JERSEY DOT'S
"Turning Problems into Solutions"
Tech Brief

Demonstration Project - The Measurement of Pavement Noise on New Jersey Pavements Using the NCAT Noise Trailer

FHWA-NJ-2003-021 May 2004

SO, HERE'S THE PROBLEM…

- Traffic noise is a serious problem;
- Engine, exhaust, aerodynamic (power train) noise, and pavement/tire noise contribute to traffic noise. However, when vehicle speeds are in excess of 45 mph, it is the pavement/tire noise that dominates;
- Research in Europe has indicated that it is possible to build pavement surfaces that will provide low noise roadways;
- However, how can we measure the noise related to the tire/pavement interface and how does different pavement surfaces influence this noise

AND, HERE'S OUR SOLUTION

- Utilize a new testing device called the NCAT Noise Trailer to solely measure the tire/pavement related noise;
- Evaluate the repeatability of the device;
- Evaluate the influence of pavement surface type on the tire/pavement related noise; and
- Evaluate how vehicle speed influences the tire/pavement related noise.

The National Center for Asphalt Technology (NCAT) was contracted to test 42 different pavement sections in New Jersey with the NCAT Noise Trailer (Figure 1 and 2). This comprised of both HMA and PCC surfaces. The HMA surfaces included OGFC, DGA, SMA, Novachip® and Micro-surface Type 3 materials. The PCC pavements included surface treatments of broom finish (no finish), transverse tined, transverse tined via sawcutting, and diamond grind.

Figure 1 – NCAT Noise Trailer

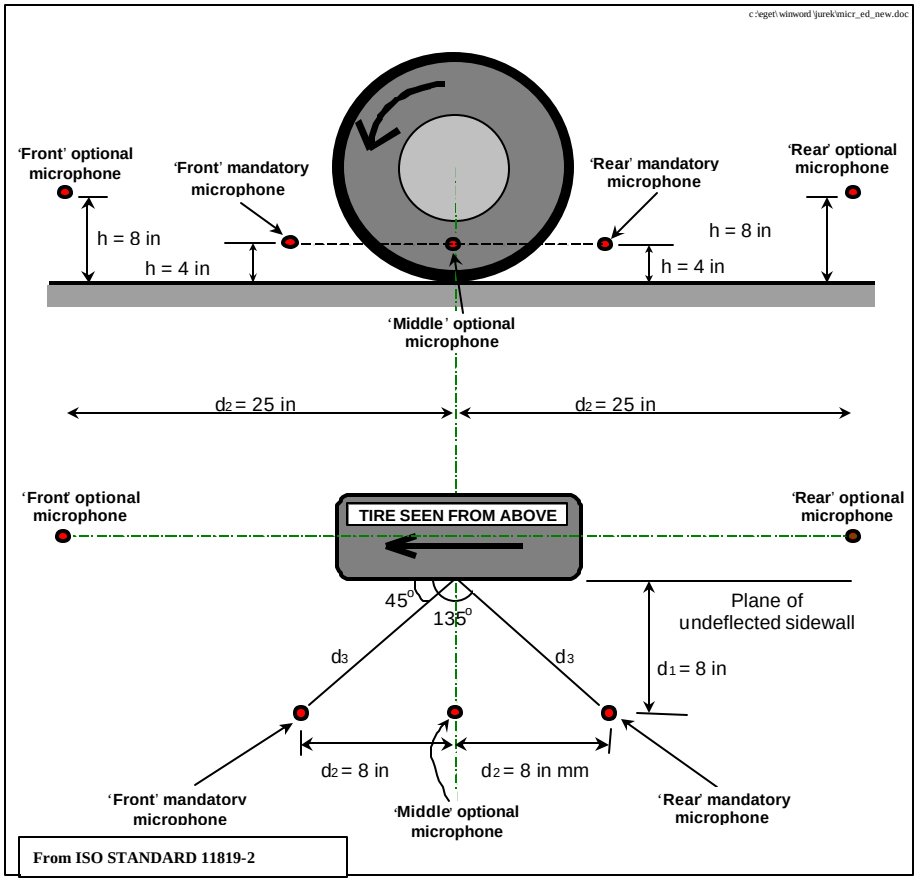

Figure 2 – Configuration Inside the Trailer

The repeatability of the test device was evaluated by testing the pavement section a minimum of three times at 60 mph and calculating the standard deviation of the three measurements. The influence of vehicle speed was determined by testing the pavement section at vehicle speeds of 55, 60, and 65 mph. The noise gradient, which is the difference of noise level vs the difference in vehicle speed, was used to describe the vehicle speed influence. The pavement sections with the greater noise gradient are more affected by the vehicle speed.

THIS IS WHAT IT CAN DO

The data developed in this study can be used by the NJDOT to decide on pavement surface type during rehabilitation or construction around residential areas. The device may also be able to be used for future noise mitigation analysis.

HERE'S WHAT WE CAME UP WITH…

The quietest pavements tested where OGFC surfaces (Figure 3), while the loudest pavements tested were PCC treated with transverse tining (Figure 4). The noise levels were influenced by the vehicle speed and were shown in to increase approximately 0.2 dB(A) per 1.0 mph increase in vehicle speed over the range of 55 to 65 mph. The noise gradient was also found to be linear, possible allowing extrapolation of data out to higher vehicle speeds.

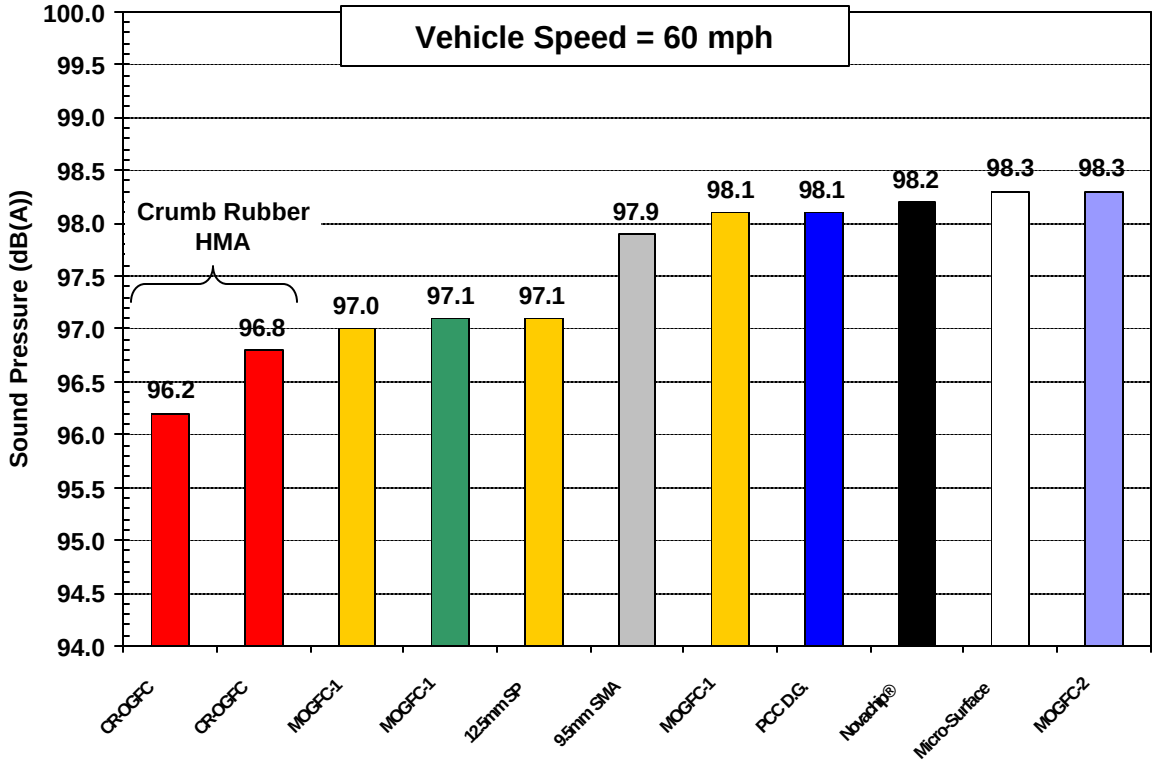

Figure 3 – 10 Quietest Pavement Sections Tested

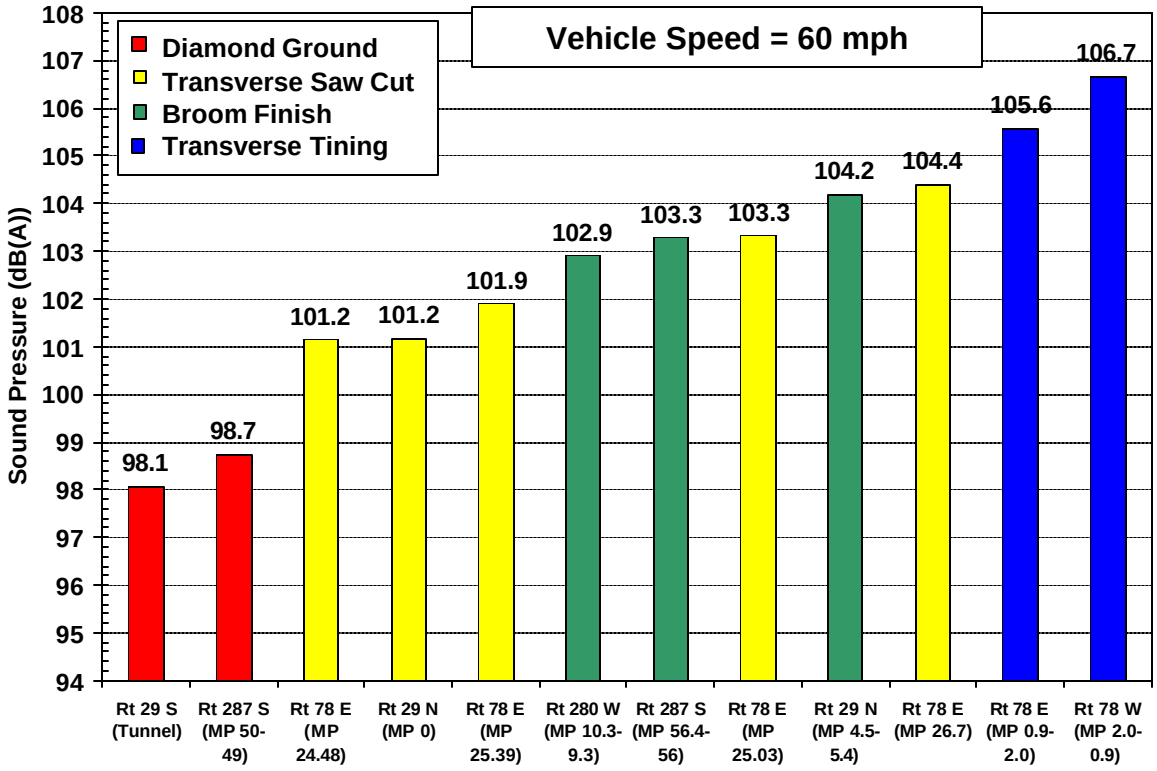

Figure 4 – Influence of PCC Surface Treatment Method on Tire/Pavement Noise

The evaluation of the repeatability of the test procedure concluded that as long as the test section of interest is greater than 0.1 miles, the test procedure provides fairly repeatable results. The repeatability increases as the length of the test section increases (Figure 5).

THE BOTTOM LINE…

The NCAT Noise Trailer, a device that can measure the influence of pavement surface type on tire/pavement noise, was used on 42 pavement sections in New Jersey. Overall, the HMA pavement surfaces were the quietest, with the OGFC having the lowest noise levels. The PCC pavement surfaces did obtain the highest noise levels, however, if the PCC surfaces can be diamond ground, the final surface would provide noise levels comparable to the HMA surfaces.

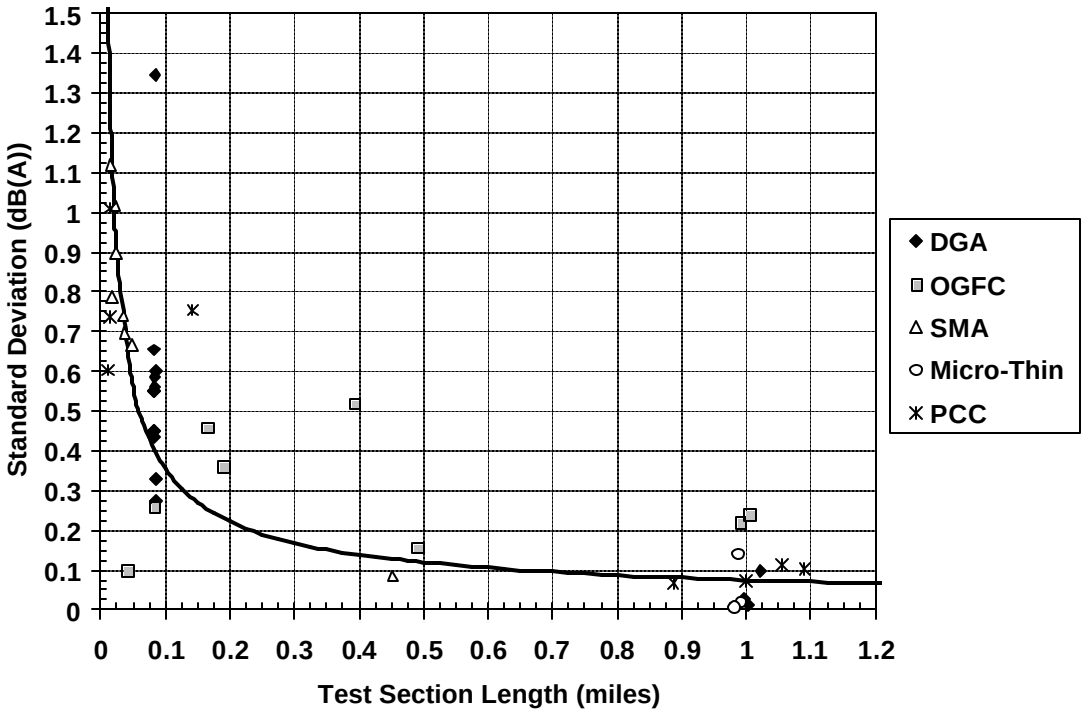

Figure 5 – Repeatability vs Travel Distance for the NCAT Noise Trailer

FOR MORE INFORMATION CONTACT

NJDOT PROJECT MANAGER:	Lad Szalaj
PHONE NO.	**(609) 530-3711**
e-mail	**Lad.Szalaj@dot.state.nj.us**
UNIVERSITY PRINCIPAL INVESTIGATOR:	Thomas Bennert
UNIVERSITY:	**Rutgers University -CAIT**
PHONE NO.	**(732) 445-5376**
e-mail	**bennert@eden.rutgers.edu**

A final report is available online at
http://www.state.nj.us/transportation/research/research.html

If you would like a copy of the full report, please FAX the NJDOT, Division of Research and Technology, Technology Transfer Group at (609) 530-3722 or send an e-mail to Research.Division@dot.state.nj.us and ask for:

Demonstration Project – The Measurement of Pavement Noise on New Jersey Pavements Using the NCAT Noise Trailer

NJDOT Research Report No: FHWA-NJ-2003-021