AMERICAN CONCRETE
PAVEMENT ASSOCIATION

MN Roads Low Volume Road Joint Effect Field Validation Testing

Workplan Prepared by
Larry Scofield

American Concrete Pavement Association
July 25, 2008

Count on Concrete PAVEMENT

MN Roads Low Volume Road Joint Effects Field Test Plan

Background

The IGGA and ACPA have been working with Purdue University to develop a diamond grinding texture with improved noise characteristics. The research began by attempting to optimize blade width and spacer configurations. Traditionally, this had been thought to control resulting noise characteristics. However, the Purdue work indicated that fin profile was the controlling variable and not the blade/spacer configuration.

Work then began to produce fin profiles that were essentially uniform on top. After experimentation, two different techniques appeared to work best. The use of three chopper blades utilized as spacers placed between two 0.125 inch conventional diamond grinding blades, and a "flush" grind with grooving. The flush grind was produced by using 0.090 inch width blades with 0.090 inch spacers to lightly grind the surface. The Purdue grinding head was then offset slightly to grind a second time to remove the fins. The flush ground texture was then grooved with 0.125 inch diamond grinding blades spaced on 0.50 inch centers. The grooves produced measured 0.012 inches deep. The chopper blade configuration used chopper blades that were dressed to 0.08 inches shorter in radius than the 0.125 inch blades.

The results of this testing are shown in Figure 1. Both the chopper blade and the flush grinding with grooving produced quieter surfaces than previously obtained. The red bars indicate the phase three testing where this was verified. The triple chopper and flush grind surfaces are indicated in the lower right hand corner of Figure 1.

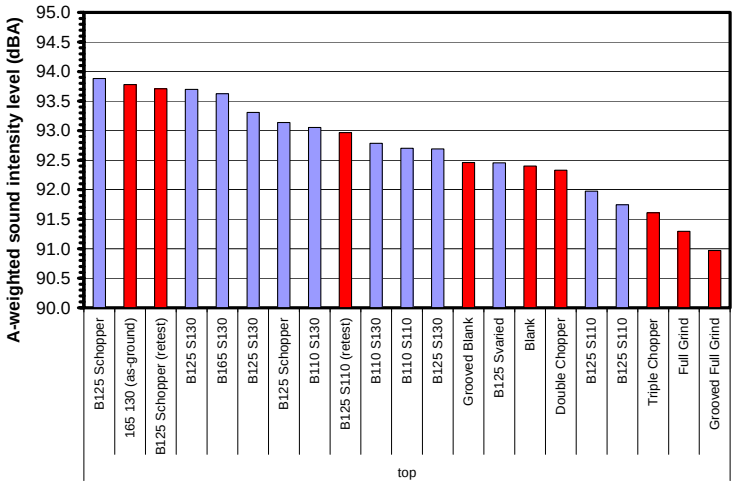

Figure 1 Results of Top Track Purdue Testing

The Purdue research uses the Purdue Tire Pavement Test Apparatus (TPTA) to evaluate the various textures. This laboratory based device, shown in Figure 2, consists of a twelve foot diameter drum upon which six cast segments are placed around the circumference as shown. The IGGA developed grinding head was used to grind the various textures and is shown in the right hand side of Figure 2.

Purdue TPTA

IGGA Grinding Head for TPTA

Figure 2 Photos of Purdue TPTA Equipment

Previous Field Validation Attempts

ACPA has made two previous attempts to field validate the Purdue joint effects study. The first time was after the construction of the diamond ground wheel tracks on cell 37. Upon completion of the grinding the tracks were tested with what was left of the original 14 year old sealant in the joints. The remaining sealant was then removed and the unsealed joints tested. These results did not confirm the Purdue work.

A second attempt was then made by using a laser trigger suspended off the back of the OBSI test car. The intent was for the laser to event the actual joint location in the audio recording. Ten joints had reflective tape placed in advance to trigger the laser as the OBSI passed over the joints. The laser placed an event signal into the OBSI audio recording so that the joint location was accurately identified in relationship to the audio signal. This procedure was performed to allow isolation of the joint slap effect in relationship to the texture generated noise.

Upon conducting this testing the results again, did not support the original Purdue results. However, considerable disagreement existed as to the ability to properly analyze the data since the data indicated speed variability across the joints. Significant speed variability would seem unlikely on a vehicle at constant velocity over a distance of only 130 ft. This issue could not be resolved.

Current Field Validation

The current and final field evaluation will utilize cell number 37, Figure 3, and the previously constructed wheel tracks, Figure 4, to further attempt to validate the Purdue work.

The current plan is to test all four wheel tracks as before, with the joint sealant removed. Once the testing is complete, new sealant will be installed with a minimal sealant reservoir. For this testing, all the joint sealant will be new and installed to the same depths.

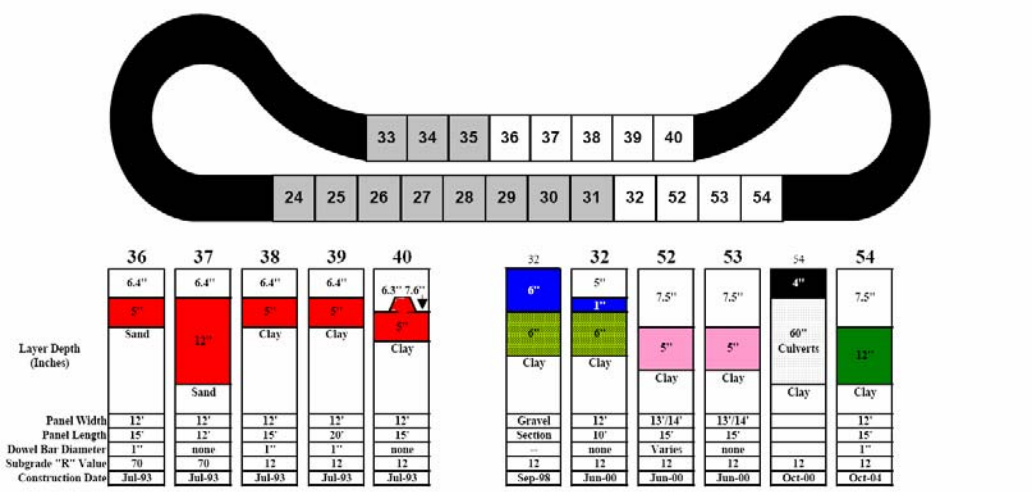

Figure 3 Mn ROADS Low Volume Road Concrete Test Sections

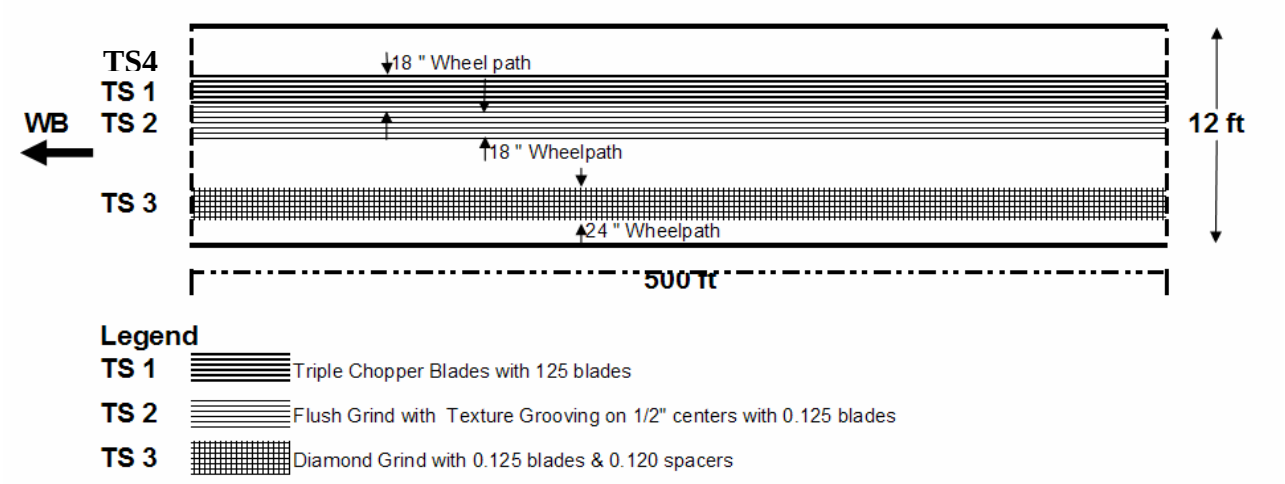

Figure 4 Joint Effect Wheel Track Test Locations

OBSI Testing

OBSI testing will be conducted in each of the four wheel tracks indicated in Figure 4. These surfaces provide a range of surface texture noise. For each of the four wheel tracks, four replicate runs will be conducted with the ACPA OBSI equipment. This results in 8 tests for each wheel track location for a total of 32 OBSI tests.

Since the wheeltrack is only 18 inches wide, guidance of the test vehicle (e.g. Chevy Malibu) will be necessary during OBSI testing. This will be accomplished by painting dots on the PCCP surface to use for guidance. A separate set of dots will be needed for each wheeltrack. The markings will need to extend through the test areas and beyond to allow adequate alignment.

OBSI testing will be conducted by the ACPA using the dual probe configuration. Testing will be conducted at 60 mph with the 16 inch ASTM SRTT tire

The construction/test schedule is indicated in Table 1.

Table 1 Construction/Test Schedule

Date	Activity	Organizations
July 29	• Remove Existing Joint Sealant • Conduct OBSI Testing & Analysis	• Penhall • ACPA & MnDOT
July 30	• Install backer rod and silicone sealant • Conduct OBSI Testing and Analysis	• Penhall • ACPA & MnDOT