123

MICHIGAN
STATE HIGHWAY DEPARTMENT
Charles M. Ziegler
State Highway Commissioner

APPLICATION OF GLASS [illegible] ON PROJECT
F 76-41, C1, [illegible] NORTH OF PORT SANILAC

By

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Research Project No. R-14 (4)
Progress Report No. 1

Research Laboratory
Testing and Research Division
Report No. 127
March 1, 1949

APPLICATION OF WHITE MEMBRANE ON PAVEMENT

F 71-1, Cl. U-25 NORTH OF PORT SARNIA

Research Project 42 B-14 (2)

On October 15 and 16, 1948, approximately 1500 lineal feet of 22-foot concrete pavement in the above project were cured with a white membrane curing compound furnished by the Truscon Laboratories of Detroit. The experiment was performed with the cooperation of the Construction Division in connection with an investigation of membrane curing being conducted by the Research Laboratory of the Testing and Research Division. The purpose of this test section was to provide an opportunity to observe the general visual effect and weathering characteristics of the white compound over an area sufficiently long to permit independent evaluation. This report contains a description of the details of application and notes on the general appearance of the pavement 6 weeks afterward.

The First Day

The morning of October 15 was rainy and paving did not begin until about 1 P.M. The weather was cold, cloudy and damp, resulting in considerable delay in setting time and disappearance of free moisture from the surface of the concrete. Construction for that day was begun at Station 1057+52 and ended at Station 1066+71. As soon as the surface moisture had disappeared, application of the white membrane was started under the supervision of Mr. Fred Fairbrother of Truscon Laboratories.

Spraying equipment used on the job was of the type furnished by the vendor to contractors for regular construction work, and is illustrated in Figures 10 and 11. For this experiment, however, new spray nozzles

had been installed to give a flat, fan-like discharge at right angles to the direction of travel across the pavement instead of the conical discharge of the nozzles ordinarily used.

At first the machine covered the pavement quite uniformly with the white compound, as shown in Figures 1 and 2. In a comparatively short time, however, the new type nozzles, which were fitted with individual screens, became clogged and marked ridging appeared (Figure 4). Because of the extremely slow setting and hardening of the concrete, the pressure of the spray bar also indenting or perforating the surface of the concrete in irregular lines across the pavement which may be seen in the center foreground of Figure 4. This perforation was also noticed on sections of pavement cured previously with clear membrane, and was eliminated later on by freeing the nozzles and raising the spray bar of the machine.

After several attempts to keep the new type nozzles free from clogging were unsuccessful, the old conical-spray type were substituted at Station 1060+75. These nozzles performed well for a time, (Figure 5) but soon became clogged, resulting in ridging as before (Figure 6). Approximately half of the first day's pour was cured after dark using the old type nozzles and considerable difficulty was experienced in keeping them free.

The Second Day

Before starting the membrane application on the second day's pour, the nozzles on the machine were again changed to the new, flat-spray type, but the individual straining screens were removed. Apparently the white pigment had been filling these screens and little trouble from clogging was experienced after their removal. Also the spray bar of the

machine was raised about 6 inches and a much more uniform application resulted. In addition to these modifications, the curing compound was applied by a double pass of the machine across the pavement, using a more rapid rate of transverse travel and overlapping one-half the width of the path laid down by the spray bar on each pass. All of the above-mentioned changes resulted in a very uniform application and elimination of the previous defects, (Figures 7 through 11). There was occasional clogging in some of the nozzles from foreign material gaining entrance during the filling of the tank on the machine, but the same kind of trouble occurs with the clear compound. Defects and nonuniformity of the coating are much more obvious with white compounds than with the clear, however.

Rates of coverage were determined for the two different methods of application (single and double pass) at Stations 1059+03 and 1070+08, respectively. Five panels of sheet metal, each one foot square, were laid end to end at right angles to the direction of travel across the pavement and directly in the path of the spray bar. The results are given in the following table:

Panel No.	Coverage Rate*			
	Station 1050+08 Single Pass		Station 1070+08 Double Pass	
	Wt. Residue, grams	Coverage s.ft/gal	Wt. Residue, grams	Coverage s.ft/gal
1	7.16	348	11.95	209
2	7.90	316	13.50	185
3	8.55	292	17.30	161
4	8.65	289	14.50	172
5	8.25	303	15.37	163
Average		310		182

* Based on solids content of 60.0 per cent and sp. gr. of 1.104

Concluding Remarks

Application: As far as the application of white pigmented membrane compound is concerned, no difficulty should be experienced in securing a uniform coating at the required rate of coverage. The present machine is satisfactory provided the new type nozzles are used with the screens removed and the spray bar raised about 6 inches. The double pass is much more effective in putting down a uniform coating than the single pass and requires only a simple adjustment of travel speed to secure proper coverage. It seems probable from observation on this and other projects that the required coverage of 200 sq. ft. per gal. is not being obtained in all cases. An automatically operated machine, with adjustable speed control for both lateral and forward movement would be the most desirable for both white and clear membranes. The Flexplans automatic machine was not tried on this job, but should prove entirely satisfactory.

Weathering Characteristics: The photographs of Figures 12 through 16 show that the white membrane weathered away uniformly without mottling or other unsightly effects. Actually, it would be difficult at present

to pick out the experimental white section from the rest of the pavement without foreknowledge of its location when travelling over the road. Weathering of the white film should take place even more rapidly during late spring and summer than it did in this case.

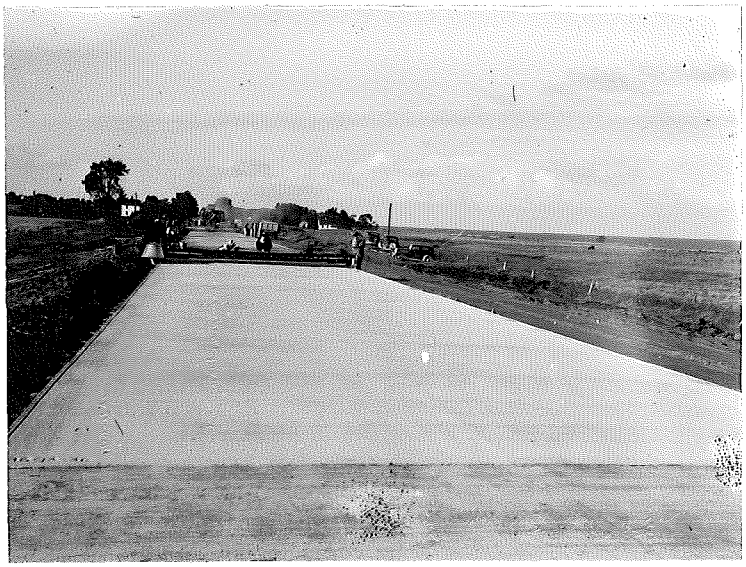

Figure 1. General view of curing project looking north from Station 1057452.

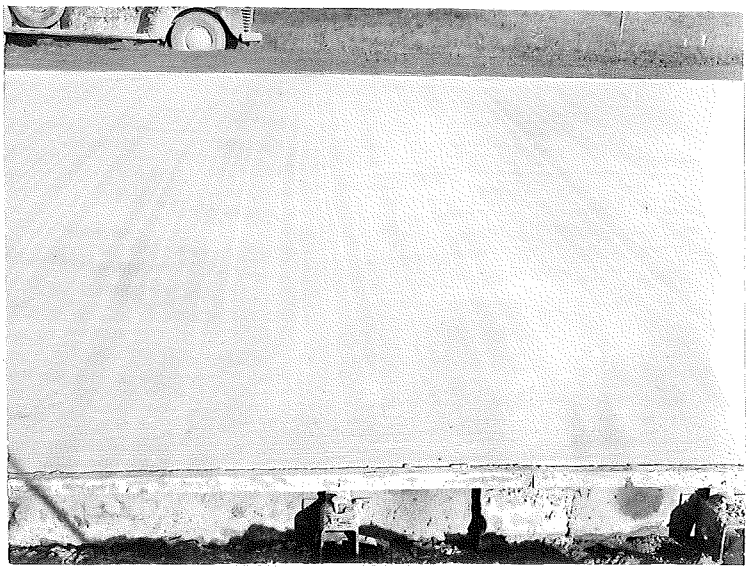

Figure 2. Closeup showing application at beginning of curing project using new flat-spray nozzles. Station 1057452

Figure 3. First day's pour immediately after removing forms on following morning, north from Station 1057+52.

Figure 4. Ridging effect due to clogging in new type nozzles just before changing back to old cone-spray nozzles. Station 1060+22

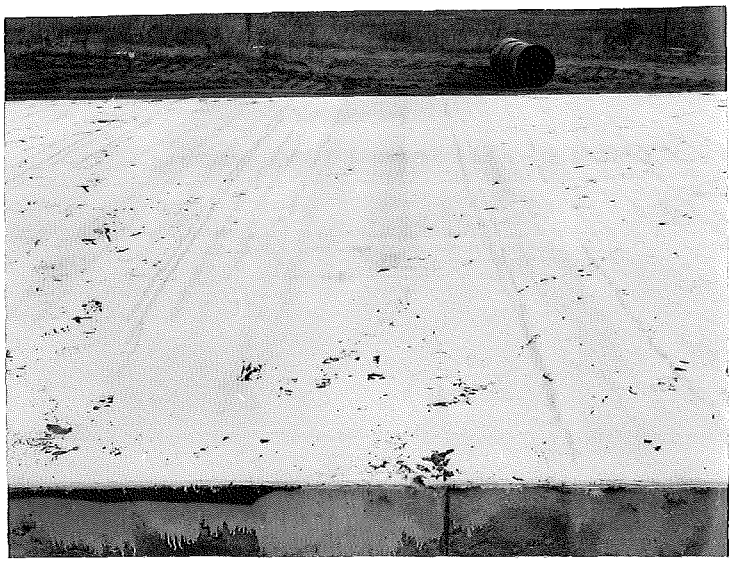

Figure 5. Application by old type nozzles. Fairly uniform film. Station 1030+75.

Figure 6. Ridging due to clogging of old type nozzles. This section was sprayed after dark. Station 1031+00.

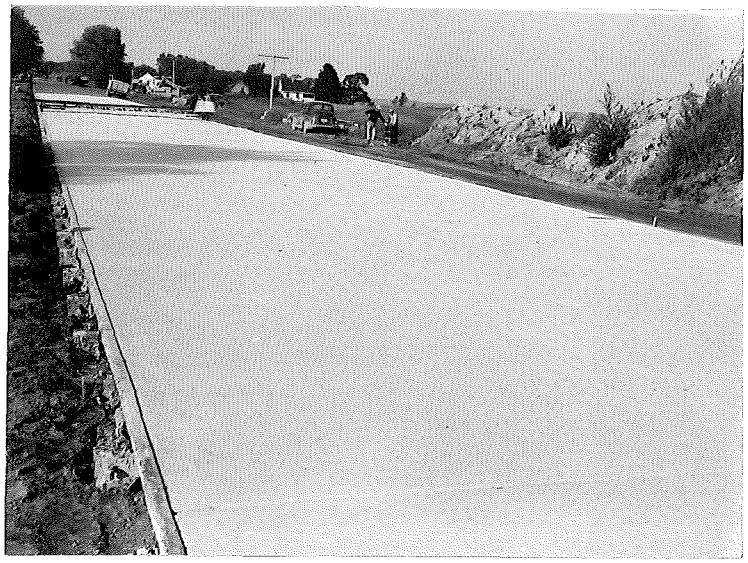

Figure 7. View of beginning of second day's pour. Application by double pass, using new nozzles with screens removed and spray bar slightly raised. Station 1066+71.

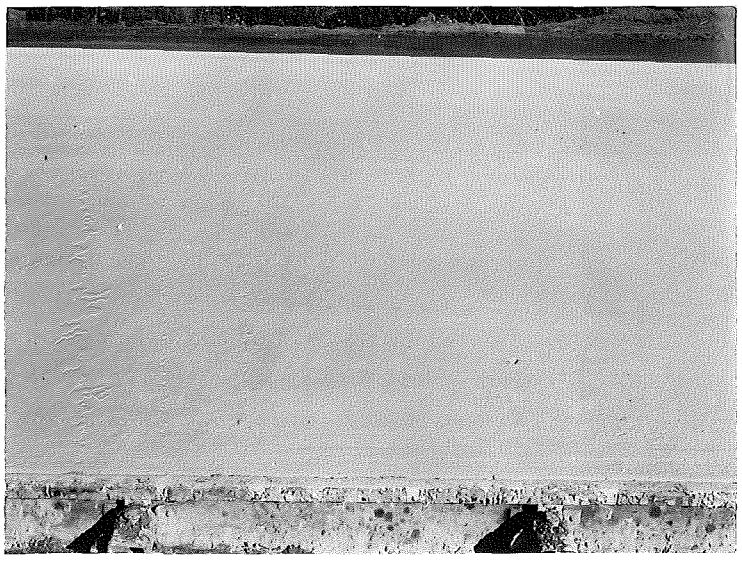

Figure 8. Closeup across pavement showing uniformity of application by double pass and new nozzles. Station 1066+81.

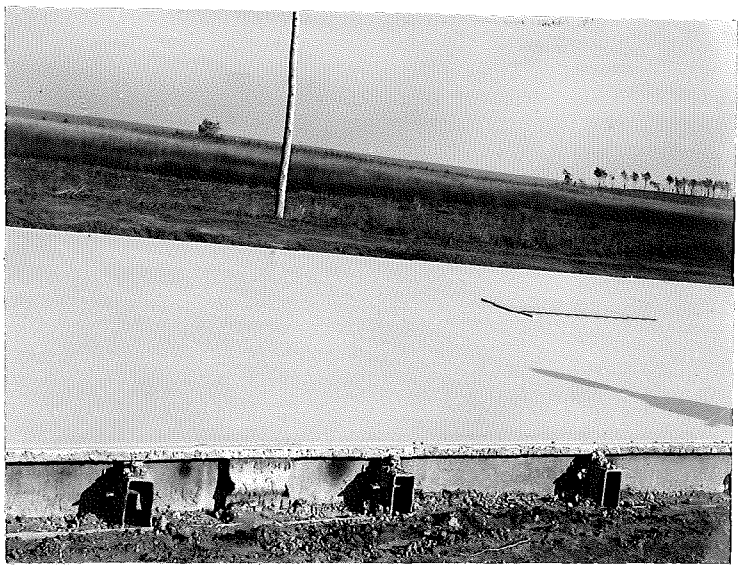

Figure 9. Test panels (right center) to determine rate of coverage. Station 1070+08.

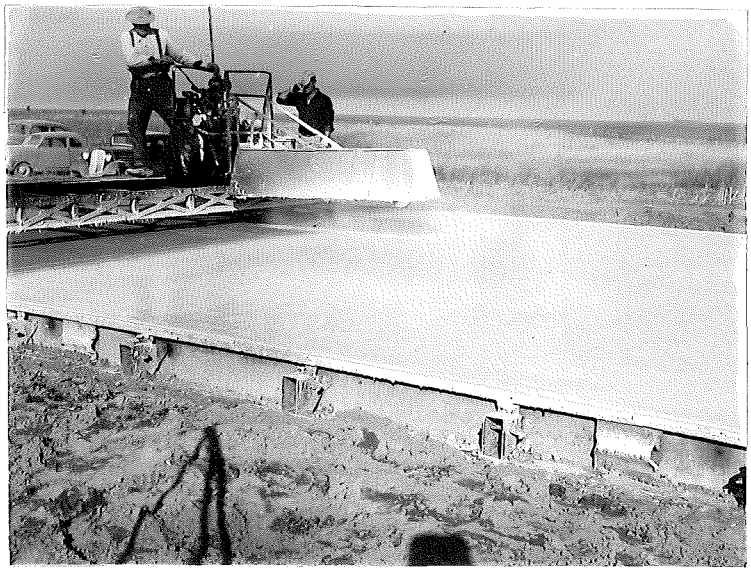

Figure 10. Overlapping in double pass.

Figure 11. Another view showing uniformity of application with double pass and new nozzles.

Figure 12. Looking north from beginning of project; 8 weeks after application. Intermittent color in center of picture is due to spraying white membrane on day-old concrete.

Figure 15. Looking north beyond end of curing project. Sun back of camera. Although application was heaviest here, the contrast is not marked.

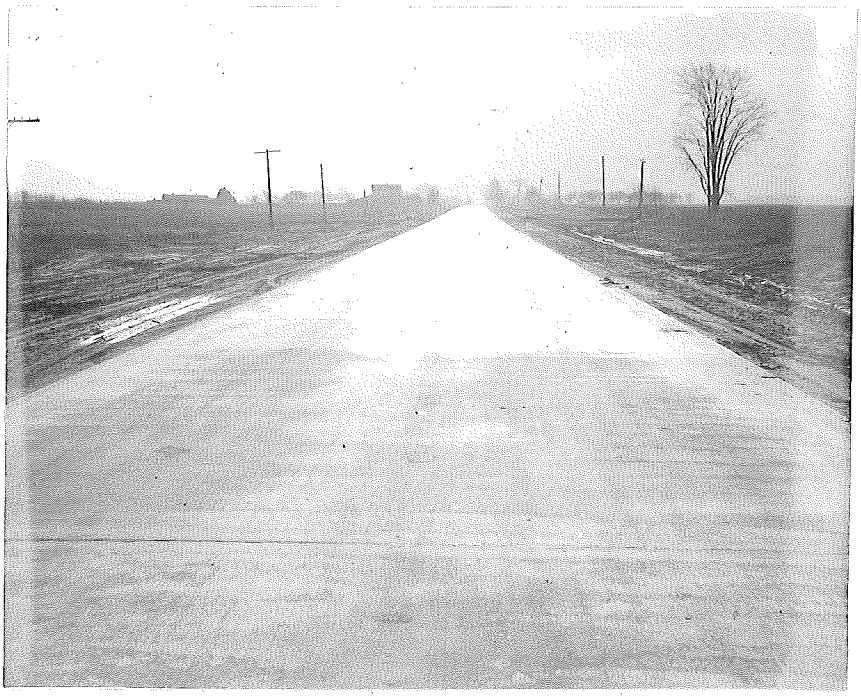

Figure 16. Looking south into the end of curing project. Sun in front of camera. Contrast is more evident when looking into the sun.

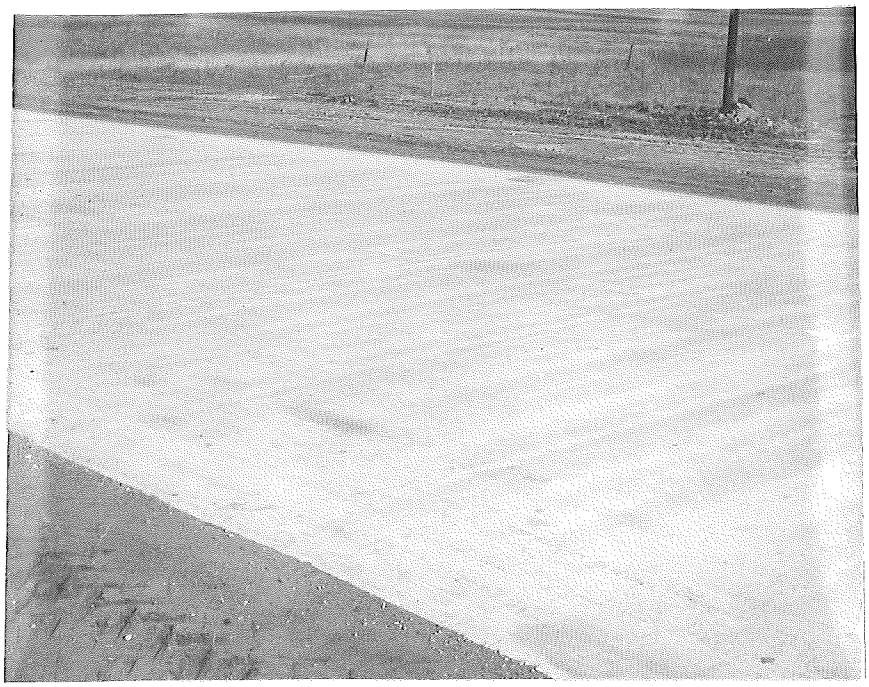

Figure 15. Closeup of white membrane 8 weeks after application.