Research on Application of Road Anti-icing Asphalt Coating in Plateau Scenic Spot

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***Abstract*—This article introduced application technology of road anti-icing asphalt coating. By conducting field tests, the construction procedures and requirements were summarized. By conducting lab tests, performances of the anti-icing asphalt coating were verified. Testing results show that the anti-icing asphalt coating gives road pavement considerable ice resisting function. Compared to normal pavement, the pavement with anti-icing asphalt coating has better sliding resistance and the snow is much easier to be removed.**

Keywords—pavement; anti-icing asphalt coating; ice resisting function

I. INTRODUCTION

This article introduced application process of road anti-icing asphalt coating applied on Dashanbao road. Dashanbao is a scenic area locates in Zhaotong city, Yunan Province, China. The climate type is plateau monsoon climate. The test road locates in Dashanbao scenic area so that it has higher requirements on environmental protection. Meanwhile, it is plateau climate, high altitude, low temperature and large temperature difference. Freezing rain and snowfall takes place in winter frequently and the road pavement is very easily affected by snow and ice.

II. WORKING PRINCIPLES

The production process of anti-icing asphalt coating is as followings. Firstly, use porous material to load snowmelt substances (inorganic salts). Then select a suitable water-based adhesive (environmental protection) as bonding material. At last, the coating material with durable anti-icing function is produced.

The main principle is that chloride separate out under capillary pressure and traffic caused pressure. Then the chloride can lower freezing point of water on road surface and prevent accumulation of snow and formation of ice. For ensuring the anti-icing performance of the coating, this research draws on the thought of drug controlled and sustained release which is widely used in medicine. After the snowmelt substances was loaded in porous material, use a kind of polymer cellulose membrane to seal pore canals of the porous material. This releases the chloride at an appropriate rate to achieve the main goal of the durable anti-icing function.

III. CONSTRUCTION AND FIELD TESTS

A. Investigation of Pavement Condition

This part includes road surface cleanliness, road disease distribution (including disease types, disease distribution, and the number of disease), road traffic status and so on. The station is K6+660~K7+700. The slope is 8%. The length is 1km. See test results in Table I.

TABLE I. FIELD TESTS RESULTS

Tests	Results
Smoothness of road surface	0.4mm
Pavement rutting	0mm
Friction coefficient	60
Tectonic depth	0.6mm
Water permeability coefficient	0ml/min

B. Construction Requirements

- Situation 1: The pavement is smooth, and the texture depth is appropriate. Under this situation, put on the anti-icing asphalt coating on the pavement directly without milling.
- Situation 2: The pavement is smooth, and the texture depth is a little bit less than ideal value. Under this situation, put on the anti-icing asphalt coating on the pavement after milling.
- Situation 3: The pavement is not smooth enough, and the texture depth is less than ideal value. Under this situation, fix the pavement, then mill it, then put on the anti-icing asphalt coating.
- Situation 4: The pavement is made of cement concrete. Under this situation, put on the anti-icing asphalt coating on the pavement after milling.

C. Process Design

The structure of pavement surface layer is AC-16. In consideration of there is inorganic salt in the coating material and the air temperature is relatively low for the coating construction, so the distribution quantity was increased properly. In order to ensure that the dry curing of the water-borne bonding material is sufficiently and rapidly carried out

during the construction process, therefore, the principle of less amount and more times was adopted. The anti-icing coating was distributed in three times. The distribution quantity was 0.5 kg/m^2, 0.3 kg/m^2 and 0.3 kg/m^2.

D. Construction Procedures

- Cooperate with the local transportation department to carry out temporary traffic control to ensure the personnel safety during the construction.
- Thoroughly remove the dirt and sundries on the original pavement surface.
- Protect the signs, markings, and ancillary facilities of the original road from pollution.
- Start the distribution vehicle to apply the anti-icing coating in three layers. Each layer should be applied after the previous layer dried up.
- Check and repair construction defects.
- Apply initial maintenance.
- Clean up the construction site.
- The traffic will be opened after the coating consolidated.

E. Maintenance and Traffic Control

In order to prevent vehicles enter the construction site that the anti-icing coating is not consolidated completely, specially-assigned person should be in charge of traffic control after construction. In this case, the temperature was relatively low during construction and there was fog took place, so that the duration of traffic control was 24 hours.

IV. VERIFICATION OF PERFORMANCES

Figure I&II demonstrate the removal effect comparison between two types of pavement, normal pavement and the anti-icing coating pavement.

At the beginning of snowfall, the pavement temperature is slightly higher than the air temperature so that the snow melts after landing and cannot form accumulation. However, as the temperature continues to drop and snowfall increases, the pavement temperature decreases so that the snow melted before permeated into the texture depth and freezes into ice. This completely eliminated the friction force of the pavement. While the manual cleaning was conducting, it was found that the ice layer bound with the pavement texture depth very closely and very hard to remove. Moreover, after the snow was removed, the pavement became wetter and more slippery. On the other hand, for the anti-icing coating pavement, the snow was very easily to remove since there is a layer of water film between the ice layer and the pavement texture depth.

FIGURE I. SNOW REMOVING EFFECT OF NORMAL PAVEMENT

FIGURE II. SNOW REMOVING EFFECT OF THE ANTI-ICING COATING PAVEMENT

At last, road friction coefficient was tested by portable pendulum tester as shown in Table II.

TABLE II. FRICTION COEFFICIENT TEST RESULTS

Anti-icing Coating Pavement		**Original Pavement**	
No.	British Pendulum Number	No.	British Pendulum Number
1	70	1	15
2	70	2	10
3	67	3	20
Average value	69	Average value	15

From this table, it can be told that the anti-icing coating pavement maintained the pavement friction coefficient well and this guaranteed the traffic capacity even if under heavy snow.

V. CONCLUSIONS

This article studies the application of the anti-icing coating technology for the highway in scenic area. Firstly, the original road pavement condition was investigated. Then, the construction plan and spraying amount were determined.

Finally, a new anti-icing coating was applied on test road and its performances were verified. Test results demonstrate that the anti-icing asphalt coating did apply anti-icing effect on the test road. It was achieved the purpose that “light snow does not remain and heavy snow is easy to remove”

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