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Quality Management and Control Measures for Greening Engineering in Gardens

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Abstract: In the process of modern urban development and construction, the garden engineering is related to the improvement of the internal ecological environment of the city. In the development of garden greening engineering construction, quality and safety management control is also an important part, which will directly affect the aesthetic degree and environmental protection benefits of the garden greening project. Based on this, this article studies the quality and safety management and control of garden greening engineering. Before simply discussing the basic characteristics of current garden greening engineering, combined with the common quality and safety problems in the construction of garden greening engineering, the basic countermeasures for the quality and safety management and control of garden greening engineering are proposed.

Keywords: Garden engineering; Quality and safety; Management and control

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1. Introduction

Although landscaping engineering has distinct ecological advantages compared to other construction projects, quality and safety remain crucial aspects that cannot be neglected during the construction process. If quality and safety management work is not implemented effectively, it will inevitably affect the aesthetics and ecological benefits of the landscaping project and also threaten the personal safety of the construction personnel. Against the backdrop of China's modern construction industry pursuing high-quality development, the quality and safety management of landscaping engineering also needs continuous adjustment in line with economic and social development. Therefore, this paper studies the quality and safety management and engineering countermeasures for landscaping projects, providing a reference for optimizing quality and safety management during landscaping project construction.

2. Analysis of basic characteristics of landscaping engineering

2.1. Large number of sub-projects

Compared to traditional construction projects, landscaping projects have a more complex composition, and the number of sub-projects is significantly higher than in other buildings. There will also be noticeable differences in project construction quality requirements, implying that management methods will differ, and the various sub-projects maintain an interconnected and interdependent relationship, leading to a significant increase in the difficulty of quality management work [1]. With the ongoing expansion of landscaping project scales, higher requirements are placed on the professional quality of management personnel. They need to master knowledge related to landscaping while developing advantages in construction management to improve the construction quality of landscaping projects. This characteristic of a large number of sub-projects makes the entire quality management content increasingly complex, presenting greater difficulties for quality management.

2.2. Special management objects

During the implementation of quality and safety management for landscaping engineering, the flowers, plants, and trees planted internally are the primary management objects, being living organisms. Precisely because of this, in management work, personnel need to set corresponding work plans based on the specific growth patterns of the plants. To meet predetermined aesthetic requirements, landscaping projects involve planting different types of flowers, plants, and trees in combination, significantly increasing management difficulty. As the crucial object for overall landscaping quality control, plants have distinct growth stages, and problems cannot all be exposed intensively in a short period, significantly raising management difficulty.

2.3. Artistic characteristics

Landscaping engineering, serving as a micro-environmental project in China's urban development, possesses both environmental greening and ornamental functions, with artistic characteristics being more prominent. Landscaping projects often employ various complex construction techniques, which, while enhancing their artistry, also significantly increase management difficulty. Furthermore, the aesthetic demands of the public evolve, and understandings of artistry are diverse, leading to some controversy in quality control [2]. Compared to traditional quality management, landscaping engineering, possessing artistic value, requires timely adjustment of construction quality management strategies due to different construction methods.

3. Common quality and safety issues in landscaping engineering

3.1. Quality issues

From the perspective of the construction and development of landscaping engineering in China, the types of quality issues are diverse and cannot always be effectively identified. Design quality issues are also among the most common. During the construction of landscaping projects, the design phase has the most direct impact on subsequent engineering construction and sensitivity. If designers select completely unsuitable plant species for combination, or if there are obvious design flaws in the green space scope, form, or structure during the engineering process, it will affect the overall greening effect of the project [3].

Simultaneously, during landscaping project construction, there are also apparent quality issues related to engineering materials, construction technology, and construction management. Some construction units select seedlings, fertilizers, planting soil, etc., that do not meet engineering requirements, or problems such as insufficient

planting depth and soil cover depth for trees during construction occur, which can significantly affect the outcome of the landscaping project and markedly reduce vegetation survival rates.

Inadequate implementation of construction management during landscaping project construction is also a primary cause of these issues. After completion, the quality of a landscaping project does not remain constant; it requires long-term maintenance management to achieve the set goals. If pruning, water and fertilizer management, and pest control work for the landscaping project are not carried out regularly, the aesthetics and environmental benefits of the project will gradually decline.

3.2. Safety issues

During landscaping project construction, personal safety issues are relatively frequent safety concerns that threaten the safety of construction personnel while also potentially affecting nearby residents and the ecological environment. Landscaping projects are typically constructed in urban public areas, and various potential safety hazards during construction are significant factors that cannot be ignored in management work. Irregular operation of machinery and equipment, movement of large-sized seedlings and equipment, and work at height are all relatively obvious safety risk factors [4]. In cases of irregular operation of construction machinery and equipment, personal injuries are likely to occur, and inadequate protective measures for work at height can lead to fall injuries.

Furthermore, environmental safety is also a major issue faced in landscaping engineering. During the construction and later maintenance of landscaping projects, chemical substances such as fertilizers and pesticides are often used. If the usage amount is not properly controlled, it could lead to ecological environmental pollution. Especially for water sources and land, the excessive use of chemical fertilizers and pesticides can directly affect the personal safety of nearby residents. After the completion of landscaping project construction, if tree planting locations are chosen unreasonably or tree species are unsuitable, it can pose certain threats to the nearby environment and traffic safety.

4. Quality and safety management and control countermeasures for landscaping engineering

4.1. Establishing a project manager working group

In the implementation of quality and safety management and control for landscaping engineering, the establishment of a Project Manager Working Group can enable macroscopic planning and deployment of the landscaping project from the source, forming a feasible management plan based on this (**Figure 1**). The Project Manager Working Group needs to conduct a comprehensive review of the construction drawing content, analyzing the feasibility of the construction plan based on the hydrogeological characteristics of the project target area. Simultaneously, it should study the construction conditions at different stages based on the meteorological characteristics of the target area and adjust the construction plan and schedule accordingly. Group members need to reasonably arrange the construction schedule according to the project's quality and construction progress requirements. The Project Manager Working Group needs to reasonably allocate time, materials, construction equipment, and personnel for various sub-projects during construction and resolve various problems arising in sub-project construction [5]. The project manager needs to analyze the economic and ecological impacts caused by plant losses and propose corresponding solutions under the premise of fully understanding issues related to seedling transplantation.

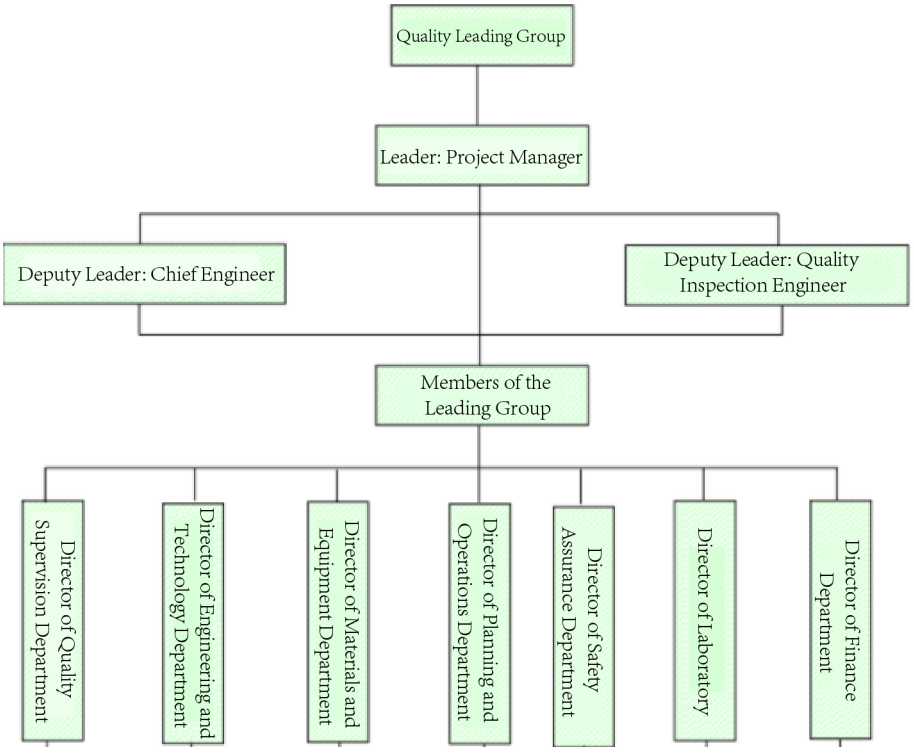

Figure 1. Structure and composition of the project manager working group.

4.2. Communication and exchange between management and design personnel

As landscaping engineering possesses distinct artistic characteristics, in quality and safety management control work, management and design personnel must engage in comprehensive communication and exchange. Based on mastering the elements of landscaping engineering design work, they should promptly discuss corresponding solutions for problems identified in the construction drawings. For example, in a certain project, trees were selected as the main greening plants. However, because trees require a long growth cycle, and the survival rate of large trees during construction is relatively low with significantly increased difficulty in later maintenance, selecting small trees with lower survival rates would fail to meet the design requirements. After comprehensive analysis and discussion by management and design personnel, considering the actual needs of the project, trees with a breast-height diameter of X cm were chosen as the greening vegetation. Being in their prime growth stage, they have good growth potential, relatively high survival rates, and their appearance can meet the specific requirements of the greening project.

4.3. Continuously improving quality and safety standards

In the quality and safety management and control of landscaping engineering, quality and safety standards play a crucial guiding role, providing direction for subsequent design, construction, and management work, ensuring the smooth implementation of the project. Simultaneously, quality and safety standards are also important prerequisites for evaluating project quality and safety. Through data evaluation and standard comparison, management personnel can effectively identify various defects in landscaping construction and promptly formulate corresponding solutions. As relevant units continuously improve the quality and safety standards for landscaping engineering, quality standards focus on multiple links such as design, construction, and management. The design

phase must comply with existing urban green space planning and regulations, and all selected vegetation and materials need to meet industry and national standards. During the construction process, construction personnel must strictly adhere to the established construction plan to smoothly implement all tasks. In the process of standard improvement, quantifiable indicators need to be established. Safety standards include various safety regulations that need to be followed during landscaping project construction. In later evaluations, the overall safety of the landscaping project can be assessed, and identified problems can be promptly improved.

4.4. Effective implementation of on-site supervision work

Whether the landscaping project can be effectively implemented according to the established construction plan is closely related to supervision work. In the design phase of the landscaping project, supervision personnel need to ensure that the design plan fully meets current green space planning and regulatory requirements and satisfies the specific needs of urban environmental development in the region. Simultaneously, the plan content should be comprehensively reviewed. Upon discovering design issues, it should be returned promptly, urging the design unit to make revisions. Supervision requirements in the design phase require management personnel to comprehensively review the feasibility and innovation of the scheme design, encouraging designers to introduce modern design concepts and technologies to ensure the continuous improvement of the ecological and economic benefits of the landscaping project.

After entering the construction phase of the landscaping project, supervisors need to check whether the construction process complies with the relevant content of the construction plan and audit the performance indicators of construction materials and equipment. Furthermore, during the construction period, supervisors need to conduct regular and irregular inspections, promptly correcting and recording non-standard construction behaviors. Supervision work in the construction phase also includes safety supervision. It is necessary to review whether safety protection measures at the project site are complete and correct various unsafe behaviors of construction personnel, thereby comprehensively improving the quality and safety of the project construction.

4.5. Reasonable selection of construction time and soil

The survival rate of vegetation in landscaping engineering is simultaneously affected by construction time and soil factors. To further improve the quality and aesthetics of the landscaping project, the construction unit needs to reasonably determine the construction time based on the climatic characteristics of the area where the garden project is located. Designers should comprehensively analyze temperature changes and ranges in southern and northern regions, comprehensively discuss the specific impacts of factors such as temperature, humidity, and light during plant growth, and compare the survival rates and flowering periods of different plants based on this to ultimately select the appropriate construction time. Soil, as the fundamental condition for landscaping vegetation growth, is affected by the types of inorganic salts, acidity/alkalinity, and permeability within it, which significantly influence plant growth and development. During project construction, relevant personnel need to comprehensively investigate soil composition and depth, scientifically adjust soil thickness and nutrient composition according to the vegetation selected for the landscaping project, ensuring the soil's nutrient structure and depth can meet the needs of vegetation at different growth stages.

5. Conclusion

In summary, landscape greening projects exhibit distinct artistic characteristics, with a significant increase in

the number of sub-projects, leading to elevated challenges in quality and safety management. In response to the current quality issues in design and construction, as well as various safety hazards during the construction of landscape greening projects, construction units should establish a project manager working group and develop comprehensive quality and safety standards for landscape greening projects to provide guidance for project construction and management. At the same time, during the construction period, it is necessary to comprehensively implement quality and safety supervision across different stages, combined with proper selection of construction timing and soil, to ensure improved survival rates of vegetation and enhanced aesthetic appeal in landscape greening projects.

Disclosure statement

The author declares no conflict of interest.

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