-conditioning, which can be met by multiple light sources on the basis of meeting the lighting requirements. Special high illumination requirements; general lighting system for production workshops and classrooms, if different illumination and shades are required in the same building space, partition design can be carried out according to actual requirements.

4. Principles of Room Temperature Tegulation Design in Energy-saving Renovation of Public Buildings

4.1 Principle of Save and Economy

Under the situation that environmental pollution and resource shortage are becoming more and more serious, a basic principle of building room temperature regulation design is to reduce resource consumption. Especially in the design of indoor supporting facilities such as HVAC, the specific energy saving embodiment is to reduce the use of construction materials and reduce the consumption of resources such as HVAC on the basis of ensuring the use of the system. For the specific characteristics of the project, equipment with high energy efficiency ratio is selected.

4.2 Environmental Principle

In order to alleviate a series of hazards caused by environmental pollution, the application of environmental protection design concept in the construction field is the basic principle of modern construction engineering construction. At the time of room temperature regulation design, it is necessary to strengthen the research on the possible negative impact on the environment during the operation of the building system. Select high-efficiency, low-noise air-conditioning equipment, fans and other sound source equipment, take appropriate noise reduction, vibration isolation measures, etc., in order to achieve zero emissions and zero pollution, reducing the impact on people's health and daily life.

4.3 Recycling Principle

Another principle of green building design is to realize the recycling of resources. In the design of building systems, in addition to the regulation of room temperature, in order to achieve the goal of energy saving, resources such as heat energy should be recycled and improved, and green building materials should be improved. And the utilization of resources to achieve efficient recycling of materials and energy.

4.4 Reliability and Feasibility Principle

In order to ensure the reliability of the scheme, it is necessary to fully consider whether the design scheme meets the requirements of ventilation and heating of high-rise buildings. The design scheme must comply with national and industry regulations to meet the needs of building users for heat and humidity, air quality, etc. Consider long-term changes, such as adapting to various weather conditions

in the four seasons of the year. In addition, in some special cases, if standard equipment cannot be used, it is necessary to check whether the non-standard equipment has reasonable and detailed parameter requirements. When the renovation project and the building area are not large, it is required to ensure the validity and feasibility of the design scheme, and pay attention to whether the equipment room area is sufficient.

4.5 Operational and Regulatory Principles

In the design and renovation of high-rise building systems, the external environment will change with temperature and humidity as the seasons change. Therefore, in different seasons, there are different requirements for the operation of building systems, such as air conditioning systems, and some changes will occur in the running functions and procedures of related equipment. In the design of HVAC, the designer should adjust the running load of the whole system, so that the whole system can fully play its role, realize the reasonable adjustment of the load of the HVAC system of the high-rise building, and achieve the goal of resource saving. At the same time, the designer should also clarify the operability requirements, and ensure the continuous operation and automatic control of the entire high-rise building HVAC system in combination with the operation of the specific air-conditioning system to meet the requirements of HVAC system operation in different environments.

5. Precautions During Room Temperature Control in Energy-saving Renovation of Public Buildings

5.1 Strengthen the Use of Natural Resources Such as Natural Wind and Solar Energy

In order to reduce the indoor and outdoor temperature difference between the building and maintain the appropriate temperature in the room, in addition to the use of various insulation materials, the use of natural wind should also be emphasized. This is because natural wind can regulate the indoor temperature and improve the air quality through indoor air circulation. . On the one hand, the use of natural wind can realize the exchange of indoor and outdoor air, reduce the utilization of HVAC equipment, and help to save HVAC resources. On the other hand, in the green building energy-saving design, it is necessary to realize the efficient use of natural wind. Following the principle of adapting to local conditions, based on the characteristics of the local monsoon, the topography and the influence of surrounding buildings, the reasonable setting of the size and orientation of the ventilation window can be realized. At the same time, it is estimated that the reasonable layout of the indoor structure layout should be done to avoid shielding ventilation due to the structure of the wall and the like, reducing air circulation and affecting the utilization efficiency of natural wind [3].

As a renewable and clean energy source, solar energy sources should be actively and efficiently used in green building HVAC design. At present, the widely used technologies in HVAC energy-saving design include solar thermal technology and radio and television technology, which can achieve efficient collection and high efficiency of solar energy. Conversion and utilization can effectively reduce the consumption of electricity resources and pollution emissions. The specific measures are to optimize the indoor hot water supply demand through the combination of the solar panel collector and the heating equipment, to realize the collection of solar energy by using the temperature controller and the floor through the setting of the circulating air conditioning system, and at the same time in different seasons. The control of the indoor temperature is realized according to actual needs. When designing, pay attention to adjusting the position and angle of the solar panel according to the actual situation to avoid the harm caused by direct sunlight. In addition, through the setting of the variable air volume system on the basis of the indoor temperature analysis, combined with the HVAC load operation, the control of the supply air temperature and quantity can be realized to avoid unnecessary waste of HVAC resources; The installation can not only achieve efficient use of natural wind, but also adjust the air volume according to the needs of each region, reduce the load of the air conditioning system, and save the consumption of air conditioning resources. In addition, in the cold and its indoor exhaust air temperature is higher than the outdoor temperature, then you can

choose a common heat recovery device to preheat the outdoor air, such as installing a heat exchanger at the indoor exhaust air outlet, so that the indoor and outdoor wind can be separated Circulate through their respective channels [4].

5.2 Reasonable Choice of Cold and Heat Source

In the design of air-conditioning system, the practical and efficient cold and heat source system should be selected according to the actual construction. The common heat sources are thermal power stations, heat pumps, small boilers, etc., and the energy utilization rate of thermal power stations and heat pumps is high. Heat pump technology refers to the use of natural heat as a heat source, using a compressor to extract the heat energy from the heat source of the natural environment, and the temperature is slightly increased and then transmitted to the high temperature heat source. In addition, thermoelectric cooling triple supply technology, storage air conditioning technology is also a common technology in energy-saving HVAC design [5]. The thermoelectric cooling triple supply technology refers to the use of natural gas to generate electricity, and then the waste heat generated during the power generation process is used as an energy source for heating or cooling, which can improve the efficiency of natural gas energy use. The storage and air conditioning technology refers to the application in many energy storage air conditioners in China. In short, in the realization of building indoor temperature control, we must proceed from the perspective of energy conservation and environmental protection, and at the same time effectively select the corresponding energy-saving system in light of the actual conditions of engineering construction.

Table 1. Air Conditioning System Air Conditioning Cold Heat Source

Combination Method	Winter Heat Source	Summer Cold Source	Cooling Tower	Chiller Plant
1	Direct Combustion Unit	Direct Combustion Unit	YES	NO
2	Gas/Oil Boiler	Electric Refrigerator	YES	YES
3	District Heating	Electric Refrigerator	YES	YES
4	Air Source Heat Pump	Air Source Heat Pump	NO	NO
5	Split Type	Split Type	NO	NO
6	Water Source Ground Source Heat Pump	Water Source Ground Source Heat Pump	NO	NO
7	Cogeneration (gas)	Cogeneration (gas)	YES	NO

6. Conclusion

To sum up, from the perspective of green energy conservation, in the design of energy-saving renovation of public buildings, by using advanced energy-saving technologies and measures to achieve indoor temperature regulation. On the one hand, it can create a comfortable and safe indoor environment, on the other hand, Avoid the consumption of resources such as HVAC. In the design and transformation, it can start from the perspective of wall insulation design, roof and door design, indoor electrical system design, lighting system design, HVAC system design. In addition, we must pay attention to strengthening the use of clean energy such as solar energy, pay attention to the selection of energy-saving and environmentally-friendly building materials and building technology, not only to meet the needs of building use, to achieve energy-saving building goals, but also to provide exemplary reference for other energy-saving renovation projects, provide experience in promoting energy consumption monitoring and energy-saving operation in public buildings.

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