MICHIGAN
STATE HIGHWAY DEPARTMENT
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CONDITION SURVEY

CHALLIS SOIL STABILIZATION

EXPERIMENTAL PROJECT

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REPORT ON CONDITION SURVEY OF GRAYLING CEMENT AND BITUMINOUS SOIL STABILIZATION EXPERIMENTAL PROJECT

RESEARCH PROJECT 36 E-5 (1)

By S. M. Cardone

At the request of Mr. R. H. McLaughlin a condition survey was made of the Grayling Soil Stabilization Experimental Project on April 3 and 4, 1946 by S. M. Cardone and R. W. Peecok of the Research Laboratory. This was occasioned by a report to the Maintenance Division by the Crawford County Road Superintendent to the effect that the west portion of the Grayling Soil Stabilization Project was rapidly deteriorating. The survey included an inspection of all test sections on the experimental project.

AR-7 Bituminous Emulsion Section; Station 0+00 to 60+00

The road surface between Station 0+00 to Station 12+00 appeared to be in excellent condition as may be observed in figure 1. The light areas in figure 1 indicate patched areas in the original seal coat laid in 1942 and not patching of the base course. The base course is apparently sound in this area. This particular section of the project had been an old gravel road prior to bituminous stabilization.

Noticeable breaks in the seal coat started from Station 17+00. See figure 2. From this point to the east end of the emulsion section existing conditions indicate that abnormal deterioration of the road surface is taking place in localized areas. Incipient failure in bond of the seal coat is general in this portion of the bituminous section. When the base course is deprived of the protection of the seal coat, it tends to abrade rapidly under traffic to the extent that considerable patching operations are necessary to preserve the road surface.

Patching operations had been started by the County Superintendent about one week prior to the condition survey. The extent of this patching work is revealed in figures 3, 4, 5 and 6. The general physical condition of the road surface throughout the bituminous emulsion section is further explained pictorially in figures 7 to 12 inclusive.

Samples of the stabilized base course material were brought back to the laboratory for determination of bitumen content. The extracted bitumen content was found to be 3.08 percent at Station 45+70 and 3.27 percent at Station 68+60. The original bitumen content of the respective areas was 3.24 percent and 3.72 percent. The stabilized material under the seal coat, although it is not a hard mass, shows no indication of complete failure due to displacement or "shoving" of the stabilized base or the untreated subgrade except at a few localized areas along edges. The stabilized base does wear rather rapidly as soon as the seal coat breaks, but where the seal coat is in good condition the base course is performing satisfactorily.

There appears to be practically no bond between the seal coat and the treated base. The surface treatment can be raised from the base with ease regardless of the hardness of the stabilized base course.

Examination of the stabilized base revealed that neither the mineral filler nor the bituminous binder were intimately mixed during construction. At one point the depth of treatment of the base course was only 3 inches.

The abnormal failures on the emulsion section are probably due to a combination of factors. First, the treated base appears to have little or no stability in certain areas evidently due either to the insufficient bituminous binder, or to improper mixing, and consequently the treated base

is susceptable to displacement under traffic. This weakness on the part of the base would naturally cause the surface seal to crack and become dislodged by traffic. Secondly, there is apparently no intimate bonding of the seal coat to the base course. Due to this fact dislodgement of the surface coat takes place as soon as a weak spot develops and the seal coat is broken down further by traffic. Thirdly, due to the fact that the base stabilization lacks coherence it wears away rapidly as soon as the surface seal is broken. Lastly, since the north lane in general is showing more rapid deterioration, see figures 9, 10 and 11 it may be possible that either the volume or weight of traffic or a combination of both factors on the entire project and especially on the north lane may have some influence in the case.

T-1, MC-2 and MC-3 Experimental Sections: Station 50+00 to 246+00

The road surface between Station 50+00 and Station 246+00 was in excellent condition, with the exception of a 40 ft. x 6 ft. patch along the edge of the north lane at Stations 230+60 to 231+00 where the road passes over a swamp hole. This, however, was caused by settlement of the embankment and cannot be attributed to failure of the stabilized base.

During sealing of the soil cement section in 1945 the seal coat application was extended back to Station 232+00 on the MC-2 section. This seal application on the MC-3 section was believed desirable because the surface was becoming soft and spongy in certain areas.

Soil Cement Section: Station 246+00 to 329+00

The Superintendent of the Crawford County Roads stated that the soil cement section between Station 246+00 to Station 329+00 (end of project) was

resurfaced during the Summer of 1949. Re-sealing became necessary on the soil cement section when the old seal coat became brittle and started to peel off. The soil cement section is at present in excellent condition. Pictures pertaining to the soil cement section are shown in figures 13 and 14.

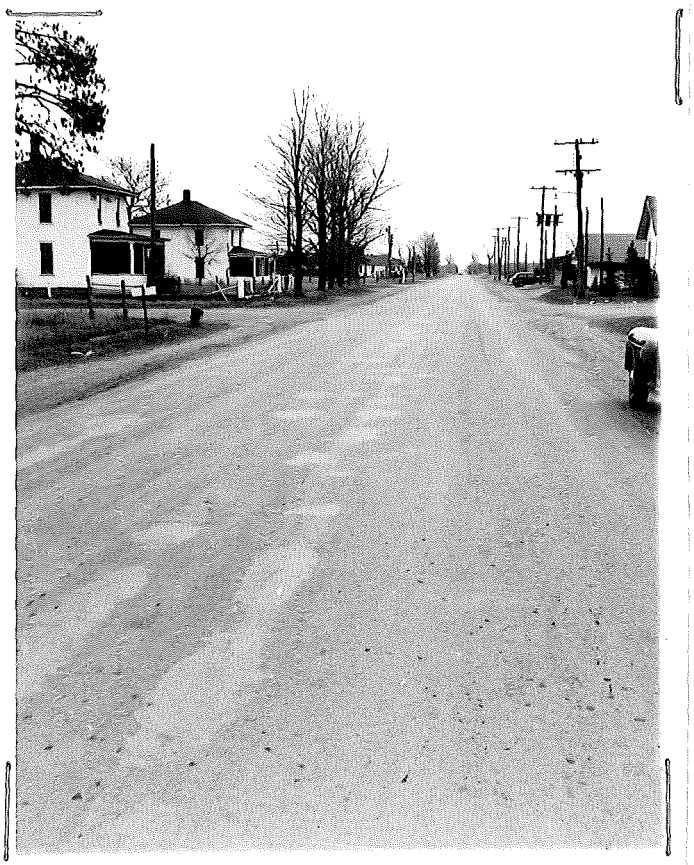

Figure 1. Looking East from beginning of project.

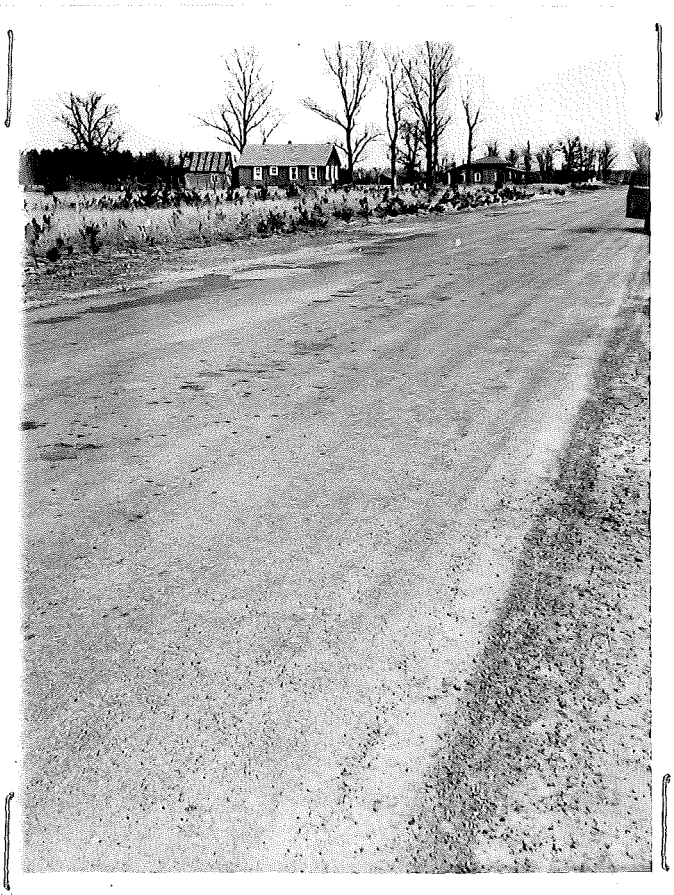

Figure 2. Series of small breaks in seal coat starting from Station 17+50. This is the point where deterioration of the surface has started.

Figure 3. View looking east from Station 30+00 showing recent patching where seal coat has failed.

Figure 4. View looking east from Station 35+50 showing area of maximum deterioration which had been patched one week before the picture was taken.

Figure 5. Close-up of large patch in figure 4 showing new patch beginning to peel off of old surface due to improper bond and insufficient thickness of patch. Station 62+00.

Figure 6. Close-up of large patch in figure 4 showing bleeding (light areas) on new patch.

Figure 7. Chuck-hole showing deficiency in bituminous binder. The material could be picked out as easily as the unstabilized soil on the shoulder. Station 45+00.

Figure 8. Break in seal coat at Station 45+00 showing progressive breaking of the seal coat and subsequent deterioration of base course.

Figure 9. Break in seal coat at Station 45+50 showing condition of stabilized base. The light spots are pieces of mineral filler not thoroughly mixed with the soil. The bituminous binder, not evident in picture, also was not intimately mixed with the sand. At this point the stabilized base showed a small amount of cohesiveness, but was also comparatively soft.

Figure 10. View of large break in seal coat along north lane between Station 57+90 and Station 68+00. Stabilized base possessed very little cohesiveness. Picture taken from Station 68+00. This type of break extended to approximately Station 79+00 which is near the end of the AE-7 bituminous mix section. The AE-7 section ends at Station 80+00.

Figure 11. Same type of break in seal coat and rutting of base as shown in Figure 10, also along north lane. Stabilized base material is soft and evidently was poorly mixed. Station 76+50 to Station 79+60.

Figure 12. Transverse crack between the AE-7 and the T-3 sections. Note the seal coat beginning to peel off at the crack in center of roadway. Station 80+00.

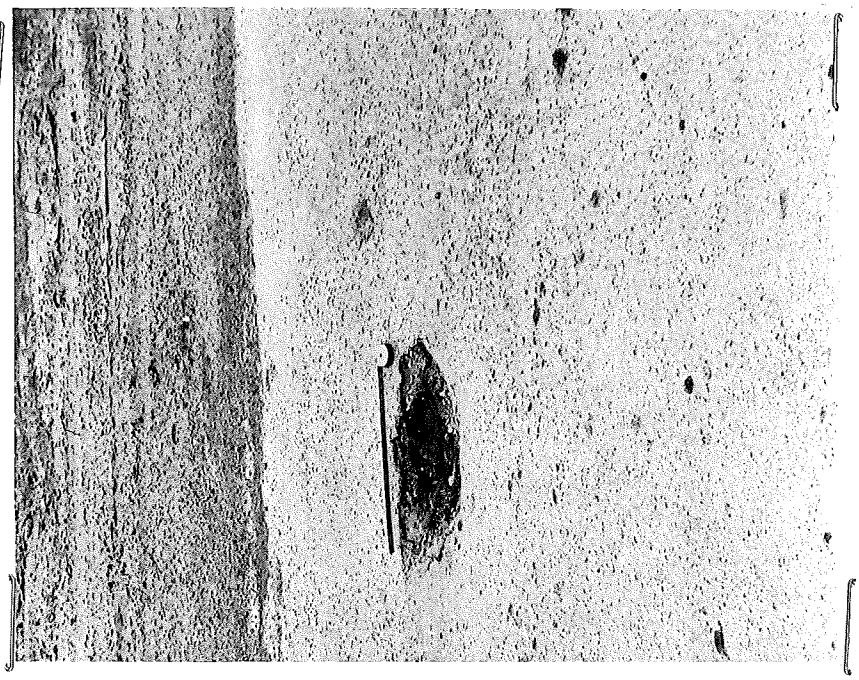

Figure 13. Break in seal coat at Station N15+25 shows chuck-hole 2" deep consisting of 1" of seal coat and 1" of loose soil over hard material below. This hole is in the soil cement section, and indicates that probably the loose soil over the stabilized base was not brushed off prior to the application of the seal coat. Or it could be the result of improper mixing of the cement with the soil.

Figure 14. View from the east end of the project looking west. Surface is in excellent condition.