Journal of World Architecture, 2023, Volume 7, Issue 3
http://ojs.bbwpublisher.com/index.php/JWA
ISSN Online: 2208-3499
ISSN Print: 2208-3480

Analysis of Construction Technology for River Regulation and Bank Protection in Water Conservancy Projects

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Abstract: There are many problems and deficiencies in traditional bank protection methods, which cause certain damage to the ecological environment of river channels. Recently, the issues of river management, improving bank protection technology, formulating reasonable construction measures, and ensuring the smooth and efficient implementation of construction have been receiving increasing attention.

Keywords: Water conservancy engineering; River management; Bank protection; Construction technique

Online publication: June 30, 2023

1. Introduction

Construction technology for river regulation and bank protection in water conservancy projects effectively prevents the adverse effects of river regulation construction on the surrounding river landscape and ecological environment, maintain the balance between construction and the ecology, ensure the safety and quality of water conservancy construction, ensure the safety of people's lives and property, and provide more high-quality services for the people. In addition, this technology can enhance the sustainability of water storage and drainage and act as a water storage during floods and natural disasters. At the same time, water conservancies can be used for irrigation, therefore effectively safeguarding the interests of many.

Traditional measures of river management have had varying degrees of impact on the surrounding environment. Bank protection can effectively improve the overall appearance of the river, maintain the balance of its ecosystem, and achieve coordinated and unified development of water conservancy project and environmental protection to a large extent, thus fully leveraging the important role of this technology in preventing soil erosion and flood control and drainage. The use of scientific and reasonable bank protection technology can further optimize the protective effect on the river environment, achieve a harmonious development between humans and nature, and ensure the performance of water conservancy projects, and promote better and faster development of China's socio-economy.

There are a few principles of water conservancy engineering, river management, and bank protection construction technology management. (i) General principle: The management of water conservancies should be in line with the overall planning and development of the city; it is important to prioritize the natural function of the river channel and make sure that it is not damaged, and that it can operate normally during river management. It is necessary to fully understand the overall ecological function, water quality, ecological landscape, and so on of the river channel; safety should be emphasized in the activities that are

going to be carried out. (ii) The overall order of rivers should be the main aspect in river management. It is also necessary to maintain the continuous operation of natural resources while protecting them and try to avoid human traces. The best way to protect ecology is to not damage it, that is ensuring good plant growth, retaining more plants in the natural environment, thus laying a solid foundation for ecological restoration work. In this way, the original natural landscape and ecological safety can be retained. The primary goal is to restore the natural ecosystem of the river channel. (iii) In the process of river management, it is necessary to establish the core idea of being people-oriented, emphasize the harmony between humans and nature, and pay attention to the guiding role of the environment for humans. Creating a good ecological environment while creating a green environment that can broaden one's horizons can subtly affect people's emotions, improve their self-cultivation, and ensure a harmonious relationship between humans and nature.

2. Deficiencies in the technology for river regulation and bank protection in water conservancy projects

At present, there are certain shortcomings in river regulation and bank protection in water conservancy projects, and it is necessary to improve the flood control and drainage of rivers.

However, the technology used in river management in China is somewhat backwards, making it difficult to achieve ecological environment protection of rivers. At the same time, bank protection is not added to both sides of the river in some water conservancy projects, resulting in poor flood control capacity. In addition, the facilities of water conservancy projects are subjected to varying degrees of erosion due to various factors, therefore affecting their actual function and efficiency, causing frequent depressions and collapses in river channels. In this case, the water conservancy management department did not put in enough effort in maintaining the river environment, leading to an increasingly serious problem of water and soil loss. After a long period of overloaded operation of water conservancy engineering facilities, the rivers become increasingly blocked, leading to river erosion and affecting the natural form of the river, causing the entire river to lose its flood resistance and drainage function, posing a serious threat to people's lives and property safety.

3. River regulation and bank protection technologies in water conservancy projects

3.1. The technique of lifting and filling in hydraulic engineering

Firstly, the soil should be properly selected, and the mining work should be done well, and construction personnel need to pay more attention to the management of embankment construction. During the process of selecting a suitable soil, it is important to ensure that the soil has strong anti-seepage ability and try to obtain materials from nearer areas to save construction time. Construction personnel need to have a comprehensive understanding and mastery of the soil quality, moisture content, mining conditions, and other related information of the soil material. For example, if the soil embankment is uniform, sub clay or medium loam soil should be used, whereas for anti-seepage embankments, soil with high viscosity should be used.

When mining soil, construction personnel should thoroughly clean the surface of the soil and select the best mining method based on the actual situation, so that the quality of soil can be controlled and that its parameters meet the relevant requirements.

Secondly, construction personnel should clean embankment foundation properly so that the subsequent embankment filling process can be carried out smoothly. Usually, the surface of the embankment is cleaned and garbage in the surrounding areas are cleared up. After cleaning the embankment and filling the first layer, corresponding compaction and leveling construction will be carried out.

Thirdly, construction personnel need to conduct compaction tests before formally filling the embankment to ensure the accuracy of the obtained data and that the construction requirements for

compaction quality are met. The moisture content of soil materials needs to be well-controlled, which is usually between 1-3%. In addition, construction personnel should set corresponding signs during the construction process to prevent leakage and other issues during segmented filling. At the same time, when compacting anti-seepage soil materials, it is necessary to control the amount of water sprayed to improve the actual construction effect.

Fourthly, during the process of filling the embankment, construction personnel need to comprehensively analyze and understand the relevant precautions and take targeted measures to ensure a safe and smooth operation. For example, if unevenness occurs during the filling process, it is necessary to fill the embankment layer by layer and take appropriate measures. In addition, construction personnel cannot perform paving and filling operations on sloping slopes. In cases where the slope of the embankment cross-section is large, corresponding construction techniques should be performed to reduce the slope.

3.2. Bank protection technology

Firstly, construction personnel use slope protection that is made of impact resistant materials to achieve the effect of bank protection. The construction personnel need to ensure the safety, reliability, and stability of the revetment, select appropriate construction materials, and minimize the scouring of the revetment, so as to prevent serious abrasion, thus preventing riverbed deformation and ensuring the overall construction effect of the project.

Secondly, a revetment can be constructed to protect the river and embankment, solve the problems of river erosion, and effectively enhance their resistance to flood disasters. Usually, it mainly includes dam structures, which cut off the water flow from the offshore embankment in advance to prevent significant erosion of the water flow. This technology has its own unique advantages, which are especially applicable in areas with high river flow and wide riverbeds.

Thirdly, the plant slope protection method can be adopted to form a comprehensive lake system. After excavating the slope, the interaction between plants and soil is utilized to protect and reinforce the surface layer of the slope, which is not only helpful to the soil layer, but also restores the damaged natural environment. When using this method, it is necessary to consider the climate, soil quality, and other actual conditions of the area to select the best plants. Usually, it is necessary to ensure that the plants have strong cold and drought resistance, and it is common to use soil fixing plants with strong resistance and immunity. In addition, ensuring a well-developed root system during the growth of the plants can effectively reduce the probability of soil erosion and help improve the overall landscape and ecological environment of the river, ensuring the harmonious and unified development of engineering and ecological environment.

The fourth method of protecting riverbanks is by building a revetment wall, where the revetment wall is built on the embankment. The construction method of revetment walls is relatively special and requires a large amount of investment. It is generally used in projects that intersect urban houses, and it is effective in limited locations. The use of this technology in river regulation and bank protection can effectively reduce the cross-section of the bank protection. Construction personnel need to be proficient in relevant construction techniques and standards to ensure the stability of the bank protection and effectively enhance its impact resistance.

The last bank protection method is the pine pile method. The pine pile method involves using a variety of trees such as larch, red pine, or Yunnan pine to ensure the straightness of the trees. In general, the curvature of one side should be less than 1% of the installed length, and piles with curvature on both sides cannot be used. In addition, the log pile should not have problems like decay and insect infestation. Protruding parts such as the bark should be removed, the central axis of the installation should be marked, and the pile head should be cut flat. If the pines are prone to decay if this method is done in a dry environment. Therefore, it is necessary to apply asphalt to the area 0.5 m above and below the water level

to provide protection. In order to effectively improve the integrity of the wooden pile and the upper wall foundation, it is generally necessary to ensure that the pine pile can penetrate deeper than 0.2 m of the foundation length. At the same time, a 5 m thick concrete layer should be installed on the foundation of the upper wall to control the length of the wooden piles. If a certain bearing capacity is required, there should be no joints in the pile. If the wooden pile is long, a vibratory pile driver cannot be used for sinking, and each pile can only have one joint. It is also necessary to ensure that the height difference between adjacent pile joints at a distance of 2 m below the ground at the street should be controlled at least 0.75 m. When dealing with the foundation of pine piles, they can be vibrated by excavators. If the conditions of the construction site are limited, other compaction methods can be used for vibration, and the order of piling should be from outside to inside. If the overall development depth of the mud is large, support piles need to be placed outside of the area with the wooden piles to avoid mud collapse.

4. Conclusion

China attaches great importance to the technology of river regulation and bank protection in water conservancy projects, promoting the coordinated development of engineering and ecological environment, and maintaining the safety of people's lives and property. Therefore, construction personnel need to master the construction standards of embankment filling technology and bank protection technology to ensure the overall safety and quality of the project. In addition, construction personnel should continuously innovate and reform construction techniques, enhance their scientific rationality, and promote the improvement of river management in water conservancy projects in China.

Disclosure statement

The author declares no conflict of interest.

References

[1] Ma H, 2020, Construction Technology for River Regulation and Bank Protection in Water Conservancy Engineering. Engineering Technology Research, 61(05): 126–127.

[2] Miao L, 2020, Analysis of Construction Technology for River Regulation and Bank Protection in Water Conservancy Engineering. Hydroelectric Technology, 2020(2): 16–18.

[3] Le D, 2019, Construction Technology for River Regulation and Bank Protection in Water Conservancy Engineering. Building Materials and Decoration, 574(13): 286–287.

[4] Zhang L, 2019, Construction Technology for River Regulation and Bank Protection in Water Conservancy Engineering. Science and Technology Innovation, 2019(27): 119–120.