

Research on the Development of Strengthening and Reconstruction Technology of Building Structure

Erjia Li

Liaoning Communication University, Shenyang, 110136 Liaoning, China

86401008@qq.com

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Abstract: With the acceleration of urbanization in China and the rapid growth of urban population, urban housing is becoming more and more tense. In the past, due to a series of reasons, the use function and durability of housing buildings could not meet people's living needs. Adopting appropriate reinforcement technology can effectively improve the structural strength of building engineering, thus prolonging the service life and performance of the project and ensuring that the building can better meet people's needs. This paper discusses the application principle and value of building structure reinforcement and reconstruction technology, and further introduces and analyzes the development of building structure reinforcement and reconstruction technology, hoping to provide reference for improving the construction quality of building projects.

1. Introduction

As an indispensable part of the national infrastructure system, residential buildings are closely related to the daily life of ordinary residents. Adopting appropriate reinforcement technology can effectively improve the structural strength of building engineering, thus prolonging the service life and performance of the project and ensuring that the building can better meet people's needs[1]. In these construction quality and safety accidents, such as shantytown renovation, affordable housing, low-rent housing and other construction projects, the quality accidents are significantly higher than those of individual development enterprises. Some government image projects have not set a benchmark in some areas, but have become the hardest hit areas of engineering accidents.

There are many factors involved in the process of strengthening and rebuilding the building structure, and the construction process is complicated. Through scientific and reasonable application of strengthening and rebuilding technology, the safety of the building can be effectively guaranteed, the use function and role of the building can be fully exerted, and the huge waste caused by large-scale demolition and construction can be avoided, thus achieving the positive role of building environmental protection[2]. This paper discusses the application principle and value of building structure reinforcement and reconstruction technology, and further introduces and analyzes the development of building structure reinforcement and reconstruction technology, hoping to provide reference for improving the construction quality of building projects.

2. The Importance of Building Structure Reinforcement Construction Technology

The number of buildings in China is increasing year by year. Relevant construction units should choose high-quality construction materials in the construction process, pay attention to the structural reinforcement of buildings in the construction process, and relevant designers should design the structural reinforcement of the building framework, which can improve the service life of buildings and improve the quality of building construction. Strengthening and reforming existing buildings, combined with the application of intelligent household appliances at present, can not only give buildings more functions, improve the quality of houses, but also reduce the overall cost, which meets people's functional needs for diversified buildings[3-4].

Scientific and effective reinforcement and reconstruction of building engineering structures will

help to improve the overall performance, safety and reliability of building structures to some extent, and promote them to have strong bearing capacity, good compression resistance, earthquake-proof effect, energy-saving and environmental protection effects, so as to achieve better social benefits. With the development of social economy, the standards required by the code are constantly improving. Sometimes buildings can't meet the new standards, but they need to be strengthened. Only by determining the reason of structural reinforcement can the corresponding reinforcement design be carried out. Because there are many high-altitude operations in building structure reinforcement construction, safety education and technical disclosure should be given to the workers before construction, and the construction workers should do well in climbing safety protection and wear safety helmets during operation to prevent casualties.

3. Application Principle of Reinforcement and Reconstruction Technology

3.1 Scientific Principle

Scientifically select the corresponding prefabricated parts to optimize the overall design. In accordance with the specified design standards, we should strengthen the in-depth consideration of prefabricated parts processing in actual design to ensure that their quality meets the requirements of structural reinforcement, improve the processing efficiency and qualified rate of prefabricated parts, and reduce the reinforcement problems of building structures[5]. In view of this, by strengthening the reinforcement and transformation of the building structure, the service life of the building structure can be effectively prolonged and the defects of the building structure caused by natural environmental factors and human factors can be reduced. If the scientific and reasonable management of the problematic building structure is not carried out quickly, it will inevitably cause greater losses.

3.2 Safety Principle

Safety is one of the basic requirements of modern housing construction projects. With the continuous improvement of various functions of housing construction projects, all sectors of society put forward higher requirements for the safety and stability of housing construction projects, which requires reasonable application of architecture transformation technology to ensure the safety of building objects in the actual housing construction process[6]. Under the principle of safety, engineers need to select suitable building materials in combination with reinforcement and reconstruction technology, and plan their dosage scientifically to ensure the quality of buildings.

3.3 Principle of Integrity

After a long period of use, the structural function of buildings will continue to decline. At the same time, today's buildings often have a certain number of years. Coupled with the limited technical level at that time, the building structure itself is lacking and unstable. Once problems are caused, it is bound to be difficult to implement remedial measures at the first time, leading to a series of bad problems in buildings[7]. The construction unit should choose the appropriate construction technology according to the actual situation of the building, and do a good job of supervision and management in the construction process to ensure that the reinforcement and reconstruction project of the building structure reaches the expected standard, so that the reconstructed building can better serve the majority of residents. Therefore, in the process of building renovation, a reasonable reinforcement scheme should be formulated based on the overall stress of the building to effectively ensure the stability of the whole building.

4. Development of Strengthening and Reconstruction Technology of Building Structure

4.1 Strengthening Technology of Carbon Fiber Material

The strengthening technology of carbon fiber material has been rapidly popularized and applied in the structural strengthening of building engineering at this stage. In addition, in the specific

application process, the strengthening technology of carbon fiber material has a good application effect on strengthening some flexural concrete members, and the height increase is relatively small. The reinforcement process of carbon fiber material is shown in Figure 1.

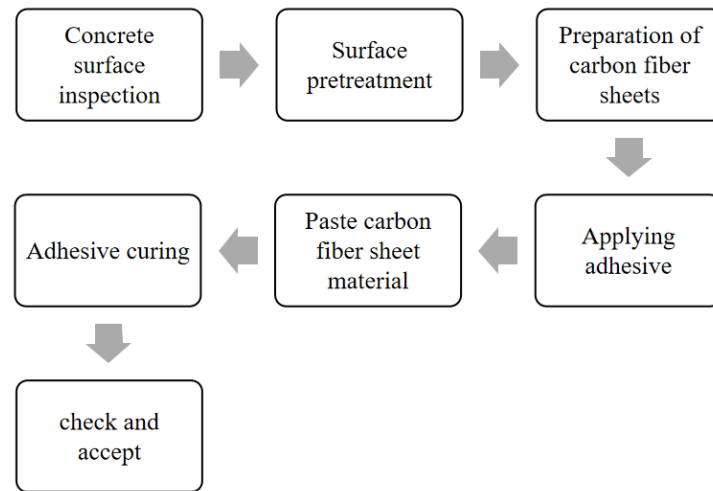


Fig.1 Strengthening Process of Carbon Fiber Material

The stability of the materials used in carbon fiber reinforcement technology is relatively high. Compared with other materials, carbon fiber materials are more prominent, and their stiffness and strength are higher than other materials. Moreover, the lighter carbon fiber materials can effectively reduce the structural pressure. Compared with other adhesive carbon fiber materials, it has high strength and strong tensile strength. At the same time, carbon fiber materials also have strong corrosion resistance, oxidation resistance and high temperature resistance, which can show the best effect under the structural transformation of buildings[8]. Therefore, it is necessary to take special protective measures during the storage of carbon fiber materials to ensure that the quality of carbon fiber meets the qualified standards and that it is successfully applied to the reinforcement and reconstruction construction, so as to achieve the goal of strengthening and reconstruction of building structures.

4.2 Chemical Reinforcement Method

In building construction, the chemical reinforcement method can solve the problem of weak position, and can reinforce the weak position. So far, cement, concrete, engineering plastics, composite materials, steel bars, etc. are used as building materials. Among these materials, steel bars, like the bones and muscles of a house, play a certain supporting role[9]. When there is no embedded steel bar in the project, this reinforcement technology is mainly an effective remedial measure, such as the remedy of missing or deviating steel bars from the design position in the construction, the reinforcement of reinforced members by increasing the cross section, the expansion and jacking of the superstructure, the extension of beams and columns, the storey-adding connection of buildings and the planting of steel bars in shear walls in high-rise buildings, etc., all of which can be effectively remedied by planting steel bars.

4.3 Bonding Steel Reinforcement Technology

Bonding steel reinforcement technology mainly uses high-performance epoxy adhesive to bond a layer of steel plate on the outside of building structural members, and plays a certain role in enhancing the bearing capacity and stiffness of building structural members by using the tensile strength of steel plates. Bonding steel reinforcement technology is generally mainly applied to the general flexural and tensile members subjected to static force, and can be applied to the reinforcement of concrete structures such as beams, plates and columns of buildings, such as the fracture reinforcement of welded joints of steel bars, the reinforcement of high concrete structure strength, the fracture reinforcement of balcony roots, the reinforcement of missing steel bars during construction, the seismic reinforcement of adding stories, the reinforcement of concentrated floor

load, the fracture reinforcement of thin web beams, and the comprehensive reinforcement of old houses reconstruction.



Fig.2 Strengthening Technology of Sticking Steel Plate

Bonding steel plate reinforcement technology is mostly used to strengthen flexural or tensile members under static action and in normal humidity environment (see Figure 2). For the reinforcement of concrete flexural members, in order to avoid excessive reinforcement, the flexural bearing capacity of the reinforced members should be controlled to be less than 40%, and the relative compressive zone height of the reinforced concrete should be controlled to be 0.85 times of the relative compressive zone height of the original members before reinforcement. Both the steel plate reinforcement technology and the carbon fiber reinforcement technology should be treated according to the requirements of building fire prevention, and the carbon fiber reinforcement technology should be avoided in areas where nails and expansion bolts are used in later decoration construction[10].

4.4 Strengthening Method with Enlarged Section

Maintenance is the basis of repair, and repair is the guarantee of maintenance, both of which are equally important and indispensable. Do a good job of equipment maintenance, deal with problems in time, improve the technical condition of equipment at any time, nip in the bud, and eliminate accidents before they happen, so as to stabilize the initiative.

In order to effectively improve the flexural capacity of normal section, shear capacity of inclined section and stiffness of section of building engineering components, and play an important role in strengthening, it is necessary to increase the concrete rubber layer in the compression area of reinforced concrete flexural members to increase the cross-sectional area and cross-sectional height. In order to ensure the application of this technology to achieve good reinforcement effect. In general, it is required that the concrete strength grade of the structural members of the original building construction project is not lower than C13. See Figure 3 for the reinforcement technology of increasing section.



Fig.3 Strengthening Technology of Increasing Cross Section

The strengthening technology of increasing section is suitable for strengthening concrete of beams, slabs, columns, walls and general structures. Before the application of this reinforcement

technology, it is necessary to select a satisfactory position in the building to carry out drilling and clean up the drilling, then fill in the prepared steel bars, adjust the direction and angle of steel bar implantation through anchor glue, and carry out construction maintenance and inspection after the steel bars are stabilized. The strengthening technology of increasing cross-section has obvious effect on buildings with insufficient seismic capacity due to too small cross-section. When it is only used for local reinforcement, the overall analysis is still needed to avoid the problems of weak parts caused by sudden stiffness change, such as sudden stiffness change of upper and lower floors or obvious torsion effect.

The method of increasing cross-section has the characteristics of strong adaptability, simple construction technology and wide application range, and is a very common method of strengthening building walls. Many members such as beams and slabs can be reinforced. This reinforcement method has the advantages of simple construction process, low construction cost, wide application range and widespread application in practice. There are still many difficulties in the application of section strengthening technology, so it is necessary to ensure the high adhesion between concrete structure and building structure during construction. When reinforcing the used steel bars, hot-rolled steel bars are usually used, and the diameter of the stressed steel bars of the control panel should not be less than 8mm, and the diameter of the stressed steel bars of the beams and columns should not be less than 12mm and 14mm respectively.

5. Conclusions

There are many factors involved in the process of building structure reinforcement and reconstruction, and the construction process is complicated. Through scientific and reasonable application of reinforcement and reconstruction technology, the safety of building can be effectively guaranteed, the use function and role of building can be fully exerted, and the huge waste caused by large-scale demolition and construction can be avoided, thus achieving the positive role of building environmental protection. The scientific application of structural reinforcement technology in building engineering is an important measure to prolong the service life of building and ensure its performance and structural safety and stability. It requires an accurate grasp of the key points and keys of various reinforcement technologies to ensure the scientific application of each technology. In order to pay attention to the selection of reinforcement methods and the determination of reinforcement schemes for building structures, it is necessary to put forward methods suitable for the current building reinforcement from the analysis of various factors such as simple construction and economic application, so as to achieve the effectiveness of the implementation of reinforcement technology.

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