Discussion based on the Technology Treatment of Soft Soil Subgrade in Highway Construction

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Abstract: Subgrade is an important foundation in highway construction projects, which has a greater impact on the overall construction quality of highway projects. Soft soil roadbeds often appear in the construction of highway projects, and targeted treatment measures should be selected for soft soil roadbeds, which can improve the overall strength and bearing capacity of the roadbed. In order to ensure the overall improvement of the quality of highway project construction, it is necessary to select targeted soft soil roadbed treatment technologies in accordance with the current status of project construction, control construction costs on the basis of ensuring construction quality, and ensure long-term development of highway engineering projects.

Soft soil roadbed has high water content, belongs to soil structure with strong compressibility, poor shear strength and poor stability. Soft soil subgrades will encounter such subgrades during highway construction. If the subgrades are not standardized during processing, they will have more negative impacts on the overall stability and integrity of the subgrade structure, and pose a greater threat to the safety of highway engineering. Therefore, in the construction of highways, the soft soil roadbed should be standardized and fully adapted to the requirements of highway projects. This paper analyzes the technical treatment of soft soil roadbed construction in highways, so as to improve the construction quality of highway engineering projects.

1. Overview of principles to be followed in the application of soft soil subgrade treatment technology

China has a vast territory, with a large number of highway engineering projects in various regions, and the geological conditions and geographical environment encountered in project construction are quite different. Therefore, at present, it is necessary to analyze the project construction requirements and select the corresponding foundation treatment technology in accordance with the basic principles of adapting to local conditions. Select the specified test section to start the test, and select the corresponding soft soil foundation treatment technology based on the test results. After the soft soil foundation treatment construction activities are over, more construction garbage will be generated in the construction area. Such garbage must be processed in a centralized manner to prevent greater pollution to the construction environment. In the treatment of soft foundation, it is necessary to do a good job in the treatment of construction water, not to discharge sewage at will, and to avoid causing great harm to the ecological environment around the construction area. During the construction of soft soil roadbed, due to the high looseness of the soil structure of the roadbed, it is easy to cause construction problems such as collapse and slippage. It poses a great threat to the personal safety of the construction personnel, so during the construction process, construction should be carried out in full compliance with the prescribed construction requirements. During construction, it is necessary to do a good job of safety management at the construction site, gradually strengthen the safety training of construction personnel and management personnel, comprehensively reduce hidden dangers to construction safety, and ensure the personal safety of personnel at the construction site [1].

2. Analysis of problems existing in soft soil roadbed construction during highway
There are many shortcomings in the soft ground, and the lack of good bearing capacity of the soft ground itself makes it difficult for the soft ground to withstand greater pressure. In the construction of highway construction, there will be comprehensive interference from many factors, which will make it difficult to improve the construction efficiency, which will have a large negative impact on the construction quality. In soft soil foundation construction, the settlement area in the construction area is large, and the gap in the soil layer of the soft soil roadbed is large, which will cause different degrees of settlement problems during highway engineering construction. Poor uniformity of soil layer voids in the construction area will cause uneven settlement problems frequently. The problem of uneven settlement of the roadbed results in the construction of the highway engineering. After the completion of the soft soil roadbed, there will be prominent crack problems in a period of application. In the end, the expected effects of highway engineering cannot be effectively realized, which will cause a serious problem of waste of resources, which poses a greater challenge to the construction of highway engineering projects. Therefore, in the construction of the project, it is necessary to fully combine the basic status of the roadbed and take various technical treatment measures.

3. Application of soft soil subgrade construction technology in highway construction

3.1 Surface drainage technology

The soft soil foundation is affected by its own characteristics and causes its structure to contain more water. During the construction process, we must pay attention to exclude more water to avoid negative impact on the construction structure. In order to control the moisture of the soft soil foundation structure, it is necessary to analyze the geographical status of the construction process and select the corresponding drainage technology. Under normal conditions, the terrain of some paths is relatively low, which will cause a large amount of natural rainwater to accumulate. Therefore, it is necessary to design an anti-seepage structure in the subgrade construction, and add more water-absorptive device materials to the soft soil foundation backfill to enhance the foundation water removal rate.

3.2 Application of reinforcement technology

The application of reinforcement technology in the construction of highway projects is a commonly used foundation treatment method. In the application of this technology, various types of nylon and glass fiber materials are mainly used, and they are mixed with many non-natural materials. In the application of soft soil roadbed reinforcement technology, it is necessary to go through different links. First, it is necessary to ensure the full integration between the soil layer and the sand and gravel, which will help improve the basic bearing capacity of the soil layer. Strengthen the construction effect of soft soil foundation in the layer treatment. On the basis of ensuring that the foundation has a good load-bearing effect and compressive effect, pre-treatment operations of various types of laying materials should be carried out during the laying of the ground. After the laying operation is completed, relevant technical measures should be selected to inspect the laying.
structure. For example, during the laying phase of the geogrid, the material should be treated uniformly to ensure the consistency of the material. In the soft foundation slope construction phase, the tightness of the construction material should be checked to ensure that it is within the specified range, and whether there is any deformation and tensile accident caused by uneven force. Finally, during the filling process of reinforced materials, according to the construction environment and construction requirements, a corresponding construction plan must be drawn up to improve the stability of the soft soil roadbed [3].

3.3 Preloading and preloading technology

The pre-compression technology measures are to implement the corresponding load pressure on the soft soil layer, which can eliminate a large amount of water in the soft soil matrix, regulate the gap problems in the structure, improve the tightness of the structure, and optimize the quality of soft soil roadbed construction. During this process, various construction technologies should be controlled. For subgrades with high viscosity at the grassroots level, the corresponding construction planning plan should be drawn up in accordance with the existing construction requirements and the construction environment before construction. Based on the analysis of construction technology application and load pressure related values, the damage to the soil environment during construction operations is minimized. During the construction, the observation of the soft soil roadbed should be done well, and a scientific observation period should be set during the preloading process to ensure that the preloading operation is fully completed.

3.4 Dynamic compaction technology

Dynamic compaction technology uses the machine's own gravity to compact the soil structure with high looseness into the soft soil roadbed structure under the action of gravity. This can effectively strengthen the compactness and basic bearing capacity of each layer of the structure. Before compaction, the quality inspection of compaction material should be carried out, and the sample should be pretreated on the road surface. At this stage, the compaction strength and compaction operation should be precisely controlled. In compaction, the basic steps are from the middle to the two ends. This process is repeated 2 to 3 times to improve the compaction quality. After the three compaction operations are completed, the compacted structure should be measured. If the actual compacted structure reaches 1 to 2 cm, the compacted structure will meet the standard.

4. The case of soft soil roadbed reinforcement during highway construction

4.1 Construction Overview

The left side of the expressway tunnel ZK3 + 965 ~ ZK4005 is set as an open tunnel section, of which ZK4005 ~ ZK4020 belong to the bamboo tunnel door section. In the design process, the requirements must not be less than 300kPa. The slope should be controlled properly during construction. In the construction drawing design, the composite protection of nail walls and mortar retaining walls was set on the left side of the temporary slope. The construction on site was not completed, and the surface was covered with mist. Sex control is crucial and has a greater impact on the safety of upper roads.

4.2 Engineering Geological Changes

It can be obtained from the relevant geological data in the original design of this section. It is found in the original design data records that the geology is gray, the soil is moist, belongs to medium density and dense, and the basic particle size is 20 to 40mm. Its maximum particle size is 100mm, and the parent rock is volcanic rubble. Filled with silty clay, the actual drilling speed is 1.2 m/h, qik ≤ 140 kPa, [fa0] = 300 kPa. After the site construction and excavation, it is concluded that the ZK3 + 988 ~ ZK4020 reverse arch is based on plane filling. Through in-depth research on the pit, it can be concluded that the lower end of the inverted arch is an ordinary fill layer, gravel layer, and silty clay layer. The thickness of plain weave is 1.9 × 3.3m, which is relatively moist and
belongs to gray-black. Most of them have a particle size of $2 \times 20$mm, and the content is 55%. During the construction process, the distribution is poor by manual filling. Qla 50kPa, $[fa0] = 180$kPa, which lacks the corresponding tensile energy in ordinary landfills, is not suitable for auxiliary substrate layers, and is often used to fill the basic load capacity in replacement. The thickness of silty clay is 0.6m, which is relatively moist and has a yellowish brown color. If the design foundation bearing capacity requirements cannot be met, the corresponding fillers should be added after excavation [4].

4.3 Reinforcement Design of Yanggong Foundation

According to the basic environment of the construction area and the geological conditions of the soft foundation, the arch foundation is effectively strengthened. Select micro steel pipe piles to reinforce the foundation and draw up a standardized treatment plan. The actual reinforcement range is ZK3 + 988 ~ ZK4022, in which the longitudinal length and the length and full width of the bottom of the inverted arch are 34m and 13.2. The inverted arch foundation shall be strengthened in accordance with the prescribed construction sequence, and a 1m thick underfill shall be dug under the inverted arch relatively. [5]The grouting hole of micro steel pipe piles should be drilled with an inverted arch under 1m. The grouting hole distance is 800 × 800mm, and the average depth of ZK3988 ~ ZK3993 and ZK3993 ~ ZK4022 is 3m and 4m. The length of steel pipe piles should refer to the basic thickness of silty clay and commonly used fillers. In the area of grouting reinforcement, a C25 concrete with a thickness of 200 mm is poured on the top surface as a slurry layer. At this stage, the top of the steel pipe should be exposed about 50mm, and then the grouting steel pipe is selected to strengthen the foundation. In the grouting operation, M20 single-liquid cement slurry is selected, and the initial grouting pressure is in the range of 1.0 to 1.5 MPA. During the construction process, the construction should be precise to ensure that the position of the 89x6 flower tube is placed at the center of the hole 130mm after grouting.[6]

Conclusion

In soft soil roadbed construction, affected by factors such as the construction environment will have a greater impact on construction quality. In order to optimize the effectiveness of construction and improve the quality of construction, it is necessary to select the corresponding construction plan in accordance with the specific construction status, comprehensively integrate various issues during the construction phase, do a good job of prevention and investigation, and ensure the stable construction of the project.

References