

Analyzing the modular design strategy of small exhibition space from the 3R principle -- Taking the Centennial Party Building Exhibition Hall of spark as an example

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Abstract. Analyzing the modular design strategy of small exhibition space from the 3R principle -- Taking the "spark" Centennial Party Construction Exhibition Hall as an example, with the continuous improvement of China's economic development and the gradual improvement of people's living standards, the environmental problems caused by rapid development are becoming more and more serious. Environmental pollution has been accompanied by people's life, and the people have complained about it constantly. Since the 18th National Congress of the Communist Party of China, the construction of ecological civilization has become the top priority. A beautiful environment is related to people's well-being. In the construction industry, more and more attention is paid to the "3R principle", namely "reduction", "reuse" and "recycling". Modularization is an external expression of the building law. Taking the functional zoning as the main content, the building is divided into modules, and the modular design is adopted to increase the flexibility of the building and save the construction cost. This paper studies and analyzes the influencing factors of architectural design, focusing on the application of modular design means to realize the full play of architectural functions.

Keywords: 3R principle, modularization, Display space.

1. Introduction

With the continuous improvement of China's economic development and the gradual improvement of people's living standards, the environmental problems brought by rapid development are becoming more and more serious. Environmental pollution has been accompanied by people's life, and the people complain about it constantly. Since the 18th National Congress, the construction of ecological civilization has become a top priority, and a beautiful environment is related to people's well-being, In the construction industry, more and more attention is paid to the "3R principle", which includes "reduction", "reuse" and "recycling". The scale of small exhibition space is limited, but the design idea of small space and multiple styles is realized through modular design, and the "3R principle" is very consistent with the modular design concept of small exhibition hall. Modularization is a manifestation of architectural form. Modular buildings show different functional zones through module styles, and form the same modules into different styles through reasonable design. Modular design is very consistent with the "3R" principle, which aims to reduce the cost of building materials and make the building modes more diverse. Starting with the analysis of architectural design strategies, this paper focuses on the discussion of using modular design for small exhibition halls on the basis of the "3R" principle, Through the research and expectation summary, this paper discusses how to achieve the goal of sustainability in modular design through the "3R" principle..

2. Related concepts of modularity

2.1 Module

The concept of module originated from German industrial production in the early 20th century. It was widely accepted and recognized in the middle of the 20th century, and then developed a series of related theories. So far, the common definition of module is: "module is a typical and universal independent unit that can be combined into a system and has a certain function and interface structure."

2.2 Modularization

Foreign designers summarize the core of "modularization" as a process of "forming a relatively small system that can be designed independently into a complex product or process". A set of system processes is divided into several small individuals, and then combined through system design. Its "modularization" includes "module decomposition" and "module centralization".

2.3 Building modularization

Modularization of architecture refers to the method of using modularization strategy to carry out architectural design and production. It is to divide a whole set of building modes according to their functions, and design the functional partitions in the form of unit modules. Finally, the modules are diversified and assembled to form a complete building partition. Its essence lies in the decomposition and combination of modules.

3. Factors affecting modularization of architectural design

3.1 Functional factors.

The starting point of all our buildings is based on practicality, so we should also follow three elements when designing, namely firmness, practicality and beauty. When designing, we should consider the purpose of the building to be designed, such as its comfort and applicability in residential space design, and its safety and convenience in public space design.

3.2 Structural factors.

Building structure is one of the main factors affecting module design. In the design, modularization is not only to optimize the building space locally, but also to consider the actual use of the design building, mainly considering its practicability. In modular design, the connection layout between the modules of each independent unit and the rationality of each space combination are also the main factors of modular structure.

3.3 Environmental factors.

The building environment also affects the modular design. In the design, the climate of the module needs to be changed based on the original module, such as sun, rain, low temperature, rain and snow. Corresponding protective measures should be taken in the module structure, or some changes should be made in the module materials to adapt to the local climate and environmental conditions

4. Principles of modular architectural design

(1) the principle of space intensification is mainly to save land resources and space. Only in this way can we realize China's sustainable development. Instead of pursuing large quantity, we should pursue practicality and beauty. Secondly, we should improve the utilization rate of the overall space, make full use of the limited space and realize the improvement of functions in the region. Finally, for the improvement of environmental quality, landscape design should be carried out to realize green life and business.

(2) the principle of functional flexibility is to optimize the functions in the module. Make residential or commercial use more reasonable and practical.

(3) the principle of reasonable structure is reflected in the reasonable efficiency, economy and elegance of structural design. Only by achieving these three rationality can we say that the structure is reasonable.

5. "3R principle" -- sustainable development strategy

5.1 Concept of "3R" principle

The traditional concept of circular economy requires to follow the "3R" principle, that is, the principles of reduce, reuse and recycle. The reduction of resource utilization is to use natural resources as little as possible at the input end of production; Reuse Principle of products, extend the service life and adopt the corresponding environmental protection concept; The recycling principle of waste is to minimize unnecessary waste of natural resources, protect the natural environment, reduce maintenance costs and realize resource recycling.

5.2 Connotation of "3R" principle

(1) Reduce: it is required to use less raw materials and energy input to achieve the established production or consumption purpose, and then pay attention to saving resources from the source of economic activities. Reduction has several different manifestations. In production, the reduction principle often requires the miniaturization and lightness of products. In addition, the principle of reduction requires that products should pursue simplicity rather than luxury and waste, so as to reduce waste emissions.

(2) Reuse: it is required that the manufactured products can be reused in the initial form. The reuse principle requires to resist the widespread use of disposable products in today's world. In order to reduce waste, the reuse principle also requires manufacturers to extend the service life of products as much as possible, rather than update them very quickly, and the corresponding environmental protection concept.

(3) Recycle: it is required that the produced goods can be turned back into usable resources after completing their use functions. According to the idea of circular economy, there are two kinds of recycling. One is primary recycling, that is, waste products are recycled to produce the same type of new products, such as paper recycling; The other is secondary recycling, which converts waste resources into raw materials for other products. The efficiency of primary recycling in reducing raw material consumption is much higher than that of secondary recycling, which is the ideal realm of circular economy.

6. Problems of display space at this stage

6.1 Large floor area

Many exhibition halls in China cover an excessive area, and the unreasonable distribution of exhibition halls highlights the feeling of large and scattered. Tourists spend most of their time on the journey from one small exhibition hall to another rather than watching the exhibition. The huge exhibition hall has extremely low space utilization, which is the disadvantage of many exhibition halls now.

6.2 High energy consumption

The building scale of the exhibition space is becoming larger and larger, and the interior and exterior decoration is luxurious. According to relevant research data, large public buildings with a single scale of more than 20000 square meters adopt central air conditioning. In addition to heating, the energy consumption per unit area is equivalent to 90 ~ 200kwh / m² per year, while the energy consumption per unit area of ordinary buildings with a single scale of less than 20000 square meters is 30 ~ 70kwh / m² per year, It is roughly estimated that the annual energy consumption of a Shanghai China National Pavilion with a building area of 15000 square meters, except heating, is 2.7 million ~ 6 million kwh, equivalent to about 750000 ~ 1.5 million yuan. This is a considerable expense.

6.3 High maintenance cost

The maintenance cost of the huge exhibition space is very huge. The internal building maintenance of the exhibition hall, the cleaning of environmental sanitation and the maintenance of various equipment occupy a lot of resources. Compared with the small exhibition hall, the existence of the large exhibition hall is very inconsistent with the current national policy of low-carbon life.

7. Analysis of modular influence strategy of small exhibition space based on "3R principle"

The modular strategy of "3R principle" in architectural design plays an important role in energy conservation and optimization of building construction, and plays an important role in improving building efficiency and optimizing building structure.

(1) Advantages of "3R principle" modular design in China's architectural design, the modular design concept has become a relatively mature design method at this stage, and belongs to the environmental protection design concept. First, it can effectively reduce the construction cost and construction time; Second, improve the adaptability of products. The modular design concept can better respond to the changes of the market. Through modular modeling and different combinations, it can become various schemes to meet the needs of the environment; Third, reduce environmental pollution and waste of resources, environmental protection, green and pollution-free; Fourth, it can effectively recycle module buildings and recycle them.

(2) The influence and integration of architectural function on the modularization of "3R principle". In the process of using building materials to create space, the specific use demand of space refers to the function, that is, the human activities contained in the space. The importance of the function of display space occupies an extremely important position in the design. Among the three elements of the building, "solid, practical and beautiful". In the small exhibition hall through modular design, each space has an independent module design space, and each module will have a detailed design to ensure its ornamental; Each module has corresponding building requirements and forms different building modes in the assembly process; The most representative of modular design is its practical characteristics. It can achieve changeable architectural styles through different combinations and improve the utilization efficiency of architectural forms. The module can be reused to reduce construction costs and maintenance costs.

(3) Green and environment-friendly buildings are the basis for the modular construction of small exhibition halls. Following the "3R principle", a set of green and color building standards in line with the "3R principle" must be formulated. The requirements for green buildings in western countries are energy conservation, environmental protection and resource recycling. In order to standardize and evaluate the concept of green building, all countries have formulated green building standards or green building standard evaluation system, the most famous of which is the LEED standard developed by the American green building committee. In 2005, China's Ministry of Construction published the "China green building evaluation standard", of which 5 of the 6 indicators are basically the same as LEED. According to the requirements of these standards and the "3R" principle, the modular small exhibition hall should: ① the site selection of the building should be in a convenient location and pay attention to the harmony with the surrounding environment. In the early stage of site selection, the utilization of rainwater, geothermal, sunshine and other resources should be considered to facilitate the rationality of energy-saving design and modular splicing in the later stage; ② Building materials should be environmentally friendly, with less waste of tailings and recyclable materials, and non essential links can save materials; ③ Carry out energy-saving design and make full use of natural resources such as sunlight, rainwater, geothermal and ventilation. ④ pay attention to indoor environmental quality. Indoor environmental protection materials shall be used to ensure indoor air circulation, and consider the possible occurrence of mold between indoor items and sunlight, oxygen and so on.

Comply with the development of the times, carry forward the green design concept in architectural design, meet people's living needs, and create a scientific, healthy and green architectural atmosphere. Therefore, modular design under the "3R" principle is a new concept to realize the harmonious development of man and nature.

8. Epilogue

With the popularity of low-carbon awareness, building a green exhibition space is becoming more and more important. In terms of reducing the energy consumption of exhibition space and improving the environmental protection awareness of librarians and readers, following the "3R" principle will certainly become the trend of the development of exhibition space. Of course, in addition to the three principles of reduction, reuse and recycling, we should also consider other factors such as the easy recovery and harmlessness of exhibition space resources, comprehensively analyze the exhibition space and use a variety of methods and means, Realize the environmental protection of the exhibition hall and gradually turn to the road of sustainable and efficient use of building production and resource conservation. The application of modular design strategy in the field of architectural design can not only effectively save architectural resources, but also maintain the sustainable vitality of architectural space. However, modular architecture can continue to develop and flourish only if it meets the actual functional needs, conforms to the corresponding social and cultural forms and adapts to the means of material construction.

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