

Points of Subgrade and Pavement Construction Technology in Highway Engineering Construction

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Abstract: Subgrade and pavement construction is a very important link in highway engineering construction. The construction quality of subgrade and pavement directly affects the overall quality of highway engineering construction project. This paper mainly summarizes the construction technology of subgrade and pavement in highway engineering construction, as follows.

1. Introduction

Under the background of accelerating urbanization construction in China, the importance of highway engineering is increasingly prominent. Highway engineering projects not only facilitate people's travel, but also promote the development of national economy, playing an important role in easing the pressure of transportation. The construction quality of subgrade and pavement directly affects the construction quality of the whole highway project. Therefore, it is necessary for the construction department to strictly control the link of subgrade and pavement construction to ensure the construction quality.

2. Common Problems of Subgrade and Pavement Construction in Highway Engineering Construction

2.1 Uneven Flatness of Pavement

Uneven flatness of pavement is a common problem in subgrade and pavement construction in highway engineering construction. The uneven road surface will affect the normal operation of vehicles, and even lead to traffic accidents. The causes of uneven pavement are related to the following factors: first, the construction workers did not implement the construction procedures according to the construction specifications strictly, and in the process of construction, they paid too much attention to the construction progress and ignore the construction quality, thus reducing the flatness of the pavement; second, the construction machinery used in the construction was not reasonable and the technical level of the mechanical operators was not high. Especially in the roller rolling operation and paving operation, once the mechanical operation didn't meet the requirements, it will directly affect the pavement flatness [1].

2.2 Subgrade Damage

Once the highway engineering project is put into use, there will be more and more vehicles on the road, and the damage to the subgrade will be more and more serious. Subgrade damage is a common problem in highway engineering construction. The causes of subgrade damage are usually related to the poor construction quality of subgrade and pavement. If the construction personnel do not strictly control the construction materials and construction procedures, the subgrade damage will occur because the construction quality is not guaranteed. In addition, if the compactness of the subgrade is not enough, and once it is affected by the vehicle bearing capacity, the subgrade will also be damaged.

2.3 Pavement Cracks

Pavement crack is also a common problem in subgrade and pavement construction in highway engineering construction. Asphalt, a common material in highway engineering construction, has higher flatness, stability, wear-resistance and durability. In construction, reflective materials can be sprayed on it, which can solve the problem of asphalt reflection of light at night. It is because of the various advantages of asphalt that makes it common in highway engineering construction in China. However, asphalt also has some shortcomings. Asphalt is a kind of flexible structure. So once the shrinkage cracks appear in the base course after asphalt pavement construction, cracks will be quickly transferred to the asphalt pavement, and then the asphalt pavement cracks will occur. Once the rainwater flows into the cracks, it will corrode the concrete structure, reduce the stability of concrete structure, making it difficult to ensure the construction quality of the subgrade and pavement.

3. Analysis on Technical Points of Subgrade and Pavement Construction in Highway Engineering Construction

3.1 Technology of Subgrade Excavation, Filling and Compaction Construction

There are two methods of subgrade excavation. One is transverse tunnel excavation and the other is longitudinal full width excavation. However, affected by the construction environment, the two excavation methods are often used together in the subgrade excavation operation. In the subgrade filling construction, the construction personnel first need to clear the subgrade. The filling operation can be carried out after the subgrade is cleaned. The layered filling construction method is adopted. Before filling, the subgrade soil layer should be comprehensively analyzed, and the soil layer thickness should be strictly controlled. The layered compaction method is required in the subgrade compaction operation. One layer shall be compacted and then another layer shall be compacted until all soil layers are compacted. In the compaction operation, the construction personnel need to master the moisture content of each layer and set up rolling method combined with the actual water content of soil to ensure that the compactness of subgrade reaches the corresponding standard and improve the stability of subgrade [2]. The common compactness in subgrade compaction is shown in Table 1.

Table 1 Common Compactness Of Subgrade

Type of Filling and Excavation	Below the Top Surface of Base Course	Compactness(%)	Maximum Particle of Filler	Minimum Strength of Filler
	Depth(m)		(cm)	(CBR%)
Zero Filling and Cubage of Excavation	0-0.80	≧ 96	10	8
Filling	0-0.80	≧ 96	10	8
	0.80-1.50	≧ 94	15	4
	Over 1.50	≧ 93	15	3
Soil Shoulder			10	4

3.2 Technology of Subgrade Drainage Construction

Subgrade drainage directly affects the overall construction quality of highway engineering. As one of the evaluation indexes of highway engineering construction quality, subgrade drainage needs special attention of construction units. The reasons of affecting subgrade drainage mainly include the following points: first, the professional quality and professional ability of construction personnel; second, the sense of responsibility of managers. Once the subgrade drainage does not meet the requirements, it will directly affect the normal use of highway engineering and reduce the construction quality of the project. Therefore, the construction unit needs to fully implement the subgrade drainage construction, have a comprehensive understanding of the hydrological situation

of the construction site, and formulate the drainage scheme according to the actual hydrological situation. For example, if the subgrade project is constructed in rainy season, it is necessary to do a good job in the backflow and blocking operation of surface water, and intercepting groundwater to reduce the soil moisture content of subgrade, and further improve the bearing capacity and stability of subgrade.

3.3 Technology of Pavement Construction

Pavement construction is a very important link in highway engineering construction. The quality of pavement construction needs to meet the requirements of highway engineering construction and ensure the safety of traffic. There are many links in pavement construction of highway engineering, such as surface course, seal coat, base and subbase. Waterproof, drainage and antifreeze are the main functions of subbase. In addition, subbase can further optimize base. Therefore, in the construction of pavement subbase, the construction personnel need to choose the best material to lay in the buffer stage layer to ensure the scientificity and rationality of laying technology, and further improve the laying quality. It is necessary to consider the particle size and sand content in the selection of paving materials, pay attention to the mix proportion design of paving materials, and properly mix, pave and roll the paving materials of subbase. In the construction of pavement base, the construction personnel need to ensure the quality of the mixture, strengthen the detection of the strength, stiffness, stability and dispersion of the mixture to ensure that the performance of the mixture meets the construction requirements. In addition, the construction personnel also need to choose the best material mix proportion in the base construction operation to ensure that the material can bear the longitudinal load and surface load. Asphalt, stone and mineral powder are indispensable raw materials for pavement construction of highway engineering. When using the above raw materials, the construction personnel need to pay attention to the mix proportion of each material, and strictly control the material laying temperature to ensure that there is a high adhesion between the materials. In this way, the compactness between the mixture can be further improved to ensure the pavement construction quality [3].

3.4 Technology of Subgrade Protection

During the construction of highway engineering, it is inevitable to break the equilibrium state of the stratum, which causes the stratum to produce certain stress. In view of this problem, it is necessary to effectively use subgrade protection technology to protect the stratum. Subgrade protection technology can avoid the long-term impact of surface water on subgrade, which leads to rock erosion and weathering, which is of great significance to improve the stability of subgrade strength. With the continuous development of technology in China's engineering construction, subgrade protection technology has also made obvious innovation. Plasma cutting protection technology is currently used in highway engineering subgrade protection, which can effectively protect embankment slope with the help of concrete precast block model. However, in the process of embankment slope protection, there will be problems such as slope rock weathering. In order to prevent the rock from further weathering, construction personnel can use high-strength materials and fiber concrete to further protect the slope, such as bolt hanging net and shotcrete with plastic mesh. It has been proved by a lot of practice that this kind of subgrade protection method has high protection effect. In the process of continuous development of engineering construction, construction personnel began to use mortar rubble slope protection technology, but the cost of this protection technology is high and durability is not high, so it is quickly eliminated. In addition, many construction units also try to use vegetation slope protection method, which won't damage the surrounding environment and will promote the sustainable development of ecological environment[4].

4. Analysis on Measures to Strengthen Effective Control of Subgrade and Pavement Construction Technology in Highway Engineering Construction

4.1 Improve Pavement Flatness

Improving the flatness of pavement is one of the measures to strengthen the effective management of subgrade and pavement construction technology in highway engineering construction. Grader is the key to ensure the flatness of subgrade base. The evaluation standard of pavement flatness is expressed by Ride Quality Index (RQI). If $RQI \geq 8.5$, the flatness is excellent. If RQI is 7.0-8.5, the flatness is good. If RQI is 5.5-7.0, the flatness is medium. If RQI is 4.0-5.5, the flatness is secondary. If less than 4.0, the flatness is poor. The flatness of base course directly affects the comfort and safety of vehicles. Generally, when there are many joints of cement stabilized materials, the flatness of base course will decrease, and more compaction time is needed. In addition, the retarder should be added in the production process of cement materials to prolong the initial setting time of cement and ensure that it has enough compaction time.

4.2 Strengthen the Control of Mixture Quality

The quality of mixture directly affects the quality of highway engineering construction project. The construction personnel need to master the best mixing time and scientific proportion of mixture to ensure that the mixture meets the mixing requirements and improve its uniformity. For asphalt material, the heat treatment time is generally controlled within six hours, and the heating temperature should be well controlled. The asphalt material can only be heated after all preparation work is completed, so as to avoid long heating time or low heating temperature affecting material performance and reducing its quality. Strengthening the control of mixture quality is the key to guarantee the construction quality of subgrade and pavement [5-6].

5. Conclusion

To sum up, the construction technology of subgrade and pavement directly affects the construction quality of highway engineering. There are many problems needing attention in the construction of subgrade and pavement. The above is the construction technology of subgrade and pavement summarized in this paper, hoping to have certain reference value for highway engineering construction.

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