

# Research on Common Diseases and Construction Treatment Technologies in Road and Bridge Engineering

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**Abstract:** Road and bridges are the most basic transportation infrastructure. Its construction quality and use of safety are directly related to the lives of the people and the stability of society. In the process of construction and use, road and bridge projects often face challenges of multiple diseases. Such as uneven settlement, steel bar corrosion and breakage, and cracks. These diseases not only affect the safety and stability of roads and bridges, but also threaten people's driving safety and smooth traffic. This article mainly analyzes the common disease problems in road and bridge projects and propose reasonable measures in a targeted manner, aiming to improve the quality of roads and bridges and reduce the chance of the diseases of roads and bridges.

**Keywords:** Road and bridge engineering; common disease problems; response measures.

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## 1. Introduction

As one of the main transportation facilities, roads and bridges are becoming increasingly large in scale. A large number of road and bridge engineering projects often suffer from various diseases during construction, maintenance, use, and management, seriously affecting the quality of road and bridge engineering, and to a certain extent, affecting social transportation and economic development. In order to extend the service life of roads and bridges, ensure traffic safety, improve traffic efficiency, and reduce maintenance costs, it is necessary to conduct in-depth research on common types of diseases in road and bridge engineering, and explore effective construction treatment measures.

## 2. The Significance of Treating Common Diseases in Road and Bridge Engineering

### 2.1. Improving the Stability and Reliability of Road and Bridge Engineering Structures

The common diseases of roads and bridges are the main factors that endanger the stability of bridge structures. For road and bridge engineering, cracks, foundation settlement, and steel corrosion and fracture are the most common diseases. However, if these small problems are not properly handled, after being put into operation, they will develop into major problems that affect the stability of the main structure after being affected by traffic loads, wind and rain erosion, and have a negative impact on the entire transportation network.[6] Therefore, the construction of road and bridge engineering must attach great importance to the control and treatment of common diseases from beginning to end, adopt advanced technology and construction techniques to reduce the probability of common diseases occurring, and quickly and comprehensively handle the problems of diseases that occur, improve the stability and reliability of road and bridge engineering structures, so as to ensure the usability of road and bridge structures.

### 2.2. Meet the Requirements for Vehicle Operation

Common diseases not only affect the quality of engineering, but also cannot meet the requirements of road traffic. During the process of putting road and bridge construction into use, various external factors can easily affect the appearance quality of the road and bridge, making it difficult to meet the driving requirements of vehicles and effectively ensuring their normal operation. At the same time, it will greatly affect the further rapid development of China's transportation industry. To meet the driving requirements of vehicles, effective measures must be taken in a timely manner to deal with road and bridge diseases when they occur in road and bridge engineering.

## 3. Common Diseases and Causes of Road and Bridge Engineering

### 3.1. Crack Disease

Cracks are one of the most common diseases in road and bridge engineering, which not only affect the structural stability of bridges, but also pose a potential threat to traffic safety and service life, seriously affecting the quality and safety of the project.

The main factors that cause road surface crack diseases are: firstly, the load, and the bearing capacity of road and bridge engineering are fixed. If the road surface is driven higher than the bearing capacity of the road surface, overloading will occur, ultimately leading to crack problems; Secondly, natural factors such as temperature, temperature changes, humidity, and dryness may also cause bridge fractures. When concrete expands and shrinks at different temperatures, cracks may occur, and moisture and freeze-thaw cycles can also have an impact on the bridge structure; Moreover, the use of low-quality materials is a common cause of crack diseases, such as low-quality concrete or steel, which may cause damage to bridge structures due to insufficient strength and durability; Final design defects can lead to the formation of cracks. If the

bridge design is unreasonable, such as unstable bearings or improper beam dimensions, it may cause cracks.[7][8]

### 3.2. Uneven Settlement Disease

The roadbed is the foundation of the road, and uneven settlement of the roadbed will inevitably cause problems such as road arches, potholes, joints, steps, heavy vehicle rolling, and rutting. Uneven settlement refers to the uneven settlement speed of different parts of a bridge, which can easily lead to structural imbalance, causing cracks and deformation.

The main reason for uneven settlement of the roadbed is, firstly, insufficient compaction of the roadbed. In order to catch up with the schedule or save construction costs, the construction was not carried out according to the specified filling thickness requirements, and excessive filling caused insufficient compaction. Secondly, if the collection and distribution of roadbed filling materials are unqualified or the filling materials have swelling properties, water infiltration will cause swelling and uplift. If the quality of the materials used does not meet the standards, it may lead to loosening and sinking of roads and bridges, resulting in uneven settlement. In addition, poor road drainage can cause uneven settlement of the roadbed due to long-term erosion or rainwater erosion.[6] Finally, traffic and vibration loads may have an impact on the foundation of the bridge, leading to settlement, frequent passage of heavy vehicles, and vibration loads causing compression and movement of the foundation soil.

### 3.3. Corrosion and Fracture of Steel Bars

The load-bearing structure of bridges is mainly composed of concrete and steel bars, and problems with the load-bearing structure can lead to a decrease in the overall quality of the bridge. Therefore, corrosion and fracture of steel bars and carbonation of concrete are also common diseases in road and bridge engineering. The corrosion and fracture of steel bars is a highly important issue in road and bridge engineering.

The main reasons for the corrosion and fracture of steel bars are carbonization and corrosion of the concrete protective layer, which is an important cause. This is mainly because the concrete is not dense enough or has insufficient impermeability, which can cause carbon dioxide to invade the surface of the steel bars, carbonize the protective layer of the steel bars, and thus cause corrosion. The high alkalinity of concrete is affected by carbon dioxide, leading to carbonation of the concrete and directly causing corrosion to the steel bars; Secondly, due to the presence of chlorides, the chloride ion content around the steel bars is relatively high, which can damage the oxide film on the surface of the steel bars. Iron ions in the steel bars react with the oxygen and water that invade the concrete to form a corrosion reaction. The environment in which roads and bridges are located can also affect the degree of corrosion. Coastal areas with humidity, high temperatures, and high salt concentrations, as well as roads and bridges around chemical plants, are more susceptible to corrosion.[8]

### 3.4. Rough and Uneven Pavement Diseases

After long-term use, road and bridge construction quality and external forces can cause unevenness in the road and bridge. This disease not only affects the aesthetics of the road and bridge, but also causes vehicle bumps, seriously affecting the normal driving of vehicles, causing traffic congestion, traffic chaos, and other problems. At the same time, uneven road and bridge surfaces can also increase various safety risks

during driving.

The main reason for uneven road surface is first in the early stage of road and bridge construction. If the construction process is improper or not strictly controlled, it may lead to uneven road surface during later use. Secondly, uneven foundation settlement is another important reason for uneven road surfaces. When the foundation is subjected to uneven external forces or significant differences in soil properties, uneven settlement may occur.[2] In addition, improper treatment of expansion joints or uneven settlement at both ends of bridge and culvert during construction of highway bridges can lead to jumping of vehicles on the road surface, thereby damaging the smoothness of the road surface. The long-term wear of vehicles on the surface of roads and bridges is also an important reason for uneven road surfaces. Especially in sections with high traffic flow and heavy vehicles, the wear and tear on the road surface will be faster. Therefore, in the maintenance process, it is necessary to prevent the occurrence of uneven roads and bridges, attach importance to the maintenance of the surface of roads and bridges, and create a safe and comfortable traffic environment for people while maintaining the aesthetics and traffic safety of roads and bridges.[9]

## 4. Common Construction Treatment Technologies in Road and Bridge Engineering

### 4.1. Crack Disease Treatment Technology

There are a number of measures we can take to combat these crack diseases.

First of all, strengthen the maintenance of bridges, including cleaning the surface of roads and bridges, regularly painting anticorrosive paint, etc., to increase the service life of bridges. Secondly, different treatments are carried out for different degrees of cracks in road and bridge pavement. When encountering the problem of similar hair cracks and large-area water leakage cracks, it is advisable to use the surface repair method; when encountering moderate pavement cracks, the grouting repair method is adopted, and the most used process to deal with concrete cracks is grouting repair; the treatment method adopted when serious diseases occur in bridge engineering is the filling repair technology. If the width of the pavement crack is large, this method should be used, and a large number of filling materials need to be used, including epoxy mortar, cement mortar, etc. [7] Thirdly, strengthen the control of overloaded vehicles, reduce the stress degree of roads and bridges to reduce the impact of load on roads and bridges. In addition, in the design and construction stage of roads and bridges, the design and construction are carried out in strict accordance with the relevant codes and standards to ensure the stability and firmness of the structure. At the same time, corresponding protective measures should be taken against natural factors, such as floods and earthquakes. Such as the use of earthquake damping equipment and improve the seismic performance of road and bridge engineering. Finally, establish a sound road and bridge management system, file management, regular inspection and evaluation of roads and bridges, so as to improve the standardization of roads and bridges.

## 4.2. Uneven Settlement Diseases Treatment Technology

For the disease of uneven settlement of foundation in roads and bridges, firstly, it is necessary to conduct geological survey on the road and bridge to determine the cause and degree of uneven settlement. Then, according to the survey results, the bearing capacity and stability of the foundation were improved by grouting reinforcement or pile foundation reinforcement. Among them, grouting reinforcement is to fill the voids and cracks in the foundation by injecting cement slurry, grout and other materials into the foundation, so as to improve the compactness and strength of the foundation. Pile foundation reinforcement refers to setting a pile foundation in the foundation, sharing the load of the superstructure through the bearing capacity of the pile foundation, and reducing the settlement of the foundation. [1] Secondly, in the construction process, strictly control the construction technology and construction quality, strengthen the control of construction materials, and ensure that the quality of materials is qualified. Finally, the road and bridge projects are regularly maintained and inspected, and potential problems are found and dealt with in a timely manner. To sum up, the treatment of uneven settlement diseases in road and bridge engineering needs to comprehensively consider geological survey, engineering design, construction technology, quality control, soil improvement, drainage system, daily maintenance and monitoring. By taking comprehensive measures, we can effectively prevent and control uneven settlement diseases and ensure the safety and stability of road and bridge projects.

## 4.3. Reinforcement Rusting and Fracture Disease Treatment Technology

First of all, in the process of purchasing steel reinforcement materials, high-quality materials should be selected to ensure that the quality of materials meets the requirements of the project. Secondly, a reasonable storage method should be chosen to avoid rust caused by improper storage. In addition, if the steel bar is corroded and broken, the steel bar that has been corroded can be derusted to remove the rust layer on the surface of the steel bar. Chemical rust removal or high-pressure water jet rust removal and other methods; steel bars with serious rust need to be replaced or reinforced; for steel bars that can be repaired, they can be welded or reinforced to improve their bearing capacity and durability; for concrete cracking or damage caused by rust, they need to be repaired and reinforced, and materials such as polymer mortar are used to fill in and restore the integrity and strength of concrete. Finally, without affecting the construction progress and construction quality, the concrete construction thickness should be appropriately increased to provide solid protection for the steel bar.[13]

## 4.4. Uneven Pavement Surface Disease Treatment Technology

To solve the uneven road surface of roads and bridges, it is necessary to carry out daily maintenance of roads and bridges. In high temperature weather, in order to prevent the road surface from cracking or expanding due to high temperature, water can be sprinkled to reduce the road surface temperature. During the rainy season, in order to avoid the blockage of the drainage system of roads and bridges, resulting in a large amount of rainwater siltation and erosion of the road surface, drainage work should be done in advance.[2]

If there is an uneven situation, the diseased part should be chiseled or repaired in time to smooth the road surface. First of all, for the short protrusions that protrude high on the road surface, you can use a grinding machine to polish it to make it flat and reduce the unevenness. If there are gaps or cracks in the pavement, they should be repaired with a grout or concrete repair agent to ensure the integrity of the pavement. Secondly, if the situation is serious and difficult to repair, it is necessary to close the traffic of the road section, first carry out large-scale demolition of the diseased road section, and use the same road section materials for construction. In addition, the pavement can also be reinforced and protected by setting a pavement layer, so as to improve the anti-seepage and anti-cracking properties of the pavement.[9] Finally, day-to-day maintenance management is also crucial. It is necessary to increase the inspection of roads, find and deal with problems in a timely manner, prevent the recurrence of road potholes, improve drainage facilities, improve drainage efficiency, and avoid aggravation of road diseases caused by rainwater soaking.

## 5. Summary

To sum up, it is inevitable that diseases occur in road and bridge engineering, but when diseases occur, the types of diseases of roads and bridges should be scientifically judged immediately, the causes of diseases should be analyzed in depth, and the maintenance and maintenance should be carried out reasonably to ensure the normal use of roads and bridges. At the same time, strengthen the prevention and treatment of diseases, reduce the probability of road and bridge diseases, and ensure the reliability, stability and safety of roads and bridges.

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