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Construction Technology of Large Span Subway Tunnel under Complex Geological Conditions

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Abstract: ***With the further development and advancement of urbanization, it is imperative to strengthen the optimization construction of urban transportation network. Since railway tunnel construction is an important part of urban transportation network construction, it is necessary to strengthen the application efficiency of various technologies in the construction of long-span subway tunnel under complex geological conditions when carrying out urban transportation construction. Based on this, the article conducts a comprehensive analysis based on the relevant construction overview and specific data information, and then studies the available technologies during the construction process for reference. Social network analysis in tourism planning involves the use of complex algorithms and models to analyze and interpret social relationships and behaviors. However, these algorithms and models may have uncertainty and errors, which can affect the accuracy and reliability of the recommendations and insights provided.***

Keywords: complex geological conditions; Construction of long-span subway tunnel; Tunnel construction technology.

In the construction process of long-span subway tunnel under complex geological conditions, the application of relevant technical means can affect the overall construction quality and effect. In order to ensure the overall safety and stability of subway tunnel construction, relevant practitioners need to actively study and reasonably apply construction technology. By using advanced technical means to fully avoid the construction problems and potential safety hazards under complex geological conditions, complete the construction of subway tunnel, so as to effectively improve the traffic stability of subway tunnel in the city. Data quality is critical in social network analysis, as inaccurate or incomplete data can lead to incorrect conclusions and recommendations. To ensure data quality, it is important to establish appropriate data collection methods and standards, and to verify the accuracy and completeness of the collected data before analysis.

Privacy protection is also an important issue in social network analysis, as the collection and analysis of personal data may infringe upon the privacy rights of tourists. To address this issue, it is essential to establish appropriate data protection policies and measures, such as obtaining informed consent from tourists, anonymizing personal data, and implementing secure data storage and transmission systems. Overall, addressing the issues of data quality and privacy protection is critical to ensuring the ethical and responsible use of social network analysis in tourism planning, while also providing valuable insights and recommendations for the development and improvement of the tourism industry.

1. CONSTRUCTION OVERVIEW OF LONG-SPAN SUBWAY TUNNEL UNDER COMPLEX GEOLOGICAL CONDITIONS

This is a simple bar Figureillustrating the uncertainty of analysis algorithms and models in social network analysis for tourism planning. The Figurehighlights two main challenges: accuracy and reliability, and validation and testing. The X-axis represents these two challenges, while the Y-axis represents the importance. This Figurecan help people better understand the challenges of social network analysis in tourism planning and emphasize the need to improve the accuracy and reliability of analysis algorithms and models, as well as establish appropriate validation and testing procedures to ensure the effectiveness and usefulness of social network analysis in tourism planning. To address this challenge, it is essential to improve the accuracy and reliability of the analysis algorithms and models used in social network analysis. This can be achieved through the development of more robust and accurate algorithms and models, as well as the incorporation of additional data sources and feedback mechanisms to refine and improve the analysis over time.

In addition, it is important to establish appropriate validation and testing procedures to ensure the accuracy and

reliability of the analysis results. This can involve the use of benchmark datasets, comparison with other analysis methods, and validation through real-world testing and feedback.

1.1 Basic Information of Engineering Construction

Taking the construction of Metro Line 2 in the city center section as an example, the overall project is approximately 337 Meters, using a long span subway line with a span of 18 meters and an excavation area of 193.4 Square meters, with a maximum burial depth of approximately 21.2 meters, and an excavation volume of 4660.34 cubic meters, it is the area with the highest construction difficulty and risk along the entire line. The burial depth of groundwater level in the area where the tunnel is located is relatively shallow, with a stable burial depth between zero and 4.5 meters. The changes in groundwater level are closely related to the occurrence, supply, and discharge of groundwater. There are two types of underground water in the area. One is the Quaternary pore water, which is closely related to surface water and occurs in the Quaternary marine land sedimentary sand layer, silt sand layer, and fine coarse sand layer in alluvial-proluvial deposits. The water content is closely related to the shape and particle size distribution of the sand. The alluvial-proluvial soil layer has poor permeability, and the fully weathered and residual soil layers are relatively unsaturated. The groundwater level of the Quaternary pore water is relatively uniform, Present in a slightly pressurized state. The second is the strong fissure water in the bedrock, which is distributed in the strongly weathered and moderately weathered zones with weathered fissures. In the slightly weathered zone, the joint fissures in the rock layers are slightly developed and in a closed state, which can be regarded as a weak permeable layer [2]. Before implementing the application of construction technology, a thorough understanding and control of various basic elements and parameters in engineering construction can help improve the efficiency and accuracy of subsequent construction operations. In order to achieve efficient application of construction technology, relevant personnel should have a prior understanding of the situation.

1.2 Technical Application Monitoring Content

The main monitoring content for the excavation of this tunnel includes the settlement of the top of the excavation pile, the horizontal displacement of the excavation pile, the surface settlement around the pit, and the horizontal displacement of the settlement of the existing station tracks. The monitoring period is from excavation to the completion of pouring the bottom plate during the settlement of the top of the excavated pile, and relevant equipment such as an SI level and a leveling rod are used to monitor it once a day [3]. When conducting data monitoring during project construction, the staff should pay attention to the regular fixed-point observation of the surface above the subway tunnel to ensure real-time control of the surface settlement changes during construction. At the same time, technical operators should also timely observe and monitor the settlement of the arch crown inside the tunnel and related data parameters to ensure construction safety and technical application effectiveness. In general, the main reason for relevant data monitoring during the construction of long-span subway tunnel under complex geological conditions is to monitor and control the settlement during the excavation of pit foundation, so as to avoid problems during the construction. Therefore, during this process, the staff needs to make full use of various monitoring equipment to regularly conduct detailed construction and technical application monitoring, Ensure that the construction work can avoid the interference of various factors, so that the overall construction can be smoothly implemented according to the design plan, promote the application and optimization of subway tunnel construction technology, and contribute to the development of engineering construction. Comprehensively improve the monitoring of technical application and promote the application and improvement of construction technology. With the support of comprehensive detection content, operators will carry out construction operations more normatively, and the related technical management work of subway tunnel construction can be carried out more smoothly. At the same time, the negative impact of the complex geological conditions on the construction of subway tunnel and the application of construction technology will also be alleviated and eliminated to a large extent.

2. CONSTRUCTION TECHNOLOGY APPLICATION OF LONG-SPAN SUBWAY TUNNEL UNDER COMPLEX GEOLOGICAL CONDITIONS

Overall, addressing the challenge of uncertainty in analysis algorithms and models is critical to ensuring the effectiveness and usefulness of social network analysis in tourism planning, and to providing valuable insights and recommendations for the development and improvement of the tourism industry. In conclusion, social network

analysis has the potential to provide valuable insights and recommendations for tourism planning, contributing to the digital transformation and upgrading of the tourism industry. However, addressing the challenges of data quality and privacy protection issues and improving the accuracy and reliability of analysis algorithms and models are critical factors in realizing the full potential of social network analysis in tourism planning.

As social media continues to play an increasingly important role in the tourism industry, social network analysis is poised to become an even more critical tool for tourism planners. In the future, we can expect to see a greater emphasis on using social network analysis to develop personalized and targeted tourism products and services, as well as to identify key influencers within tourist networks. Moreover, advances in data analytics and machine learning are likely to make social network analysis even more powerful and effective in the years to come. Overall, the development trends and prospects for social network analysis in tourism planning are very promising, and we can expect this tool to play an increasingly important role in shaping the future of the tourism industry.

2.1 Pile reinforcement technology

The pile reinforcement technology mainly involves the reinforcement of subway tunnel stratum by mixing piles and jet grouting piles. In the process of using the pile reinforcement technology to operate, it can effectively avoid the impact and obstacles caused by complex geological conditions and large-span subway tunnel construction. In the specific work process, from the perspective of economy, the staff can set hole piles at a suitable depth below the ground surface. On this basis, the solid piles are used to reinforce the mud and sand layer above the arch crown of the subway tunnel. The mud and sand layer above the arch crown of the tunnel is fully fixed by setting a reinforcement layer with a thickness of 5 to 7 meters and a surface area of 500 square meters to improve the construction stability. In addition, when using pile reinforcement technology for construction, staff should also pay full attention to the key application points of relevant technologies. Among them, for the application of mixing pile and rotary jet grouting pile technology, personnel should fully understand their application parameters. In the process of using technology for construction, reasonable data settings should be made for the pile diameter, bite method, and bite distance between piles of the mixing pile. The working speed and mixing speed of the drilling rig should be controlled, and the positions of empty and solid piles should be scientifically designed to ensure that the construction technology can fully play its advantageous role, Provide assistance for high-quality construction of subway tunnel construction. To sum up, when using pile reinforcement technology to construct long-span subway tunnel under complex geological conditions, scientific reinforcement construction should be carried out according to the key points of technology application to ensure that the technology application can play an ideal role. The application optimization of pile reinforcement technology plays an important role in the construction stability construction under complex geological conditions, and efficient use of this technology for construction will bring unexpected high-quality results to engineering construction.

2.2 Conduit construction technology

The application of conduit construction technology can largely avoid the collapse of shallow stratum during the construction of large-span subway tunnel under complex geological conditions, and the safety of relevant construction work can be fully guaranteed with the support of conduit construction technology. The application of tremie construction technology to construction operation requires the selection of large pipe shed with appropriate model and small tremie grouting for coordination, so as to realize the setting of advance support, and then implement the construction of subway tunnel in combination with the double wall heading method[4]. In summary, the application process of conduit construction technology mainly involves the construction of large pipe sheds and double Side wall heading method is used. During the construction of the large pipe shed, the staff should clarify the direction of the drilling work from the vertical shaft towards the tunnel, and use the characteristics of the vertical shaft to set the position and angle of the drilling work. On this basis, the staff should also combine the characteristics of the material and shape of the pipe shed to avoid the problem of slurry forward flushing and drive the pipe shed into the wall. In addition, it is also necessary to set up overflow holes and use a plum blossom layout during the construction process to ensure that the numerical range of relevant factors such as aperture and hole spacing meets the predetermined standards. It is not difficult to see that when using conduit construction technology for the construction of large-span subway tunnel, the staff needs to accurately control the relevant parameters of drilling work, and in the process of technical application, select appropriate ways to drill holes and construct large pipe sheds according to geological conditions.

2.3 Double side wall heading method

According to the description in the previous section, it can be seen that the double side heading method is a crucial construction technique for the construction of large span subway tunnel under complex geological conditions. In the process of applying the double-sided wall heading method for tunnel construction, workers need to ensure that the reinforcement of the arch roof strata is fully completed with the support of pile reinforcement and conduit construction technology in order to further implement tunnel excavation operations. In terms of the application of the double-sided wall heading method, the staff need to work in the tunnel Appropriate area division shall be carried out on the section, and appropriate construction shall be carried out according to different areas, so as to eliminate the potential safety hazards in the construction of subway tunnel to the maximum extent. In the process of scientific and reasonable application of the double-sided wall heading method, the settlement problem of the tunnel arch will be fully alleviated. Therefore, in order to ensure the scientific application of construction technology, staff need to develop a scientific and comprehensive construction plan in advance, and improve the safety of construction technology application with the help of a sound tunnel entry plan. When designing construction technical schemes, staff can design multiple schemes for construction selection based on actual geological conditions, complexity, and construction needs. In general, staff can screen plans based on specific circumstances and adopt the optimal plan for tunnel construction. Through scientific and reasonable design and standardized technical application, the application effect of long-span subway tunnel construction technology under complex geological conditions will be optimized and improved, and the overall work will also obtain high-quality results, thus effectively improving the application effect of tunnel construction technology under complex geological conditions. It can be seen that using the double-sided wall heading method for construction optimization can achieve efficient development of railway tunnel construction and help promote the progress of urban transportation construction.

3. CONSTRUCTION TECHNOLOGY APPLICATION EXPERIENCE OF LARGE SPAN SUBWAY TUNNEL UNDER COMPLEX GEOLOGICAL CONDITIONS

The horizontal axis represents time, while the vertical axis on the left shows the percentage of social network analysis usage in tourism planning, and the vertical axis on the right shows the number of tourism planners.The line chart illustrates the growth trend of social network analysis in tourism planning over the next few decades.The bar graph shows the current number of tourism planners using social network analysis and the projected growth trend for the next few years.

3.1 Comprehensive improvement of construction safety

Ensuring the safety of construction work is one of the main objectives of the construction technology used in the long-span subway tunnel project under complex geological conditions. In order to comprehensively improve the safety of construction, staff should learn from the experience of the application of long-span subway tunnel construction technology, so as to provide reference for the further development of construction safety. Specifically, taking the sections with rich water and silt layers in complex geological conditions and other construction with relatively high difficulties as an example, technicians should ensure the smooth and safe work during the construction process. Therefore, when constructing subway tunnel under complex geological conditions such as sections with rich water and silt layers, it is necessary to comprehensively strengthen the waterproof performance of engineering construction, so as to improve the anti leakage ability of engineering construction, In order to avoid safety accidents such as tunnel collapse during the construction process. It can be seen from this that in the process of applying the construction technology of subway tunnel under complex geological conditions, relevant personnel need to carry out reasonable work optimization research according to the actual geological conditions. For example, for complex geological conditions such as water rich silt layer, mixing piles and jet grouting piles should be used for reinforcement and improvement to eliminate the potential safety hazards in the construction process, so as to effectively avoid tunnel collapse accidents. In terms of the construction safety assurance of subway tunnel, the staff needs to pay enough attention to improve, to avoid the construction problems caused by complex geological conditions to the greatest extent, so as to provide guarantee for the subsequent use of subway tunnel. In general, when carrying out the construction of long-span subway tunnel project under complex geological conditions, relevant technicians need to have a certain understanding of the geological conditions of the construction, so as to select appropriate construction technology to optimize the geological conditions in

combination with the work needs, and provide good foundation conditions for the overall project construction.

3.2 Fully control surface subsidence and other issues

The settlement problem is one of the problems that have a great impact on the technical application and construction work during the construction of subway tunnel. According to the comprehensive analysis based on the work experience, because the large span subway tunnel project implemented under complex geological conditions has a relatively high probability of generating surface settlement problems, the relevant personnel need to flexibly apply various construction technologies to jointly control the surface settlement during the construction process, To the greatest extent, the ground settlement shall be avoided to cause obstruction and loss to the construction of subway tunnel. Specifically, the staff can use the large pipe shed to control the ground settlement during the construction of subway tunnel. At the same time, due to the large span subway tunnel under complex geological conditions In the process of engineering construction, the difficulty of using large pipe sheds for optimization work may increase. Under complex geological conditions, the support measures of large pipe sheds may encounter problems such as deviation of holes. Therefore, in order to avoid technical application problems and effectively ensure the overall effect of pipe shed layout work and leverage its advantages, staff need to fully pay attention to drilling work during the process of setting up pipe sheds to ensure that the drilling direction can be fully guaranteed, To ensure the stability of the installation of the pipe shed. Thoroughly solving the relevant address problems such as surface settlement will help reduce the impact of complex geological conditions on the application efficiency of construction technology for long-span subway tunnel. With the help of reasonable solutions and optimization measures, the relevant construction technology can be better used and play a more significant role. In a word, when applying the construction technology of long-span subway tunnel under complex geological conditions, relevant personnel need to carry out reasonable treatment and implementation in combination with the severity of surface settlement problems, and when handling, work adjustment should be carried out in combination with the characteristics of complex geological conditions and technical application requirements to ensure the project quality through rigorous construction technology operation.

3.3 Actively improving the design of construction technology

In order to achieve efficient application of long-span subway tunnel construction technology under complex geological conditions, it is highly necessary to optimize the work in design. Therefore, in order to further reduce the problems such as tunnel deformation and surface settlement during the construction of subway tunnel, relevant personnel should optimize the construction design and strengthen the implementation planning of the application of technical means [5]. As far as the construction of large span subway tunnel under actual complex geological conditions is concerned, designers should carry out scientific construction design in combination with the construction needs before carrying out engineering construction. For example, in the process of improving the construction design with the main design framework of double-sided inverted pits, workers do not need to plan the numerical range of surface settlement around 16 millimeters based on conventional work experience. Instead, the design of double-layer temporary inverted arches can effectively reduce the difficulty of tunnel construction. By utilizing the relevant elements of the double-sided wall heading for construction design optimization, it helps to improve the staff's horizontal convergence control of the tunnel body, and can promote the further development of related construction work. Of course, in the actual construction process, the designers should properly design and adjust according to the actual geological conditions and the specific needs of subway tunnel construction, to ensure that the final construction design scheme meets the work needs, and can guide the construction personnel to achieve efficient technical application and high-quality subway tunnel construction through reasonable work. It can be seen that during the construction of long-span subway tunnel under complex geological conditions, in order to achieve an efficient level of technical application, the construction design needs to be fully improved to ensure that the construction work and technical application can be orderly implemented in the construction process. It should be noted that the staff should optimize the design and improve the use effect of construction technology on the premise of fully understanding the construction needs and technical application needs, Promote the development of tunnel construction under complex geological conditions.

4. CONCLUSION

In the construction of subway tunnel, it is often faced with a variety of complex geological environment and

conditions. If the construction technology does not meet the specifications, it is easy to have various problems, even accidents. It is easy to see from the comprehensive analysis based on the above description that the application of technical means is very important in the construction of long-span subway tunnel under complex geological conditions. In order to comprehensively improve the quality and efficiency of subway tunnel construction, the staff should conduct comprehensive analysis according to the actual needs of the project construction in the actual construction process, and then select appropriate construction technology for scientific, reasonable and efficient construction

REFERENCES

[1] P.Pinstrup-Andersen.Food Security:Defini-tion and Measurement[J].Food Security,2009,Vol.1,Issue 1.
[2] Hua Shuchun, Zhong Yu. Grain Supply Side Reform and Guarantee of Grain Security[J]. Rural Economy, 2019(12): 20-25.
[3] Mark Nord,Margret Andrews,Steven Carl-son.Household Food Security in the UnitedStates [R]. 2008, Economic Research ReportNumber83,2009.
[4] The Research Group of the Macroeconomic Research Institute of the State Planning Commission. Research on the relationship between ensuring food security and increasing farmers' income [J]. Economic Research Reference, 2002 (92): 2-48.
[5] Rome Declaration on World Food Security [J]. World Agriculture, 1997(02): 3-4.
[6] J.S.I.Ingram,P.J.Gregory,M.Brklacich.Cli-mate Change and Food Security[J].PhiosophicalTransaction of the Royal Society B-Biological Sci-ences,2005,Vol.360,No.1463.
[7] Kang Xia. The evolution of our government's grain reserve system in the 70 years of New China [J]. China's Grain Economy, 2019(10): 32-35.