OFFICE MEMORANDUM

MICHIGAN
DEPARTMENT OF STATE HIGHWAYS

To: P. Milliman, Supervisor
Physical Research

From: F. Copple

Subject: Pavement Damage Related to Tire Studs. Research Report R-680. Research Project 65 F-82.

On June 12, 1968, three pavement projects were inspected which showed possible tire stud damage. These pavements are located in Houghton and Hancock where, according to local highway personnel, the majority of automobiles are equipped with studded tires for winter driving. In general, damage was more apparent in wheel tracks at horizontal curves and at intersections where vehicles would be accelerating or decelerating.

Figure 1 shows a comparison of pavement wear in two areas located within ten feet of each other. However, one photo shows a badly worn area in the wheeltracks and the other an undamaged area near the curb subject to relatively little traffic. The pavement shown in Figure 1 is located in Hancock on M 203, Quincy St. near Elevation St. (Construction Project M 31031-004). This 85-100 penetration bituminous aggregate surface, constructed to Michigan 4.11 specifications, was placed in the fall of 1967 and has carried traffic for less than one year.

Figure 2 shows another badly worn area of pavement on the same M 203 project, but located on a horizontal curve. Figure 3 is another view of the same M 203 pavement project but in an area outside of town where traffic volume is lower. This surface shows no visible wear.

A worn portion of US 41 SB also located in Hancock is shown in Figure 4. For this construction project, Hancock St. (U 31052-011), constructed in late fall of 1967, 4.11 bituminous aggregate surface was specified which had a penetration of 200-250. The high-penetration asphalt may have been a factor in the rapid surface wear.

On each of the bituminous aggregate construction projects, much of the sand-asphalt had apparently been removed by traffic leaving only coarse aggregate exposed.

The south ramp of the Houghton-Hancock bridge (M 26 westbound) is shown in Figure 5. This rigid pavement was constructed in 1960. As with the bituminous pavements, finer surface particles have been removed leaving only coarse aggregate exposed.

On the projects just described, there is no positive way to determine to what degree tire studs caused or contributed to the described surface wear. However, it is proposed that the following steps be taken to gain further information:

A. Immediately conduct pavement skid tests in areas of suspected tire stud damage. Where sand particles are removed, it is probable that skid coefficients would be significantly reduced. Since much of the damage on the Houghton-Hancock pavements occured on sharp curves, it will be difficult to obtain accurate data with available skid test equipment. These would be ideal locations to use the portable skid resistance measuring device recently listed on the Laboratory equipment budget request.

B. Locate other similar pavement surfaces both in areas of intensive tire stud use and in areas where tire studs are relatively few. Inspect these pavement surfaces as described in Paragraph A.

C. Inspect the three pavement projects described above twice annually to determine how damage progresses. One inspection would be in the fall and the other in early summer. In this manner, the damage occuring during tire stud season might be isolated.

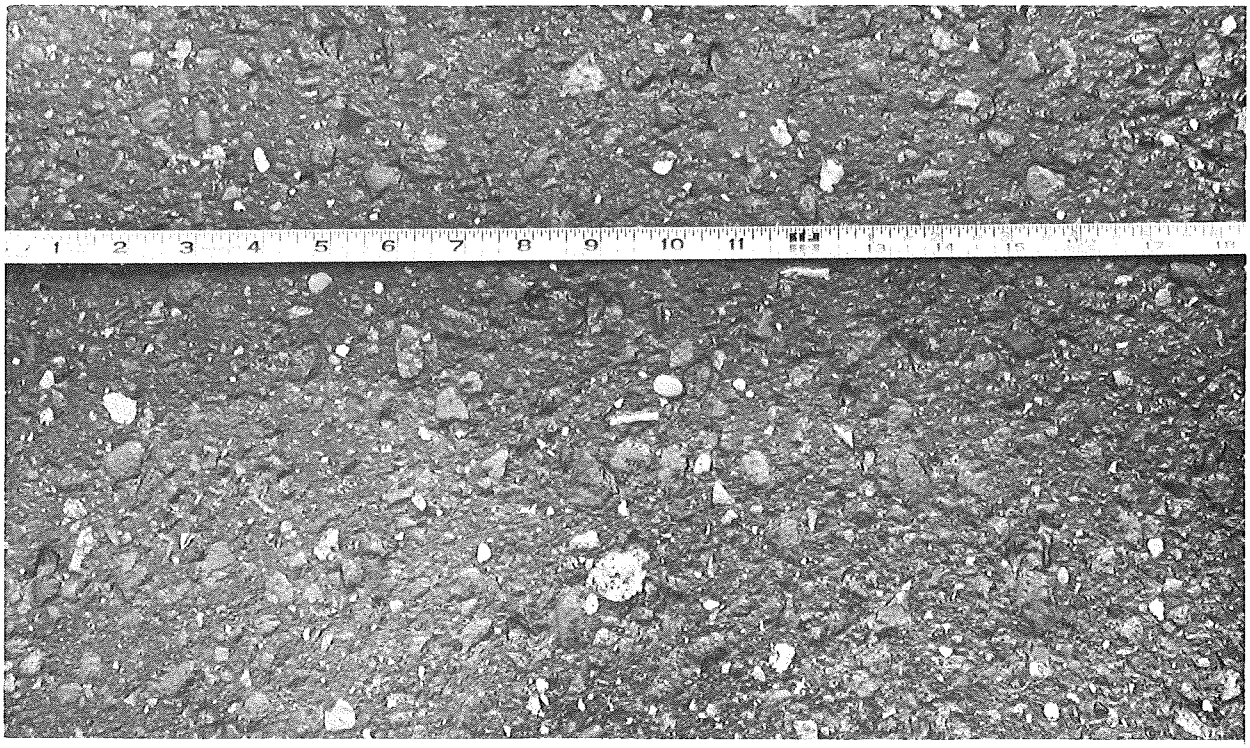
D. A positive way to isolate the effects of tire studs on pavement would be through use of a circular laboratory test track where variables could be carefully controlled. This Laboratory could build such a track as part of an HPR study to include other skid research factors such as the effects of wheel load on surface polishing.

TESTING AND RESEARCH DIVISION

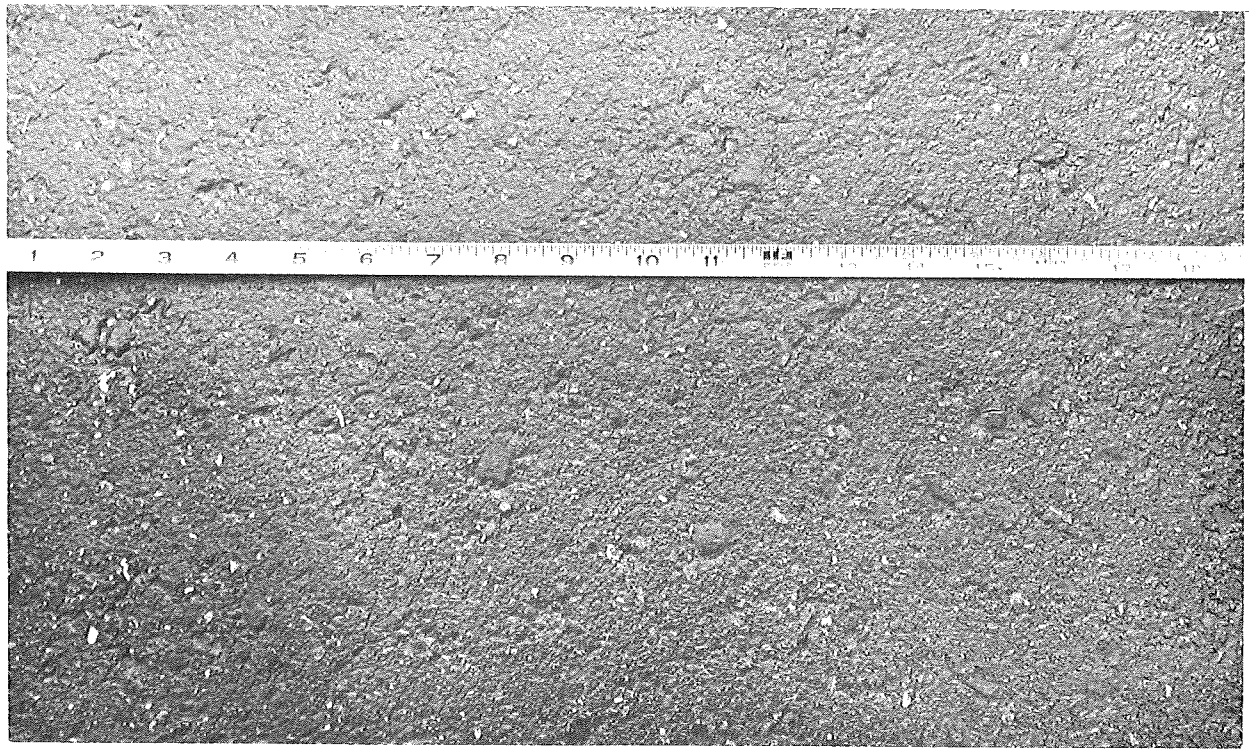
F. Copple

F. Copple, Supervisor
Pavement Performance

FC:sjt



Condition of pavement in wheel tracks.



Condition of pavement in low intensity traffic area.

Figure 1. Comparison of surface condition on M 203, Hancock (construction project M 31031-004).

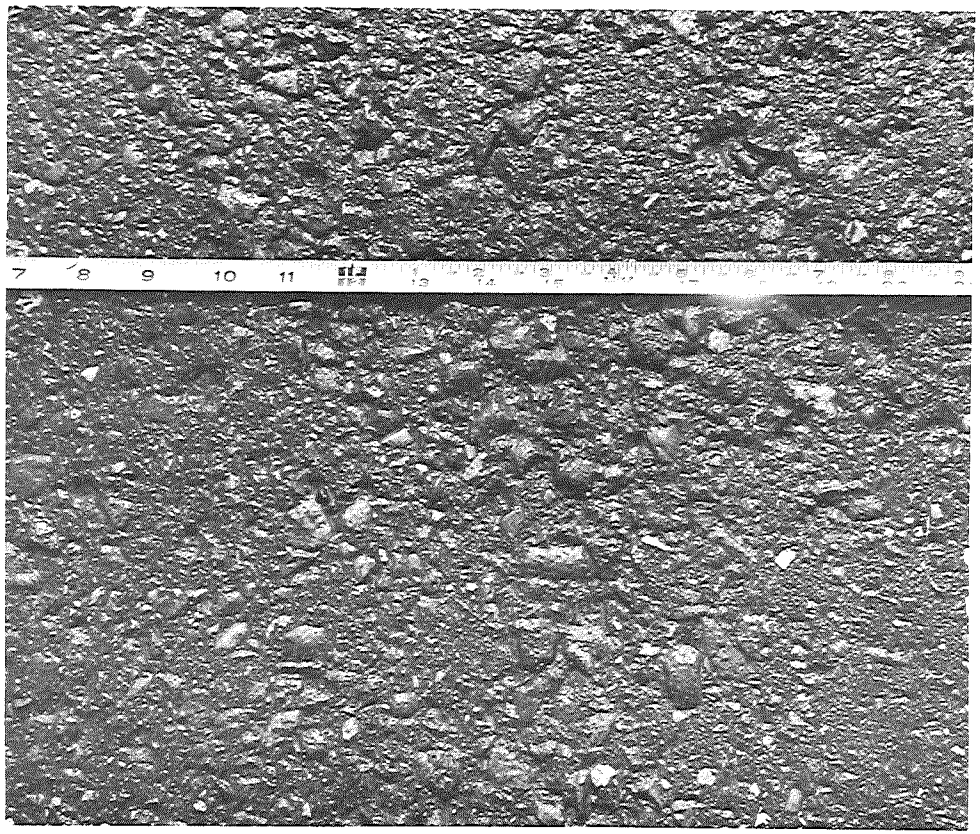
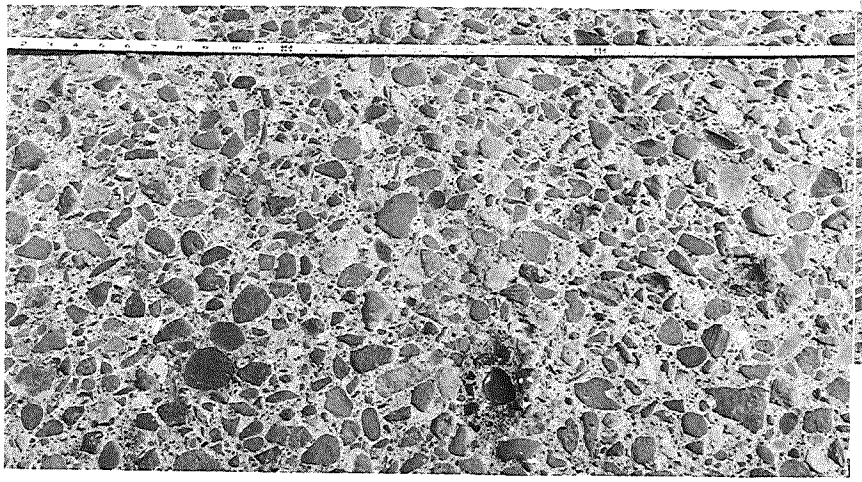


Figure 2 (above). Pavement surface on horizontal curve on M 203, Hancock (construction project M 31031-004).

Figure 3 (right). Pavement surface on M 203, Hancock (construction project M 31031-004). Relatively low traffic volume area.

Figure 4 (left). Typical view of Southbound US 41, Hancock (construction project U 31052-011).



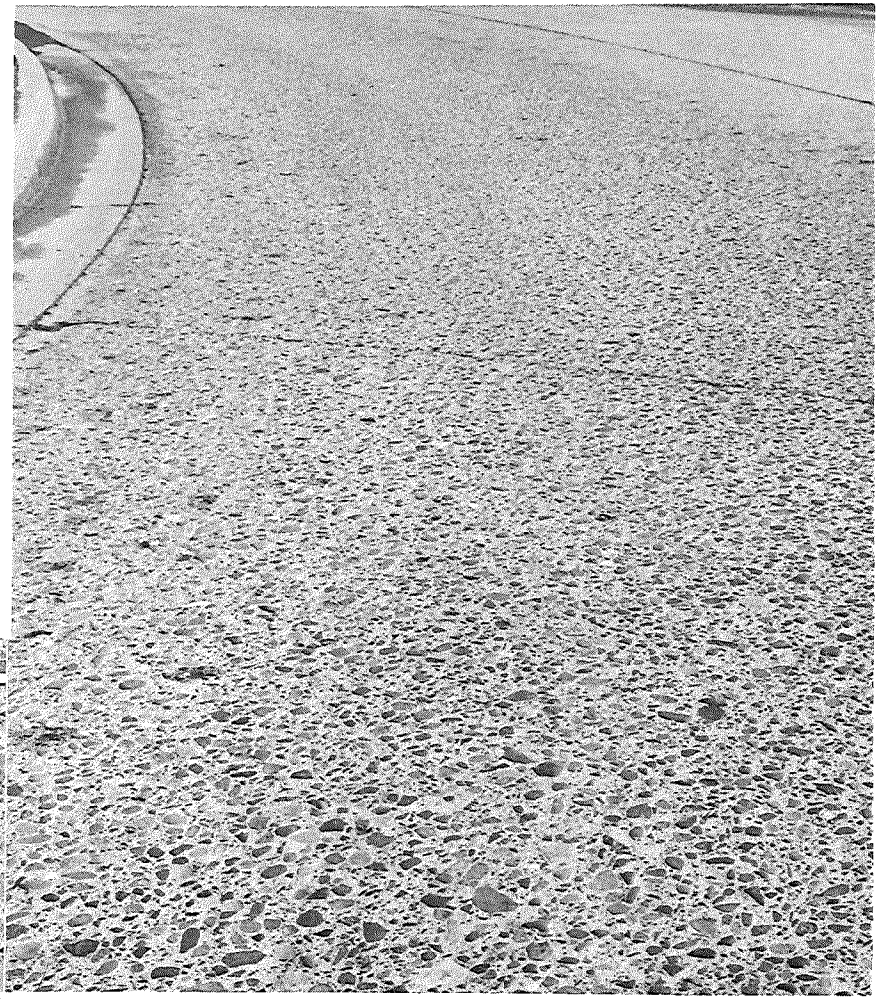


Figure 5 (left and above). South ramp of Houghton-Hancock bridge. Westbound M 26.