Construction technology of rock-filled roadbed in highway engineering construction

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Abstract: The application of stone-filled roadbed construction technology in highway engineering construction is more and more extensive, but there are many factors affecting the technical effect. It is necessary to strengthen the construction preparation and construction process specifications to ensure the smooth development of the construction. In order to improve the stability of the path and strengthen the construction supervision, the construction personnel also need to clearly grasp the technical points, so as to take effective measures to control the deformation of the roadbed, thereby improving the construction quality and progress, and prolonging the service life of the road.

1. Introduction

In the practice of rockfill roadbed construction technology, environmental safety control, construction preparation, program formulation, construction in accordance with roadbed stability requirements, quality management and other operational aspects are essential, but it is difficult to break through the technical effectiveness, and technical application Accuracy has a direct relationship. This time, based on the research on the construction technology of rock-filled roadbed in the construction of highway engineering, the construction technology and technical points are analyzed, and it is hoped to play a positive role in the construction of highway engineering in China.

2. Technical analysis of rock-filled roadbed construction in highway engineering

The construction process includes construction survey, foundation treatment, unloading gravel, paving, sprinkling, compaction, inspection visa, and roadbed renovation, as shown below;

2.1 Construction survey

Repeatedly review the control equipment and materials submitted by the design unit, and use the total station to accurately measure. After confirming the correctness, according to the construction needs, add the water level and the dense conductor point, re-measure the original ground elevation of the roadbed cross section, draw a cross-sectional view, and accurately calculate The packing parameters are based on the actual ground elevation measured, and the parameters such as the roadbed construction width are derived.

2.2 Substrate treatment

According to the design requirements, the crude oil structure in the roadbed area is treated, the shrubs and tree roots are removed, and the pits are filled or compacted. After cleaning the site, perform pre-filling and compaction, requiring a degree of compaction >90%. For highway engineering construction based on stone-filled roadbed construction technology, it is necessary to strengthen the treatment of the roadbed base to meet its composite stability requirements. In order to improve the overall quality of the project, rock and fine-grained soil can be used to build the roadbed. At the same time, the traditional substrate treatment method is optimized, and the number of transition layers is required to be about 3 layers, and the thickness of each layer is in the range of 40-55 cm. To optimize the subgrade base by rockfill roadbed operation, it is first necessary to understand the construction requirements and use fine-grained soil in combination with other

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materials to improve the stability of the base structure.

2.3 Packing loading and unloading

In the transportation and loading and unloading construction of the packing, the position of the slope should be reasonably marked first, and the distance between the two points should be controlled at about 20cm. Secondly, control the thickness of the pine slope and the position of the packing carriage to ensure construction efficiency. During the loading and unloading process of the packing, the main equipment of dump trucks and excavators are used to reduce the safety hazards and ensure the effectiveness of the loading and unloading work of the packing. The packing entering the construction site shall be unloaded in strict accordance with the requirements, reduce the residence time of the packing on the vehicle, and ensure the quality of the packing and the construction progress.

2.4 Layered filling

The roadbed packing is taken from the ground and excavated from the riverbank along the line. It is mainly gravel. It is required to take the position of the material. The construction section of the roadbed is >50m, the depth of reclaiming is <1.5m, and it is excavated according to the riverbank. After processing the soft soil roadbed sand cushion, in order to ensure the construction progress and subsequent construction quality, the improvement of drainage performance should be strengthened. Firstly, according to the design requirements, the filling thickness is reasonably calculated to determine the particle size of the filler, and the stone material is usually layered into the fill layer according to the thickness of 30 cm. In addition to this, a test section is required. At the same time, the lithology of the rockfill embankment is different, and the filling effect is also quite different. When filling the roadbed, it is divided into layers at a horizontal level according to the full width of the cross section, and is filled with the full width of the cross section and horizontally horizontally. Reasonable use of the grid method, using the grid and dump trucks per vehicle, and 50m looseness thickness, calculate the amount of sand removal. When the height of the roadbed fill is >3m, each layer should be overfilled 50m along each side of the roadbed to facilitate compaction machinery. After the roadbed is filled to the design elevation, the slope of the slope should be designed according to the design, and the slope should be brushed in the order from top to bottom.

2.5 Slope code building

When the slope code is used to fill the stone roadbed, it is usually completed by first filling and then building, and then building and filling the two methods. In order to ensure the quality of construction, the following points should be paid attention to in practice; scientifically manage the proportion of roadbed ground and timely handle the inward tilt. When laying the stone foundation, pay attention to the separation distance and the reserve of the expansion joint. For the change of the base geology, the segmentation operation can be completed. The strength of the rockfill should be >30MPa, and the particle size should meet the design requirements. The compactness of the stone is strengthened to prevent the occurrence of voids and looseness. Manually matching the excavator to complete the filling, with the requirements of composite bearing capacity, in order to ensure the tight meshing of the stone, the contact surface treatment should be strengthened, and it is required to be slightly inclined inward. According to the actual construction conditions, reasonably control the height of the fill, scientifically adjust the thickness of the masonry, and the height of the fill. Under normal circumstances, the fill height is <5m, the masonry thickness is <1m, the fill height is 5-13m, and the masonry thickness is >1.5. m; filling height>12m, masonry thickness>2m.

2.6 Roadbed paving

The roadbed paving steps are as follows; the first is to use the bulldozer to complete the rough pushing operation. The second is to complete the roadbed leveling by manual mechanical means. The horizontal and vertical directions of the fill layer should be smooth and even, and the shoulders should be compacted initially without landslide. The third is to manually remove the large-size filler by the loader, and fill the fine joint with fine stone slag to improve the smoothness of the road

surface. The fourth is to set the road arch in the road base table according to the 2% slope to optimize the drainage performance of the subgrade surface. Fifth, through the operation of professional construction personnel, the quality of the pavement looseness in the roadbed tiling is treated. Under normal circumstances, the thickness of the pavement is about 50cm, and the gap between the ideal and the ideal value is large. It should be handled in time and properly controlled. Subgrade filling layer thickness. Filling the gap between the large-size materials can be achieved by paving gravel or stone scraps, and controlling the amount of sprinkling of the paving layer reasonably, controlling about 1/3 of the volume of the rockfill. Different types of roads, there are also differences in the selection of stone-filled roadbed paving rules. For example, highways and first-class roads need to be laid on high-grade roads, and they can be layered and compacted. For roads that are difficult to construct and have a large number of blasting, the paving construction should be completed by dumping. In the dumping operation, it is necessary to complete the construction in a layered filling method in accordance with the construction requirements in the range of over 1 m of the road bed, and at the same time give compaction treatment [1].

2.7 road base compaction

When compacting the roadbed, the speed and number of presses should be reasonably controlled to ensure the quality of the subgrade structure. First, control the uniformity of the construction environment to ensure that the soil structure meets the design standards. Secondly, the sedimentation difference method is used to check the compaction quality to reasonably control the number of crushing. Finally, according to the settlement, sedimentation plate, pile displacement and other information, strengthen the scientific management of roadbed compaction. When the relevant information and design requirements are inconsistent, the construction unit should take effective measures in time to improve the quality of pressure implementation. Stone stacking should ensure its uniformity and ensure smooth paving work based on reasonable control of differences. In the actual construction, the 18t self-weight roller is usually used, and the moving speed of the roller is slow, and sudden acceleration or braking is prohibited. The roller can only move back and forth, and it is forbidden to move left and right. In the forward state of the roller, the vibration mode should be turned on, and the roller in the retracted state should be crushed in the closed vibration mode to ensure the compaction effect. When the roller compactor vibrates, it will directly damage the roadbed packing structure and reduce the rolling quality. Under the working condition of the roller, the two sides of the roadbed should be crushed first, and the overlapping spacing of the rolling press should be controlled at about 35cm. The porosity is measured by the irrigation method, and the settlement difference is determined. The depth below the bottom surface of the road surface of the hard stone is 80-150 cm, the paving thickness should be ≤400 mm, and the maximum particle size is less than 2/3 of the layer thickness. The test determines the compacted dryness and porosity. Requires ≤23%. The depth below the bottom surface of the road surface of the lower embankment shall be > cm, the paving thickness shall be ≤ 600 mm, and the maximum particle size shall be less than 2/3 of the layer thickness. The test shall determine the compacted dry weight and the porosity requirement shall be ≤ 25%. It is required that the settlement difference before and after rolling is <3mm. Self-testing of the roadbed working face after rolling, requires no obvious holes on the surface, and it is difficult to dig the shovel. The slope code is dense and compact, and the slope is smooth. After the self-inspection is passed, the roadbed edge and the centerline are scattered with white ash, and the roadbed area is clearly filled and reported to the supervision engineer for acceptance [2].

3. The construction technology points of stone-filled roadbed

3.1 Construction preparation

Construction preparation work is equally important for rockfill roadbed construction, as shown below; first, strengthen traffic guidance, reasonably set temporary bypass routes and construction enclosures, create a good construction environment, and ensure traffic and construction safety.

Second, according to the project implementation plan, do a good job in technology and rationally distribute roadside piles and corner piles. The third is to do a good job in regional measurement and provide a basis for rational construction. The measurement technician is required to be able to clearly grasp the advanced equipment, so as to measure the hydrological data and geological data of the construction site in detail. The fourth is to strengthen the analysis of construction technology, construction key points and other difficulties, so as to rationally set safety protection measures to achieve forward-looking and continuity of stone-filled roadbed use. The fifth is to strengthen construction safety education, improve the safety awareness of construction workers, ensure the comprehensiveness of construction preparation, and thus improve the overall construction quality.

3.2 Construction comprehensive plan

To strengthen the comprehensive construction plan of rock-filled roadbed, the following points should be achieved; first, strengthen the strength and uniformity analysis of the substrate. The subgrade has different heights and different bearing capacity. The subgrade with a height of >2m should have a bearing capacity of >320MPa. Followed by the load-bearing capacity of the 15-20m height subgrade, again the bearing capacity of the 10-15m height subgrade, the minimum is the bearing capacity of the 6-10m height subgrade. To improve the stability of the roadbed, it is also necessary to ensure an even distribution of load-bearing capacity; in this regard, when formulating the plan, the load-bearing analysis should be strengthened to make up for and supplement the deficiencies. Fine-grained soil or rock mixing bases are often used to ensure load-bearing pressures that meet construction needs. The second is to strengthen the treatment of the substrate and the mixed substrate. When designing the fill roadbed, the material of the transition layer is mostly fine-grained soil. The materials are required to meet the construction basis and standards, and the inspection needs to be strengthened to ensure that the structural quality of the transition layer meets the design requirements. In the construction of special areas, rock and fine aggregate materials are often used to make the mixed base. The transition layer is completed according to the time, and the stone filling is required to coordinate with the regional construction.

3.3 Material quality requirements

China's social economy is developing rapidly, promoting the pace of development of traffic road engineering, paying more attention to engineering quality issues, and improving road quality requirements. In the construction of the project, the following construction requirements should be met; first, the selection of roadbed rockfill materials. The sandstone and stone ratio should be strictly controlled to control the stone mixing process. To ensure that the strength of the stone meets the design requirements, it is not applicable to the construction of highway engineering for stone materials with severe expansion and weathering. The second is the choice of construction machinery. Heavy-duty compactors and bulldozers are used to ensure the compaction and flatness of the roadbed, thus improving the quality of construction. The third is the construction drawing design. The design and construction drawings shall be comprehensively carried out around the actual situation of the construction site, strengthen the survey and mapping of on-site geological conditions and natural conditions, and ensure the accuracy of the construction drawing design. Reasonable designation of design parameters such as roadbed strength to meet the requirements of engineering stability construction. The fourth is the application of construction technology. The construction technology of rockfill roadbed has strict requirements on the professional level of construction technology and construction technicians. Construction should be carried out in strict accordance with the construction technical specifications to ensure the bearing capacity and thickness of the roadbed and the overall construction quality meet the requirements [3].

3.4 Inspection and supervision

Inspection and supervision are indispensable for improving the application of stone-filled roadbed construction technology in highway engineering. However, in fact, highway engineering construction pays close attention to post-examination inspections. After quality problems occur, it is necessary to re-construct highway projects. It is not only time-consuming and labor-intensive, but

also increases construction costs, and construction resources are seriously wasted, which is not conducive to the sustainable development of highway engineering construction. In this regard, inspection and supervision should be strengthened and run through the whole process of highway engineering construction. Strengthen the organic combination of pre-existing prevention, in-process control and post-processing, and carry out inspection and supervision on various construction links. Focus on the implementation of roadbed earthwork construction technical plan, in accordance with the relevant construction quality acceptance specifications, supervision and guidance according to local conditions, strengthen the inspection and acceptance of all links, especially in the layered rolling process, can achieve the refinement of acceptance basis, thus ensuring inspection Rolling results. Strengthen the supervision of the construction environment and rationally implement basic work such as drainage. After the completion of the project, the standard treatment of engineering wastes will be strengthened to reduce the environmental pollution impact of engineering waste. Only by improving the intensity of inspection and supervision, and through the construction of highway projects, can the overall coordinated development of the project be promoted.

3.5 Ground treatment

The quality of foundation construction directly affects the overall project construction results and the project investment life. The foundation is also an important prerequisite for the application of construction technology; in this regard, China has strict regulations on the construction of roadbed. The construction of all grades of highway projects shall be carried out in strict accordance with the foundation standards stipulated by the regulations. Regardless of whether it is a highway or a primary or secondary road, the compaction index shall be >85%. Although the foundation code has a clear definition of the bearing capacity, it does not mention the clear construction direction and construction technical specifications for the bearing capacity construction. The construction personnel are required to strictly handle the actual situation in strict accordance with the design requirements. To this, strengthen the professional of the construction personnel. The level is particularly critical, enabling it to clarify construction objectives and rationally control the bearing capacity of the subgrade. In addition, it is necessary to strengthen the application test, test the basic bearing capacity and stability of the foundation, and take reasonable measures to ensure that it meets the basic technical requirements. The strength of the subgrade base should be evenly distributed, especially the fine-grained mixed rock base and the packing buffer transition layer, so as to continuously improve the stability and quality of the road.

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