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Modified Chip Seal Surface Treatments Vs. Conventional Chip Seal Surface Treatments.

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13. Sponsoring Agency Name and Address

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14. Supplementary Notes

15. Abstract

Purpose and Need

The current chip seal surface treatment, which consists of a layer of asphalt material followed by a layer of stone chips has been presenting some problems such as poor bonding of the aggregate to the asphalt material. This causes some of the aggregate to break away as soon as normal traffic commences. With the loss of aggregate from the surface, the roadway loses its wear characteristics as well as surface friction.

Objective

The objective of this study was to evaluate modified types of chip seal surface treatments and to compare these modifications to the conventional chip seal surface treatments currently used on North Dakota roadways.

Scope

The Materials and Research Division of the North Dakota Department of Transportation monitored and evaluated the following items: Evaluation of different methods of chip seal placement, Loss of aggregate from the pavement surface, Evaluate performance of different types of asphalt material. Material and Research evaluated this experimental project for a period of five years on an annual basis. The project was located on Highway 3 south of Dunseith, ND and also on Highway 2 west of Grand Forks, ND in the west bound lane.

Summary

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Common distresses were as follows; chiploss, centerline stripping, and stripping at the shoulders.

There is approximately a $0.13 difference between what is currently used (section 6-ranked last using HFMS-2 oil) versus the best performing section (8).

The basic theory in designing surface treatments is that the aggregate used should be primarily one size. When the aggregate is placed on top of the asphalt film, the particles are un-arranged. Rolling arranges the aggregate to a dense pattern and traffic helps orientate the aggregate to their densest positions, lying on their flattest or largest side. If the aggregate does not have a flat (fractured) or a wider side, the aggregate will have a tendency to roll out of the asphalt film.

Table 10 contains the sample results of the Class 42 and Class 43 material used on this project.

The Class 43 - modified had 72% of the material retained on the No. 4 sieve while the other aggregates retained only 55% to 58%. Approximately 55% of the Class 43 - modified material had at least one fractured surface, which helps keep the aggregate from popping out under the traffic conditions.

Two different oil types were used in this research project at different application rates. It is difficult to determine the performance of these oils based on the varying application rates. However, oils used on this project have performed satisfactory on other projects.

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The chip loss on this project is minimal. The heavier application rate of oil followed by the fog coat may have minimized the chip loss. The fog coat may have given the seal coat a darker appearance.

Bleeding was a problem on this project for the first seven to eight miles. Bleeding is thought to be the result of the poor condition of the existing asphalt mat. Within two years of the seal coat application, maintenance was done to correct rutting and shoving in the existing mat.

Recommendation

The recommended oil application rate is approximately 0.02-0.04 gal/yd^2 heavier than currently being used. The heavier rate of oil is to allow the Class 45 sand to become embedded in the oil and help cement the chips in place. The addition of the sand will also lighten up the appearance of the surface thus reflecting more light at night for safer driving.

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