

On Technical Difficulties in the Construction of Prestressed Anchor Cable in the Management of Geological Disaster

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Abstract: Prestressed anchor cable is a complex anchoring project, which makes the anchor cable fixed in the rock mass through the function of prestress. It is widely used in geological disasters to support hydropower stations and highway first-grade railway slopes. In this paper, the rational use of prestressed anchor cable in the management engineering of geological disaster is analyzed through the exploration of prestressed anchor cable, and the technical difficulties of prestressed anchor cable in the management of geological disaster are further analyzed.

1. Preface

In recent years, geological disasters occur frequently in China, such as surface subsidence, debris flow and landslides. There are two reasons for disasters, one is natural reasons, the other is man-made reasons. It shows that it is urgent to effectively prevent geological disasters. The prestressed anchor cable is a kind of anchoring project which fixes the anchor cable in the interior of the rock mass in the way of prestress. It has unexpected effect when it is reasonably used in the management engineering of geological disaster.

2. Overview of Project

There are landslides in a province. The landslides are long strip, 110m in width and 400m in length, and the thickness of the slope is about 3.2-16.7m. At the front of the landslide, the development of the transverse cracks is serious, and the height of the dislocation reaches about 0.75m, and the landslides are mostly blocky gravels, and contain a small amount of unequal mud ^[1]. Through the study of this area, it is decided to effectively control the landslide and deal with the situation of landslide by the way of prestressed anchor cable support.

3. Analysis of Difficulties in Construction of Prestressed Anchor Cable Project

Compared with other construction environment, the construction area of prestressed anchor cable project is higher and steeper, so it is more difficult to arrange temporary access road, and it is also inconvenient to transport mechanical equipment and materials. Prestressed anchor cable is a construction project with large quantities and technical difficulties, which has strong concealment and complexity. However, in the case of poor geological conditions in the construction area, certain safety defense measures should be taken to ensure the safety of the construction. Therefore, in the use of prestressed anchor cable for geological disaster control project, the construction personnel should take a reasonable way to use the project to ensure the safety of construction.

4. Analysis of the Main Points of Prestressed Anchor Cable Construction

4.1 Anchor Hole Positioning

According to the actual situation of the slope at the construction site, the construction design is standardized with strict requirements, so that the hole position of the prestressed anchor cable can be accurately placed on the slope, and then the opening position is clearly marked with a conspicuous mark to ensure that the opening position shall not be less than 20mm in deviation ^[2].

At the same time, the anchor cable holes that have been tested and qualified are numbered to ensure that the subsequent construction can be carried out smoothly and provide a strong basis for drilling construction.

4.2 Rig in Place

In order to effectively improve the drilling efficiency and hole formation quality of the prestressed anchor cable project, the construction of geological disasters should be carried out according to the geology of the anchoring stratum, the geotechnical type, hole depth, and aperture to select a reasonable and effective drilling tools according to the geological conditions. The down-hole-drilling rig is used for the construction of the project. Therefore, after the construction operation platform is set up, the rig should be disassembled on the flat ground, and then the dismantled parts should be manually moved. And each part shall be transported to the construction platform for reassembly to ensure that the machine can be effectively used in the construction ^[3]. After the drilling rig is assembled on the working slope, the stability of the drilling rig chassis should be adjusted, the drill bit should be aligned with the hole position, and then the tilt angle of the drilling rig operation should be adjusted, and the position of the drilling rig should be fixed at the same time. Through such operation measures, the preparation work for the project construction can be effectively completed, and the effective execution of the drilling operation can be ensured.

4.3 Drilling

In this management project of geological disaster, dry drilling is used to drill the anchor cable hole. The dry drilling method should pay attention to the bonding performance of wall, and pay more attention to the geotechnical conditions of the slope to prevent the deterioration of its geological conditions ^[4]. The drilling speed is directly related to the formation conditions and the performance of the rig. As long as the two conditions are combined, the drilling speed can be effectively controlled. The specific drilling operation is as follows: an inclination of 10 ° is used as the drilling inclination angle. When the hole is opened, the drill bit should be placed in the hole for multiple drilling to ensure that the inclination and hole position of the hole are drilled correctly. When drilling a hole, it cannot be done overnight. It needs to be drilled multiple times, and each time is at the depth of 3m to 5m. At the same time, during the drilling process, the inclination of the hole position must be accurately measured. In this way, it is possible to take effective measures to correct the hole in time when the hole position deviates, and to ensure that the hole slope cannot exceed 3% of the inclination angle when the hole is formed.

In addition, during the drilling operation, the site construction situation should be recorded in detail. If there is a poor drilling situation such as shrinkage and collapse, the construction operation should be stopped immediately, and the poor drilling should be handled by the way of wall grouting. After the cement mortar is set, the drilling work shall be continued ^[5]. Besides, if water seepage and hole collapse occur during drilling, it can be dealt with through effective technical measures. The specific operations are as follows:

(1) Treatment of water seepage in the hole: if there is water seepage in the hole, and the water seepage is large, the drilling tool should be pulled out from the hole when the impactor is submerged, and then the pressure grouting method should be used to consolidate the hole to effectively solve the problem of water seepage.

(2) Treatment of hole collapse: the reason for hole collapse is that the rock mass is not solid enough when the borehole enters the rock mass fracture, which leads to hole collapse. In case of hole collapse, the drilling shall be stopped immediately and the drilling tool shall be taken out from the hole, and then the hole wall shall be strengthened by grouting. During wall grouting, cement mortar can be used as slurry to keep the grouting pressure within the range of 0.1 to 0.2MPa. After grouting, the drilling work shall be resumed 24 hours later to ensure the smooth progress of drilling. In addition, in case of rainy days during the construction process, the infiltrated mud shall be discharged out of the hole before grouting to avoid adverse impact on the wall fixation effect when grouting.

(3) Treatment of anchor cable hole: in the process of drilling, when the hole position has reached

the designed depth, it should be noted that drilling cannot be stopped immediately, and the drilling should be kept stable for 1 to 2 minutes, so that the hole diameter meets the design requirements ^[6]. The remaining ballast and water viscosity on the hole wall should be cleaned in time, and special attention should be paid that when using high-pressure water gun to clean the anchor cable hole, it can only be used when the rock mass is intact and relatively hard. If the high-pressure water gun is used in the case of rock fragmentation, it is easy to lead to rock collapse, resulting in hole collapse.

4.4 Fabrication of Anchor Cable

In the construction of this project, all anchor cables used shall be uniformly cut in the processing site, and if some steel strands cannot be cut in time after entering the site, they shall be stored in a dry and clean environment to avoid the impact of humidity and smoke ^[7]. It is worth noting that three key points should be paid attention to when laying off the steel strand. First of all, the guide frame, cutting machine, grinding wheel, support frame and the steel strand should be placed at the same level to ensure the blanking accuracy of the steel strand after entering the processing site. Secondly, when setting up the bracket, a piece of packing paper should be placed in the groove every 2M and be replaced regularly, which can effectively protect the surface of the steel strand for painting. Furthermore, when setting out the steel strand, we should pay attention to the situation of excessive elasticity to prevent the potential danger of injury. At the same time, it is not allowed to use electric welding to process steel strand, and cutting machine shall be used for cutting. And when cutting the steel strand, it should conform to the designed cutting length.

4.5 Anchor Cable Grouting Project

In this project, the part that needs grouting is divided into two links, namely the tension section and the inner anchor section. The cement grout is used as the grouting material, and the grouting operation can only be performed after the anchor cable enters the hole. When preparing the slurry, it is necessary to control its amount according to strict requirements, and strictly control the amount of materials according to scientific requirements. Among them, before grouting in the tension section, the hole wall should be flushed first. After flushing, we should wait for a period of time to be dried, then perform the pouring operation, control the pressure within the range of 0.2 to 0.3 MPa, and grout the cement slurry to the design. After the cement slurry is poured to the design position for 5 minutes, we should check the slurry. If the slurry sinks, refill it. If it does not sink, stop grouting. The grouting method of the inner anchor section is the same as that of the stretch section grouting except for the flushing step ^[8].

4.6 Tension of the Anchor Cable

In management projects of geological disaster, the most important part of the construction of prestressed anchor cables is tensioning. When the anchor cable is tensioned, the tensioning equipment should be prepared first, including supporting oil pumps and jacks. After the machine is ready, strict inspection is performed to adjust the accuracy of the pressure gauge accurately, and the accuracy is not less than 1.5. And in the inspection process, the direction of the jack piston should be adjusted to the direction and tension operation. In addition, in the process of anchor cable tensioning, it is not allowed to operate arbitrarily or act intuitively. It should be strictly implemented in accordance with the current norms and standards. The anchor cable tensioning operation should be performed under the standard to ensure the smooth operation of tensioning and effectively avoid the occurrence of hidden dangers. When the anchor cable is stretched to anchoring, one-way pre-tensioning should be adopted for the end.

5. Conclusion

It is learned from the above that when using prestressed anchor cables for the management of geological disaster, the difficulties and points of construction should be analyzed according to actual engineering. At the same time, during the construction process, effective and reasonable technical measures should be taken to ensure the construction quality and efficiency of prestressed

anchor cables and give full play to the application of prestressed anchor cables in disaster management.

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