Research and Application of Remaining Building Regeneration Design

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Abstract: Architecture is the memory of the city, which records the development and vicissitudes of the city. With the rapid urbanization process, effective measures are taken to carry out low-carbon transformation, utilization and regeneration design of a large number of abandoned and relict buildings and their environment, so as to improve and prolong the building's life span. function and longevity, reducing waste of resources. Therefore, in this paper, an exploratory renovation design is carried out for the relic buildings in a certain area, and they are transformed into certain use values, so that the relic buildings can not only play new functions, but also retain the imprint of urban development.

Keywords: remains; architecture; regeneration design

1. Introduction

With the pace of urban development, many of the remaining buildings in the city have been destroyed, abandoned or demolished. The development of the urban economy will inevitably usher in the flow of population, the expansion and relocation of enterprises, and the transformation of old urban areas [1], which will inevitably make A large number of relic buildings and their ancillary facilities are abandoned and idle, and these relic buildings with certain cultural value and economic value will be destroyed and demolished [2]. As a man-made resource, most of these buildings are still in the design life period, and the structure is sturdy and durable. Demolition and reconstruction consume a lot of manpower, material resources and financial resources, and will cause certain damage and impact on the environment. Therefore, on the basis of maintaining technological progress and prolonging the relative life of buildings, the low-carbon transformation, utilization and regeneration of existing heritage buildings, and the inheritance and protection of these historical buildings that cannot be reproduced and replicated are invaluable [3-4].

2. Architectural Regeneration Design

There are two basic ways to construct buildings: new construction and retrofit and reuse [5]. The reuse of old buildings has two meanings. One is to ensure the basic premise of ensuring the use of old buildings, and to re-use them, generally by means of reinforcement, repair and maintenance; Under the premise, redesign is generally adopted, such as reconstruction and expansion. Through reuse, the building can continue to be recycled, and the historical and cultural content it carries will be preserved accordingly [6].

The proposal of regeneration is based on the concept of "urban regeneration" and extends it. At present, there is no clear and rigorous definition. The core idea is to have more humanistic care, more freedom, and more ecological concepts on the basis of the theoretical achievements of reuse. and creation concept. The regeneration design of the heritage building is to reinforce, repair and improve on the basis of not violating the original structure of the building. It has both proper preservation and innovation, giving the building new life and new uses, and prolonging the service life of the building. It has the advantages of resource reuse, reduction of consumables, preservation of urban history and culture, etc., reflecting humanistic feelings and ecological awareness [7]. From the professional point of view of architecture, in the process of urban construction and development, the renovation of old industrial buildings, civil buildings and other relic buildings is particularly important. Buildings are major energy consumers, and the demolition of legacy buildings will bring about greater resource consumption and environmental problems, and will bring greater economic burdens to the city. Therefore, in the entire life cycle of the building, reducing the impact on the environment from construction, use to final disintegration, extending the life cycle of the building, and applying the concept of sustainable development to the reuse of relic buildings can effectively solve or reduce these problems.

3. Theories Related to Regenerative Design

First of all, it is necessary to understand and study the basic situation of the original building, combine local geographical factors and cultural characteristics, explore the organizational relationship between historical inheritance and spatial arrangement, and transform, replace, supplement, reorganize and expand the function and structure of the original building space. In order to make the design of old industrial buildings successful, we can try some methods to regenerate the old industrial buildings left in the northeast.

3.1. The Body Maintains its Appearance

According to different functions, its appearance form also has different architectural artistic characteristics. According to the development of the city and the characteristics of urban style, building regeneration can be carried out on the basis of maintaining the appearance of the building [8]. For example, the Fabrica Pompea Sports and Cultural Center was originally a state-run metal barrel factory. The entire building complex was converted into a social center for leisure, entertainment, library and sports activities, preserving the original appearance of the complex. Irregular ventilation holes, unpainted concrete walls, clear water brick walls and red brick walls are filled with an industrial atmosphere. The designer made a bold treatment to transform an old metal barrel factory into a special part of the city, which is connected with the whole city.

3.2. Ontology Function Replacement

Recycling pays attention to the appearance of the building and the division of the internal and external space should match the new function [9]. For example, a large-span building space can be directly transformed into public buildings such as theaters, auditoriums, exhibition halls, lecture halls, fitness centers or museums. The focus of the raw design is to preserve the appearance of the building in the process of recycling, and its architectural space changes due to the change of its functions, and organically integrates with the local history and humanities. For example, four gas storage tanks with huge brick exterior walls in the outskirts of Vienna were built in the 19th century and were originally used to store gas. After 1985, the city of Vienna switched to LPG and the building was abandoned. Due to the development of the city, after being designated as a new urban area, Austrian and French designers transformed these 4 storage tanks into large multi-functional complexes, with garages and commercial warehouses underground, and a few floors at the base as commercial, office and entertainment areas, the upper part is more than 600 apartments, becoming a new local landmark. It not only maintains the original historical traces of the building, but also gives the building new content [10].

3.3. Ontology Space Segmentation

In the recycling project, the original development history of the building should be respected, and the logical relationship between the form, structure and style in the original building body space should be respected [11]. In the specific design, the architectural style of the original old industrial building should be maintained, and the historical and cultural atmosphere of the original old building should be preserved [12]. Therefore, the space can be divided to meet its different functions. For example, Beijing 798 Art Park is an old factory area of the original electronics industry, and then gradually developed into an aggregation of various spaces such as art centers, galleries, design companies, artist studios, restaurants, bars, etc., while maintaining the characteristics of the original space form , and meet the needs of the use of new functional space; it not only retains the sense of historical industry, but also does not lose the modern flavor, leaving historical memory for modern people and continuing the historical context.

3.4. Ontology Space Expansion

Combined with new functional conditions and changing space requirements, new buildings can be built close to, accommodating or adjacent to the original buildings, and the old and new buildings can be integrated in a way of connecting parts according to the new functions, so that the original building space is in the plane. and façades have been expanded and supplemented [13]. For example, Harbin Xicheng Red Square, whose original site was Harbin Jilian Machinery Factory is the historical witness of Harbin's industrial development after the founding of the People's Republic of China. Connect the old factory with the new business district. The industrial expo corridor displays real objects, photos, models, drawing boards, and industrial equipment such as cars, pliers, cerium, milling, etc., so that the formed Northeast Asia Contemporary Art Exhibition Center is organically combined with the living shopping center, and it has become a centralized display base for industrial culture. and educational base. It not only retains the precious historical traces, but also rejuvenates the old factory buildings with new vigor and vitality [14-16].

4. Regenerative Design Applications

4.1. Regeneration Design of Civil Remaining Buildings

Research on various factors that affect the renovation of urban relics, drive regional environment, culture and economic construction from point to surface [17]. On the premise of resource waste and consumption, the exploratory renovation design is being carried out for the old buildings in the "Shell Village" in the Xinkailiu area of Xingkai Lake, to provide technical support and theoretical basis for further in-depth research on the regeneration design of old industrial buildings. Increase the attention to the sustainable development of industrial heritage buildings, propose effective renovation strategies, and provide a feasible design blueprint for the future development of the regeneration design of heritage buildings.

Specific case: "Empty Shell Village" in the new Kailiu area of Xingkai Lake is located about 200 meters from the lake bay fishing port scenic spot. In order to develop tourism projects, 90% of the villagers have been relocated, leaving behind many civil relic buildings. value. The area has been gradually planned and designed, and the large-scale demolition is undoubtedly a waste of resources, and is currently undergoing renovation development. Because the geographical location of Xingkai Lake is close to Russia, combined with the characteristics of local resources, the theme of the regeneration design of relic buildings is combined with

the tourism development project of Xingkai Lake. Therefore, some buildings in the "Shell Village" are based on Russian-style buildings. The characteristic regeneration design is shown in Figure 1, Figure 2, and Figure 3.

Figure 1. Civil relic buildings before renovation

Figure 2. Renovated building plan

Figure 3. Interior renderings after renovation

4.2 Regeneration Design of Industrial Heritage Buildings

The use of old industrial heritage buildings to influence local culture and the impact of old industrial heritage buildings on the area where they are located, combined with the internal and external environments, creates a modern and sustainable characteristic cultural building [18]. Following the ecological principles of sustainable development and local cultural characteristics, a transformation model of replacing the old with the new and using the old to make up for the new has been researched to provide a reference for the regeneration design of industrial plants in other small and medium-sized cities in severe cold regions. There are nearly 200 old industrial factory buildings of various types in the northeast region. In addition to those used for production, most of the old buildings are abandoned and idle, which is undoubtedly a waste of resources. Taking Jixi City as an example, it is an old resource and old industrial city with a long and solemn cultural history. In the process of urban economic development, due to the depletion of resources, old industrial plants and old coal mine plants are gradually being idled and abandoned. These resources can be fully utilized to develop new functions through building regeneration design, such as: transforming old industrial plants into Printmaking creation center and art exhibition area; transform old buildings into film and television shooting bases; transform mining areas into coal museums, etc. Renovate old buildings according to local characteristics, so that old buildings can not only play new functions, but also reflect the industrial characteristics in the process of urban development, and leave the memory of urban development [19-20].

Specific case: Through on-site research and surveying and mapping, a large amount of data and information about the industrial heritage buildings in Jixi area were collected. The old industrial plants and old coal mine plants were gradually abandoned and abandoned, leaving many industrial heritage buildings. use value. The area has been gradually planned and designed, and the large-scale demolition is undoubtedly a waste of resources, and is currently undergoing renovation development. Combined with the popular trend of sports and fitness, the theme of the regeneration design of relic buildings is combined with the development project of sports venues. Therefore, the regeneration design of part of the relics of the steel plant is carried out, as shown in Figure 4, Figure 5, and Figure 6.

Figure 4. The exterior of the industrial heritage building before the renovation

Figure 5. The internal structure of the industrial heritage building before the renovation

Figure 6. The renovated sports field

5. Conclusion

The regeneration design of relic buildings is to reinforce, repair and improve on the basis of not violating the original structure of the building. Through reuse, the building can continue to be recycled and retain the historical and cultural content it carries. Appropriate retention and innovation, giving buildings new life, new uses, and extending the life of buildings. It has the advantages of resource reuse, reduction of consumables, preservation of urban history and culture, etc., reflecting humanistic feelings and ecological awareness.

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