Preliminary Exploration on the Construction of Urban Landscape Gardens and the Maintenance Management of Road Greening

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Abstract: The construction of urban landscape gardens and the maintenance management of road greening are crucial components of urban ecological construction and the improvement of the human living environment, playing decisive roles in the initial quality and long-term effects of green landscapes, respectively. This paper focuses on the construction of urban landscape gardens and the maintenance management of road greening. It first elaborates on the core technologies and quality control points in the construction of urban landscape gardens, then analyzes the core content and technical methods of road greening maintenance management, and proposes corresponding optimization strategies. It aims to provide practical references for enhancing the construction quality of urban landscape gardens and strengthening the maintenance management level of road greening.

1. Introduction

With the continuous acceleration of urbanization, the urban population has been steadily increasing, and the urban ecological environment is facing numerous challenges, such as the intensification of the urban heat island effect, a decline in air quality, and a reduction in biodiversity. In this context, as an important part of the urban ecosystem, urban landscape gardens can not only regulate the urban climate, purify the air, and conserve water sources but also provide residents with places for leisure and entertainment and shape a unique urban cultural landscape. Therefore, in-depth exploration of effective strategies for the construction of urban landscape gardens and the maintenance management of road greening holds significant practical importance and value. It has also become an urgent and important issue in the current field of urban construction.

2. Core Technologies and Quality Control Points in the Construction of Urban Landscape Gardens

2.1 Technical Preparations and Basic Control in the Pre-construction Phase

Technical preparations and basic control in the pre-construction phase are prerequisites for ensuring the orderly progress of landscape garden construction, focusing on "feasibility assessment" and "risk anticipation." At the technical preparation level, it is essential to conduct on-site reviews of design drawings, taking into account the actual topography, landforms, and the distribution of underground pipelines at the site. Adjustments should be made to the plant configuration areas and hardscape layouts in the drawings to ensure compatibility with on-site conditions. Meanwhile, a comprehensive detection of soil characteristics should be carried out to clarify indicators such as soil fertility, acidity-alkalinity, and permeability, based on which a soil improvement technical plan should be formulated to create suitable conditions for subsequent plant growth.

In the basic control process, a comprehensive material inspection and acceptance mechanism should be established, especially for plant seedlings and construction materials. Quality standards should be clearly defined according to design requirements, and strict checks should be conducted on the growth status and root integrity of seedlings, as well as the specifications and performance of construction materials, to prevent substandard materials from entering the construction process.

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Additionally, detailed construction technical disclosure documents should be formulated based on the project timeline and procedural logic, clarifying technical parameters and operational specifications for each stage. Specialized training should be organized for construction personnel to ensure that the construction team fully grasps the technical essentials and avoids quality issues caused by technical misunderstandings from the source.

2.2 Implementation of Core Technologies and Process Control in the Mid-construction Phase

The mid-construction phase is the core stage for transforming design plans into actual landscapes, focusing on the two key areas of plant planting and hardscape construction, and strengthening the precision of technology implementation and the rigor of process control. In terms of plant planting technology implementation, appropriate planting procedures and technical methods should be determined according to the growth characteristics of different plants, including the excavation specifications of planting holes, the control of planting depth, and initial fixation measures after planting, to ensure that plants can take root stably in the new environment. At the same time, attention should be paid to the coordination between plant planting and the surrounding environment, and the planting density and layout patterns should be reasonably planned to ensure sufficient growth space for plants while presenting the expected landscape effect.

For hardscape construction, operations should be carried out in strict accordance with technical specifications, from foundation excavation and structural construction to surface decoration. Technical parameters should be well controlled in each process to ensure the structural stability and functional practicality of hardscape facilities. In process control, a regular quality inspection mechanism should be established, and professionals should be arranged to inspect the construction quality on a regular basis, focusing on whether the connection between construction processes is smooth and whether technical indicators meet the standards, to promptly identify and correct deviations in construction. Additionally, coordination and cooperation among various construction links should be strengthened to coordinate the progress of plant planting and hardscape construction, avoiding quality and efficiency issues caused by process conflicts and ensuring the orderly progress of the overall construction work.

2.3 Initial Maintenance Technologies and Quality Acceptance Control in the Post-construction Phase

The implementation of initial maintenance technologies and quality acceptance control in the post-construction phase are important linking links to ensure the long-term stability of the landscape garden effect, taking into account both "plant adaptation" and "quality assurance." In terms of initial maintenance technology implementation, targeted maintenance plans should be formulated according to the plant varieties and growth stages, reasonably controlling the frequency and amount of watering to avoid affecting plant growth due to excessive or insufficient water. Meanwhile, appropriate pruning of branches and leaves should be carried out according to plant growth conditions to adjust plant morphology and reduce nutrient consumption. Early monitoring and prevention of pests and diseases should also be conducted to help plants quickly adapt to the new environment and shorten the slow-growth period through scientific maintenance. For hardscape facilities, initial protection work should be carried out, and reasonable measures should be taken to prevent newly completed facilities from being damaged by external forces, ensuring the integrity of hardscape facilities.

Quality acceptance control should be based on design drawings and industry norms, and a multi-dimensional comprehensive acceptance index system should be established, which should not only include core indicators such as plant survival rate, overall landscape appearance, and functional integrity of hardscape facilities but also take into account implicit requirements such as construction process compliance and ecological adaptability, forming a comprehensive and rigorous acceptance standard framework. In the acceptance implementation stage, a three-party collaborative acceptance mechanism involving design units, construction units, and supervision units should be established. Through on-site inspections to verify the planting effect and hardscape construction situation, combined with professional technical testing methods to quantitatively evaluate the

quality of soil improvement and the operation status of irrigation systems, the acceptance results should objectively reflect the construction quality.

3. Core Content and Technical Methods of Road Greening Maintenance Management

3.1 Daily Basic Maintenance: Building a Plant Growth Guarantee System

Daily basic maintenance, as the core link to maintain the normal growth of road greening plants and ensure landscape stability, should establish standardized operational procedures centered around "water and fertilizer regulation" and "environmental optimization." In water and fertilizer management, differentiated water and fertilizer supply plans should be formulated by fully considering the soil physicochemical properties of road greening areas and the growth cycle laws of different plants. Water management should adjust the irrigation frequency and method according to seasonal and climatic changes to avoid plant withering due to drought or root rot caused by excessive irrigation. Fertilizer application should be based on the nutritional needs of plants at different growth stages, scientifically combining nitrogen, phosphorus, potassium, and other nutrients, and paying attention to the reasonable combination of base fertilizer and top dressing to enhance plant stress resistance and promote healthy branch and leaf growth through precise fertilization.

Meanwhile, regular soil improvement and weed removal work should be carried out. In response to problems such as soil compaction and poor permeability that are prone to occur in road greening soil, physical loosening methods can be used to improve soil structure and enhance soil water and fertilizer retention capacity. Weed removal should follow the principle of "early detection and early removal," and weeds should be promptly cleared through manual or mechanical methods to prevent them from competing with greening plants for nutrients and water, ensuring sufficient growth space for greening plants and maintaining the overall cleanliness and aesthetic effect of road greening [1].

3.2 Specialized Technical Treatments: Optimizing Landscape Morphology and Plant Health

Specialized technical treatments aim to improve greening quality through precise technical means, with the maintenance of plant morphology and health of road greening plants as the core goals. In pruning and shaping work, appropriate pruning times and methods should be determined according to plant species, growth characteristics, and the functional requirements of road traffic. For trees, emphasis should be placed on controlling the branch height and crown shape to ensure that their growth does not affect traffic flow and the normal use of road facilities. For shrubs and hedges, regular pruning should be carried out to maintain neat contour lines and ensure landscape unity. For ground cover plants, the growth height should be reasonably controlled to prevent them from over-spreading and destroying the landscape hierarchy. During pruning, attention should be paid to the treatment of pruning cuts, and necessary protective measures should be taken to reduce the risk of wound infection and promote rapid wound healing, ensuring healthy plant growth.

Pest and disease control is another important part of specialized technical treatments, following the principle of "prevention first and comprehensive control." By strengthening the monitoring of plant growth conditions, early identification of pest and disease signs should be achieved, and physical and biological control methods should be preferred, such as using trapping devices to capture pests and introducing natural enemies to inhibit the spread of pests and diseases. When necessary, low-toxicity and low-residue chemical agents should be reasonably selected, and the dosage and frequency of use should be strictly controlled to avoid impacts on the surrounding environment and human health, ensuring that road greening plants are always in a healthy growth state[2].

3.3 Dynamic Monitoring and Emergency Management: Ensuring the Stable Operation of the Greening System

Dynamic monitoring and emergency management are key measures to deal with sudden situations in road greening and maintain the long-term stability of the greening system. Dynamic

monitoring requires the establishment of a regular inspection mechanism, regularly checking the growth status of road greening plants and the integrity of facilities, and recording problems such as abnormal plant growth, landscape damage, and facility failures in detail. Through data analysis, the patterns of problem occurrence should be sorted out to provide a basis for maintenance management decisions. During the process, attention should also be paid to potential risks such as extreme weather and human-caused damage, and early warning plans should be formulated in advance for risk anticipation and prevention.

Emergency management requires the formulation of special disposal plans for different sudden situations. Specifically, in the face of extreme weather such as heavy rain, strong winds, high temperatures, and low temperatures, timely protective measures should be taken, such as reinforcing and supporting trees, taking anti-cold and heat preservation measures for cold-intolerant plants, and strengthening irrigation and water replenishment in drought-stricken areas. For greening damage caused by human-caused destruction and traffic accidents, a rapid response mechanism should be established, and personnel should be organized to carry out repairs in the first time, replacing damaged plants and repairing damaged facilities to minimize the impact on the road greening landscape and ecological functions and ensure the continuous and stable operation of the road greening system.

4. Optimization Strategies for the Construction of Urban Landscape Gardens and the Maintenance Management of Road Greening

4.1 Establishing a Collaborative Mechanism between Construction and Maintenance to Strengthen Full-cycle Linkage

The construction of urban landscape gardens and the maintenance of road greening are not independent links. It is necessary to break the separation between the two and establish a full-cycle collaborative mechanism to achieve seamless linkage from construction to maintenance. In the early planning stage of the project, the maintenance team should be encouraged to get involved in advance, allowing maintenance personnel to participate in discussions on the construction plan design. Combining long-term maintenance experience, they can put forward optimization suggestions on plant selection, planting technical parameters, and hardscape structural design to avoid increasing the difficulty of later maintenance due to unreasonable design.

During the construction process, a regular communication mechanism between the construction team and the maintenance team should be established. Maintenance personnel can regularly visit the construction site to understand the progress of plant planting, soil treatment, and hardscape construction quality, promptly identify problems that may affect later maintenance and feed them back to the construction team, urging them to make timely adjustments. After the project is completed, a standardized handover process should be carried out. The construction team should provide detailed technical information on the construction to the maintenance team, including plant varieties, planting time, soil improvement measures, and irrigation system layout, and conduct on-site technical disclosures to ensure that the maintenance team fully grasps the maintenance essentials and lays a foundation for subsequent scientific maintenance.

4.2 Promoting Technological Innovation and Application to Improve Management Efficiency and Quality

In the construction of urban landscape gardens and the maintenance management of road greening, new technologies and new materials should be actively introduced to enhance management efficiency and quality through technological empowerment. In the construction process, digital technologies can be explored for application, such as using BIM technology to conduct three-dimensional modeling of landscape gardens, simulating plant planting effects and the structural stability of hardscape facilities, identifying design and construction conflicts in advance, and optimizing construction processes. Intelligent planting equipment can be used to achieve precise hole digging and quantitative fertilization, reducing manual operation errors and improving

construction efficiency.

In the maintenance management stage, a smart maintenance system can be introduced. By installing soil moisture sensors, pest and disease monitoring equipment, etc., real-time data on soil moisture, plant growth status, and pest and disease occurrence can be collected. Big data analysis technology can be used to process the data and generate personalized maintenance plans to guide maintenance personnel in carrying out precise irrigation, fertilization, and pest and disease control work, avoiding blind maintenance. Meanwhile, the promotion and use of eco-friendly materials and technologies should be encouraged, such as using biodegradable mulch to inhibit weed growth in road greening maintenance, reducing the use of chemical herbicides, selecting native plant varieties with strong pollution resistance and stress resistance, lowering maintenance costs, and enhancing the ecological stability of the road greening system[3].

4.3 Improving the Management System Construction to Strengthen Personnel and Responsibility Control

A sound management system is an important support for ensuring the construction quality of urban landscape gardens and the maintenance effect of road greening. It is necessary to optimize from two aspects: personnel management and responsibility control. In personnel management, a professional talent training mechanism should be established, and construction and maintenance personnel should be regularly organized to participate in professional training, covering the latest construction technologies, maintenance methods, and eco-friendly concepts. At the same time, skill assessments should be carried out, and the assessment results should be linked to job promotion and salary treatment to motivate personnel to improve their professional capabilities.

In terms of responsibility control, it is necessary to clarify the responsible entities for each link of construction and maintenance and establish a clear responsibility system. Construction quality targets and maintenance effect indicators should be decomposed into specific departments and individuals to ensure that all work is carried out by specific people. Meanwhile, a supervision and assessment mechanism should be improved, and a professional supervision team should be organized to regularly inspect and assess the construction quality and maintenance work. Scientific assessment indicators should be formulated, including plant survival rate, landscape integrity rate, and pest and disease control effect. Rewards should be given to outstanding teams and individuals, and those who fail to meet the standards should be held accountable and urged to make rectifications within a time limit. Through strict supervision and assessment, the standardization and standardization of construction and maintenance work should be promoted.

5. Conclusion

In conclusion, the construction of urban landscape gardens and the maintenance managem ent of road greening are long-term projects that run through urban ecological construction a nd landscape shaping. Their quality and efficiency are directly related to the improvement o f the urban human living environment quality and the stability of the ecosystem. Therefore, it is necessary to provide systematic ideas for solving problems such as separation, extensi ve management, and non-standardization that may exist in current construction and maintena nce through multi-dimensional optimization strategies. In the future urban development proce ss, garden landscape construction and road greening maintenance management need to conti nuously adapt to the new requirements of urban ecological construction and make dynamic adjustments according to actual situations to promote urban landscape gardens and road gree ning to continuously exert ecological, ornamental, and social benefits and lay a solid ecolog ical foundation for building a more resilient and vibrant modern city.

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