Micro Terrain Construction of Service Facilities along the Expressway

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Abstract. The service facilities along the expressway are designed to meet the needs of drivers and passengers, which is directly related to the convenient travel of the general public. In order to break through the rigid construction mode of expressway service facilities, this paper analyses the micro terrain design and construction of different types of expressway service facilities, and discusses the micro terrain construction of expressway service facilities, so as to improve the view of the landscape and the sense of physical and mental pleasure of the drivers, passengers and service personnel, eliminate security risks and improve service efficiency.

1. Introduction
The service facilities along the expressway are an important window for the transportation industry to serve the economic and social development, directly related to the convenient travel of the general public. In addition to providing fuel filling, maintenance, meals, toileting, rest and other services for drivers and passengers, it also plays an important role in meeting the physical and mental needs of drivers and passengers and effectively preventing drivers from fatigue driving.

In order to break through the rigid mode of expressway service facilities construction, we can improve the viewing of service facilities landscape and the sense of physical and mental pleasure of drivers, passengers and service personnel through the organic combination of micro terrain design and construction and Ecological Landscape Greening Based on micro terrain, so as to eliminate security risks and improve service efficiency.

2. Micro Terrain Design of Expressway Service Facilities

2.1. The First Point of Micro Terrain Design for Expressway Service Facilities
In the design process, the design unit shall conduct on-site investigation on the green areas within the highway land. Combined with the needs of landscape greening and site drainage, the micro terrain transformation and design are carried out, and the vertical design drawings of each area are drawn. In the design disclosure, the construction content and index requirements of the construction unit shall be specified, and the specific implementation measures shall be detailed.

2.2. The Second Key Point of Micro Terrain Design for Expressway Service Facilities
The subgrade between the main line of confluence section and ramp shall be micro topographically trimmed. When filling, the main line slope shall cross the ramp subgrade according to the designed slope rate, the slope toe shall be slightly higher than the top elevation of the drainage ditch, and the top of the drainage ditch shall be slightly lower than the pavement elevation of the ramp. When excavating,
it is advisable to gradually slow down the slope rate and make a smooth transition with the adjacent slope.

Figure 1. Legend of micro terrain construction in the site (1).

2.3. The Third Key Point of Micro Terrain Design for Expressway Service Facilities
When the cutting slope in the site changes direction, it should be arc treated. When grading without conditions, the planting density of shrubs should be increased properly on the variable slope.

Figure 2. Legend of micro terrain construction in the site (2).

2.4. The Fourth Key Point of Micro Terrain Design for Expressway Service Facilities
High retaining wall should not be set at the foot of cutting slope in the site. When there is a retaining wall, trees, shrubs and climbing plants should be planted outside the retaining wall to cover it.

2.5. The Fifth Key Point of Micro Terrain Design for Expressway Service Facilities
The service facilities along the expressway are areas with large flow of people, so it is not suitable to plant plants with strong toxicity. The landscape features should be simple, generous, practical, convenient and other features. Local characteristic materials can be added appropriately, and regional architectural symbols and materials can be used to realize the integration of architectural landscape, natural and cultural landscape.
When selecting materials for buildings and micro terrain in service area, local materials shall be used as much as possible, which can not only reduce cost and save energy, but also make buildings have unique regional characteristics and coordinate with local human and natural environment. For example, there are many stones in Dali, most of the Bai People's houses are made of local materials, and stones are widely used as the main building materials.
2.6. The Sixth Key Point of Micro Terrain Design for Expressway Service Facilities

Service area, parking area and other areas shall give priority to meet the service function and traffic demand. The site area should be as flat as possible, and micro terrain design can be carried out locally. Management center, maintenance work area, centralized residential area and other housing construction areas are more flexible. The microtopography design of the site area should be adapted to local conditions to avoid large-scale filling and excavation. The layout of facilities can also be high and low, flexible layout, and combined with the terrain to create hills, artificial lakes, pavilions and other landscape.

2.6.1. Key Points of Micro Terrain Design in Service Area. The site area of service facilities shall be selected according to the requirements of planting. The combination of arbor irrigation specifications should form a hierarchical visual experience. For the service area with good natural scenery, the viewing platform and rest path can be set along the red line of the construction land, and the small hills and pavilions can be reserved in the green area for the service area with conditions.

2.6.2. Key Points of Micro Terrain Design in Parking Area. Trees with straight trunk and tree shape can be selected around to form a certain shade, so that the vehicle is not exposed to the sun; In large
green areas or key areas, there can be flower combinations, which can be used for rest and viewing by drivers and passengers. In terms of tree species selection, some high-grade garden trees with ornamental value can be used. It is mainly composed of small trees and shrubs with colorful leaves and flowers to create a living garden environment.

2.6.3. **Key Points of Micro Terrain Design in Housing Construction Site**

- Focus on the integration of relevant facilities of outdoor works in the site, and take into account the coordination of overall layout of single building and architectural facade style. The design elements of the building facade show the regional cultural characteristics and styles, and integrate the local ethnic cultural elements into the design of some main building designs. Reasonable use of color and pattern matching, highlighting the local ethnic culture and features.

![Figure 5. Legend of national cultural elements integrated into house building design.](image)

- The construction concept of "follow the trend, design flexibly and keep in place" should be adhered to in the field of housing construction. Through the flexible layout of roads in the site, linear optimization, height difference design of single building and other treatment methods, to maximize the expression of natural terrain and human landscape.

- The single building shall be arranged according to the original terrain of the site. The height difference design shall be reasonably controlled according to the building height and the building spacing. The space between multi-storey buildings (floors ≤ 6) should be controlled at 20-40m, and the height difference of single building should be controlled at 5-10m.

- The microtopography in the site area shall be mainly constructed by outdoor works. Through the site greening area leveling micro terrain construction, with the help of the original mountain forest water body, vegetation landscape integration design, and assist the relevant hard landscape for landscape construction.

![Figure 6. Legend of micro terrain construction in the site (3).](image)

- When the outdoor engineering green area creates the undulating shape, the boundary slope should be slowed down and the slope rate should be controlled within 1:3 generally. The boundary grading of outdoor engineering sports facilities shall be as gentle as possible.
Different sports venues can be connected through platforms and steps, and integrated with terrain to create a spatial level for transition.

**Figure 7.** Legend of micro terrain construction in the site (4).
- The green landscape of the construction area first meets its functional requirements, such as selecting the tree species with beautiful posture and bright leaf color at the entrance. The planting design is mainly courtyard greening, with open form, combination of arbor, shrub and grass, natural planting, forming a rich plant landscape. Combined with the regional cultural landscape, the green landscape environment of the building area with regional characteristics is designed.

**Figure 8.** Legend of micro terrain construction in the site (5).

3. **Micro Terrain Construction of Expressway Service Facilities**

3.1. *The First Point of Micro Terrain Construction of Expressway Service Facilities*
The construction unit shall carry out the construction of micro terrain of service facilities in accordance with the construction content and index requirements specified in the design disclosure link.

3.2. *The Second Point of Micro Terrain Construction of Expressway Service Facilities*
The micro terrain construction of service facilities shall be subject to special acceptance in accordance with the design documents. The civil construction unit shall complete the earth and stone works according to the requirements of the design unit and the construction unit, and deliver them to the follow-up unit after passing the inspection. Landscape engineering construction and other follow-up processes can be carried out only after micro terrain is accepted.

3.3. *The Third Point of Micro Terrain Construction of Expressway Service Facilities*
In the implementation of greening, attention shall be paid to the fine construction management to ensure that the ancillary works of the road surface are smooth and beautiful, all angles are covered with green, and there is no dead angle, so as to realize no wound or bare land within the road vision, so
as to build a green cultural corridor that serves the travel with landscape greening and guides the beautiful ecology.

![Figure 9](image)

**Figure 9.** Legend of micro terrain construction in the site (6).

4. **Protection of Micro Terrain Construction Effect**

In order to protect and maintain the effect of micro terrain construction and avoid man-made and other damages, it is necessary to set up supervisors and inspectors to supervise and regularly inspect the micro terrain of service facilities along the expressway, and timely report and deal with any problems found.

In addition, attention should be paid to the maintenance and management of the micro terrain drainage system of the service facilities. For example, when using cohesive soil to plant grass for protection, it is necessary to check the drainage cross slope and whether there is ponding pit to avoid ponding and ensure smooth drainage. When the bad weather such as sudden rainstorm affects and destroys the micro terrain effect of road landscape, it should be repaired or rebuilt in time.

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