

Scientific planning and design of urban road greening landscape under the guidance of Sponge City

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Abstract: Under the influence of the continuous accelerating of urbanization process, urban roads have achieved rapid development, which directly promoted the local economic development level and the people's living standards. Based on this situation, people began to pay more attention to the comfort and environmental protection of daily production and living environment. Therefore, under the influence of various related factors, the Sponge City theory was derived and began to bring its role into full play, especially had a more and more prominent guiding role in the urban road landscape planning and design. Hereby, this paper mainly conducted a detailed analysis on the scientific planning and design of urban road greening landscape under the guidance of Sponge City.

1. Practical significance of scientific planning and design of urban road greening landscape under the guidance of Sponge City

First, be conducive to reduce the urban natural disasters. The Sponge City can smoothly drain off water and store water during the concentrated precipitation period, it can reduce the phenomenon of drought and floor in the city. During the drought periods, the rainwater accumulated in advance can effectively alleviate the drought, thus having a certain regulating effect. This theory can greatly alleviate urban natural disasters and avoid unnecessary economic losses. Therefore, the design of Sponge City and optimization of urban road greening landscape design can alleviate the urban natural disasters to a large extent. Secondly, be conducive to improve local microclimate. Sponge City construction is mainly based on urban construction, residential areas, roads, greening, etc. It is mainly to turn the city into green. Therefore, the urban road greening under the guidance of Sponge City theory can effectively alleviate natural disasters, form inner-city microclimate and promote the restoration of the urban environment. It also can effectively mitigate the occurrence frequency of severe weather and greatly reduce natural disasters and their impact on human beings.

2. Scientific planning and design Technology of urban road greening landscape under the guidance of Sponge City

2.1. Water Saving Technology

When the rainy season comes, the amount of precipitation is very large and the flow rate of rainwater is relatively fast, as a result, it is easy to cause the rainwater to carry away sediment and

other related sundries when flowing through the green belt, thus hindering the collection and utilization of rainwater and severely blocking the drainage pipe. Moreover, the rapid flow rate of rainwater will directly increase the burden of drainage pipes. Therefore, rational utilization of water saving technology according to the actual situation not only can ensure that the speed of rainfall runoff slows down, but also can slack the runoff time, so as to effectively solve the above negative phenomena.

2.2. Regulation and Storage Technology

Based on the concept of Sponge City, the regulation and storage technology in urban road greening landscape design is very critical, which can effectively alleviate the urban flood phenomenon. While in the dry season, the regulation and storage technology also can save the rainwater and avoid the serious shortage of groundwater resources. In addition, there are significant differences in the amount of rainwater collection and storage in different regions, and the demand for water resources is also obviously insufficient. As a result, some places are seriously short of water resources, while other places have too much. When there is a large amount of rainwater and the storage space is insufficient, the rainwater can be transferred out of other areas through the regulation and storage technology so as to have sufficient time to store and purify rainwater.

2.3. Infiltration Enhancement Technology

The so-called infiltration enhancement technology is to speed up the rate of infiltration. At present, most of the raw materials used for urban roads in our country are asphalt and cement concrete, which have excellent airtightness performance. Therefore, the rainwater infiltration function is very poor, so it is often difficult for rainwater to infiltrate rapidly and causes serious waterlogging. However, the infiltration enhancement technology can directly accelerate the rainwater seepage velocity and promote the rapid recharge of urban groundwater. For the design of road greening landscape, the major choice is to change the paving materials of the greening belt and select the materials with strong permeability. When the amount of precipitation is relatively large, the gaps of the materials will be used as the main channel to realize the infiltration of rainwater into the soil. While in the dry seasons, the gaps of the materials are conducive to the air circulation, which is contribute to avoiding the urban dry island effect.

3. Scientific planning and design of urban road greening landscape under the guidance of Sponge City

3.1. Project profile

In the main roads greening landscape design of a city's new pattern demonstration zone, the red line of the road is 50 meters, and the layout is four-plate and five-belt. In the center, there is a two-meter-wide median strip, and on both sides, there are twelve-meter-wide motor vehicle lanes, and 2 meter-wide side partition strip, 4.5 meter-wide non-motorized vehicle lanes, 1.5 meter-wide avenue greenbelt, and 4.5 meter-wide wide sidewalk. Among them, the total length of the S-road is 3726 meters, the greenbelt of roadside on both sides is 15 meter-wide, and the green area is 145237 square meters. While the total length of the F-road is 6167 meters, and the greenbelt of roadside on both sides is 10 meter-wide, and the green area is 178788 square meters.

3.2. Design scheme

3.2.1. Design of vehicle-dividing greenbelt

The vehicle-dividing greenbelt is actually the bio-retention zoning, its main task is to regulate the motor vehicle lanes and rainfall runoff. Because the road hierarchy is relatively high, the traffic flow is relatively large, and there are a lot of solid particulates and pollutants in the pathway, the project selected the complex bio-retention facilities, the design of greenbelt is in low elevation, and the top water storage depth is about 0.2 meters. The median strip is located at the top of the arch of the road cross-slope. The rainfall runoff in the cross-slope direction cannot be gathered here quickly and comprehensively. When there are deviations between the road longitudinal slope value and cross slope value, the green belt can closure the runoff around the centerline of the road in time. In the design, it should install the orifices curb set at the direction of the longitudinal slope of the road, especially the position of the median strip at the intersection start-stop position and the turning of the road, and pave the gravel belts at the entrance, so as to achieve the energy dissipation and intercept the particulate matter. The important role of the side partition strip is to quickly absorb the rainfall runoff in the motor vehicle lane. The runoff of the motor vehicle lane is very large, the pollution is very serious, and the passing motor vehicles also caused much garbage and dust. Therefore, in the direction of the motor vehicle lane, scientific and reasonable design of orifice curb is carried out at the interval of 1.8 meters, and gravel belts and retention belts are arranged at the opening side, so as to increase the volume of runoff that flowing into the green belt and realize purification and storage functions. The side partition strips are separated by about 50 meters apart, the overflow hole is set here to realize the connection with the rainwater pipe, and the water retaining dam is designed on the road section with the road longitudinal slope higher than 1%, so as to ensure the scientific and reasonable treatment of rainwater overflow and drainage. Because the side partition strips absorb the direction of rainfall runoff and flow rate, the lawn is about 0.8 meters in distance from the inside edge of the motor vehicle lane, but the main plants planted 1.2 meters away from one side of the non-motor vehicle lane are hedges and tall arbor trees, thus realizing the further optimization and improvement of the high and low levels of the greenbelt. The median strip has a relatively small effect on the rainfall runoff, and it needs to be shaped emphatically, but in the landscape, sight indicator and anti-dazzle design, the specific characteristics of the land around the road should be taken into account and highlight the uniqueness of the road.

3.2.2. Design of roadside trees greenbelt

In this project, the main functions of the design of roadside tree greenbelts and the sidewalk pavement are regulating and storing rainwater in the lanes. The sidewalks are paved above the self-permeable underlying surface, so the rainwater can be quickly infiltrated into the grass and soil through the water permeable bricks. The roadside tree greenbelts are rationally arranged in the form of tree pool with single arrangement of plants. Among them, the tree pool should choose the LID tree pool and the surrounding should be paved with flush curb, so that the rainfall runoff on the sidewalk can enter the LID tree pool directly and timely. As the cross slope of non-motorized vehicle lane gradually inclines towards the sidewalk with a slope of 1.5%, therefore, LID tree pool needs to build inlet flume in the non-motorized vehicle lanes to absorb the rainfall runoff. Around the roadside trees, ground cover plants and gravel buffer strips with a slope of about 1.5% should be scientifically and reasonably arranged, and the combination of the two methods should be adopted, so that the rainwater interception capacity of the tree poll can be significantly improved. It also should try its best to avoid soil erosion in the tree poll, and make a good landscape effect.

3.2.3. Design of roadside greenbelt

The roadside green belt plays a certain role in regulating and storing the rainwater that mixed into the greenbelt. This is mainly because the road direction that the cross slope of the greenbelt passed though about 1.5%, the far end of the road mainly uses the combination structure of arbors, shrubs and vegetation to form the plant buffer zone during the design time. The short-cut of the road is set as a sunken green space. Based on the existing terrain, it should choose the green area with good natural water collection conditions, the crooked road should be arranged at the inner part of the green space's major arc, and the long and straight road should be distributed to the edge of the green space in punctate form. The midway is effectively connected by the planting grass swales, the far and near road ends and sunken green space, so as to form a continuous ecological green space system. After rainwater enters the greenbelt, the plant buffer belt is used as a carrier to realize filtration and interactively transmit with the grass swales, and the rainwater would intersect with the sunken green space and then be filtered and absorbed through the plant roots and surface soil, thus effectively supplementing the groundwater after purifying the water quality. However, the sunken green space can be reasonably set with the overflow holes, so that the exceed-infiltration rainwater can enter the rainwater pipeline after passing through the overflow holes.

According to the function of the surrounding plots and the user's behavioral needs, the roadside greenbelt is divided into two major areas: the function section and the image section, and the planting design mainly converged at the image section of the far end of the road. While the greening around the residential areas is closely related to people's travel. Among them, the combination model of F road is that one step makes a difference. For the distant view, it should select the collocation pattern of the evergreen and deciduous trees, for the medium view, it should select some flowering shrubs, and for the close view, it should plant the perennial grass and ground cover plants that are relatively resistant to water and humidity. The combination of the distant, medium and close views makes the road become the main themed area of flowers, leaves and fruits. Some of them have the rest areas and create a good landscape of four seasons' evergreen, while they should also have certain leisure functions. As a green wall, the multilayer flora has largely separated the living area from the roads, which has effectively relieved the serious interference caused by vehicle noise, thus directly providing people with a quieter and more comfortable living environment.

Greening around industrial areas should definitely abide by the relevant principles of simplicity and generosity, dust prevention, tousele removal, and avoidance of environmental hazards of pollutants. Therefore, the S road can choose a regular style. For the distant view, it can select the tall arbor trees and enclosure the path space, thus forming the road skyline. For the medium view, it can select the green and small arbors and coleus shrub. For the close view, it can select the linear hedge, and pay attention to the collocation of plant color and seasonal changes, thus creating a good road landscape and drivers can always ensure that their sight is not obstructed and play the role of traffic guidance.

3.2.4. Selection of the plants

First of all, planting tress based on the environment. The greening site conditions of urban roads are relatively harsh, so it should select the plants with strong vitality and adaptability that can be managed in an extensive way, it should try to take the indigenous plants as the main species, or select some suitable and domesticated plants from other regions for supplement. Secondly, adjust measures to local conditions. Because of the geographical environment varies greatly with different regions, the water content of green space is not clear. Influenced by the local seasonal rainfall, the precipitation in summer is relatively large, so the vegetation should give full play to its regulation and storage function, the vegetation should have the good water and humidity resistant ability.

While the rainfall in winter is relatively small, the vegetation should give full play to its cold and drought resistance ability. In addition, the vegetation will also be affected by the internal horizontal elevation difference of the rainwater management facilities and equipment. Therefore, based on the actual situation, it should select the aquatic plants, hygrophyte and terrestrial plants with the drought and flood resistance ability. Thirdly, ecology is the first. The reasonable selection of plants also needs to give full play to its purifying effect, and the plants with stronger root system, lush stems and leaves that can purify the pollution should be preferentially selected. Pay attention to the biological diversity and choose floral that can realize the harmonious intergrowth, so as to form an ecological group, avoid the adverse effects of vegetation competition on growth and development, and maintain sustainable thriving of green landscape. Finally, realize the harmonious intergrowth. Urban road greening must also have certain ornamental value. Relevant factors such as plant color and texture should be fully considered. It should select the plants with good landscape effect and ensure that the layers of the landscape is plentiful, the collocation is reasonable, the seasonal aspect is obvious, and can meet the aesthetic needs of urban road landscape to a large extent.

4. Conclusion

In summary, the design of urban road greening landscape under the guidance of Sponge City can not only optimize the road greening effect, but also can directly reflect the urban public space and landscape expression. However, choosing a scientific and feasible design has a direct impact on the planning target of the Sponge City and the shaping of the city image. At the present stage, people's cognition of the Sponge City is getting deeper and deeper, and the design of urban road greening landscape is becoming more and more mature, thus further promoting the realization of diversified functions of urban road greening landscape. That needs to strengthen the training and education of relevant staff in the construction process, so as to help realize the scientific planning and design of urban road greening landscape.

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