

# Study on Construction Technology of Soft Soil Sub-grade of Road Engineering

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**Abstract:** With the large-scale road construction, road facilities in the soft soil foundation has gradually become the main cause of highway engineering quality. The main purpose of soft soil sub-grade treatment is to improve the engineering properties of soft soil sub-grade, so that it can meet the requirements of the relevant specifications for the stability and deformation of the foundation. In this paper, the application of soft soil sub-grade processing technology are introduced in detail, and discusses the technological innovation and the application of road engineering construction process, the soft soil sub-grade treatment.

**Keywords:** Road engineering; Construction technology; Soft soil sub-grade

## 1. Introduction

With the progress of science and technology and the development of society, the weight of the car is increasing and the trend of heavy. Under the influence, the problems of soft soil foundation in highway facilities are the main reasons for the quality of highway engineering. In the course of highway construction in our country, the engineering problem of soft soil sub-grade is very common because of the structure characteristics and stress characteristics of soft soil sub-grade. Soft soil sub-grade problem not only seriously reduces the quality of the project, but also because of its potential safety problems have seriously affected people's daily traffic travel. Further statistics show that our country has completed the highway construction project in about 30% of the road there is a soft soil foundation. The soft land gene has the characteristics of light weight, which will affect the construction period, so that the project completion time can not be guaranteed, and the maintenance of the road surface will be maintained from time to time after the completion of the construction, which will affect the normal use of the highway. In summary, the research of soft soil sub-grade construction technology is very important to improve the quality of highway construction.

## 2. Overview of Soft Soil Sub-grade

### 2.1. The definition of soft soil sub-grade

The definition of soft soil sub-grade in soft soil is related specification defined more broadly. It contains the design strength is not up to the requirements of wet clay. To a certain extent, the strength and stability of sub-grade engineering is determined by the dry and wet condition of the sub-grade fill. The water content in the soil determines the dry and wet condition of the sub-grade, and the duration time of all kinds of water action and action is

closely related to the water content of the soil. In the process of the construction of sub-grade and pavement engineering, due to the roadbed and road surface elevation and construction of drainage facilities is set incorrectly, rain and other water delay slot penetrate to the inside of the sub-grade caused by sub-grade softening. In addition, because of the increase of the underground water level, the long time of the roadbed can be in a damp condition, which can lead to the softening of the roadbed.

Soft soil road gene has a certain deformation characteristics, the specific performance in: Soft Soil Sub-grade in the load to the compression stability of the need for longer, and the larger the amount of deformation. The lateral deformation of soft soil sub-grade is larger than the general soil mass. The deformation of soft soil foundation is large because of its soil subject matter of mud or silt soil with large amount of water, the compression deformation of the rear water volume are so big, and its distortion is larger. Also because of the soft soil foundation of the discharge of a large amount of water, the content of free water in the soil void is difficult to flow containing, so under the action of load not launching soon. Therefore, the deformation effect only slowly, generally last for several years or even decades. At the same time, the soft soil is larger than the general soil, and the ratio of lateral deformation and vertical deformation is larger than that of the ordinary soil.

### 2.2. Factors affecting the treatment of soft soil foundation

First of all, need to consider the situation of the foundation. Choice of treatment technology of soft soil foundation affected by soil condition and foundation structure. In order to reduce the disturbance to the ground, the compaction method is used to reduce the disturbance to

the ground, and the compaction method is used to improve the performance of sandy soil.

Secondly, the need to consider the nature of the road. The higher the road grade, the higher the quality of the construction requirements, the higher the requirements of the soft soil foundation treatment measures. If the road level is relatively low, you can lay a simple road, in the foundation settlement after the laying of conventional road, in order to save the project funds. Road shape, width and height are also needed to be considered an important factor, often broad, low embankment using replacement method may appear local damage, and high and unstable embankment using pressure weight method will also be limited. The greater the height and width of the embankment, the greater the possibility and extent of the settlement of the clay layer.

Again, need to consider the surrounding environment. Road engineering construction needs to consider the construction of the noise, water, vibration, and the impact of groundwater changes on the surrounding environment. If near the construction site, especially the toe of the embankment surrounding houses and other buildings, we must control the total settlement and avoid large subsidence and uplift occurred. It is difficult to effectively control the impact on the surrounding environment, the need to communicate with the masses, prior to the construction of residential buildings to take protective measures, otherwise the need to consider the use of elevated bridges instead of the embankment.

### **3. Road Engineering Soft Soil Sub-grade Construction Treatment Technology and its Application**

With the rapid development of economy, the scale of the construction of high grade highway is gradually expanded. In the course of construction, the road line selection is inevitable. And in the soft soil sub-grade for road construction, it is necessary to deal with the soft soil sub-grade to meet the needs of carrying capacity and deformation. The main purpose of soft soil sub-grade treatment is to improve the engineering properties of soft soil sub-grade, so that it can meet the requirements of the relevant specifications for the stability and deformation of the foundation. The soft soil sub-grade treatment includes improving the strength of the soil, improving the capacity of resisting liquefaction of the soil and improving the permeability of the soil, and to a certain extent, the elimination of other adverse effects.

#### **3.1.Surface treatment technology to improve soft soil sub-grade**

The surface treatment technology of road soft soil sub-grade is common in the range of poor soil, and as one of the main treatment methods of soft soil sub-grade of road engineering. Surface treatment technology is mainly

through the increase of materials and other engineering measures to improve the surface strength of the soil, in order to improve the overall bearing capacity and deformation of the sub-grade. On the basis of simple construction technology, the load of the soil should be distributed evenly on the soft soil foundation. Surface treatment technology is mainly aimed at the soft soil subgrade surface soil for improvement. In the full understanding of the basis of the engineering geological conditions of the construction site, road construction and technical personnel can be on the surface soil composition, water content, strength and load data for analysis and detection, in order to improve the technology and further improve soft soil sub-grade construction quality.

Soft soil sub-grade surface treatment technology, although to a certain extent, improve the engineering mechanical properties of soft soil foundation, but can not effectively ensure the stability and durability of the roadbed construction. Taking into account the end of the road construction is difficult to carry out large-scale repair and maintenance work, in the use of surface treatment technology to deal with soft soil sub-grade problems, technical staff must consider the use of good roads and other issues.

#### **3.2.Displacement method to improve soft soil sub-grade**

In the actual process of road construction and surface treatment technology can only improve the engineering mechanical properties of soft soil sub-grade surface soil and the durability of the roadbed still cannot be guaranteed, normal use and maintenance of the on the road caused a serious impact. According to the rich experience in construction design, the technical personnel gradually put forward and improve the replacement technology of soft soil sub-grade treatment. The replacement technology used to deal with soft soil sub-grade is to ensure the stability and bearing capacity of soft soil sub-grade by replacing the high strength soil with soft soil. The main construction methods of replacement technology of soft soil sub-grade include: artificial replacement of soil and the use of explosion technology and other forced displacement of soil. One of the main advantages of the replacement technology of soft soil sub-grade is that it can completely change the soil of sub-grade, which has been adopted by most of the road engineering construction. From the analysis of the reliability of the roadbed, the replacement is stronger than the forced displacement, and its application scope is more extensive. In the actual construction process of the replacement of soil is often coarse grained soil, in the artificial replacement will often be compacted soil. The main disadvantages of the replacement technology of road soft soil sub-grade are as follows: the damage of soil mass at the roadbed is serious and the construction cost is not easy to control.

### 3.3. Loading technology to improve soft soil sub-grade

Treatment of soft soil roadbed by loading technology mainly refers to the method of artificial compaction to improve the engineering mechanics properties of soft soil sub-grade. In the actual project, the heavy roller should be used to carry out the repeated manual compaction of soft soil sub-grade. This not only can effectively discharge the water in the soft soil roadbed, reduce its water content, but also can reduce the soft soil roadbed in the pore, significantly reduce the amount of deformation of soft soil roadbed. Based on the repeated compaction of soft soil sub-grade, the soft soil sub-grade can be pressed into the sub-grade soil which can meet the requirements of the road engineering construction. In the process of repeated compaction of soft soil sub-grade, the construction quality of the compaction work should be detected and supervision to ensure the compaction effect of soft soil sub-grade. Loading technology to deal with soft soil sub-grade is simple and effective, not only can achieve the requirements of road sub-grade construction, but also can significantly reduce the construction cost, has been widely used in China's road engineering construction of soft soil sub-grade treatment.

### 3.4. Other technologies to improve soft soil sub-grade

**Sand cushion method:** sand cushion method is in the soft land base to the top of the paving thickness of 0.6 ~ 1.0m sand cushion as consolidation of soft soil layer to the upper part of the drainage layer, to speed up the settlement of the development and shorten the process of consolidation method. **Riprap and method:** the subgrade bottom cast a certain number of rubble, mud extruder base, to improve the foundation strength. The method is simple, rapid and convenient in construction. Mainly applicable to the perennial water of the depressions, drainage problems, peat is flow state, thinner thickness, surface without a Hardshell flaky can sink up to the bottom of the swamp or thickness of 3 ~ 4m of the soft soil. **Laying blind ditch method:** first, manual or machine dug a rectangular trench or trapezoidal ditch along the highway horizontal every 10m spacing of soft soil 150cm x 150cm blind ditch in the adoption of 1.5m above; on the soft soil layer at 1.5m by several other forms available. Secondly, along the road are longitudinally arranged longitudinal blind ditch, the spacing control in 10m; third, in the blind ditch dug filling block size in not easily be softened with vesicular rocks of 30 ~ 50cm, fill in the above laying 10cm macadam and gravel spread a layer of geotextile to prevent blind ditch water overflow, prevent soil layer under the drain, blind ditch clogging and drainage effect; fourth, in the above backfill layer of earth rock mixture, paving compaction until qualified. This process is referred to as the ground treatment of sub-grade.

## 4. Road Engineering Soft Soil Sub-grade Construction Technology Innovation and Development

Due to the lack of construction experience and construction quality control is not strict and other reasons, the technical measures used in the treatment of soft soil sub-grade is still a big problem. Generally speaking, the durability and cost of the construction of soft soil subgrade in the common. These problems need to continue to explore and solve the road engineering construction technical personnel. In today's world, the economy and the rapid development of science and technology, any scientific field must be out of the road of innovation, or will be eliminated by the times. Road construction in the soft soil sub-grade problems as an important factor affecting the construction quality of modern road construction must be properly handled. Road construction technology in the process of its development needs of the construction of technical personnel constantly innovation, only in this way can effectively ensure the smooth progress of China's modernization. At present, the relevant theory and research of domestic and foreign scholars have entered a new stage of the problem of soft soil subgrade in the course of road construction. More and more road engineering practitioners into the soft soil foundation construction technology reform and improve the work, which no doubt has a huge role in promoting the development of road engineering. Road engineering soft soil subgrade treatment technology as an important part of road engineering construction technology to a large extent the same with other construction technology in civil industry, but also has its own characteristics. So in the process of development of road engineering in soft soil foundation treatment technology, to all-round, three-dimensional view of the problem, multi angle thinking problem, must not be behind closed doors, only in this way can we effectively guarantee the smooth progress of the modernization of our country.

## 5. Conclusion

With the progress of science and technology and the development of society, the problem of soft soil subgrade is becoming more and more serious. Soft soil subgrade problem not only seriously reduces the quality of the project, but also because of its potential safety problems have seriously affected people's daily traffic travel. Road engineering technical personnel should improve the understanding of the soft soil roadbed, while improving the level of their own technology. In order to improve the construction quality of road engineering, road engineering construction design personnel should seriously improve the construction of soft soil foundation treatment technology, in order to make it better for our country's modernization construction services.

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