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Green Building Standard System and Key Technical Measures

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Abstract: Green building is a manifestation of actively responding to the national "dual carbon" strategy.With the large-scale promotion of green buildings, the country has successively issued multiple evaluation standards for green buildings.This article is based on the "Green Building Evaluation Standards" GB/T 50378-2019, and proposes key technical measures for green buildings in combination with reality, providing reference for green building designers.

Keywords: Green building; Energy conservation and environmental protection; Key technologies

Introduction

Green building is a type of building that emphasizes environmental protection and sustainable development, with a focus on reducing negative impacts on the environment, including reducing carbon emissions, sustainable use of resources, reducing energy and water waste, and improving indoor air quality[1].Green buildings are high-quality buildings that save resources, protect the environment, reduce pollution, provide people with healthy, applicable, and efficient usage space throughout their entire lifecycle, and maximize the harmonious coexistence between humans and nature[2].

1. Introduction to Standards

The Green Building Evaluation Standards is a specific practice in the field of green development in China, aimed at implementing the concept of green development and promoting high-quality development of green buildings[3].

2. Key Technologies

2.1 Safety and durability

"Safety and durability" refers to the measures to enhance durability that buildings need to consider during the design phase, which provides stronger guidance for building design and makes the evaluation of green buildings easier to operate[4].

Consider active anti fall design for balconies, windows, protective railings, etc.The outer windows adopt measures such as high windows, limiting the opening angle of window sashes, and installing invisible anti-theft nets to comprehensively improve the safety performance of the building itself and ensure personnel safety.The design of external windows needs to comply with the relevant provisions of the current national standards GB15763 "Safety Glass for Building Use" and JGJ113 "Technical Regulations for the Application of Building Glass".

Anti slip measures shall be installed in areas such as building entrances and platforms, building ramps, staircase steps, public corridors, elevator lobbies, kitchens, bathrooms, and bathrooms.The anti slip level shall be determined in accordance with the requirements of JGJ/T 331 Technical Regulations for Anti slip of Building Ground Engineering to improve the anti slip level of the road surface.Anti slip measures shall be installed in areas such as building entrances and platforms, building ramps, staircase steps, public corridors, elevator lobbies, kitchens, bathrooms, and bathrooms.The anti slip level shall be determined in accordance with the requirements of JGJ/T 331 Technical Regulations for Anti slip of Building Ground Engineering to improve the anti slip level of the road surface.

In order to improve the adaptability level of buildings, universal, open, and flexible use space design should be adopted, or measures should be taken to change the use function of buildings; Separation of building structure and building equipment pipelines.In terms of high-strength materials, concrete can be reinforced with a protective layer thickness of steel bars or with high durability concrete to improve material durability.The waterproof and sealing materials meet the national standard GB/T 35609-2017 for the durability of polymer waterproof rolls, waterproof coatings, and sealants in the evaluation of green products.

2.2 Health and Comfort

"Health and Comfort" fully refers to the content of healthy buildings, focusing on the impact of decoration materials, water quality, indoor acoustic environment, hot and humid environment, natural ventilation, thermal comfort, and other factors on human health.

The concentration of pollutants in indoor air should meet the Indoor Air Quality Standard GB/T18883 or be further improved based on the standard.During the design phase, the building should be designed for sound environment to ensure that the indoor sound environment and sound insulation performance of the building meet the requirements of the Code for Sound Insulation Design of Civil Buildings GB 50118.

In terms of natural lighting and ventilation, natural lighting can allow people inside the building to fully enjoy the warmth of nature, and can also reduce indoor artificial lighting time; Good indoor ventilation not only improves indoor air quality, but also benefits the overall energy efficiency of buildings.

In terms of indoor thermal and humidity environment, studies[5-6] have shown that when the indoor temperature and humidity environment of a building deviates too much from the design parameters, it may lead to Sick Building Syndrome (SBS).Whether using natural ventilation or artificial cold and heat sources in buildings, the indoor thermal and humidity environment should be optimized during the design phase to ensure that the building meets the provisions of the GB/T 50785 Evaluation Standards for Indoor Thermal and Humidity Environment of Civil Buildings.

2.3 Convenience of Life

Research[7] shows that 90% of people's time is spent indoors, and buildings and their surroundings should provide convenient services for people.

The new energy vehicle industry in China is developing rapidly.The country's support for new energy vehicles continues to increase, leading to an increasing demand for charging.Therefore, it is required to install electric vehicle charging facilities in building sites.

Sports and fitness activities can improve the body's cardiovascular function, muscle strength, flexibility, balance, and responsiveness, improve body composition, and thus achieve the effect of enhancing physical fitness and improving health levels.Reasonably setting up fitness venues and spaces both indoors and outdoors in buildings can facilitate fitness activities for occupants, improve their physical fitness.

In terms of intelligent applications, setting up an energy management system to monitor, analyze, and optimize building energy consumption can further save energy during operation.Setting up an indoor air quality monitoring and water quality online monitoring system can monitor indoor environmental quality and water quality in real time, providing a healthy indoor environment and clean water environment for indoor personnel.

2.4 Resource Conservation

"Resource conservation" mainly includes several aspects, including land conservation and land use, energy conservation and energy utilization, water conservation and water resource utilization, and material conservation and green building materials.

In terms of land conservation and land use, the per capita residential land index of residential buildings is a key factor in controlling their land conservation, and the plot ratio of public buildings is a key factor in controlling their land conservation.It is necessary to reasonably design the plot ratio of public buildings and the per capita residential land index of residential buildings.The development and utilization of underground space is one of the important measures for urban land conservation and intensification.It should be developed and utilized in a reasonable and scientific manner.

In terms of energy conservation and utilization, the use of high-efficiency cold and heat source units, transmission and distribution systems, energy-saving electrical systems, etc. can achieve a certain degree of energy conservation.Renewable energy includes solar energy, hydro energy, wind energy, biomass energy, geothermal energy, etc.The application of renewable energy such as solar hot water, rooftop photovoltaics, and heat pumps in buildings can reduce the dependence of buildings on traditional energy and achieve sustainable resource utilization.

In terms of water-saving and water resource utilization, water-saving equipment is required, with a water efficiency level of 1 or 2.In addition, it also includes the use of water-saving irrigation, intelligent irrigation systems, and non-traditional water sources.

In terms of material conservation and green building materials, it includes integrated design and construction of civil and decoration engineering, using mild high concrete and high-strength steel.Utilize recyclable materials and green building materials to achieve efficient utilization of building materials.

2.5 Environmentally livable

"Environmental livability" emphasizes putting people first, emphasizing the shaping of a livable and healthy environment on the site, mainly including factors such as sunlight, thermal environment, outdoor greening, sound environment, wind environment, and alleviating heat island intensity.

In terms of site ecology and landscape.During the project development process, the original ecosystem within the site should be protected, and the surface soil should be reasonably recycled and utilized, while also taking into account ecological restoration or compensation measures.During the design phase, rainwater facilities and green rainwater facilities should be reasonably designed based on the annual runoff control rate, and combined with greening.

In terms of outdoor physical environment.In the planning stage, reasonable site selection should be made based on the functionality of the building, and the acoustic environment of the site should be optimized and designed.Plant protection and other methods should be used for noise reduction.In terms of reducing on-site light pollution, measures are taken to control the visible light reflectance of glass curtain walls and reduce night lighting pollution.During the planning phase, it is necessary to optimize and analyze the wind environment of the site, layout the buildings reasonably, and create a good outdoor wind environment for personnel.

2.6 Improvement and Innovation

"Improvement and innovation" refers to the adoption of advanced, applicable, and economical technologies, products, and management methods in various stages and stages of construction.Improvement and innovation mark a leap in construction performance and technology. Improvement and innovation include further reducing HVAC energy consumption, inheriting regional architectural culture, designing green capacity reasonably, industrialized construction, applying BIM technology, adopting green construction, and adopting engineering quality potential defect insurance.

3. Conclusion

On the basis of understanding the "Green Building Evaluation Standards" GB/T 50378-2019, technical measures that can be taken for new buildings in terms of safety, durability, health and comfort, convenient living, resource conservation, and livable environment are proposed.Through the application of various technical measures, green buildings can achieve high-quality development.

References

[1] GB/T 50378-2019 "Green Building Evaluation Standards" [S]. Beijing: Ministry of Housing and Urban Rural Development of the People's Republic of China two thousand and nineteen

[2] Li Renchun, Wang Ruojinxi. Analysis of building energy efficiency design in Xizang -- Taking the small enterprise incubation base in Qushui Industrial Park as an example [J]. Green Science and Technology, 2017 (2): 111-114

[3] Li Zhuangzhuang, Wu Kexin, Cao Jichang, Zhang Yakui, Gao Liang, Li Jifan, Ren Feng. Comparative Study of Evaluation Standards for Green and Low Carbon Buildings between China and Foreign Countries: A Comparative Study of Evaluation Standard Systems between China and Germany [J]. Construction Science and Technology. 2024 (07): 58-60+72

[4] Zhang Yongheng. Research on the Application of Green Ecological Technology - Taking a Residential Project in Baoding City as an Example [J]. Green Building. 2023 (4). 40-42

[5] Fang L, Wyon D P, Clausen G, et al.Impact of indoor air temperature and humidity in an office on perceived air quality, SBS symptoms and performance.[J].Indoor Air, 2004, 14(7):74-81.

[6] S.C. Sekhar, Thermal comfort in air-conditioned buildings in hot and humid climates – why are we not getting it right? Indoor Air 26 (2016) 138–152, http://dx. doi.org/10.1111/ina.12184.

[7] JIN M, LIU S, SCHIAVON S, et al. Automated mobile sensing: Towards high-granularity agile indoor environmental quality monitoring[J].Building and Environment, 2018, 127:268-276.

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