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Implementation and Penetration of the Green Concept in Bridge Construction

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Abstract: *With the concept of sustainable development being put forward, people pay more attention to green ecology and emphasize green development. The construction field is no exception. Therefore, the discussion on building construction under the guidance of green concept has become a hot topic in the society. As a special project in construction, bridge construction should also implement the green concept. This work mainly studied the implementation and penetration of the green concept in bridge construction, and analyzed the main green construction techniques based on making clear the significance of bridge green construction. In this way, the objectives of implementing the green concept in bridge construction will be really achieved. It is also hoped that this work will provide some guidance and reference for the exploration of green construction in other fields of architecture.*

Keywords: *Green construction; Bridge construction; Technology innovation; Strategy*

1. Introduction

Bridge construction is an important construction project in China, which has a direct and profound influence on the development of China's transportation industry. At present, the process of urbanization is accelerating, the number of bridge construction projects is obviously increasing, and the scale is generally expanding. Therefore, how to strengthen the construction management and how to penetrate the concept of green construction are worth discussing. In terms of the current bridge construction situation, it can be found that there are serious problems of environmental pollution and resource waste, which affect the project cost and the sustainable development of society. Therefore, it is a major research topic to permeate green concept in bridge construction and actively promote green construction technology.

2. Significance of Permeating the Green Concept in Bridge Construction

2.1. Protect the ecological environment

There are many bridge construction projects in China, so the construction scale is relatively huge. As the construction site involves many links, the construction process is complex, which also means that construction waste will be generated during the process. However, the traditional construction operation mode pays less attention to construction waste. As a result, these construction wastes are piled up or dumped casually. Consequently, these resources cannot be effectively used, but pollute the ecological environment, especially by occupying a certain amount of land resources and causing ecological imbalance. Based on the concept of green construction, the bridge construction should actively select green materials and green construction technology. Additionally, it should also pay attention to the efficient disposal of various construction wastes and garbage, which will reduce the damage and occupation of land resources, reduce ecological threats, and effectively protect the ecological environment.

2.2. Improve the utilization rate of building materials

The green construction concept emphasizes low-carbon construction and efficient recycling of materials. For bridge construction, the consumption of materials is very large. If the concept of green construction can be implemented in the construction, the comprehensive utilization of resources will be maximized and the recycling rate of materials will be improved. In particular, the selection of some green and economical materials with high quality can reduce the generation of waste, and turn idle

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resources waste into treasure. Construction management under the guidance of green construction concept also puts forward higher requirements for the storage management of materials to guide the purchase of green materials, storage management and quality acceptance. In this way, the material can be recycled to the maximum extent under the premise of meeting the use standards, and the construction waste can also play its recycling value.

3. Implementation and Penetration of the Green Concept in Bridge Construction

3.1. Strengthen dust control

For bridge construction projects, dust is a prominent problem, and its most direct harm is to destroy the ecological environment and threaten human health. The dust problem can be solved from the following aspects. First, for the soil or garbage produced in the construction process, the dust risk management in the transportation should be strengthened to ensure that the transportation vehicles are clean. Besides, the car wash tank can be set at the entrance of the construction site, so that the dust problem can be controlled in time when the materials are dumped. Second, dust control is carried out by sprinkling water to control the height of dust in the construction process within a reasonable range [1]. Under normal circumstances, it should not be higher than 1.5 meters, so as to effectively avoid the widespread spread of dust. Finally, the dust problem caused by building demolition should be concerned. Dust control plan should be formulated in advance, and dust control measures such as dust cleaning, dismantling water sprinkling and dust blocking should be taken to reduce the dust harm.

3.2. Focus on light pollution issues

The problem of light pollution in bridge construction cannot be underestimated. In order to pursue the construction schedule, many construction teams often work overtime. The whole night lighting will affect the lives of residents around the area and cause light pollution. In order to reasonably control light pollution, the construction unit should choose lighting appliances and install them properly [2]. If necessary, light retaining panels can be added to weaken the lighting radiation range or adjust the lighting as mobile lamps, so as to avoid the adverse impact of direct lighting equipment on residents' life.

3.3. Control noise pollution

The problem of noise pollution in bridge construction is caused by the large number of construction equipment and construction machinery. Adhering to the concept of green construction, it should take multiple measures to strengthen the control of noise pollution. For example, the construction machinery or equipment with low noise can be selected to reduce its noise pollution to the surrounding environment. In addition, construction equipment can also be improved, such as choosing a reasonable way to block and reduce the noise of machinery. For another, for the noise generated in the process of material transportation of the construction unit, it should be deployed in advance to avoid the noise of material friction reasonably, and the mechanical construction location should be arranged to minimize the noise pollution.

3.4. Control air pollution

In the bridge construction, air pollution cannot be underestimated, especially in the asphalt concrete pavement construction link. Asphalt concrete, concrete mixture production, mixing, transportation or paving, can cause serious air pollution. Therefore, it needs to pay attention to the air pollution in the process of construction, add purification device, and cover asphalt with sealing cloth on vehicles to ensure the waterproof performance and reduce noise pollution.

3.5. Save water and land

The penetration of green construction concept in bridge construction is also reflected in saving water and land [3]. In terms of water saving, it can recycle the washing water or timely check the construction machinery and equipment and timely repair the faulty machinery, so as to avoid leakage problems and the waste of water resources. The construction unit should treat the sewage in accordance with relevant regulations and ensure that the sewage meets the discharge standards before discharging

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it out. In the aspect of saving land, the key is to plan land use scientifically, and try best not to occupy the forestry land and cultivated land around the construction site. The construction unit shall investigate the surrounding environment in an all-round way, protect the existing cultivated land resources, reasonably divide the areas, and set up scientific operation areas. For the stacking management of chemicals and dangerous goods, it is necessary to install the corresponding safety protection devices to avoid the pollution of water resources or land resources.

3.6. Reduce raw material waste

In recent years, the level of science and technology in China has made great progress and enhancement. Scholars and scientific research personnel have developed a variety of new construction materials. Compared with traditional construction materials, the new construction materials have better performance, which can effectively improve the quality of highway bridge engineering, and can extend the service life of bridge engineering. In the process of using construction materials such as steel and cement, some construction units do not carry out reasonable planning and design in advance during the construction of raw materials. In addition, steel and cement are non-renewable resources, and long-term use will damage the surrounding environment to some extent. Therefore, it is required that the leadership and management personnel of the construction unit must strengthen the cost consciousness, and regularly organize the construction personnel to carry out training and continuing education, to advocate resource saving and cultivate the consciousness of resource saving. In addition, new materials should also be used to eliminate polluting raw materials and optimize the allocation of resources. Before carrying out the highway bridge construction, the construction materials should be selected according to the actual situation of the project, and the quantity of construction materials that may be used should be preliminarily determined. What's more, in the construction process of highway bridge construction, it should pay attention to the recycling of discarded materials, make full use of raw materials, reduce the cost of materials, and pay attention to saving raw materials [4].

4. The Implementation and Penetration Case of Green Concept in Bridge Construction

The G3 Tongling Yangtze River Highway and Railway Bridge project, undertaken by China Railway Major Bridge Engineering Group, spans Tongling Freshwater Dolphin National Nature Reserve, so the water environment and ecological environment along the route is sensitive. The construction is based on the concept of green construction, and the department of safety, quality and ecology has been established to supervise the implementation of various environmental protection measures in the construction and production process. Under the premise of ensuring quality and safety, the project department maximally saves resources and reduces construction activities that damage the environment. In the construction site of G3 Tongling Yangtze River Bridge, the drainage ditch is equipped with sand settling tank every other distance for construction sewage precipitation and sediment removal to ensure the smooth drainage at the construction site. Concrete mixing station is equipped with seven sewage treatment tank, and the construction wastewater can be used for road sprinkling after repeated precipitation and intelligent treatment. In order to recycle mud, the builder uses "mud pool and mud pump" as the circulation structure in the drilling construction, and the mud will not "fall" in the punching process. The bridge across the river is set up with bridge deck runoff collection pipeline and collection pool. The cross-river bridge is equipped with runoff collection pipes and ponds. Runoff from the bridge deck is treated by the collection pipe into the collection pond, and then discharged into the nearby sewage treatment plant to avoid directly entering the Yangtze River through the bridge drainage hole. The construction not only carries out water pollution prevention from details, but also protects air environment through strict measures. The project department hardens the construction pavement and drilling platform, covers the excavated earthwork and exposed soil with green net, and clears the drilling slag and earth with the covered muck truck to effectively control the dust on the site. The sand and stone bin is completely closed equipped with automatic spray device to spray dust in the space of the bin. The implementation of green construction should take "reduce" as the starting point. In the rebar workshop of the project department, the rebar connection adopts mechanical operation to reduce the loss of rebar; the steel cage segment bracket is made of steel corners, which makes full use of the waste reinforcement [5]. The pavement of temporary construction walkway is paved with precast concrete panels, which can be reused when the walkway is dismantled. The construction trestle and drilling platform are constructed of "steel pipe column, berea piece, distribution beam and precast concrete slab", and all materials are recyclable.

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5. Two Major Supports of the Bridge Construction Based on Green Concept

5.1. Relatively sound green construction technology management system

For road and bridge construction, since the construction project is systematic and complex, involves many links and covers a wide range of content, it is necessary to establish a relatively perfect construction technology management system and give an overall check. It is necessary to carry out construction work orderly with the support of technical management system. Also, in the green construction management, the perfect construction of the construction system is essential. Although the application time of green construction technology is short, there are many types of construction technology. If it can be supported by a sound technical management system, then the promotion of green construction will be more smooth. The construction of green construction management system should be regarded as a major focus of green construction management. Managers and grass-roots construction personnel should participate in the construction of green construction management system, and consciously mark their own behavior with the standard of management system, and finally play the application value of green construction technology. Relying on the technology management system, it is essential to strengthen the technical communication and exchange. Relevant responsible persons should clarify the application standards and key points of green construction technology, and promote the whole process of green construction management with effective technical disclosure. In addition, construction enterprises should also pay attention to green construction management training, so that the construction personnel and management personnel have a good sense of green construction, and consciously carry out work according to the green construction technology management system.

5.2. Optimization technology of road and bridge construction resources

Bridge construction is a kind of construction which consumes a large amount of resources, including both natural resources and non-natural resources. One of the major footholds of green construction is the efficient utilization of resources, so it is necessary to focus on the utilization rate of resources in the road and bridge construction. The construction area of the bridge project itself is large, and the occupancy rate of land resources is high. As a non-renewable resource, the land resources will suffer heavy losses once they are wasted. Therefore, before green construction, the design and management personnel should strengthen the planning of land areas, try to avoid the special land such as farmland and forest land, and keep the red bottom line of land use. In addition, it is necessary to pay attention to the consumption of building materials. When purchasing construction materials, the construction party should pay attention to the current requirements and standards of energy conservation and emission reduction, and select green and environmentally friendly and recyclable building materials. The use of building materials should also strengthen the application management of building materials, focusing on improving the reuse rate of materials. The renewal of construction technology is closely related to the utilization of resources, therefore, when selecting construction technology, it is necessary to uphold the principle of green construction, improve the utilization rate of resources with the optimization of technology, reduce the generation of building materials, and reduce unnecessary waste of resources in bridge construction projects.

6. Conclusions

These days, people are very concerned about ecological and environmental protection and sustainable development, and the concept of green construction is deeply rooted in people's hearts. Under such an era background, the green construction of bridge engineering has realistic necessity. Based on analyzing the significance of bridge green construction, this work researched on the bridge construction deployment measures under the guidance of green concept from the aspects of dust control, light pollution control, noise control, water conservation and land use. In addition, the work also analyzed how to establish a relatively sound green construction technology management system from the macro level, and how to optimize the road and bridge engineering construction resources utilization technology. Finally, the work elaborated the green construction management of bridge combining concrete cases, which will provide specific guidance for theoretical research and practical deployment of bridge green construction.

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