TRAFFIC LEADING SIGN SETTING IN SNOW STORM AREA

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1. Introduction

After the rebuilt of National Highway G312, the traffic capacity was improved greatly, and driving was more comfortable. But reported by the traffic police station of Yili Prefecture, the traffic accident number increased a lot. There is a longer winter at Guozigou, from December to April of the next year, total five months. The average snowfall is 1.2m, and the maximum is 1.89m. In winter, the whole Guozigou Area is covered by snow. Especially in snowing days, drivers have bad eyesight and reduced sight distance, and because of large amount of snow, the whole road surface is covered by snow. For those road sections with side channels, it is very hard to distinguish where is the road and where is the side channel, it is hard for drivers to find where is road shoulder, so it is easy to lost the correct route and fall into side channel or down the road base. According to the data provide by local traffic police authority, the accidents of this type covered 60% of the total in winter, and this kind of accidents was 34% more than that before the rebuilt.

The reasons are:

First, large amount of snowfall makes the road and side landforms mixed together, it is hard to make it clear;

Secondly, In winter nights and snowing days, the weak sight and diffuse reflection light of snow make drivers hard to find the edge of road shoulder, so it is easy to have traffic accidents and cause property damage and injuries and deaths.

So based on the mature experience of foreign countries, we carried continuous research and development work of new materials, new structures and new technology, after detailed site investigation, survey and comparison, two sites with high density of traffic accidents were chosen to be implemented the setting of experimental traffic leading sign for snow protection.

2. Principles for the design of Traffic Leading Signs in snowy area

2.1 Principles

The purpose of setting traffic sign is to provide full and clear information, this refers to the rationality and capability of be recognized of the design and layout of traffic signs. A reasonable design of traffic signs shall satisfy three requirements: eye-catching, easy to be recognized, universally accepted.

2.2 Form and structure

In this experiment project, based on foreign countries experience and our country's standards, Arrows showed in figure 1 were used. In order to reduce the weight, this light signal board was designed as follows: its body was 1.2m long and 15cm wide, the head of arrows was a 30cm wide equilateral triangle.

Because in snowy area, there is much rainfall and serious rain corrosion, aluminum alloy material was used to make base boards, it is light and corrosion proof. As the sign board was small, if it was covered by frost or snow and can not be clear in time, drivers would have trouble to determine the road shoulder along the route.

First we shall give little chance that let snow or frost cover it. Bending the board like V shape (See figure 2), having this section shape, it is not easy for frost or snow to cover on it, even if there was some, it would be fall at action of small wind. And also It is not easy to form water film or frost ice on the board, this will reduce surface corrosion and increase durability and visibility.

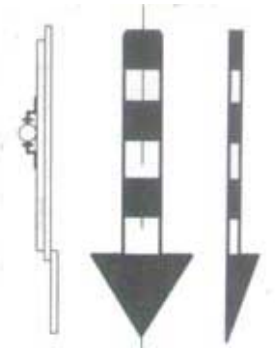

Figure 1 tridimensional structure of sign

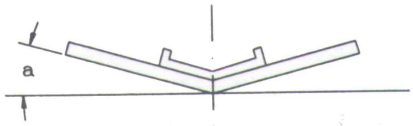

Figure 2 type of sign section

2.3 Design of Visibility Effect of Sign Board

Because sign boards are small, the drivers' recognition sight scope is also very small, especially in nights or snowing days, the visibility is even worse. So the high reflection film shall be used, its reflection effect is very good, it is made from materials with regressive reflection structure. It has many advantages, and can function properly in winter days, snowing days, and better in nights, and correctly providing effective information for drivers, they can know conditions of above road and make preparative measures. Leading by the traffic signs, drivers would avoid lots of traffic accidents.

The color of signs is a very important factor. Because that is the color which showed information from the background and attracted the attention of drivers. According to the law of color visibility, highway traffic signs usually use red, yellow, green, blue, but no middle colors. We had made comparative indoor and site experiment between "red alternating with white" board and "red alternating with yellow" board, after analyzing the data, we found that "red-white" board has better visible effect. It is mainly because that "red-white" combination has sharper contrast, more attractive, and easier to be recognized.

3. General layout of traffic leading signs

3.1Basis of crosswise sign setting

When considering where traffic leading signs are placed, first, they shall be placed at road sections with high density of traffic accidents. So the geometric shape of road route, traffic volume and traffic combination shall be studied. Traffic leading signs shall be placed so as to assure safe, fast, clear traffic, and led by traffic signs, the traffic can pass through fast.

Just like showed in Figure 3 and Figure 4, signs were crosswise placed so that the arrows of signs pointed to the inner edge line of road shoulder for safety purpose. In order to widen the snow sweeping area and not disturb snow sweepers in winter, and increase the section area for traffic and assure the smooth passing, signs were hanged up by cantilevers. The length of cantilever was 4.5m, considering the construction errors, natural down deformation by weight, probably added road surface course, and historic snow deposit thickness and machine for snow sweeping, generally the net height shall keep a margin not less than the thickness of snow deposit.

Overally considering above factors, in order to assure that the arrows can not be touched by vehicles, the minimum net height was 5.5m. While the height is not the higher the better, if too high, signs do not have good visibility for drivers, if too low, vehicles can not pass smoothly. There, along the driving direction, even in nights or snowing days, drivers can clearly know where he is on road by traffic leading signs, led by continuous signs, they can pass through snow deposit or wind-blown snow road section smoothly.

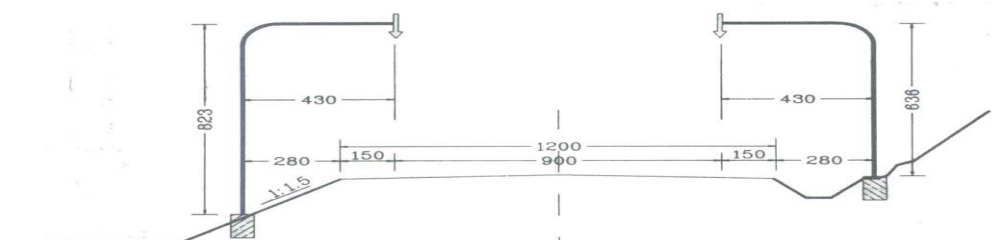

Figure 3 plan view of fill section

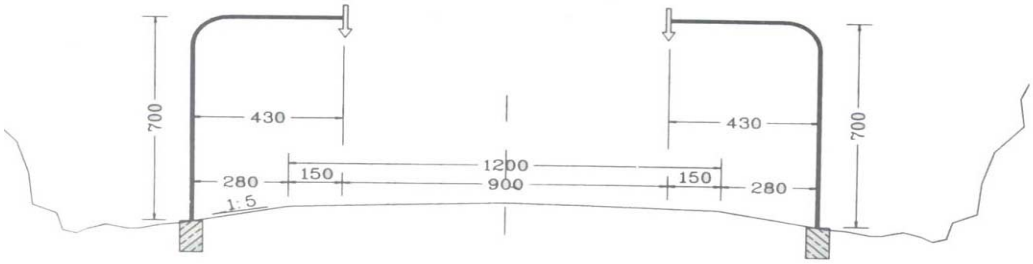

Figure 4 plan view of excavate section

3.2 Basis for longitude setting

It is well known that there are four processes: identifying, recognizing, understanding and acting when drivers read signs. If the space between signs is too long, it is easy to lose direction, if too narrow, there is much waste of money and working machines were affected. According to the highway technical standards, at mountainous hill sections, in winter the speed for straight driving is 40km/h, and 20 km/h for bend sections, considering the space left for signs of distance affirmation, and referred foreign countries' experience, shown in figure 5, the space for straight section was 160m, and 40m for bend sections.

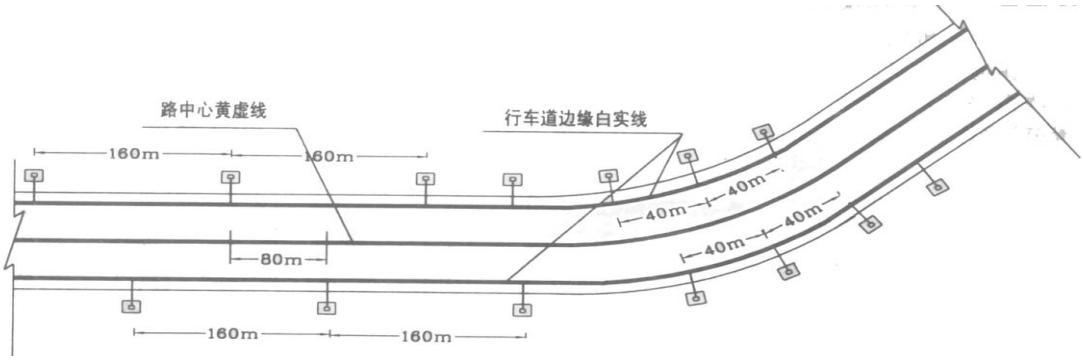

Figure 5 plan view of longitudinal route

3.3 Installation of Signs

When installing signs, the sign board shall form a right or nearly right angle with the center line at straight road sections; at bend sections, the sign board shall have the same direction with the radius and be vertical to tangent direction of road curve. The reflection face of sign boards shall be at right side of traffic direction.

3.4 Type of structures of signs

At present, the structure of sign is generally of single cantilever, shown in figure 6. In our country there is no design requirements for this type of leading signs in present design standards. Referring foreign countries' standards, we selected two types of single cantilevers made from bended steel tube or inserted steel tube. In order to be economic and more reasonable in dynamics, we suggest that variable cross section seamless steel pipe shall be used so as to reduce the deformation by the weight of steel.

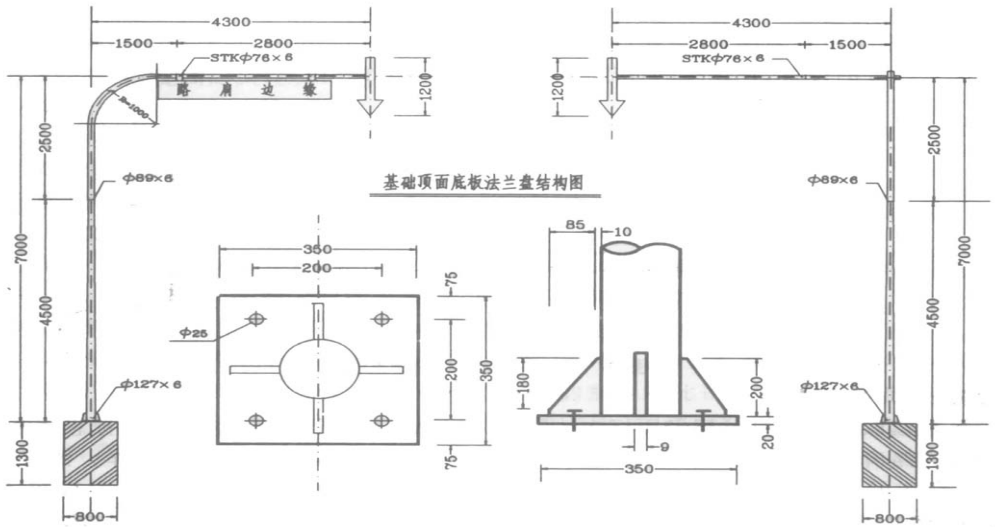

Figure 6 structure of leading sign

4. Conclusion

The implementation of traffic leading signs at snowy areas along G312 highway at Guozigou has achieved good economic results. According to the return investigation, there has been no traffic accidents since the signs had been set up. The drivers told local road maintenance authorities that these signs were very effective. Traffic signs are designed for safe and fast traffic, for those snowy and ice areas with variable weather condition, in winter, snow deposit, snowslide, wind-blown snow are all endangering the safe travel of vehicles, if sign boards like “Snow slide area, No parking, Skidding, Install Anti-skid Chain” were installed along these dangerous road section, reminding the driver, many accidents would be avoided. See Figure 7

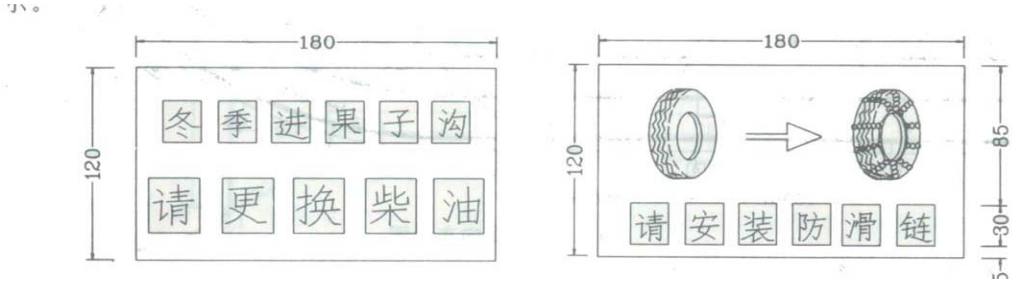

Figure 7 demonstration of warning sign

In one word, properly installed traffic signs can increase traffic capacity, reduce accidents and unnecessary loss of lives and properties. We suggest that authorities can accept this kind of traffic leading signs, and treated as one of normal traffic signs in routine administration, and apply it to similar highways. Of course, the highway safety facilities in ice and snow areas are not perfect, it is need to carry further research work, adopt more reasonable, economic and beautiful traffic signs.

Figure 8

Figure 9