

# The Design of Green Engineering in the Creation of Beautiful Highway

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**Key words:** Beautiful highway, Design concept, The design of green engineering

**Abstract:** In view of all kinds of problems in the creation of beautiful highway, points out the various aspects that are not adapted to create the requirements. From the design concept, to improve the construction of the highway, from the perspective of green project put forward a number of issues need to pay attention to.

Create the beautiful highway suitable for the current situation of social development, In this process, we need to do a comprehensive analysis of the impact factors of various aspects. In this paper, combined with a specific project, the processing aspects that need to be concerned in the design of green engineering in the creation of the beautiful highway is described in detail.

## Introduction

The proposed highway expansion project is the only one of the main channels of the north and south of this region.

The road reconstruction project, in which the old road mileage is about 17 km. This road was upgraded from the original township road, whose roadbed width is 6.5 meters to 7.5 meters. The road grade is low, which even can't reach the four grade highway standard in the local turning back and longitudinal slope. The main problems of it are as follows:

1) Pavement damage is very serious.

The pavement of the old road in this project is poor, which is the asphalt surfacing pavement that has not been repaired for many years. Because of the overloading of heavy vehicles during the construction of the highway, the pavement condition deteriorated sharply, and the large concave pit, loose pavement can be seen everywhere.

2) Too much sharp corners and steep slopes.

The old road has 8 small radius back curve, in which the radius of the flat curve is less than 15 meters and the minimum horizontal curve radius is about 10 meters. While, the longitudinal slope of a few back bends are larger, and synthetic longitudinal slope of the largest up to 21%. It is so difficult to get along the inside of the curve that must through the other road to turn smoothly, especially for large vehicles. Sharp bends and steep slope in the heavy-duty vehicle kneading, the road was seriously damaged, the inside corner due to lack of curve widening, resulting in vehicle wheel track is beyond the scope of subgrade.

### 3) Serious damage to the protection facilities.

For the safety protection facilities set up on the road outside the embankment, online form good paragraphs, is mainly corrugated steel fence, the status quo is basically intact. Provided outside the chicane crash pier is basically being destroyed, the individual sections of this should be successive collision pier now remaining sporadic and block, and its anti-collision function completely ineffective. And if you encounter a slippery curve, it is very dangerous.

### 4) Road dust serious pollution of the environment.

Section reconstruction of the project, the hand is because of the destruction of the loose pavement caused by pavement after years of neglect. On the other hand is mainly for expressway construction process and damage of subgrade and pavement of heavy vehicles, most of the road is the basic form of the clay gravel road, the vehicles passing Yang dust non serious, which caused serious influence to the vehicles running on the road, pedestrians, and the surrounding residents. The phenomenon of "Sunny day out of ash, seriously affecting the rainy day travel mud" caused serious influence to the travel of the nearby residents.

### 5) Both sides of the road construction invade Highway Bound.

The road built by the project for many years ago, on both sides of the road building has invaded into the road of the land within the red line, alterations to the project brought more difficult, resulting in alterations in the demolition of a large number of cost.

The highway engineering will respond to the call of "the smooth, safe, comfortable and beautiful", and make "ensure smooth, safety, and tree brand, tree image" as the breakthrough point, creating a geographical and cultural characteristics of the landscape corridor, enhancing the quality of cold plate road and make it become a tourist highway boutique and an Chang Shu Mei demonstration project.

## **Engineering survey**

### *Landform*

The project is located in the Yunnan Guizhou Plateau over to Xiangxi hilly slope zone, northwest high, southeast low. With an average elevation of 500-1000 meters in between, Wuling mountain peak in the territory, mountains to the East is hilly areas, river cutting is shallow, ground gently rolling, along the banks of the river is mountain Bazi, the general elevation between 300-800; mountains to the west is karst mountain landform, the general elevation of between 600-1000 meters, the relative elevation of 600-800 meters. But, far away from the river in karst mountain hills, more surface depressions, undulating ground is not too large. The whole landscape is mainly mountainous.

### *Meteorological and hydrological*

Where the area belongs to the subtropical humid monsoon climate zone, ample sunshine, mild climate, abundant rainfall, warm day, no period is long. Annual average temperature of 18 degrees Celsius, the coldest month for January, the average temperature in 2 to 6 DEG C, the hottest month is July, average temperature in 24 to 28 DEG C; territory in the comparison of the same height, temperatures in the west is higher than that in the East; abundant rainfall in the territory, the average annual rainfall mm at 1100~1400, concentrated in 4 to 8 months, accounted for 60% ~ 65% of the annual rainfall. Total annual sunshine hours for 870.7 hours, frost free period of 250 days.

### *Vegetation*

Along with better vegetation, shrubs, trees with low coverage, low density. The age of Chinese fir and poplar forest and shrub vegetation in the majority, and partial distribution of farmland.

### *tourist resources*

The road along the route around 10km range distribution in a number of places in the class tourist attractions, mostly for geological and cultural landscape, and surrounding the distribution of Tujia nationality, unique folk customs.

### **The general design**

By using the relevant research results, the design of "one center, three promotion, five improvement" is carried out. Fully integrated the actual situation of the project area, follow the "people-oriented, sustainable development" of the road, emphasis on safety and environmental protection, the construction of smooth, safe, comfortable and beautiful "highway engineering.

The design goal of the project is that under the premise of limited funds, as much as possible of accident black spots focus sections to conduct a thorough transformation, and make the original road upgrade to the second grade crossing highway, and give full play to the design idea of "the smooth, safe, comfortable and beautiful".

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From the technical scheme, that is, through the cut-off taken straight to improve the indicators, widening roadbed, increasing lane in special sections and obstacle around town and channelized intersection and so on, eliminating the road congestion completely, improving traffic capacity to highlight the "smooth". In accordance with the requirements set norms, complete content, style, combing improve traffic safety facilities. By setting the emergency lane, on the measures of road traffic safety and geological disasters hidden investigation remediation, line horizontal and longitudinal indexes of a balanced portfolio, plane cross regional slow access, adding ditch cover plate and the renovation of dangerous bridges etc., and to safeguard the "security". Make full use of cut-off straight abandoned old and discarded soil field, or setting parking rest area (emergency stop), add water point, characteristic agricultural products selling point, service facilities, viewing platform and maintenance materials stacking area service and support facilities in proper position, and to realize the "comfortable". Introduction of landscape design methods to make full use of appropriate local growth of plants to carry out afforestation and beautification of highway design, basically artificial traces are not exposed, and fully display along the natural landscape, folk customs, history, culture and industry culture, combining industry regulation with government to support remediation road region environment, strengthening pavement recycled materials use and energy saving environmental protection design, and to strengthen the "beauty".

### **Greening Design**

#### *Design ideas*

For greening fill embankment on both sides, we should create a retractable visual space from the overall, and borrow the beautiful scenery of the roadside, shielding local indecent landscape. Taking into account the driving safety and comfort, we should in the outside of the curve used to guide the planting. This will not only meet the demand for traffic safety but also meet the demand for landscape visual corridor, abandoning the past, "a road, two rows of trees" mode. According to the topographical features of the surrounding the across the board, the roadside greening design points:

general greening, the green dotted greening, bend greening, landscaping features, green nodes, broken down greening, greening of retaining wall, a total of seven kinds of mode.

#### *Design scheme*

##### 1) General greening

Roadside group planting trees, a natural transition from the surrounding vegetation, and appropriate embellishment color foliage and flowering plants, induce the traffic and prompt action. It is in the form of group planting instead of the determinant planting model. It is usually used in general sections of the greening.

##### 2) Retaining wall greening

We plant vines and flowering shrubs through the wall top, sheltering the retaining wall and embellishment, weaken the rigid sense of wall. We selects these plants: winter jasmine, wild rose etc..

##### 3) Road embankment greening

We design a group of trees planted in the roadside, in order to achieve the natural transition and the surrounding vegetation. At the same time, we design the guide the planting in turning radius is less than 200m to the outside of the curve, is generally used in a row planting and appropriate embellishment color foliage and flowering plants, the traffic induced and prompt action. Plant selection: Cinnamomum camphora, Ligustrum, crape myrtle, Prunus cerasifera etc..

##### 4) Wide platform greening

We design the use of Grafts and group planting, and choose 1 ~ 2 kinds of flowering plants to form the excitement of roadside landscape, creating a distinctive roadside landscape. Plant selection: cherry, crape myrtle, redbud etc..

##### 5) Slope greening

Due to the reconstruction of excavation section more than is located in the valley, and is complete stone slope. We design to plant vines in slope and broken down and local ornament flower, to create a natural roadside rocks greening effect. Selection of plants: winter jasmine, wild rose, Mucuna etc..

##### 6) Retaining section

We design to flower shrubs and vines planted on top of the wall, covering and ornament the retaining wal, weakening the rigid sense of the retaining wall . Selection of plants: winter jasmine, wild rose etc..

## **Reference**

- [1] Guiying Xu. Discussion on the importance of road greening design and the principles that should be followed [J]. Shanxi architecture, 2010.(in Chinese)
- [2] Qingsen Xue. Highway green design should be consistent with the characteristics of highway and natural environment [J]. Traffic in the North, 2007.(in Chinese)
- [3] Guang Wang. A discussion on highway greening design [J]. Beijing gardens, 2008.(in Chinese)
- [4] Xiaochun Qin, Xiaoning Zhang, Changyu Guan, Yongmu Shen. Road greening design based on the new concept [J]. Chinese and foreign highway, 2007.(in Chinese)
- [5] Lan Zhang. Road greening design and plant selection analysis [J]. green science and technology, 2015.(in Chinese)