Research on Color Pavement Layout of Expressway Service Area

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Abstract. In order to solve the existing problems of highway service area color pavement layout. According to the demand and characteristics of expressway service area, this paper analyzes the psychological effect of color, and puts forward the functional demand of color pavement in service area. The layout principle and method of color pavement in service area are expounded. The results can provide reference for the color pavement design of expressway service area.

1. Introduction

With the improvement of people's aesthetic demand, the traditional white (cement pavement) and black (asphalt pavement) pavement has become monotonous, unable to meet the needs of modern road construction. As a new paving technology in recent years, color pavement has the characteristics of warning and appreciation, which is widely used in highway, urban greenway and park. But the relevant research about the color pavement of service area is still less. Chen [1] analyzed the application of color pavement in the service area of expressway based on his working experience. Yang [2] introduced the application of color pavement in the bicycle path in the Ming dynasty city wall area of Xi'an, and explained the classification, characteristics and application scope of color pavement. Wang [3] introduced the types of color pavement, design method of mixture and the construction technology of colored asphalt pavement. Zhang [4] introduced the application of 4 kinds of colored bridge deck pavement in the bridge deck pavement reconstruction project of Beijing pedestrian bridge, and preliminarily evaluated the adaptability of 4 kinds of colored bridge deck pavement through appearance evaluation and a series of road performance tests. Lin [5] analyzed the characteristics of colored asphalt concrete pavement and elaborated the color and functional design content. Wang [6] proposed that multiple factors such as tunnel clearance, skid resistance and vision should be taken into account in road tunnel pavement. Wang [7] elaborated the current situation of the bicycle road system in Beijing and the characteristics of color pavement, and analyzed the advantages and disadvantages of different kinds of color pavement. Dong [8] studied the reinforcing function of the tactile sensation of colored concrete pavement on the theme of the scenic spot, and explored the guiding function of the slope of colored concrete pavement on the behavior of tourists. There is still a lack of research on the application of color pavement in service areas.

2. Psychological effect of color

2.1. The warm and cool feeling

Colour itself does not have the property of change in temperature, because people got edification and association from natural phenomenon and daily life, produced "cold" and "warm" feeling to colour. If...
the color of red, orange and yellow feels warm, we call them warm colors. Blue, green, blue and purple colors feel cold, and they are called cool colors.

2.2. The light and heavy feeling
Because of the color of the surface of an object, it may appear to be different feeling in weight. White objects make people feel light, just because we see white when associating with white clouds, cotton and other light substances, and see black when associating with coal, steel and other heavy substances, so black objects make people feel heavy. The light and heavy feeling of the color mainly depends on the lightness of the color. The lightness of the color feels light, the darkness shows heavy.

2.3. The swell and shrink feeling
In contrastive process, the outline of certain colour gives a person the sense that swell or shrink. In the contrast relationship between color, warm and bright color feel like swell, while cool and dark color feel like shrink.

2.4. The forward and recede feeling
In the process of color contrast, some color seem to forward, while others seem to recede. Different colors in different background contrast, people's sense of color produced a change in the distance. Under normal circumstances, the color of high lightness and warm color has forward, convex, close feeling, and the color of low lightness and cool color has the feeling of recede, concave, far away.

2.5. The hard and soft feeling
The feeling of light object is soft, the feeling of solid object is hard. The soft and hard sense of color depends on the lightness and purity of the color. The grey series with higher lightness has a soft sense, while the grey series with lower lightness has a hard sense. The higher the purity, the harder it is, and the lower the purity, the softer it is.

3. Function of service area color pavement

3.1. Traffic organization
At present, the problem of mixed traffic between vehicles and pedestrians in the service area is serious and the right of way is not clear. In order to ensure the smooth and safe traffic between vehicles and pedestrians, the efficient division of the right of way is one of the effective ways to solve the mixed traffic and reduce traffic accidents. Color pavement can make various colors and patterns on the road surface to distinguish the special lanes and sidewalks, and define the parking areas of different vehicles, and improve the traffic safety and operation efficiency.

3.2. Landscape ascension
The traditional pavement is either black asphalt or white concrete. Looking at monotonous roads for a long time can dull drivers' attention, increasing the risk of traffic accidents. Through the use of color pavement of different colors, the landscape environment of the service area can be significantly enhanced, providing a comfortable and pleasant service area environment for tourists. In addition, characteristic and beautiful color pavement, can reflect local humanity characteristic, make the service area that has cultural theme characteristic.

4. Layout principle of color pavement

4.1. Functional adaptability
The color pavement can provide anti-skid, warning, guidance, beautification and other functions. The overall layout should be carried out according to the functional requirements of different areas in the service area. For example, in different parking areas, color pavement of different colors is used for functional positioning and partitioning to guide drivers to park vehicles correctly. In the main service
area, it is considered to use the color pavement to show the local cultural characteristics. In the handicapped parking space, female parking space and other humanized special areas, the use of special patterns and colors, clear the specific users of the parking space.

4.2. Environmental compatibility
As a part of the service area landscape, the color pavement should be coordinated with the service area space environment. Reasonable use of color characteristics for color matching, avoid the use of too many colors, to form a simple and beautiful service area environment. The color pavement should be coordinated with the main color of the building of the service area. The color scheme and the usable area should not be too much, so as not to affect the main color of the service area space environment.

4.3. Cultural heterogeneity
The colors and patterns of the color pavement should reflect the local cultural characteristics. The color pavement should echo the architectural style of the service area, show the regional characteristics. It is necessary to give tourists different cultural feelings and enhance the cultural connotation of the service area.

5. Layout method of color pavement

5.1. Cultural element extraction
Through investigation and analysis of local cultural tourism resources, typical cultural elements with characteristics are selected. The theme symbols and colors that can represent the cultural characteristics are extracted and applied to the color pavement, as shown in Figure 1.

![Figure 1. Cultural element extraction](image)

5.2. Functional partitioning of the service area
According to the different demand intensity, the service area can be divided into main function area and secondary function area. According to the different service functions, the service area can be divided into comprehensive service area, vehicle parking area, vehicle refueling area, vehicle water maintenance area, logistics service area and leisure green area. Among them, the parking area can be divided into parking spaces for extension trailers, dangerous goods vehicles, poultry transport vehicles, and handicapped vehicles. The color pavement can break the monotonous and boring situation of the square pavement, improve the performance and function of the pavement, and make the function partition of the service area clear. In different functional areas to use different colors of the color paving, can give drivers and riders to clear guidance and positioning.

5.3. Traffic flow analysis
The traffic flow of the service area can be divided into small car traffic flow, bus traffic flow, large truck traffic flow, trailer traffic flow, dangerous goods vehicle traffic flow, livestock vehicle traffic flow, etc. According to the service function, it can be divided into main traffic flow line, internal
management vehicle flow, fire truck traffic flow, etc. According to the traffic mode, it can be divided into vehicular traffic flow and pedestrian traffic flow. According to the service purpose, it can be divided into stopping traffic flow, refueling traffic flow, maintenance traffic flow, etc. According to different traffic flow lines, paint different schemes of color pavement along the traffic flow lines, guide the vehicles entering the service area to conveniently and quickly arrive at the entrance of each functional area, guide the vehicles to park orderly, make the personnel find the destination conveniently and quickly. Color pavement can effectively realizes the separation of vehicle types, so that vehicles in each parking area can easily drive out of the service area, and greatly improves the efficiency of the entire service area. At the same time, the pleasant color pavement makes the tourists have a good visual experience, which greatly improves the overall impression of the service area.

5.4. Application scene of service area color pavement

5.4.1. Roadway
Parking space for various types of vehicles should be set up in the service area. In order to make all kinds of vehicles orderly enter and park, color pavement should have the function of vehicle diversion. In the service area, color pavement with high color saturation can be used as the guide line for pedestrians and vehicles, and vehicles can be divided by different color pavement.

5.4.2. Parking space
The color pavement of the parking space adopts the color corresponding to the color of the driveway marking, and divides the vehicles according to different colors to realize the division of the parking area of various models, so that different models (except small private cars) can park in an orderly manner, as shown in Figure 2. For the colorful pavement of small car parking space, regional culture can be conveyed through fine pattern design to increase the landscape effect of the service area, as shown in Figure 3.

In addition, for special parking spaces such as handicapped parking spaces and female-only parking spaces, color pavement with different colors and patterns can be adopted to specify the specific use objects and time of the parking space, as shown in Figure 4.
5.4.3 Pedestrian and zebra crossing
Analyze the pedestrian traffic flow from each parking area to the main service building, consider to coordinate with the color pavement of the roadway, draw the color pavement of the pedestrian and zebra crossing along pedestrian traffic flow line, and match the characteristic logo to increase the cultural characteristics, as shown in Figure 5 and Figure 6.

![Figure 5. Pedestrian color pavement](image1)

![Figure 6. Zebra crossing color pavement](image2)

5.4.4 Recreational area
In the leisure area of the service area, such as amusement park and theme culture exhibition area, colorful pavement is adopted to highlight the leisure function, create a happy theme atmosphere, and display the local culture, as shown in Figure 7.

![Figure 7. Service area children's park color pavement](image3)

6. Conclusions
This paper analyzes the function and layout principle of the color pavement in the service area, summarizes the consideration factors for the layout of the color pavement, and puts forward the layout method of the color pavement in the service area. The main conclusions are as follows:

- The function of color pavement in service area mainly includes traffic organization and landscape improvement. The layout of color pavement should meet the principles of functional adaptability, environmental coordination and cultural heterogeneity.
- Service area color pavement should consider psychology effect of color, basically include the warm-cool feeling, the light-heavy feeling, the swell-shrink feeling, the forward-recede feeling, the hard-soft feeling of color.
The layout of color pavement should firstly extract regional cultural elements and apply them to the color and pattern design of pavement. Then, according to the service area function partition and traffic flow line, determine the service area vehicle lane, parking area, sidewalk, crosswalk, leisure area and other areas of the color pavement layout scheme.

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