

Design Strategy of Highway Speed Transition Section

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Abstract: In this paper, combined with the relevant speed theory and characteristics of the law, the current highway speed transition design problems are studied and analyzed. In the process of specific analysis, mainly combined with the characteristics of different types of highway speed changes and road section design requirements, this paper studies and analyzes the design methods of different types of highway speed transition section. And on this basis, according to the design principles and requirements of highway operation speed transition section, the paper summarizes the matters needing attention in the design of highway operation speed transition section, in order to provide certain reference value for relevant personnel.

Key words: Road route; Operating speed; Transition section design; Strategy analysis

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1 Introduction

Generally speaking, scientific and reasonable design of highway speed transition section can not only effectively reduce the change of running speed between adjacent sections, but also improve the safety and rationality of highway route design, and provide good guarantee for driving safety. It can be said that the design of highway speed transition section can be regarded as the extension of highway route design method in China, which has important design significance. Combined with the previous design

experience, due to the influence of geographical environment and traffic flow and other factors, there are great differences in the performance of operating speed characteristics of highways at all levels in China. For example, for expressways and first-class highways, the driving speed has a decisive influence on the running speed on horizontal curves with different radii to a certain extent. For all levels of highway curve sections, the influence of curve length on the running speed is small, and the influence of entering speed and curve radius is large. That is to say, in the specific design process, designers should choose the appropriate design strategy for application according to the performance law of different road section speed characteristics.

2 Based on different types of highway design index and running speed change law research

In this paper, different types of highway design indicators and operating speed change law research, mainly according to a large number of built highway project comprehensive indicators and operating speed investigation, according to the design speed performance, the highway project is divided into the following types for research and analysis.

2.1 Class I

This kind of highway is mainly for the first-class highway with design speed $\geq 100\text{km/h}$ and expressway in plain area. For the design work of the transition section of the operation speed of this kind of highway project, because of its flat and open terrain and relatively high design speed, the operation speed

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can be consistent with the design speed. According to the current design feedback, the running speed transition section under the condition of this kind of highway project can basically meet the running speed requirements of 100 ~ 120km / h. It should be noted that the terrain conditions of this kind of highway are good, and it is easy to cause the problem of speeding.

2.2 Class II

This kind of highway is mainly for projects with design speed between 60 km/h and 90 km/h. Generally can refer to the mountain highway and a highway. Due to the influence of terrain and construction scale, the design speed of these highway projects is lower than that of class I. And in terms of the overall linear index, it is not very high. That is to say, the running speed is easy to be affected by the geometric alignment conditions of the local highway, resulting in the reduction phenomenon. Generally speaking, on this kind of highway, drivers often take acceleration driving for operation^[1].

2.3 Class III

This kind of highway is mainly aimed at the highway section with design speed between 30 km / h and 60 km / h. generally, it is mainly two lane highway. Combined with the previous design experience, the design of two lane highway is easily affected by the project scale and cost factors, so the selection of the current design index needs to consider a number of factors for reasonable determination. Generally speaking, highway line shape design will give priority to the use of the principle of bending with the ditch. Therefore, for this kind of highway project, the horizontal curve radius is usually less than 250 m. From the aspect of speed change, due to the limitation of horizontal curve radius, the vehicle will be forced to slow down in the process of driving on curve road or long steep slope road. Combined with previous experience, the running speed of vehicles in these two sections should be strictly controlled within the specified range, that is, 40 ~ 60 km/h.

3 Analysis on design strategy of transition section of different types of highway operation speed

Combined with the above contents, it is not difficult to see that except for class I, there are obvious differences between the operation speed and design

speed of the other two kinds of highway projects. The main reason is that the speed difference between the two kinds of highway projects in the adjacent sections is too large. At the same time, the running speed of some sections is inconsistent with the design. Therefore, the contradiction between highway alignment design and driving expectation is easy to occur in the operation process. In order to solve this problem in time, we need to optimize the operation speed transition section for the above three types of highway projects, as follows.

3.1 Type I design strategy

This kind of highway project has a high performance in terms of operation speed, and there is often little difference between the design speed and the operation speed. Therefore, there is no need to pay attention to the design of speed transition section. However, it should be noted that this kind of highway project has superior performance in geometric alignment conditions, and can support higher running speed, which can easily lead to the problem of vehicle speeding. Combined with the past experience, the problem of vehicle speeding in this section is much higher than the other two types of highway projects. Therefore, in the design process, designers should check and analyze the superelevation and sight distance according to the actual running speed of the section, so as to ensure the driving safety^[2].

3.2 Class II design strategy

This kind of highway project is easy to be affected by the local geometric alignment, and there are fluctuations in the running speed. In addition, there is a big difference between the running speed and the design speed of some sections, so in the design of the running speed transition section, we can add a speed transition section to ensure that the section has enough transition length. At the same time, in the design process of the transition section, the designers should combine the determination of the technical indicators of the route with the transition operation speed, in order to achieve the purpose of good operation speed control. In the specific design process, designers should reasonably determine the technical indicators according to the running speed of the section. In addition, the transition section of super-high subgrade should be set scientifically in combination with the change of running speed. At

the same time, do a good job in the inspection of supporting work to ensure the traffic safety of the highway section.

3.3 Class III design strategy

This kind of highway project is easily affected by the cost factors and regional environmental factors in the process of planning and design, which leads to the comprehensive consideration of many factors in the specific design. Combined with the past experience, this type of highway can mainly reflect the characteristics of deceleration in the curve and acceleration out of the curve. As the speed of the road section changes greatly, in the specific design process, the designer should reasonably set the speed from the overall design point of view. And on this basis, combined with the actual situation of running speed, the super-high transition section and driving sight distance are set reasonably. It should be noted that according to overtaking and other requirements, overtaking sections can be set at intervals of good linear conditions to avoid dangerous driving^[3].

4 Analysis of matters needing attention in the design of highway running speed transition section

First, the design of highway speed transition section should be combined with horizontal and vertical design index parameters to realize continuous transition design process. For all types of highway projects, the plane and vertical design index should not be widely used in the design of high limit index. Instead, the transition design process should be relaxed according to the balance of the front and back indicators.

Second, the proportion of curve to total mileage should be appropriately increased in the design of highway speed transition section. Combined with the previous design experience, it is not difficult to see that when the longitudinal slope of the route is slow, the running speed is easily affected by the radius of horizontal curve, resulting in the phenomenon

of speed slowing down. In view of this, in order to ensure the safety of the driving process, designers can use the growth horizontal curve to achieve good speed relaxation.

Third, the design of highway running speed transition section should take the running speed as the final speed to realize the design process of superelevation and widening. In the specific design process, designers should make overall planning and reasonable deployment for the highway superelevation design and widening design according to the running speed and numerical performance of specific sections. And according to the speed numerical feedback, do a good job in the inspection of driving safety sight distance, to ensure the safety of the car driving process^[4].

5 Conclusion

In a word, in order to ensure the accurate implementation of the design work of the transition section of highway operation speed, it is suggested that the designers should take the initiative to make overall planning and reasonable deployment of the relevant design work in combination with the type of highway project and the surrounding factors, so as to ensure the design effect of the transition section from many aspects as far as possible, and provide a good guarantee for the driving safety.

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