

Application of Garden Plants in Slope Protection Engineering

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Abstract: Road slope protection project is an essential project in road construction. The traditional slope protection method can no longer meet the requirements of people's landscape experience. With the proposal and development of the concept of ecological civilization, garden plants and road slope protection projects should be organically combined. The application of garden plants in slope protection engineering is discussed from three aspects: the types of slope protection, the selection of protective plants, and the greening technology of road slopes.

Keywords: Garden plants, Slope engineering

1. Introduction

The development of road traffic means the improvement of the level of economic construction. Since the construction of the first Hujia Expressway in my country in 1988, the total mileage of the national expressway has reached 131,000 km, ranking first in the world. While road construction brings convenience to people, it also brings great negative impact on the environment, such as destroying local vegetation communities, eroding soil, destroying topography and landforms, and destroying local hydrological conditions, among which the damage to vegetation communities is the most serious. , and the destruction of vegetation will lead to soil erosion. Therefore, it is very necessary to do a good job of slope protection while constructing highways.

Slope protection engineering refers to the general term for various paving and planting on the slope to prevent the slope from being scoured. The traditional slope protection methods include retaining wall support, anti-sliding pile support, mortar rubble, shotcrete, anchor and shotcrete slope protection, etc. These works play an important role in the stability protection of the slope and can also effectively prevent soil erosion. . However, with the passage of time, these measures will be eroded and aged by wind and rain, and the strength will become worse and worse, resulting in higher maintenance costs in the later period. As people pay more and more attention to the natural ecological environment, the requirements for landscapes are also increasing, and the demand for road landscapes is also increasing, such as urban roads and surrounding roads, and roads in tourist attractions. The landscape experience brought by the traditional slope protection method can no longer meet the needs of today's people. The gray hard project forms an incongruous contrast with the surrounding green mountains and green water, and cannot be integrated into a harmonious whole^[1,2].

With the development of "land greening", the greening of road traffic has been put on the agenda. The protection of slopes cannot only rely on concrete and cement works. It is an environmentally friendly and effective measure to use plants to restore the slope ecology. Slope ecological

restoration refers to the engineering method of using plants themselves or the combination of plants and non-living materials to reduce soil erosion and soil erosion and reduce the instability of slopes^[3]. The use of plant slope protection is to use plant roots to reinforce soil, and use plant stems and leaves to intercept rainwater, so as to strengthen and protect shallow slopes. Ecological slope protection can not only improve the landscape effect, but also the green vegetation can carry out photosynthesis, absorb carbon dioxide, release oxygen, reduce the carbon emissions of vehicles, and absorb harmful gases in the exhaust.

Ecological slope protection started late in my country, and the theory of slope protection landscape is relatively lagging behind. In order to allow road users to enjoy the beauty visually and psychologically, the author will discuss the development of vegetation slope protection from the perspective of plant landscape.

2. Selection of Slope Protection Plants

2.1 Classification of slope soil types

In view of different soil types and site conditions, the requirements for protective measures are also different. There are four basic types of highway slope soil, which are sand type, sand type, soft rock type and hard rock type. The soil of sandy slope is mainly sandy soil, and the specific protection measures include bag type plant slope protection, digging pits and planting grass, and digging ditches and planting grass in guest soil; The sand and gravel slope soil is mixed with soil, sand and stone and protected by hydraulic spraying; The soft rock slope soil is mainly weathered and cracked rock, which is protected by hanging net and spraying; The soil of the hard rock slope is rock, which is sprayed by hanging nets, planted with shrubs on the platform, planted with vines on the slope, and climbed along the slope with preset grass ropes or iron wires.

2.2 Selection principles of slope plants

2.2.1 The right place and the right kind. In combination with the site conditions and environmental climate on the slope surface, local plant varieties shall be selected and foreign excellent plants shall be introduced appropriately.

Select the plant species suitable for the area, display the landscape characteristics and integrate the landscape into the surrounding environment.

2.2.2 Plant diversity and coordination. Using artificial intervention to simulate the natural environment for ecological restoration, using different kinds of plants, not only can effectively enrich the ornamental, but also more conducive to plant growth. On the basis of maintaining the diversity of plants, the coordination between plants and the environment should be considered to meet the diversified aesthetic needs and show the diversity of natural landscape.

2.2.3 Reasonable collocation of plant communities. The reasonable collocation of plant communities can quickly and effectively enhance the stability of the slope, increase the stress resistance, reduce the pests and diseases, and is of great significance for the restoration of the ecological environment.

2.3 The plant selection of slope plant community shall be based on the regional climate environment, different slope types and slope protection requirements, scientifically and reasonably determine the plant types suitable for slope growth, reasonably match the plant communities, and establish a long-term stable plant ecological community from the long-term perspective[4].

The slope plant community is divided into herb type plant community, shrub grass type plant community, arbor shrub type plant community and special type plant community. Among them, the herbaceous plant community grows fast in the early stage, is easy to survive, rapidly degrades the soil toxicity, activates the soil, makes the soil conducive to plant growth, and is suitable for grassland, agricultural land and steep rock slope; Shrub grass type plant community, with rapid growth and easy survival in the early stage of herbage, developed shrub root system, good slope fixation effect, accelerating the formation of stable plant community, suitable for gentle slope, urban suburb, quarry site, highway (railway) slope, near water bank slope, etc; The arbor shrub type plant community is more abundant and stable, close to the natural community, suitable for forest, gentle slope, filling slope and spoil heap; Special types of plant communities have good landscape effect and high landscape requirements, such as parks and highway entrances.

3. Slope Protection Type

3.1 Spraying and sowing of net hanging guest soil spraying and sowing technology of net hanging guest soil is to fix the galvanized net on the slope from top to bottom, then mix the guest soil, fiber, corrosion prevention agent, long-term slow-release fertilizer and seeds in a certain proportion, add them into the special equipment, mix and mix them fully, and then spray the compressed air onto the slope through the compressor to form the required growth foundation^[5].

By spraying vegetation on the slope, the erosion and water and soil loss caused by rain on the slope are effectively suppressed. The planting base composed of soil improvers and organic fiber materials is conducive to the long-term survival and growth of plants.

3.2 Straw stick Technology

Straw stick technology^[6] on the basis of leveling the slope surface, the straw is sterilized, the straw is wrapped around the bamboo rod to make straw sticks, then soaked with thin mud, and the ribbed steel is used to anchor the top and bottom of the slope to form a firm force layer. The bound straw sticks are fixed on the force layer with galvanized iron wire at a certain distance, and then covered with soil. The first covering

thickness should cover the straw sticks to make them not exposed to the soil, and then watering is used to make the guest soil fully settle; For the second time, the subsidence part shall be covered with soil and watered again after watering. Finally, the grass seeds shall be sown, and the small shrubs or vines shall be planted after the grass sprouts. The straw stick material can provide nutrition for plants in later stage after being decomposed.

3.3 Grass planting for slope protection

Before planting, the slope shall be mechanically graded, and then the tillage layer shall be manually loosened to remove the debris with a diameter of more than 2 cm, weeds, tree roots and other sundries. After watering the finished slope, the treated grass seeds can be mixed with sand for sowing. The seeds can be sown by using a seeder or manually to ensure that the seeds emerge quickly and evenly. In order to stabilize the soil and fix the seeds, it is necessary to cover them after sowing. Non woven cloth can be used to cover them, which is permeable and breathable, and can prevent rain erosion. When the grass seedlings grow up, they can jack up or drill out the non-woven cloth. At the same time, with the increase of turf coverage, the non-woven fabric also gradually weathered^[7].

3.4 Mixed injection technology

Mixing and spraying greening is to use special spraying and mixing machinery to spray dry mixed materials such as soil, fertilizer, organic matter, water retaining materials, plant seeds and cement onto the rock surface, and form a layer of hardened body with continuous voids on the rock surface through the bonding action of cement. The voids are filled with plant seeds, soil, fertilizer and water retaining materials, so as to realize the greening of rock slope^[8].

4. Road Slope Greening

4.1 The difference between road greening and landscaping: road slope protection greening is to recover and protect the environmental trauma caused by road construction by using the principle of ecological restoration, so as to achieve the effect of water and soil conservation slope stabilization and greening and beautification. Landscaping focuses on visual and sensory beautification. Most of the plants used are beautiful and have ornamental value. The construction is difficult, but the cost is high, and the maintenance and management requirements are fine. The greening of Expressway focuses on restoring nature, ensuring traffic safety and improving road environment. The selection of plants requires local plants with fast growth and strong tolerance. Because the site conditions of the road slope are poor, the soil fertility is low, and the water and fertilizer retention capacity is poor, the construction is difficult.

4.2 The significance and function of slope greening, slope greening is to induce plants through artificial intervention, accelerate their growth and succession, make plant communities coincide with the surrounding environment, form an organic whole, and realize the sustainable development of ecological environment^[9].

4.2.1 Slope reinforcement. The roots, stems and leaves of plants can effectively prevent soil erosion and strengthen the slope. The deep root has anchoring effect, while the shallow root has reinforcing effect.

The vertical root system of the plant passes through the loose weathering zone in the shallow layer of the slope and is anchored to the deep and stable rock and soil layer to act as a

prestressed anchor. For example, the roots of legumes, grasses and small shrubs can strengthen the soil at 0.75-1.50 m underground. The test shows that the finer the diameter of the plant root, the higher the tensile strength. The calculation formula is as follows:

$$T=nD^2 \quad (1)$$

Where, t is the tensile strength of the root; D is the diameter of the root; n . M is the empirical constant of a given tree species. The tensile strength t of various types of roots with a diameter of 2-5 mm is 8-80 MPa.

The root system of shallow root plants is intertwined in the slope soil, which can be regarded as a three-dimensional reinforced material with prestress, and can effectively improve the cohesion of the shallow soil on the slope.

4.2.2 Guide the line of sight. During the driving process of the vehicle, the driver's sight is guided. Through different planting forms, the driver can know the road changes in advance, make the driver prepare in advance, and bring the driver a sense of psychological safety through continuous and soft slope landscape.

4.2.3 Ecological restoration. Vegetation slope protection is beneficial to ecological balance. Green plants have the functions of purifying air, preventing pollution, absorbing dust and reducing noise. According to the data, 60% of the oxygen on the earth comes from the photosynthesis of green plants. The one-way trees on both sides of the 1km road can absorb 1000 kg of CO and release 730 kg of oxygen every day. While photosynthesis, plants also absorb harmful gases such as carbon monoxide and nitrogen oxides in automobile exhaust.

5. Summary and Prospect

According to the characteristics of different slope environments, try to use multi-level plants of trees, shrubs and grasses for planting. According to different slopes, select appropriate plant species, such as Bermuda root with Jasmine or honeysuckle, Ryegrass with purple locust. In terms of plant selection, local native plants shall be selected as much as possible. Seed banks of native plants can be established in different regions to stabilize the genetic genes of local plants, maintain the diversity of local plants, and make plant communities closer to the original natural state^[9].

In the development process of slope protection engineering, learn the new technologies and concepts of slope protection in foreign developed countries according to the local conditions. To change the original concept, the construction of landscape ecology should be regarded as the benefit target in the growth period. Effectively combine the management and maintenance of vegetation with the construction

technology, and reduce the cost of ecological protection in the later stage from the perspective of scientific management and technology application^[10].

In a word, the ecological protection of Expressway Slope in China is still in the stage of continuous exploration, and its relevant theoretical research and engineering technology are not perfect. Based on the practice and research of ecological protection of expressway slope, the author puts forward some schemes and measures for ecological construction of slope, which have some limitations. The final effect and practicability of slope ecological protection still need to be constantly practiced and tested. Only in this way can we grasp the advantages and disadvantages of various protection forms more scientifically and thoroughly, and explore the slope ecological protection forms suitable for different regions.

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