

# Application of Building Engineering Technology in Old House Reconstruction Project

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**Abstract:** With the continuous improvement of China's urbanization level, more and more people have poured into the city, which has caused greater residential pressure to the city. And with the continuous rise of land prices, cities want to solve the problem of population living, they need to transform some old houses, increase the building area of the old houses, to meet more residential needs. This paper focuses on the transformation of old buildings. By analyzing the reasons for the transformation of old buildings, it summarizes the principles of the transformation of old buildings, and leads to various construction engineering technologies that can be actually applied in the process of the transformation of old buildings, so as to meet the basic needs of the transformation of old buildings through the rational application of construction engineering technologies.

**Key words:** Old House Reconstruction; Building; Transformation Technology; Construction Engineering Technology; Reinforcement and Reconstruction

**Introduction:** Since the reform and opening up, China's construction industry has been developing at a relatively fast speed, and the protection of historic architectural relics is also relatively good, so until now, more old buildings can be seen in the city. These old buildings include both architectural relics that need to be protected and houses built since the reform and opening up. However, with the continuous improvement of people's living standards, more modern electronic equipment is needed in daily life, which causes some residents living in old buildings to put forward higher requirements for housing construction, and are increasingly dissatisfied with the existing living environment. Therefore, under such circumstances, it is necessary to transform or reinforce all kinds of old buildings, on the one hand, to ensure the safety of old houses, and on the other hand, to meet the living needs of old housing residents.

## 1. Analysis of the reasons for the need to renovate the old house

### 1.1 Security issues

In the process of the continuous development of the construction industry, the building codes and standards are also constantly improving. However, the construction codes and standards used in the original construction are relatively low, and the strength and performance of materials have not fully reached the existing international level. Therefore, once encountering natural disasters or various human factors, problems such as cracking and collapse may easily occur, which will cause huge security risks to the lives and properties of people living in old houses. [1] In addition, with the rapid development of urbanization in recent years, there will be many projects near some old buildings, such as the construction of new buildings, the demolition of old buildings, and the emergence of projects, which will lead to changes in the residential foundation stress of the original old buildings, and easily lead to various

cracks in the old buildings. Specifically, there are the following reasons for the existing security problems in the old house:

The first reason is natural aging. At present, there is no building material whose own performance can resist the erosion of various chemical, biological and physical factors from the nature. Therefore, as time goes on, building materials will gradually decline, or even lose their original performance, making it difficult for buildings to meet the specifications and standards. For example, for the materials commonly used in modern buildings, such as concrete and reinforcement, the concrete may be aged and cracked, and the reinforcement may be rusted and corroded. [2] The appearance of these phenomena will reduce the original bearing capacity and safety of the building, and in serious cases, the building may collapse due to insufficient capacity of the building materials.

The second is the cause of man-made damage. Most of the residential buildings in China are applicable houses, commercial residential buildings built in large quantities, and a small number of self built houses. More often, the design of such houses will focus on the overall practicality, coordination, etc., and emphasize the sense of residence, but there may be problems such as unsatisfactory design and unreasonable functions. This leads to some residents who are not professional builders when they decorate or transform their houses, and may cause damage to the houses during the decoration or transformation, reducing the safety of the houses.

The last is the cause of natural disasters. Any building will be affected by various natural factors in daily life, such as sunshine, wind, rain, earthquake, etc. The greater the intensity of such natural factors, the greater the damage to the building. Take wind as an example, the stronger the wind is, the greater the wind load will be, which will make the horizontal load of the building higher, causing the risk that the bending moment of the building structure will become larger. In addition, typhoon and hurricane will cause greater harm to the building. In addition, rainwater entering buildings and ground vibration caused by seismic waves will endanger the performance of buildings and reduce their safety. [3]

## 1.2 Use questions

The old houses are different from the new ones. Most of the old houses have been built for a long time. In addition, there may be some reasons for neglect of maintenance in the process of living. The doors and windows of many old houses will be loosened to varying degrees, and the walls will be prone to unevenness and cracking. Moreover, the construction standards and techniques used in the construction of most old houses were limited to the conditions and living standards of the people at that time. Now, with the continuous improvement of people's living standards and the continuous improvement of building technical conditions, if you look at the sense of habitation of the old house, you will find that there are many problems in the old house, which will not only make residents difficult to have enough sense of belonging and satisfaction when living in the old house, but also the design of many houses can not better adapt to modern facilities.

## **2. Basic Principles of Old House Reconstruction**

### 2.1 Principle of integrity

When carrying out the old building reconstruction project, we must consider the specific situation of the whole old building from the perspective of integrity and comprehensiveness, fully understand the layout, material performance, component composition and other conditions of the old building, and through the overall analysis and consideration, we can get the choice of overall reinforcement, temporary reinforcement and permanent reinforcement in the process of old building reconstruction, At the same time, the new build and the old build work together. Only after the overall analysis of the whole building and its surrounding environment can we effectively avoid the problem of adverse impact on the old house again during the transformation of the old house, avoid the formation of new safety problems, and ensure that the old house can be used better after the transformation.

## 2.2 Economic principle

Whether it is the reconstruction of old buildings or other buildings, we must pay attention to the principle of economy in the process of reconstruction. For example, when strengthening and transforming the old house, it is necessary to make full use of the existing building structure of the old house, give full play to the original building structure effect, and avoid redundant demolition and reconstruction in the transformation process, so as to effectively control the cost used in the process of on-site reconstruction.

## 2.3 Safety principle

During the reconstruction design of old buildings and the actual construction process, we must fully consider various potential safety hazards that may exist in the old buildings during or after construction, as well as various factors that may lead to construction accidents or project quality accidents. During the design and construction process, it is necessary to strictly check all kinds of potential safety hazards to ensure the safety and effectiveness of the construction in the reconstruction process, so that the overall structure of the old house after reconstruction is safe and reasonable, and will not affect the personal safety and property safety of the old house residents.

# **3. Building engineering technology used in the reconstruction of old buildings**

## 3.1 Storey adding and reconstruction technology

In the past, when building in China, most of the buildings built were middle and low rise buildings, and now most of these buildings are located in the golden section of the city. Therefore, these middle and low rise buildings can not stop using, and with the increase of land price, it is necessary to expand their building area. At this time, it is necessary to increase the floors of these middle and low rise buildings through the old house reconstruction project. To be specific, the following construction engineering technologies can be used in the process of storey adding and reconstruction:

When adding external floors, the first technology that can be used is the direct floor adding technology, which means adding one to three floors directly on the basis of the old building without changing the original structural bearing system and plane layout of the old building. In addition, in the process of adding floors, it is also necessary to fully consider the situation of the original buildings, so as to carry out the load-bearing reinforcement and seismic transformation of the old buildings in the process of adding cities.

Secondly, the floor can be added by changing the load transmission, that is, by adding some wall beams and columns of the old house, and strengthening the wall beams and columns, to change the original building structure layout of the old house and its load transmission path, and then use the direct floor adding technology, so as to fully display the use value of the building, and the transformation cost is relatively low. However, as with the direct addition technology, the number of layers that can be increased by using the load transfer layer adding technology is limited, generally one to three layers.

The third external floor adding technology is the coat structure floor adding technology. This technology refers to adding a new coat structure outside the old house, so that the newly built floor can wrap the old house inside, and the newly built floor, all the added load is borne by the building's outer coat structure, avoiding the adverse impact on the old house due to the increase of load during the addition process. There is no limit to the storey height that can be increased by this jacket structure layer adding technology.

Of course, the above three external extended range technologies can be used separately or in combination to increase the floors of old houses, which can maximize the use value of old houses, reduce the cost and avoid the problem of cost waste.

In the process of Zengcheng transformation, there are both external and indoor ways to increase floors. When adding indoor floors, you can use the separate floor adding technology, that is, build another frame inside the building, so as to achieve the effect of adding distance to the building. There is also the integral storey adding technology, that is, the original load-bearing structure of the building is linked with the newly added load-bearing structure, so as to achieve the internal storey adding of the building. In addition, there are the hanging type storey adding technology and the cantilever type storey adding technology. Both of these two types of incremental transformation methods achieve the internal storey adding through the hanging type structure and the cantilever type structure.

### 3.2 Structural transformation technology

With the development of the times, the use of houses has also changed. For example, some old houses that were originally located in the suburbs have also been developed into prosperous areas of new cities. Therefore, some old houses that face the streets want to change residential buildings into commercial buildings, which can increase the profit income of the houses, but it also means that the old houses need to be transformed from the original small bay layout into a larger bay layout, At this time, it is necessary to carry out structural transformation on the plant room. The following technologies can be used in structural transformation:

The first is single beam underpinning technology. Single beam underpinning refers to setting a joist on the top of the old building wall that needs to be demolished, and setting columns bearing combined with the old building wall under the joist to share the original load of the old building wall. This transformation technology can make the old house transformed have a more beautiful wall shape, but because the force transfer principle of the single beam underpinning technology is relatively simple, it is more difficult in the construction process,

which is more suitable for the transformation of the old house with higher storey height and no ring beam in the floor.

Since there is single beam underpinning technology, there is double beam underpinning technology. Double beam underpinning technology is also known as wall side sandwich beam underpinning technology. For the wall of the old house to be demolished, two symmetrical joists are set on both sides of the top of the wall, and columns combined with the wall of the old house are set under the joists to share the load of the wall of the old house. Compared with Shaoliang removal and replacement technology, this technology has smaller deformation of the upper part, stronger bearing capacity and less construction difficulty, but it is less beautiful and more suitable for the old building reconstruction project of the lower wall removal.

The third structure transformation technology is called frame underpinning technology. This technology is aimed at the upper and lower parts of the wall of the old house that need to be demolished, so as to form a closed frame on the demolished wall to bear the load of the original wall. This technology can make the force transmission of the building load more uniform, and the construction process is also safer. However, due to the need for more reconstruction, the construction period is longer, and the construction will be more difficult.

#### **4. Conclusion**

In general, through the relevant research on the reconstruction of old houses, I know that there are two main reasons why the reconstruction of old houses is needed. The first reason is that the building performance of the old houses has changed due to natural environment, human damage, natural aging and other factors, which may lead to potential safety hazards in the old houses; The second point is that with the development of the times, people have more demands and higher requirements for buildings. The purpose of old house reconstruction is to increase the building use value of old houses. In the process of reconstruction, in order to ensure safety and avoid cost problems, it is also necessary to follow the principles of integrity, safety, economy and construction convenience. Finally, according to the needs of old house reconstruction, the paper briefly expounds the construction engineering technology that can be used in the reconstruction of additional floors and structure.

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