

# Analysis on Reconstruction Design of Old Urban Roads

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**Abstract:** With the continuous development of cities, the urban roads built in the early days can no longer meet the needs of modern urban transportation. Therefore, in the current urban development and construction process, the reconstruction of old roads is the key construction content. At the same time, the transformation of old urban roads is also an inevitable requirement to improve the urban road system and improve the level of urban communication infrastructure construction and transportation service capacity. The reconstruction of old roads meets the requirements of the overall planning and construction of modern cities, and plays a vital role in promoting the development and progress of urban economy and improving the quality of life of urban residents. In the process of urban old road reconstruction, because the original urban road environment is very complex and involves many factors, the rational design of the construction scheme of the old road reconstruction project is the key factor affecting the effect of the old road reconstruction. This paper makes an in-depth exploration and analysis of the old road reconstruction design of urban roads, and puts forward scientific and reasonable suggestions in combination with the actual situation, so as to provide reliable theoretical support for improving the old road reconstruction level and promoting the urbanization development process in China.

**Keywords:** Reconstruction of Old Roads; Problems; Key Points of Design

## 1. Introduction

With the continuous development of urban economy, the scale of the city is expanding and the population is increasing, so the requirements for urban road traffic are getting higher and higher. At present, China's urban roads bear great communication pressure, and strengthening urban road construction is a necessary construction measure to improve urban traffic environments and relieve traffic pressure. In the process of modern urban development, various urban roads with different functions constitute a perfect urban transportation network, such as expressways, trunk roads, secondary trunk roads, branch roads, park roads, etc. A perfect urban transportation context is an important condition for ensuring the normal operation of the city, an indispensable

important infrastructure for modern cities, and a lifeline for urban economic development and construction. In recent years, China's urbanization process is advancing rapidly, and the main urban roads built in the early stage can no longer meet the requirements of modern urban development. Especially, the main city has been built for a long time, and the population and building density are high. It will cost a lot to re-plan and construct the main city, and there are many resistance factors, so it is impossible to re-plan and construct it comprehensively. In order to effectively improve the road environment in the main city and meet the urban traffic requirements, it is necessary to upgrade some roads that do not meet the current urban economic development requirements, so as to effectively improve the traffic service quality of the

old roads, optimize the traffic functions, and play a positive role in promoting the urbanization development process and urban economic construction in China.

## **2. Analysis of the status quo of urban roads**

### **2.1 Unreasonable old road planning**

In the early urban road construction, the factors such as location and regional convenience were mainly considered, and the overall road network in the region was not scientifically and rationally planned, and the new requirements of urban development for roads were not considered. After the rapid development of the city, the population flow has greatly increased. At this time, the old roads of the city can no longer meet the current urban traffic demand, and the unreasonable design of the old roads in horizontal, vertical and horizontal directions is highlighted, such as many bends and short distance between road intersections, which seriously reduces the quality of urban traffic services and increases traffic pressure.

At present, there are serious cross-sectional problems in the old roads in China's urban roads. Because the total width of the old roads is insufficient, the widths of crosswalks and non-motor vehicle lanes have to be reduced, and even some old roads have no crosswalks at all, which greatly increases the traffic risks and easily causes safety accidents. In addition, the insufficient total width of old roads has seriously affected the quality of road greening, resulting in insufficient green area, which has a very serious impact on the overall environmental quality of the city. To solve these problems, it is necessary to transform the old roads, which is an inevitable requirement of modern urban development, and also an essential and important construction measure to optimize the urban environment, improve the urban transportation service function and promote the urban economic development.

### **2.2 Old road quality problems**

With the continuous development of urban economy, the number of private cars has greatly increased, and the transportation industry has developed, which has greatly increased the traffic flow and vehicle load. In this case, the subgrade and pavement performance of urban

roads built in the early stage cannot meet the requirements of modern urban road construction, and naturally cannot meet the requirements of today's vehicle traffic. Because the traffic capacity of the old roads has been exceeded for a long time, the roadbed and pavement of the old roads in cities have various problems, such as cracks, damages, collapses, etc., which greatly increases the traffic risk and poses a serious threat to people's traffic safety.

The problems of subgrade and pavement of old urban roads are mainly caused by the following two reasons:

First of all, the original road construction technology level is low, and the quality of materials is not as good as the quality performance of various new materials appearing at present. Then, the soil quality has been wrongly evaluated, the wrong technology has been adopted, and materials with insufficient strength have been used, which ultimately leads to the poor quality level of old roads in cities.

Secondly, it is influenced by seasonal climate factors. For example, the aging of the road surface caused by the wind and the sun leads to the deflection and collapse of the road surface and roadbed.

In view of various problems existing in urban roads, it is very necessary to renovate old roads. However, because the renovation of old roads involves more aspects, has a wider scope of influence and is more susceptible to external factors, it is necessary to find the most suitable design scheme for the renovation of old roads, which has a vital impact on the renovation effect of old roads.

## **3. Reconstruction design of old urban roads**

### **3.1 Collection of historical data**

Before the reconstruction of old urban roads, it is necessary to comprehensively collect relevant historical data, which should include the underground pipelines and drawings, the distribution of surrounding buildings, the original completion drawings and reconstruction and maintenance drawings of the reconstructed roads, and so on. It should be noted that the formal as-built drawings are the main data form, but the oral contents of the project construction participants with high credibility can also be used as reference materials in the design of the

old road reconstruction scheme.

After collecting relevant historical data, it is necessary to screen, sort out and analyze these data and information, and make a preliminary clarification on the actual situation of the original road, including pavement subgrade structure and treatment, pipeline type section position relationship, pipe diameter size, etc. These data and information are important basis for the design of the old road reconstruction scheme.

### **3.2 Site investigation, inspection and survey**

According to the historical data, carry out field reconnaissance on the old road site to be reconstructed, compare whether the historical data is consistent with the actual situation, and check the accuracy of the historical data. In addition, it is necessary to have a deep and comprehensive understanding of the real conditions of the roads to be reconstructed, so as to provide accurate reference for the design of reconstruction schemes.

In the process of field reconnaissance, it mainly includes surface reconnaissance, topographic survey, geological survey, road condition and pipeline survey, etc. of the old roads to be reconstructed, and it is necessary to form corresponding investigation and inspection reports. In the process of field reconnaissance, suitable detection and survey methods should be selected according to the purpose of old road reconstruction, and reasonable detection and survey can effectively save the investment cost of old road reconstruction.

After issuing the investigation, inspection and survey report, according to the report data, the present situation of the old road to be reconstructed is analyzed in detail. According to the actual situation, the old road reconstruction construction scheme is designed scientifically and reasonably, and the design scheme with good feasibility and economy is formulated.

### **3.3 Graphic designs**

Old road reconstruction is different from general road construction. Therefore, when designing the reconstruction scheme, we should try our best to avoid demolishing all the original roads for reconstruction, but widen and lengthen them on the basis of the original roads. The core of old road reconstruction is to reconstruct intersections. This part of the reconstruction project includes the reconstruction of intersection traffic convenience, sub-

grade and pavement, etc., so that vehicles can pass faster and safer, and the road conditions are smoother.

In the process of intersection reconstruction, in order to avoid sharp turns, it is necessary to increase the turning radius of the intersection so as to improve the turning safety. In addition, it is necessary to set up obvious road signs to guide and remind the passing vehicles to ensure traffic safety, and reserve crossing passages in combination with pipeline layout. Attention: in the old road reconstruction, it is not necessary to fully investigate and understand the pipeline layout, and fully consider when designing the reconstruction scheme. It is also necessary to fully analyze the specific environment around the road section, such as buildings and other influencing factors, and do a good job in the reserved design of passages and threading pipelines to avoid secondary excavation of the road surface, which can save resources and improve the quality of the old road reconstruction.

### **3.4 The longitudinal section design**

In the reconstruction of old roads, the design of longitudinal section is one of the key contents. Terrain elevation should be fully considered when designing the center line of the profile. When realizing the elevation, it is necessary to take the cross slope guidance as the basis. There are often a large number of buildings around the old roads, such as office buildings, shops, residences, etc. In order to accurately design the elevation of the center line, it is necessary to comprehensively consider the building elevation along the road in the vertical section design.

In addition, in the vertical section design, the survey work must be carried out strictly and standardly according to the requirements of relevant standards, so as to obtain accurate data information and provide data reference for the vertical section design, such as plane mileage pile number and so on. According to the requirements of road construction, the reconstruction scheme of road trial slope should be designed, and the site should be rechecked. Only when the test results are qualified can the next step be continued. If the test results are unqualified, the design and testing should be repeated to effectively ensure the accuracy of the measurement results and the effectiveness of the design.

### **3.5 The cross-sectional design**

Road cross-sectional design, which mainly includes motor vehicle lanes, non-motor vehicle lanes, pedestrian walkways, green belts and other parts, is also an important part of the old road reconstruction design. The width of each lane is one of the key points in the design. It is necessary to comprehensively analyze the traffic flow, traffic conditions and greening requirements, and give full consideration to road resources, ecological environment protection and other aspects to ensure that the old road reconstruction design scheme meets the modern needs.

In the early stage of road construction, the buildings on both sides of the road have been planned, and the width of the road cannot be changed in the design process, but can only be adjusted from the cross section of the road. When the traffic volume increases, it can be considered to appropriately reduce the width of pedestrian passages, thus increasing the width of motor vehicles; If we want to increase the broadband of crosswalks or green belts, we should comprehensively consider the specific road planning requirements and the traffic flow of the road section, so as to give the most suitable design scheme for urban road reconstruction.

### 3.6 Subgrade designs

(1) Affected by the development of the times, the bearing capacity of the old road subgrade cannot meet the requirements of modern roads. With the rapid increase of vehicles in modern society, higher requirements are put forward for road traffic load, which leads to settlement of many old roadbeds. Therefore, in the old road reconstruction, the old subgrade must be effectively treated, so that the newly built subgrade and the old subgrade can achieve a balance in terms of traffic load and other performance, and ensure the effective splicing of the new and old subgrade. At the same time, it is necessary to add a waterproof design for subgrade in marginal areas such as greening sub-belts.

(2) Excavate steps and lay geogrids reasonably. Excavation of steps with appropriate width is the key con-

struction link to ensure the effective connection between old and new subgrade. In order to ensure the normal use of reverse steps of old subgrade slope, the width of steps must be reasonably determined, which should be no less than 2 meters, effectively ensuring the integrity of new and old subgrade.

(3) Pavement and supporting facilities. Optimizing the pavement design can ensure that the pavement can fully meet the driving demand of vehicles, and can also effectively improve the aesthetics of urban roads. First of all, we should check and analyze the road surface comprehensively, and deal with the road surface diseases according to the current road driving requirements. Redesign and reform the pavement to meet the demand of road bearing. At the same time, optimize the design of road water supply and drainage system, barrier-free ramp, fire protection and communication manhole cover, improve road supporting facilities, comprehensively improve the performance of old roads, and fully meet the requirements of urban traffic development.

## 4. Conclusion

To sum up, urban old road reconstruction is a very complex project, which must be investigated comprehensively and designed scientifically and rationally, so as to effectively improve the urban transportation network, improve the quality of urban transportation services and lay a good foundation for urban economic development.

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