

Discussion on the Exploration of Grouting Construction Technology in Water Conservancy Engineering

Yide Lu

Huangzhong County Water Bureau, Xining 811603, China

Abstract:

At present, with the rapid development speed and development space of water conservancy projects in China, the foundation that can be used for the construction of water conservancy projects is less and less. As the foundation grouting technology has been applied in a wider range and more attention has been paid to the adaptability of the foundation grouting technology and geological conditions, the requirements on the foundation are usually very harsh in water conservancy projects, and their foundations must be strictly treated through special requirements in order to achieve the performance requirements of seepage prevention and stability that water conservancy projects must have. Therefore, it is very important to use the appropriate technology to deal with the foundation of the water conservancy project, and it is necessary to fully prepare and deal with the waterproofing of the ground foundation in the early stage of the water conservancy project construction, otherwise it will bring many difficult problems to the construction unit. Therefore, the foundation grouting construction technology plays a very important role in the construction of water conservancy projects. This paper aims to briefly analyze and discuss the foundation grouting construction technology of water conservancy projects.

Keywords:

Water conservancy project; grouting; construction technique

1 Main construction methods of grouting construction technology

1.1 Full hole one-time grouting technology

Full-hole one-time grouting construction technology is a relatively basic and simple construction method, in the construction to drill directly from the grouting hole, the drilling process will be to the predetermined depth, and then direct grouting, in the grouting process to a one-time continuous completion of the entire hole grouting. However, there are some problems in the application range of full-hole grouting technology, the scope of application is relatively small, the effect of grouting is also general, and it is very susceptible to the influence of hole depth. Therefore, there are certain requirements for rock soil structure during construction.

1.2 Top-down subsection grouting technology

Subsection grouting technology involves pre-segmenting the boreholes, usually the length of the section should be controlled between three meters and five meters. Using the top-down grouting sequence, the drilling grouting of the upper section should be implemented first, and the subsequent grouting work can be carried out after the grouting of the upper section is solidified, and then the grouting operation of each section is completed in turn. In the process of application, the quality of grouting is relatively high, so it is easier to apply in some geological conditions where the rock layers are relatively fragile, and the quality of grouting can be well controlled by using this grouting technology in these areas.

1.3 Bottom-up subsection grouting technology

In the construction of the bottom-up grouting technology, it is necessary to drill holes in accordance with the bottom-up sequence. This grouting construction technology is relatively simple in operation, and the construction amount is usually relatively small, so the construction method should be strictly controlled to control it within a reasonable range. The bottom-up construction method can avoid the problem of grouting when applied in the area with good rock condition. Sublevel grouting

from bottom to bottom, water pressure test should be carried out in each sublevel, and then the grouting quality of each drilling section should be well tested.

2 Specific application of foundation grouting construction technology in water conservancy engineering

2.1 The application of grouting construction technology in the construction of karst sections

The grouting of karst development areas is generally carried out by experience or by reference to the practice and grouting test results of similar projects. The grouting of karst sections is treated in different ways according to whether there is a filler or not, but the construction with filler is more difficult. In the face of infill karst sections, the construction technology should be determined by the depth and size of the karst.

(1) High-pressure grouting is used for the construction of karst areas. When treating karst, high-pressure cement grouting is usually used without flushing, that is, in order to achieve the purpose of making the filler squeezed and compacted, a relatively high grouting pressure is used for treatment, so as to improve its stability and impermeability. In addition, high-pressure grouting also has a splitting effect, which can make the cement interspersed into the soil in a strip and form a grid-like package, which greatly improves the stability of the dam.

(2) High-pressure rotary grouting is used for the construction of karst areas. High-pressure rotary grouting is mainly used to drill the grouting pipe with a special nozzle into the predetermined position of the soil layer with a drill rig, and then use a high-pressure pulse pump to spray the cement slurry through the injection device at the lower end of the drill pipe to the surrounding area at high speed into the soil mass, meanwhile one side of the drill pipe rotates at a certain speed, and the other side is slowly lifted at a low speed, so that the soil is fully mixed with the cement slurry, and after cementation and hardening, a cylinder with a relatively uniform diameter and a certain strength (called a jet grouting pile) is formed in the foundation, so that the foundation is reinforced.

(3) The application of foundation grouting construction technology in shallow mud-bearing karst. Shallow mud-bearing karst is mainly manifested as large-scale karst exposure in the circumference or shallow burial, at this time, the filling should be dug out first, then the cement will be backfilled, and finally the grouting treatment will be carried out.

(4) The application of foundation grouting construction technology in deep karst. If the karst is buried for more than 50m, then it is a deep karst. For deep karst, if it is difficult to use rotary spraying method or flower tube method and other similar auxiliary measures, we can use grouting technology to grouting around the karst, so that the filling of the karst is gradually squeezed and finally solidified under the action of cement, and finally the karst cave position is drilled and grouting according to the principle of sequential encryption.

2.2 Irrigation method of large suction volume in water conservancy engineering

Generally speaking, the grouting of rock joints in water conservancy projects is generally finished within 1-3h, and the unit ash consumption is less than or equal to 120-220kg/m. At this time, as long as the normal construction process can be followed. However, it is necessary to take relevant measures to solve the situation that sometimes the grouting is difficult to end due to the large amount of slurry suction in rock cracks. The main reason for this is that the special formation structure conditions can cause the cement slurry to overflow from the nearby surface or gradually drain along a fixed channel. In this case, the following construction principles should be observed:

(1) Adopt current limiting measures. The injection rate is limited to no more than 10-15L/min to reduce the flow speed of the slurry in the fissure and promote the slurry deposition as soon as possible. After the injection rate is significantly reduced, the pressure is raised to keep the injection rate basically at the level of 10-15L/min, and the grouting is finished until the end of the grouting standard is reached.

(2) The pressure reduction treatment method is adopted. The grouting treatment is carried out by reducing the pressure or even by artesia flow, and the grouting pressure is gradually restored after the slurry is solidified and cannot flow, and the treatment is carried out in accordance with the normal process.

(3) The treatment method of multiple grouting is adopted. Multiple grouting is intermittent grouting, that is, a certain amount

of grouting or grouting time is the standard, when the standard is reached, the grouting should be interrupted and the grouting should continue after waiting for a certain time. As for the specific grouting interval time can be set according to the requirements of the project, the purpose of grouting and geological conditions depending on the situation, but usually do not exceed 2-8h. This special case of grouting, at the end of the design pressure does not necessarily have to reach; If it is not possible to end the grouting under the design pressure, the grouting can be ended at low pressure, and after a period of solidification, the hole is swept and the irrigation is repeated, and the grouting is completed under the design pressure.

2.3 Application of grouting construction technology in the case of serious water leakage

There are generally two causes for serious water leakage in the construction of water conservancy projects. The first is that the construction site of the water conservancy project is located in the soluble rock area, such geological conditions are very easy to form karst caves and dissolved trenches, and serious water leakage. The use of conventional grouting methods is not only ineffective, but also costly, so it is necessary to adopt other solutions.

(1) The treatment method of mold bag grouting is adopted. The mold bag is a very high strength textile, and its materials are mostly nylon, polypropylene or polyester, so it also has very good wear resistance. Using mold bag grouting, the water in the slurry will seep out under the pressure of the slurry, while the sand and stone particles in the slurry will remain in the mold bag, so that the water-cement ratio of cement is reduced, the solidification time is shortened, and the consolidation strength is enhanced. In addition, bound by the mold bag, cement does not have the characteristics of flow under water, will not be washed away by the water; The "deformation ability" of the mold bag can make it adapt to a variety of shapes of the cave, which is conducive to the blockage of the cave.

(2) Use filling grade batching for treatment. In popular terms, it is to use relatively viscous cement to irrigate gravel and coarse sand, and pay attention to the diameter of gravel in the process of irrigating gravel from small to large. If there is still no good effect after this, you can use more viscous cement irrigation grade ingredients. At this time, the grade ingredients should include: sand, gravel, soil and other mixtures with uneven particles, which can form a natural reverse filter layer. The number of grade ingredients injected should be flexible, can be 200kg, can also be 1000kg, the purpose of filling particles is mainly to use a grade gravel in the narrow gap to form a "bridge", quickly blocked the gap in the middle, in order to form a filter layer, and finally the channel blocked.

Conclusion

Grouting technology in water conservancy engineering is a very complex construction technology, and the requirements for designers and construction personnel are relatively high in construction, so great attention should be paid to it in construction. In recent years, the basic grouting technology of water conservancy engineering has been greatly developed, in the construction of the basic grouting technology of the indicators to carry out full research, the design program to optimize, in the construction to achieve the advantages and avoid the weaknesses, to ensure the construction effect of the water conservancy project, to better promote economic and social development.

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