TRIAL INSTALLATION OF RUMBLE STRIPS IN ASPHALT SHOULDERS

MICHIGAN DEPARTMENT OF
STATE HIGHWAYS AND TRANSPORTATION

TRIAL INSTALLATION OF RUMBLE STRIPS IN ASPHALT SHOULDERS

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At its June 1974 meeting the Pavement Selection Committee approved a trial installation of rumble strips in asphalt shoulders. The Research Laboratory was asked to coordinate the work with the Construction and the Traffic and Safety Divisions. Ernest Wiedenhoefer represented the Construction Division and Nejad Enustun, the Traffic and Safety Division.

On the basis of information from an installation in Cook County, Illinois, it was decided that the most practical construction method would be to roll an imprint of a template into the asphalt. Several template designs were considered; however, the design used in the Cook County project (Fig. 1) was selected because of its reported success in providing a noisy riding surface. Although it was realized that a full shoulder-width template would be better than a partial-width one, the problem of moving a full-width steel plate, weighing about 500 lb, led to the decision of using a 3 by 3-ft template. Fabrication of the plate was done in the Research Laboratory's machine shop.

The basic objectives of the trial installation would be to determine the construction feasibility of the template method and to determine the ability of the imprinted corrugations to retain their shape and roughness with time.

Shoulder reconstruction project 76023, 04293A and 25042, 04294A on M 78 in Shiawassee and Genesee Counties, beginning approximately 1/2 mile southwest of Morrice Rd then easterly to Miller Rd, was selected for the trial installation. The experimental rumble strips are located on the outside shoulder of the westbound roadway just west of the Bancroft interchange. The shoulder consists of 5 in. of bituminous stabilized material and 1-1/2 in. of bituminous aggregate shoulder.

The installation was made on September 18, 1975 and consists of 12 rumble strips spaced approximately 80 ft apart. Three of the strips are located from Sta. 1119+00 to 1120+60 before the ramp gore, and the remaining nine begin just after the ramp taper at Sta. 1100+80 and end at Sta. 1094+40. The rumble strips are approximately 12 in. away from and perpendicular to the concrete pavement edge. As shown in Figure 1, each rumble strip consists of six V-shaped grooves 4-1/2 in. wide at the surface and 1 in. deep. The grooves are spaced 6 in. apart at the bottom which results in a flat strip 1-1/2 in. wide between each groove at the surface.

Attempts to roll the template into the bituminous material after one pass with a 14-ton roller failed, because the material was too compact and had cooled too much. On the basis of these attempts, it was decided to install the grooves behind the paver before any compaction was done. Also, since the roller cannot stop on the bituminous layer without making a low spot in the surface, it was necessary to space the rumble strips about 80 ft apart to allow the roller to turn onto the concrete pavement between each strip.

The installation of a sequence of rumble strips was begun approximately 500 ft behind the paver where the temperature of the mix was in the 175 to 200 F range. However, the time consumed in moving and placing the template by hand and the slowdown in the rolling process, caused by the necessity of roller to turn off the shoulder between each strip, cooled the asphalt material too much and made the installation difficult. Therefore, after three strips were installed a new sequence was started about 200 ft behind the paver where the mix temperature was measured to be 260 F. Nine strips were installed before the material became too cold for installation.

Each strip was pressed into the shoulder by two passes of a 14 ton roller. No additional compaction was applied in the rumble strip areas except in the last sequence of nine the template was repositioned in the grooves and one pass of a 14 ton roller was made. Since this additional roller pass was made after the mix had cooled considerably, it did not result in added compaction of the material in the rumble area, but did result in neater appearing grooves by smoothing out imperfections in the surface. Although the template and roller method of installing rumble strips in asphalt may result in satisfactory corrugations, it appears it would be difficult to compact and displace the material sufficiently to obtain corrugations that are flush with the shoulder surface. In the trial installation the rumble strips are about 1/2 in. higher than the surrounding surface.

An overall view of the trial installation is shown in Figure 2 and a closeup of a rumble strip is shown in Figure 3.

In order to obtain information on the effectiveness of the asphalt rumble strips, their sound levels at various speeds were measured with a Type I Sound Level Meter. For comparison purposes the sound levels of concrete pavement and concrete shoulder rumble strips were also measured. The results of these measurements are shown in Figure 4. Each point at each speed shown on the graph represents the average of two readings taken on each of 12 rumble strips. The points plotted for the pavements represent 24 readings on the slab taken between joints. The sound was measured from the front seat of an American Motors Ambassador car equipped with standard rib-treaded and belted tires. On both types of rumble strip only the right front and rear tire passed over the corrugations. Although this may be a somewhat crude and simple test, it does indicate that the asphalt rumble strip, as constructed, has a sound level in the approximate sound range of concrete rumble strips. It also indicates that an increase of about 10 dbA was obtained when the car left the roadway and ran over the rumble areas in the manner described. An increase of this magnitude would correspond to about doubling the loudness of the sound in the car.

In conclusion, it is suggested that the asphalt rumble strips be evaluated for one year to determine if snowplow damage or general deterioration will occur so that only a negligible increase in sound level occurs when a car passes over the corrugation.

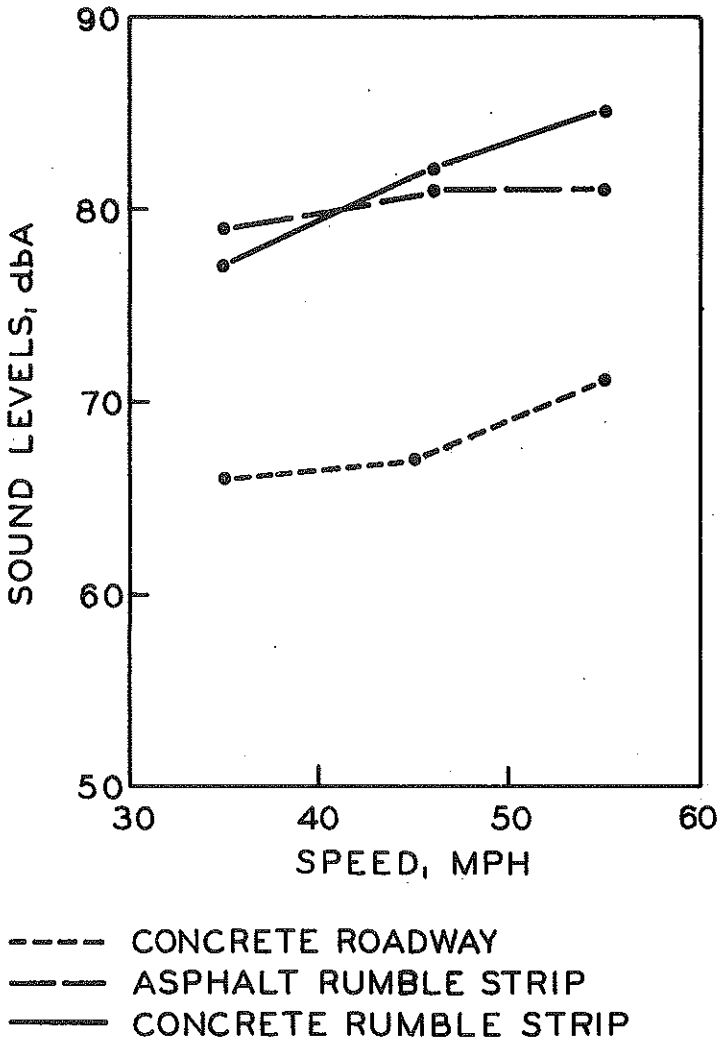
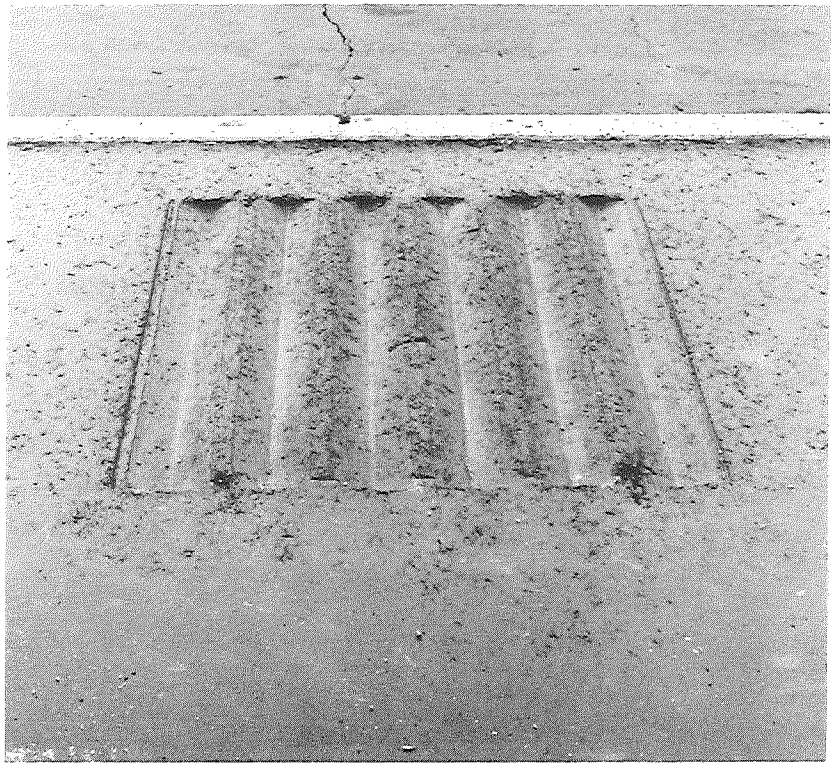


Figure 4. Comparison of sound levels of asphalt and concrete rumble strips at various speeds.

Figure 2. Overall view of trial installation on M 78.

Figure 3. Closeup of a rumble strip.



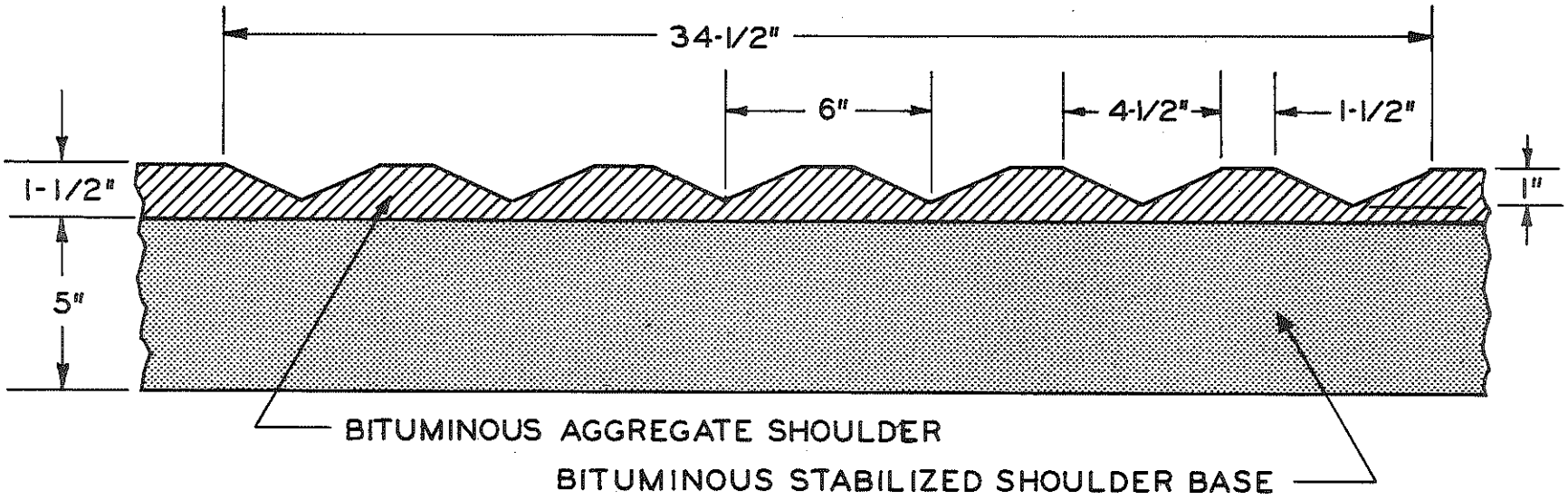


Figure 1. Cross-section of rumble strip design used on westbound M 78 shoulder near Bancroft Interchange.