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
Project SS-3-003(018)224
Common distresses were as follows; chiploss, centerline stripping, and stripping at the shoulders.

Project SNH-6-002(050)337
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/yd² 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.