

Research on space optimization strategy of old-age buildings based on the concept of green building

Yan Gan¹, Yuzhu Wen¹, Jixiang Zhou¹, Yufan Shi¹, Yujia Huang¹, Na Zhang¹, Yuxiang Zhang^{1,*}

¹ Shenyang Urban Construction Institute & School of Architecture and Planning, Shenyang, 110000, China

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Abstract: With the deepening of the aging degree in our country, how to make old-age buildings better serve the elderly and solve the problems of living and old-age for the elderly is gradually becoming a hot topic of concern in the construction industry. Combining the concept of green building and the particularity of old-age buildings, this paper discusses the current problems faced by old-age buildings. Through the rational application of green building design methods to the design of old-age buildings, a preliminary analysis and summary of green design strategies for old-age buildings are summarized. Taking the old-age building as the starting point, this paper expounds the connotation of the optimal design of the old-age building space. Combining the principles of comfort and livability, efficient use of space, green passive design, etc., the methods of optimal design of old-age building space care is studied from three aspects: space configuration, visual effect, light energy and wind energy demand.

1. Introduction

According to the seventh national census data, in 2020, the number of elderly people aged 65 and above in my country will reach 191 million. From the perspective of proportion, the elderly population Accounting for 13.5%, my country has entered an aging society, and the optimization of nursing homes needs to be solved urgently. At present, most of the nursing homes in China are slightly transformed from old buildings. The interior space is depressing and cluttered, and the lighting and environment are not conducive to the mental health of the elderly. Some old-fashioned old-age buildings only have simple room display, and the aging-appropriate facilities and the classified care system for the elderly are not perfect. Use green concepts to create energy-saving and environmentally friendly buildings, save costs and lower the threshold for occupancy. Improve the functional zoning of old buildings, and introduce more natural ventilation and natural light through renovation to create good living conditions.

2. Necessity of Space Optimization of Old-Age Buildings

With the improvement of people's living standards and the enrichment of material life, contemporary people's demand for the elderly care environment is also increasing. We need to

adapt to the changes of the times to transform backward buildings, and use energy saving and emission reduction to improve space quality and energy consumption.

3. Optimal Design Principles For Existing Cases

3.1 The principle of comfort and livability

Nursing buildings are the main space for the elderly to live and communicate, and the living quality of nursing homes is particularly important for the elderly. Therefore, in the space optimization design of nursing homes, it is necessary to have clear functional divisions and reasonable traffic lines, to share the environment without affecting each other, and to have good ventilation and lighting. The design should be people-oriented, taking into account the psychological needs of the elderly, to create a comfortable and livable space environment.

3.2 Green carbon neutrality principle

The space optimization design of the nursing home under the green concept reflects multiple concepts such as "scientific development concept" and "people-oriented", which conforms to the development requirements of human society and conforms to the trend of the times. Therefore, the passive design of carbon neutrality is integrated into the space optimization design, and the green configuration is integrated, which can not only realize the recycling of resources, but also provide a more comfortable environment for the elderly.

3.3 Principles of efficient use of space

In the optimization design, it is necessary to avoid the dead space that is difficult to use, and to make full use of each space, so that it can improve various living functions in a limited area.

4. Problems Existing In Existing Cases

This time, taking the nursing home in Dongxinhuang Town, Zunhua City as an optimization case, the building was fully investigated and deficiencies were found. The whole is classified into the following three points: (1) High energy consumption of doors and windows (2) Low effect of shading measures (3) Poor lighting and ventilation effect in indoor public areas.

4.1 Energy consumption of building windows of nursing homes in Dongxinhuang Town, Zunhua City

Through investigation, it was found that the doors and windows of the elderly's bedrooms in Dongxinhuang Town Nursing Home are ordinary wooden doors and windows, and the energy consumption is serious. Without artificial energy regulation, it is easily affected by the external natural climate, resulting in the living environment being cold in winter and hot in summer. This is because traditional windows are used in the nursing home in Dongxinhuang Town, Zunhua City. Most of them have a single function and only have the function of ventilation and heat insulation.

4.2 Shading and heat insulation measures are inefficient

It was found that most of the windows of Dongxinhuang Town Nursing Home are recessed. In summer, when facing the high-intensity direct sunlight at noon or the west sun exposure, the interior is sultry, and refrigeration equipment is needed to relieve the feeling of dryness and heat. In

summer, the energy usage rate of the machine is high, but using the refrigeration equipment for a long time will make the elderly uncomfortable and the energy consumption will be high.

4.3 The lighting and ventilation effect of the corridor space for the elderly is poor

After investigation, it was found that the corridor space of the elderly living space in the nursing home in Dongxinhuang Town, Zunhua City is a long strip with windows only at the ends of both sides. The lighting effect is not good, it needs to rely on artificial lighting to see the road conditions, and the energy consumption is extremely high. In addition, the ventilation conditions are poor, which is easy to cause poor indoor ventilation, and the exchange of indoor and outdoor gases is not smooth, and it is easy for odorous gases to accumulate in the corridor space.

5. Use Passive Design to Optimize the Space Plan of Existing Old-Age Buildings

This time, for the shortcomings of the nursing home in Dongxinhuang Town, Zunhua City, we will optimize the space design of the nursing home through passive design. The optimization plan is the following three points: (1) Improve the window design (2). Increase the sunshade Measures (3). Effective use of light energy and wind energy.

5.1 Energy saving of doors and windows

Building doors and windows are the weakest link in the peripheral structure of the building, and the thermal insulation performance is relatively poor. Therefore, the team used solar shutters internally, which not only weakens the glare of the sun, but also effectively absorbs energy and converts it into electricity, reducing the loss of electricity. In the bedroom, the space staggered is used to maximize the lighting surface of the house, improve the living comfort, and achieve passive priority and active optimization.

5.2 Building shading and heat insulation

Take effective shading measures to reduce the building air-conditioning load caused by the solar radiation of the exterior windows and improve the energy consumption of the building. After investigation, most homes for the elderly in Dongxinhuang Town are recessed. The problem of high-intensity direct sunlight at noon in summer or exposure to the west sun cannot be well solved. The team adopts the method of shading and heat insulation. For example, in the design, the horizontal shading device must be extended, exceeds the width of the north-facing opening. Avoid the eaves that block the light entering the room all the time, the distance between the top of the glass and the underside of the eaves should be at least 30% of the height, and the width of the eaves should be 45% of the height from the window sill to the bottom of the eaves to reduce equivalent temperature. The roof is provided with aluminum foil to seal the air interlayer, such as planting roof insulation means.

5.3 Demand design of light environment and wind environment

Due to the deterioration of visual function and blurred vision of the elderly, the requirements for a bright light environment are higher, and sufficient light can improve the well-being of the elderly. Moreover, good natural ventilation can take away the turbid indoor air, maintain fresh air in the building, and inhibit the growth of bacteria, which is an effective method to prevent diseases. After investigation, the roof of the elderly home in Dongxinhuang Town is a sloping roof, and the

interior is arranged in an inner gallery style. A long corridor is in the middle, rooms are arranged on the north and south sides, and windows are opened at both ends of the corridor. Such a layout makes the lighting and ventilation performance poor, and additionally requires more light sources. Therefore, the team raised the top of the sloping roof, set up a sealed skylight on the raised sloping roof, and used glass surfaces for effective lighting, increasing the degree of lighting in the interior corridors and reducing the dependence on artificial light sources during the day. Small windows are opened on both sides of the elevated sloping roof for effective ventilation, thereby accelerating the indoor air circulation and effectively improving the indoor air turbidity.

6. Conclusion

With the increasing proportion of China's aging population, the elderly care industry has become a potential factor for development. At the same time, for the elderly care industry, green and sustainable development plays an important role. This article uses passive design to optimize the space of old-age buildings in the renovation of existing cases. Through the investigation of the nursing home in Dongxinhuang Town, Zunhua City, the renovation of some old-age buildings with the same problem is carried out. Under the premise of green as the core, passive design is adopted. By transforming the structural design of the house itself to achieve the comfort that the elderly like, the optimization plan is more humanized and practical. At the same time, reducing additional cooling or heating equipment and reducing energy consumption. Make full use of renewable energy to meet the optimization of old-age building space under the green concept. While improving the quality of life of the elderly, it also fully responds to China's call for carbon neutrality and green emission reduction.

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