

Research on Construction Technology of Deep Foundation Pit of High Voltage Transmission Line in Plateau Area

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Abstract: With the further expansion of China power grid, it is the current and future trend of power system development to set up high-voltage or even ultra-high-voltage transmission lines. Because the construction environment of high-voltage transmission lines is very complex and changeable, how to ensure the construction quality and progress of transmission lines according to the construction drawings provided by the design unit is the key to the construction of transmission lines. The quality level of deep foundation pit excavation is a representative factor that profoundly affects the construction quality level of high-voltage transmission line projects in plateau areas. Only by managing the construction quality of all sub-projects in the power system can the stability of power operation be effectively guaranteed. This paper expounds the key points of deep foundation pit excavation construction technology, in order to analyze the deep foundation construction technology of high-voltage transmission lines in plateau area, and provide theoretical support for the deep foundation pit construction of high-voltage transmission lines in plateau area.

Keywords: Transmission line, Construction of deep foundation pit, Plateau section.

1. Introduction

With the rapid growth of China's economy, the technical requirements for the construction of high-voltage transmission lines are getting higher and higher. A very important part of the power supply and distribution network is the transmission line, which transmits electric energy from remote mountainous areas to cities, and is the main artery of agricultural and industrial economic development in China [1]. Transmission line is an important part of power system, and it is responsible for the transmission and distribution of electric energy in power operation. In a word, the stable operation of the power system depends on the construction quality of all sub-projects in the power system, that is to say, only by managing the construction quality of all sub-projects in the power system can the stability of power operation be effectively guaranteed [2]. The quality of transmission line construction in plateau area has a consistent relationship with the improvement of power supply efficiency of transmission network in this area [3]. In the process of economic construction in plateau area, it is necessary to provide stable and reliable power supply for its corresponding life and industrial production [4]. In the construction of transmission line project, the foundation construction of deep foundation pit is a very critical link, which has a very important impact on the whole subsequent construction process [5]. Therefore, it is necessary to conduct in-depth analysis and research on its construction technology, and on this basis, put forward targeted measures to ensure the construction quality of deep foundation of transmission line project.

High-voltage transmission lines generally choose the structure of iron tower or pipe pole, but in order to save the investment cost of the project, many transmission lines in remote mountainous areas generally choose the structure of iron tower or concrete pole. For the tower project, the construction quality of the tower foundation is the key to ensure that the transmission line will not sink during normal

operation or the tower will not topple or distort under the external force [6]. For the construction of transmission lines, the quality level of deep foundation pit excavation has a vital influence on the construction quality level of the whole transmission lines [7]. If the construction is not carried out in strict accordance with the construction drawings, or the scheme is not adjusted according to the actual situation in case of special circumstances, it will leave a great potential safety hazard for the operation of the tower. Once the foundation concrete cracks, foundation subsidence landslide and foundation water accumulation, etc. will affect the smooth operation of the transmission line, and even lead to a major accident of pole fall, resulting in very serious economic losses [8]. This paper expounds the key points of deep foundation pit excavation construction technology, in order to analyze the deep foundation construction technology of high-voltage transmission lines in plateau area, and provide theoretical support for the deep foundation pit construction of high-voltage transmission lines in plateau area.

2. Significance of Transmission Line Construction Quality Management in Plateau Area

2.1. Ensure the quality and safety of transmission line construction.

In the process of power engineering construction, managing and controlling the construction quality of transmission lines not only provides a strong guarantee for the overall construction quality of power construction to a certain extent, but also avoids safety accidents caused by quality reasons and reduces the construction safety risks. After the line retest is completed, the tower foundation shall be excavated, and the excavation of the foundation shall be subject to the design and on-site measured terrain [9]. Before digging the pit, the sundries such as the foundation surface and the floating soil nearby should be cleaned up. Because

high-voltage transmission lines need tower structure construction in construction, and there are certain operational safety risks in trial operation after wiring, only by improving the construction quality of transmission lines in plateau can the safety of its construction promotion and use be ensured. For the tower installed on the rock structure, scientific and reasonable excavation measures must be selected to ensure the integrity of the rock structure when excavating the foundation. In the process of digging a foundation pit, we should make full use of the plumb line to accurately control the verticality and diameter of the foundation pit, and check the root opening size and pit depth frequently to ensure that the size is moderate and controlled within the expected range. In the process of construction, construction quality management must be done in strict accordance with the relevant regulations of the State and State Grid Corporation to ensure that all technical indicators are achieved.

2.2. Improve construction efficiency

The natural environment in the plateau also affects the construction of transmission line network, which makes it more difficult to guarantee the quality of power engineering construction in the plateau. Therefore, high-quality transmission line construction in the plateau is an important part of improving the energy supply system in the plateau, and it is also an essential facility guarantee for the economic development in the plateau. In the construction of transmission line network, once the quality control of any link is not done well, it will affect the quality of the whole power grid construction, and the quality problems of transmission lines are found in the later stage. In order to ensure the quality of project completion, it is necessary to take measures to remedy or rework directly, which will lead to the decrease of transmission line network construction efficiency and the extension of power system network construction time in plateau areas, which is not conducive to the control of transmission line construction progress [10]. The climatic conditions in plateau area are poor, and the effective construction time is short. Managing and controlling the

construction quality of transmission lines can minimize the occurrence of faults and construction accidents, avoid the waste of construction manpower and materials to a certain extent, and improve the construction efficiency of transmission lines. If there is a problem in the construction process, technicians can handle it at the first time. All construction technical data should be recorded and kept.

3. Key Points of Deep Foundation Pit Construction of High-voltage Transmission Line in Plateau Area

3.1. Quality management in the construction preparation stage.

In the process of deep foundation excavation of power transmission project, special supervisors must be arranged to manage the safety of the construction process. In any project construction, the construction drawing paper is the foundation of the project construction, and the same is true in the plateau transmission line project construction. Before the construction of transmission lines, it is necessary to optimize the design of the drawings. Especially before the construction work is advanced, it is necessary to find out the deficiencies of the construction design of transmission lines in plateau through the technical joint review and optimization discussion of many participating units, and improve the design quality through technical optimization. Before the foundation construction of deep foundation pit, it is necessary to thoroughly clean up the clods and soil residues near the pit mouth. Avoid serious production safety accidents caused by the soil at the pit mouth falling into the pit in the process of foundation pit excavation, and may even cause casualties of construction personnel. During the foundation construction, the constructors must go up and down the foundation pit through the ladder, and the whole process needs to fasten the safety belt. Figure 1 shows the wiring process of transmission lines.



Figure 1. Transmission line stringing process

Before all construction equipment is put into use, its performance and various technical indicators should be systematically and comprehensively checked and analyzed to

avoid any failure during use that may affect the construction process. In the economic construction of China Plateau, the transmission line project should not only take care of the local

climate, but also survey the local topography and geological conditions with high quality. Before the project starts, the construction organization should be optimized and adjusted, and the construction technical scheme and cost budget should be reviewed and the quality improved. If the diameter of the deep foundation pit is not clear in the early stage, and the diameter of the deep foundation pit is not enough, then it will not only be difficult to construct, but also significantly increase the construction cost. After the deep foundation pit is excavated, concrete should be poured on the hole wall immediately, so as to shorten the time that the hole wall is exposed to the air as much as possible.

3.2. Quality management of transmission line infrastructure construction

In the construction of transmission lines in China Plateau, the quality of foundation construction is directly related to the safety of line operation. Therefore, in the construction of transmission lines in Plateau, the quality control of foundation construction must be done to ensure that the construction of transmission lines meets the design requirements. The proper selection of towers is closely related to the speed and economy of transmission lines, the reliability of power supply and the convenience of maintenance. The first step in the construction of foundation structure is to investigate and analyze the geological conditions of tower foundation construction, and to optimize the design scheme and change the technology through the analysis of the actual situation, followed by the pouring construction of steel and concrete structure caps. In the process of foundation pouring, due to the large temperature difference in the plateau area, the antifreeze admixture with the corresponding dose after the test should be added to the concrete mortar according to the temperature condition. At the same time, during the installation of the anchor bolts, the size and position should be checked repeatedly, and then the concrete mortar should be poured after being fixed correctly. The basic process of high-voltage transmission line construction is shown in Figure 2.

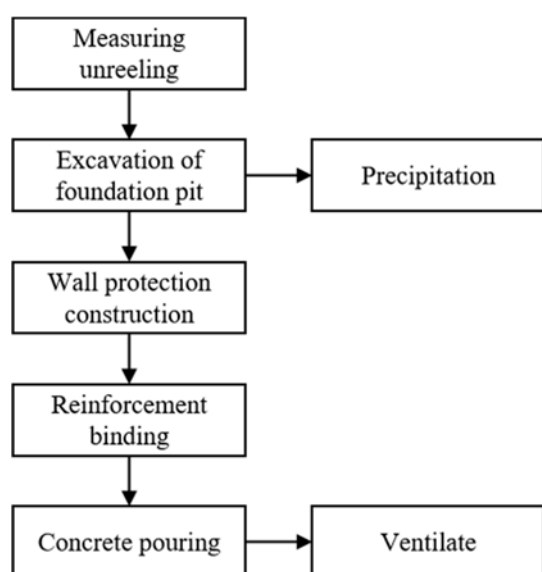


Figure 2. Basic process of high-voltage transmission line construction

During the long-term operation of transmission lines, towers are the main supports of conductors and lightning

wires. In addition, plateau areas are affected by rain and snow for a long time, so the requirements for their load force are high, and the deformation should be controlled within a certain range. In addition, in the construction process, considering that the towers in plateau areas are mostly on steep hilltops, the front side of the tower should be controlled as much as possible to reduce the excavation amount of foundation works. During the long-term operation of transmission lines, towers are the main supports of conductors and lightning wires. In addition, plateau areas are affected by rain and snow for a long time, so the requirements for their load force are high, and the deformation should be controlled within a certain range. In the process of foundation construction, the excavation of the original earth and stone will probably affect the stability of the soil. If the excavation and accumulation are not standardized, it may also increase the pressure on the slope, and together with the invasion of various bad weather in the plateau area, it is easy to cause landslides and other disasters. Therefore, after the foundation construction is completed, the foundation treatment must be done well, the abandoned excavation must be removed, the potential safety hazards can be reduced, and the normal operation of the transmission line can be ensured.

4. Conclusions

With the rapid growth of social economy and the accelerating process of urbanization, the scale and quantity of urban construction projects are increasing rapidly, and the problems of urban construction and management are becoming increasingly prominent. The construction quality of high-voltage transmission line foundation works plays a key role in the safe and stable operation of the whole power system. The construction quality of transmission lines is largely determined by the quality management and control in the construction stage. Because the construction of transmission lines in plateau areas is affected by many factors such as natural environment and geographical conditions, it is difficult and stressful to ensure the construction quality of transmission lines. During the long-term operation of transmission lines, towers are the main supports of conductors and lightning wires. In addition, plateau areas are affected by rain and snow for a long time, so the requirements for their load force are high. In the process of transmission line construction in plateau area, there are key points of quality management in the construction of towers, wires and other structures. Only by knowing these key points of quality management, and constantly improving the effectiveness of quality management by constantly improving the practicality of quality management in specific engineering construction practice, can the construction of power system network in plateau area be optimized.

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