Construction Management and Application of New Building Materials in Landscaping Projects

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Abstract: As an important means to improve the urban environment, enhance urban ecological quality, and residents' quality of life, the level of construction management and the application effectiveness of new building materials largely determine the overall quality and benefits of landscaping projects. This paper focuses on the construction management of landscaping projects, exploring it from the dimensions of quality, progress, safety, and cost. It also elaborates on the application advantages of new building materials such as new elevated bricks, plastic blind drains, and ecological concrete. The aim is to promote the coordinated application of construction management and new materials to improve the quality of landscaping projects.

1. Introduction

In the context of an environment-friendly society, vigorously promoting the construction of urban landscaping projects has become an inevitable trend. Compared with traditional projects, landscaping projects are no longer limited to conventional vegetation planting and landscape arrangement but aim to build comprehensive projects that integrate functional services, landscape creation, and ecological restoration. They play a crucial role in conserving water sources, purifying the air, and improving people's quality of life. With the expansion of the scale of landscaping projects, the application of new technologies and materials, and the increase in project complexity, higher requirements for refined construction management have been put forward for landscaping projects in the new era. In view of this, seeking optimization paths for construction management in landscaping projects and application models for new building materials, and promoting their coordinated development have become an inevitable choice for the transformation and upgrading of China's landscaping industry.

2. Key Points of Construction Management in Landscaping Projects

During the construction of landscaping projects, strengthening construction management can provide a solid guarantee for project quality, safety, and benefits. Specifically, it is necessary to establish a refined construction management system around the overall objectives of construction management to cover all aspects of project construction and safeguard the final effectiveness of the project. The key points are as follows:

2.1 Quality Management

In the construction management of landscaping projects, quality management is a key content, with the essential goal of accurately implementing the project design plan and ensuring the healthy growth of plants. Therefore, construction quality management should run through the entire process of project design, construction, and management [1]. To ensure the growth quality of seedlings, priority should be given to selecting native varieties that are adapted to local soil and climatic conditions. The specifications of seedlings, such as crown width, diameter at breast height, and height, should be checked. At the same time, the activity of the root system of the soil ball, the integrity of the soil ball, and the state of branches and leaves should also be inspected. Especially when planting seedlings out of season, to prevent water loss in seedlings, straw ropes can be wrapped around them, and transpiration inhibitors can be sprayed on the surface. Soil is the

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foundation for plant growth. Before planting, the soil pH value, air permeability, drainage, and organic matter content should be checked. Generally, the normal range of the pH value is 6.0 - 7.5, and the organic matter content should be no less than 2%. If the soil at the construction site is barren, the soil can be replaced before construction, and pearlite and humus soil can be added, along with an appropriate amount of organic fertilizer to enhance soil fertility and create a suitable environment for the growth of seedling roots. For hardscape areas such as squares, garden paths, and revetments, the durability and strength of materials should meet the requirements. Taking permeable bricks as an example, the non-slip coefficient should be above 0.5, and the compressive strength should be no less than 30 MPa.

The construction process of landscaping projects is relatively complex, and reasonable operation standards should be formulated in combination with terrain shaping, water supply and drainage, and seedling planting. Terrain is the framework of the landscape, and the designed slope should be considered. The slope of natural green spaces is mostly 5% - 15%, and that of hard areas should be kept above 0.3% to avoid water accumulation leading to root rot of seedlings. During the backfilling process, each layer should be no more than 30 cm thick and fully compacted to avoid soil settlement affecting the inclination of seedlings in the later stage. In the design of the water supply and drainage system, according to the regional terrain and climatic conditions, a rainwater collection and irrigation system should be designed to achieve effective recycling of water resources and reduce groundwater consumption. If the regional terrain has a large elevation difference, a natural slope with a slope of more than 0.5% can be formed using the terrain conditions to allow rainwater to naturally flow into drainage ditches. When laying drainage pipes, PVC corrugated pipes can be used, with a slope of more than 3%, and the joints should be properly sealed to avoid leakage. During the seedling planting process, the excavation should be carried out carefully to ensure that the soil ball is large enough to avoid root damage and excessive water evaporation. The soil ball should be fixed during transportation. When planting seedlings, materials such as straw bags and straw ropes should be removed, and then the backfill soil should be tamped in layers and fully watered to a depth of more than 30 cm below the soil layer. In addition, during the construction of hard landscapes, attention should be paid to adjusting the details of the landscape structure. A graded crushed stone cushion and a non-woven fabric isolation layer should be set on the base road surface, with the thickness of the crushed stone cushion being 15 cm - 20 cm. Joints with a width of 2 mm - 3 mm should be reserved on the surface layer, and joint sealants should be used to fill them to prevent weed growth [2].

2.2 Safety Management

Although landscaping projects do not have safety risks such as deep excavations and high-altitude falls as common engineering projects do, it is still necessary to prevent safety hazards such as electricity use, mechanical operation, and plant toxicity. Before construction, construction personnel should be organized to receive pre-job safety education and training to understand the "Safety Operation Regulations for Landscaping Construction" and master safety points such as on-site mechanical operation and tool use. Special workers such as excavator drivers and electricians should hold relevant certificates to work. During operation, they should wear reflective vests, safety helmets, and safety ropes. There are many mechanical equipment such as excavators and lawn mowers on the construction site. The circuit and oil circuit conditions of the equipment should be checked before daily operation, and faults and hidden dangers should be dealt with in a timely manner. A safe working environment should be created. When operating mechanical equipment, other personnel should keep a sufficient safe distance, and a specially assigned person should be responsible for on-site coordination and control. The keys should be taken away immediately after the equipment is powered off. Hand tools such as shovels and scissors used on site should be regularly polished and maintained, and non-slip sleeves should be used at sharp positions during operation. If chemical agents need to be used during operation, a specially assigned person should be responsible for their storage, and on-site construction personnel should be urged to wear masks and gloves to avoid damage caused by contact with chemical agents. In addition to

managing the safety of personnel and mechanical tools, environmental risk control on the construction site should also be carried out. During the hot season, construction personnel are prone to heatstroke due to long-term outdoor work, which can induce health problems. Therefore, long-term high-intensity outdoor work should be avoided, and anti-heatstroke supplies such as Huoxiang Zhengqi Water and mung bean soup should be provided. During the rainy season, the structural stability of construction slopes should be checked the structural stability of construction slopes should be checked, and safety warning signs should be set up" to make it grammatically correct in English, and safety warning signs should be set up to avoid safety accidents caused by landslides [3].

2.3 Progress Management

The construction progress management of landscaping projects is directly related to whether the project can be completed within the construction period. During the construction process, it is easily affected by factors such as natural weather, seasonal changes, and material supply. Therefore, a scientific and reasonable construction progress plan should be formulated before construction, key nodes should be determined, and dynamic adjustments should be made according to specific conditions to ensure that construction tasks are delivered on schedule with the cooperation of multiple parties [4]. Based on the contracted construction period, the critical path in the construction should be marked, and the daily work tasks and required resources should be refined. Daily team meetings should be held to report the construction progress and deviations on the construction site. If the underground pipeline is complex on the construction site and delays the earth excavation period, timely consultation and analysis of the reasons should be carried out, and reasonable corrective measures should be formulated. On the construction site, coordinated allocation of human resources, materials, and mechanical equipment should be carried out according to management needs, and human resources should be flexibly adjusted according to work procedures. In the early stage of excavation and sorting, priority should be given to earthwork procedures, and in the later stage of seedling planting, priority should be given to gardening procedures to dynamically allocate personnel and avoid personnel idleness. Timely consultation should be carried out with suppliers regarding seedlings, especially large-scale arbor trees, which should be ordered in advance. Safety protection during transportation should also be ensured. Before permeable bricks and other paving materials enter the construction site, indicators such as material dimensions, specifications, and color differences should be carefully checked. For equipment such as cranes and excavators used on site, they can be purchased or rented according to construction needs, and the operating time of mechanical equipment should be reasonably allocated to avoid delays in the construction period due to equipment shortages.

2.4 Cost Management

The construction cost of landscaping projects involves mechanical costs, material costs, labor costs, etc. The essential goal of cost management is to reduce unnecessary construction costs through refined construction control without affecting quality and safety. In the early stage of budget preparation, various cost items should be accurately calculated according to the design drawings and construction plans, and an elastic space of about 10% - 15% should be reserved according to market price fluctuations. During the peak season, the prices of some seedling species may increase by up to 20%. During the construction process, the connection between work procedures should be optimized. The soil should be filled in time after sorting to reduce the idle time and repeated labor of mechanical equipment. Sick and weak seedlings should be eliminated during seedling acceptance, and paving materials should be customized according to construction needs. On-site mechanical equipment should be rented as needed, and some small mechanical equipment should be handed over to the construction team contractor for use, with fees settled according to the final workload.

2.5 Post-construction Maintenance Management

Due to the characteristics of landscaping projects, post-construction maintenance management also

needs to be implemented after the project is completed to ensure the healthy growth of plants and achieve continuous optimization of the landscape level. The survival and growth of plants cannot be separated from the support of nutrients and water. Reasonable water and fertilizer management strategies should be selected according to different growth stages and plant types. In terms of water management, the principle of "watering when the soil is dry and stopping when it is wet, and adapting to the season" should be followed. Tall arbor trees have deep root systems, and the amount of watering should be determined according to the diameter at breast height. The soil should be kept moist in the first three months after planting. Shrubs with shallow root systems are suitable for watering in small amounts multiple times to avoid root rot caused by water accumulation. Ground cover plants have shallow root systems and are suitable for sprinkler irrigation for about 10 minutes in the morning and evening in summer and reducing the frequency to 2 - 3 times a week in winter to keep the soil surface moist. In terms of nutrient management, organic fertilizers such as oil cake and composted chicken manure should be added to the planting holes of seedlings to provide a continuous supply of nutrients for the growth of new roots of seedlings.

3. Application of New Building Materials in Landscaping Projects

3.1 New Elevated Bricks

Compared with traditional hard paving materials, new elevated bricks adopt a highly permeable base material and a hollow structure design, with strong water permeability. The surface of new elevated bricks is designed as a hollow grid with a porosity of more than 30%, and there are 5 - 10 cm high bottom support feet at the bottom. An elevated layer is laid, which can effectively reduce the contact area with the base layer and leave enough space for the growth of seedling roots. In terms of material composition, high-molecular adhesives, recycled aggregates, and inorganic mineral additives are used to provide a compressive strength of C25 - C30 and a water permeability coefficient of more than 0.5 mm/s. In addition to improving the problem of impermeability of hard ground, such materials can also be designed with different colors and stripes to enhance the overall aesthetics of the landscape. New elevated bricks are usually applied in areas such as park entrances and pedestrian paths, ensuring safe walking for pedestrians while also allowing rainwater to quickly infiltrate into the ground, effectively relieving the pressure on the drainage pipe network [5].

3.2 Plastic Blind Drains

Plastic blind drains are a new type of drainage material that can replace gravel blind drains and traditional cobblestone materials. They are mostly formed by wrapping a layer of geotextile filter around a plastic core. They provide an efficient drainage channel. Plastic blind drains have high drainage efficiency. The internal drainage space rate of the plastic core is high, and the resistance to water flow is small, enabling the rapid collection and discharge of excess water in the soil. Plastic materials have the advantages of anti-aging and corrosion resistance, and the surface is covered with a layer of geotextile to prevent soil particles from invading the core and provide long-lasting and stable drainage performance. A comparison of the performance of plastic blind drains and traditional cobblestone blind drains is shown in Table 1.

Table 1 Performance Comparison between Plastic Blind Drains and Traditional Cobblestone Blind Drains

Characteristic	Plastic Blind Drain	Traditional Cobblestone Blind Drain
Material Self-weight	Lightweight, easy to install and transport	Heavy, high cost of transportation and installation
Drainage Efficiency	High drainage efficiency and smooth water flow	Low drainage efficiency, prone to blockage by mud and sand
Construction Difficulty	Easy to operate, can be laid in rolls	Complex construction, requires manual filling and

		handling
Durability	Corrosion-resistant, strong durability, and long service life	Poor durability, prone to blockage by silt
Soil Filtration	Good filtration effect, effectively avoids blockage	Unstable effect, prone to failure

3.3 Ecological Concrete

Traditional concrete is dense and impermeable. Through material composition and structural innovation, ecological concrete can achieve ideal water permeability and strength while also exhibiting biological friendliness. Ecological concrete mainly includes two types: vegetation-growing type and porous permeable type. The former adds water-retaining agents, slow-release fertilizers, and alkaline-neutralizing materials to permeable concrete to adjust the material pH value to 7 - 8, creating a suitable growth space for plant roots. The latter is composed of a small amount of cement, coarse aggregates, and water-reducing agents, with a water permeability coefficient of more than 1.0 mm/s. According to the different uses of the materials, the compressive strength of ecological concrete can be adjusted, and ideal frost resistance can be provided.

3.4 Lightweight High-strength Composite Materials

Traditional garden features such as landscape walls and plank paths are mostly made of natural stone, wood, and other materials, but stone is heavy, and wood is prone to corrosion. The use of lightweight high-strength composite materials can not only reduce the self-weight of the materials but also provide corrosion resistance and high strength. For example, unsaturated polyester resin is used as the main body of the composite material, an appropriate amount of glass fiber is added as a reinforcing skeleton, and antioxidants or ultraviolet absorbers, as well as expanded perlite and ceramsite, are added. The density of such materials is one-third of that of stone, but the strength reaches 30 MPa, and they have ideal corrosion resistance, which enables long-term use and reduces the cost of later maintenance and repairs due to damage.

4. Conclusion

In conclusion, landscaping projects have the advantages of purifying the air and improving the ecological environment. In the specific construction of projects, full-process construction management should be strengthened, and various new building materials should be introduced. Construction should be carried out in accordance with the construction plan to ensure the quality of landscaping projects and create more ideal economic and ecological benefits.

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