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MICHIGAN
STATE HIGHWAY DEPARTMENT
Charles M. Ziegler
State Highway Commissioner

# TREATED SAWDUST FOR SKID CONTROL ON ICY PAVEMENTS

By

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# TREATED SAWDUST FOR SKID CONTROL ON ICY PAVEMENTS

At the request of Commissioner Charles M. Ziegler, an investigation has been made to determine the merits of a proprietary product called "Saif" for skid-proofing icy pavements in comparison with common sand-chloride mixtures.

Saif is a sawdust impregnated with a calcium chloride brine. It is manufactured and marketed by the Normandy Chemical Corporation of Port Huron, Michigan, who furnished the Department with sufficient material (2-1/2 tons) to make comparative tests. The material was shipped to the Highway Maintenance Garage at Brighton on February 14, 1950. Due to the lateness of the season and uncertainties of weather, it has been possible to make only one series of road tests this winter. The field study was made on March 1, 1950 under the supervision of E. A. Finney and C. C. Rhodes of the Research Laboratory. Results of the study are presented in this report.

## Physical and Chemical Characteristics of Saif

Saif was tested in the laboratory with the following results:

| | |
|---|---|
| Unit weight, lb. per cu. ft.: | |
| loose | 24.1 |
| vibrated | 29.1 |
| Moisture content, as received percent of dry weight | 28 |
| Calcium Chloride content, percent of dry weight | 29 |

## Rust Inhibition

The manufacturer claims certain rust-inhibiting properties for the material. Consequently the extract was tested for the presence of chromate and phosphate, the two types of rust-inhibiting chemicals most commonly used at present, with negative results. Samples of steel placed in extracts of several different concentrations rusted in the same manner as steel panels

in contact with straight calcium chloride solutions of equivalent concentration.

Field Test

On March 1, 1950, a field test was carried out to compare the performance of Saif with that of a regular maintenance sand-chloride mixture containing 200 pounds of flake calcium chloride per cubic yard of sand. The application was made on Flint Road between US-16 and US-23 at Brighton. The road was "blacktop" and covered with a nearly continuous sheet of ice about one-half inch thick. Operations were begun at 2:11 p.m. and ended at 3:55 p.m. Air temperature remained at 20° F. throughout the afternoon. The work was performed by personnel of the Brighton garage under the supervision of Mr. Lemon.

Operations involving Saif and sand-chloride were as follows, beginning at the eastern end of the road where it joins US-23:

| Sec. No. | Material | Distance, miles | Quantity lb. | Quantity cyd. | Application Rate |
|---|---|---|---|---|---|
| 1 | Sand-chloride | 0.20 | --- | 1/3 | 1-2/3 cyd per mi. |
| 2 | Saif | 0.20 | --- | 1/3 | 1-2/3 cyd per mi. |
| 3 | Sand-chloride | 0.30 | --- | 2/3 | 2.2 cyd per mi. |
| 4 | Saif | 0.12 | 100 | - - | 800 lb. per mi. |
| 5 | Saif | 0.30 | 100 | - - | 333 lb. per mi. |
| 6 | Saif | 0.50 | 375 | - - | 750 lb. per mi. |

In the first two test sections (1 and 2), sand-chloride and Saif were put down at just about normal application rates, by volume, (Figures 1 and 2). When applied in equal volumes, the sand-chloride and sawdust-chloride were about equally effective in skid control when tested immediately after application by driving a car over the treated areas. Close-ups of the two treatments at the time of application are shown in Figures 3 and 4.

An attempt was made in Sections 4 and 5 to achieve an application rate for sawdust conforming to the 400 lb. per mile recommended by the manufacturer. Section 5, in which this rate was approximated, was much too sparsely covered to be effectively skid-proofed and the results from sections 3, 4, 5, and 6 demonstrated that an application of about 750 to 800 pounds of Saif per mile is necessary to produce coverage apparently equivalent to the normal 2 cubic yards of sand-chloride per mile.

The tests were made in a brisk cross wind and it was observed that the sawdust had a tendency to drift in the wind causing some displacement sidewise during application. Also, because of its lighter weight it was not possible to distribute it as widely over the roadway as the sand-chloride mixture.

Furthermore, when the project was visited the following afternoon, the sawdust-chloride had disappeared almost entirely from the surface (Figures 5 and 6) while the sand was still anchored on the ice and very much in evidence. The temperature had dropped from 20° to 10° F. during the 24 hours, and the remaining particles of sawdust which had survived the wind were embedded below the surface of the ice, thus losing their effectiveness entirely. (Figure 7)

It was noted also that the method of feeding the materials manually to the mechanical spreader on the truck was not conducive to economy in the use of anti-skid materials. With this method, quantities are apt to be governed largely by individual judgment rather than controlled weights and it is almost impossible to achieve a predetermined rate without a series of successive checks on the amounts used.

Comparative Costs

On the basis of the quoted price of $54.00 per ton for Saif and an application rate of 750 lb. per mile, the material cost of treating 1 mile of 22-foot pavement would be $20.25. The material cost of treating the same area with sand-chloride containing 200 pounds of the chemical per cubic yard of sand is $6.40, based on a price of $22.00 per ton for flake calcium chloride, $1.00 per cubic yard for sand, and a distribution rate of 2 cubic yards per mile. These figures represent an application of Saif amounting to about one-half the volume of sand-chloride used per mile. Even at this rate the material cost of Saif would be more than three times that of sand-chloride.

Conclusions

On the basis of this study, the following conclusions are drawn:

1. Saif must be distributed at a rate of at least 750 to 800 lb. per mile to obtain an adequate initial application. This quantity represents a volume of about 1-1/4 cyd per mile.

2. When Saif is applied at the above rate, the initial material cost is more than three times the cost of 2 cyd of sand-chloride required to treat the same area.

3. Saif appears to have no advantage over sand-chloride as a skid-proofing agent except possible greater ease of handling, and has the disadvantage of not "staying put" for extended periods during cold, windy weather.

4. The calcium chloride incorporated in the sawdust is no less corrosive to steel and concrete surfaces than the calcium chloride in sand-chloride mixtures.

FIGURE 1. SAND-CHLORIDE 1-2/3 CU. YDS. PER MILE

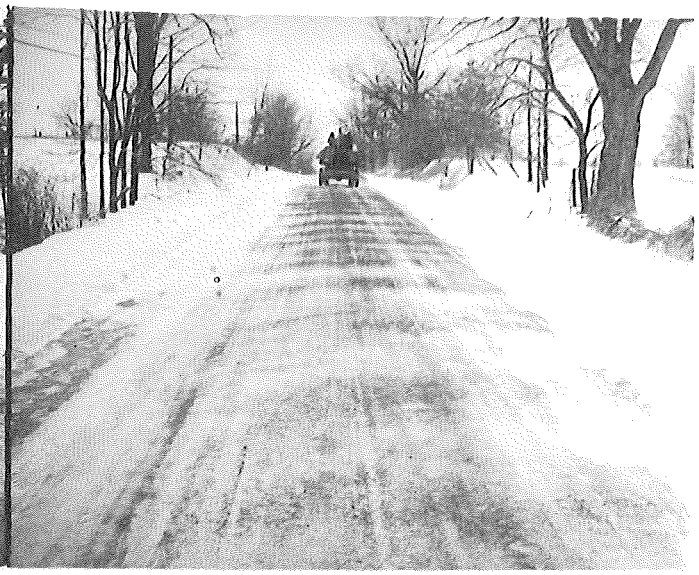

FIGURE 2. SAIF, 1-2/3 CU. YDS., OR 1084 LB., PER MILE

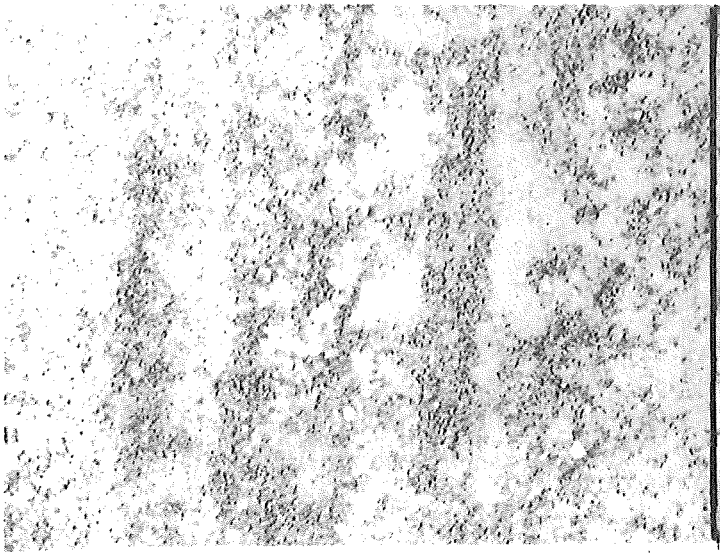

FIGURE 3. SAND-CHLORIDE-TREATED SURFACE SHORTLY AFTER APPLICATION

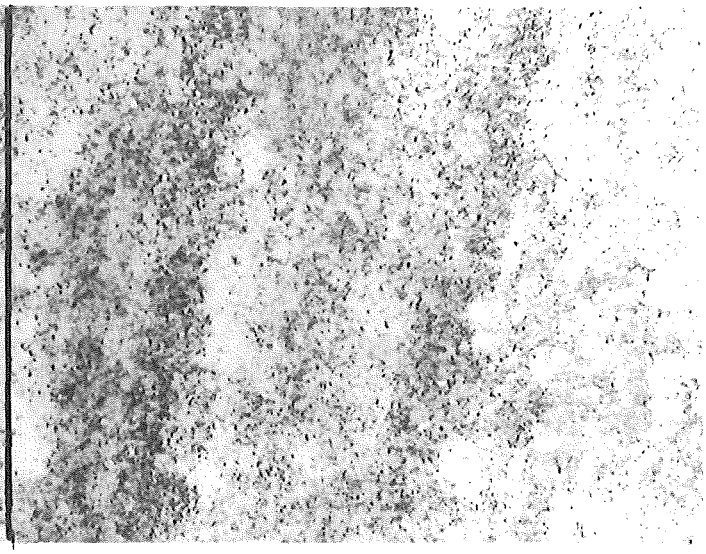

FIGURE 4. SAIF-TREATED SURFACE SHORTLY AFTER APPLICATION

FIGURE 5. SAIF APPLIED AT RATE OF 750 LB. PER MILE (IN BACKGROUND)

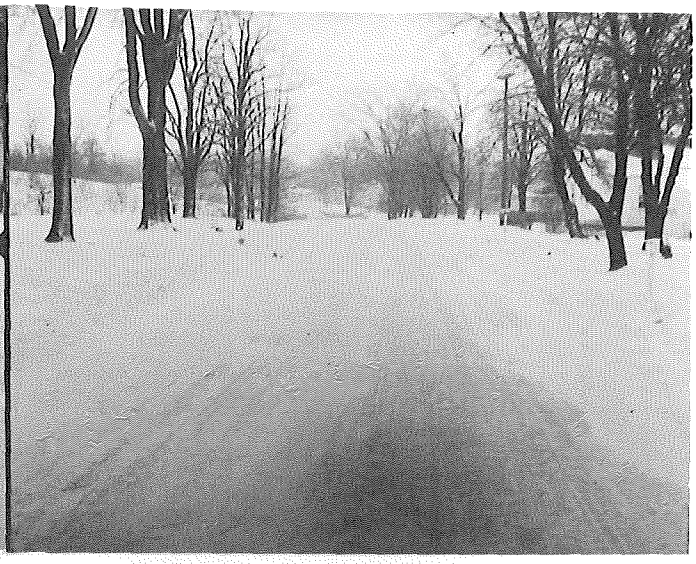

FIGURE 6. SAME AREA AS IN FIGURE 5, ONE DAY LATER

FIGURE 7. CLOSEUP OF SURFACE IN FIGURE 6. MOST OF THE SAWDUST HAS BLOWN AWAY OR SUNK BENEATH THE SURFACE OF THE ICE (BLACK SPECKS IN PICTURE ARE SAWDUST PARTICLES)