Concrete and Asphalt: Misinterpretations Cloud the Issue

Research results published recently by the National Center for Asphalt Technology (NCAT) show concrete pavements are just as quiet as asphalt pavements, but that’s not what NCAT is saying. Their interpretation of the study contends that asphalt is quieter. In reality, noise differences between concrete and asphalt pavements were as minimal as two or three decibels (dBA).

The Federal Highway Administration’s (FHWA) “Highway Traffic Noise Analysis and Abatement Policy and Guidance” clearly states that, “the use of specific pavement types or surface textures must not be considered as a noise abatement measure.” Despite this, many specifiers still look for comparisons between materials. At least two recent studies show concrete and asphalt pavement noise levels are comparable.

What’s The Noise About?

It’s not just roadway neighbors who are concerned about noise. According to the FHWA, projects using federal funds must pass a noise pollution evaluation as part of an environmental assessment. Noise is measured at ground level near surrounding buildings, and a measured level exceeding 67 dBA requires a noise-abatement feasibility analysis.

Noise levels drop as sound waves travel away from their source. Studies show typical noise levels generated by high-speed travel on asphalt and concrete surfaces are about 69 to 72 dBA at distances of about 8 m (25 ft) from the pavement. In most U.S. cities, residential buildings built to code are situated about 15 m (50 ft) or more from the edges of roadways, reducing the intensity of noise levels by as much as 6 dBA.

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Slight noise differences from road surface type are insignificant compared to proximity of buildings to roadways. While a variety of components contribute to roadway noise, such as engine and exhaust noise, one factor is tire/road noise. Surface texturing techniques employed to reduce hydroplaning and increase skid resistance can also increase tire/road noise, sometimes in the form of tire whine.

Tire whine depends on the specific tone created by tire/road interaction; the higher frequency of the tone, the louder and more prominent it is perceived to be. Research performed in Wisconsin in 1997 showed that uniformly spaced transverse tines produce prominent tones, while randomly spaced and longitudinal tines do not. Likewise, drag, diamond ground and abraded textures do not produce prominent tones or whine. These studied facts suggest that specifying agencies look closely at their texturing selections when building with concrete to assure that they optimize the noise reduction characteristics.

Re-examining NCAT’s Results

Results of the NCAT study (performed for the Michigan Department of Transportation) were released in October 2002, and proved that concrete pavements can be just as quiet as asphalt pavements. The study compared nine test sections, including a variety of concrete pavement surfaces: diamond ground, light transverse tined, heavy longitudinal tined and heavy transverse tined, as well as asphalt surfaces.

While test results show the noise levels of nearly all nine sections were within 3 dBA of each other, NCAT presents the results in a way that makes concrete pavements appear loudest. By averaging the results of all the concrete sections, including heavily textured surfaces mandated by MDOT, the study includes a graphic that would make concrete seem louder than asphalt.

In fact, the diamond ground concrete pavements were quieter than four out of five asphalt sections, and within 1 dBA of the other asphalt section. Even the widest disparity in noise level was only about 3 dBA.
Experts call into question the test method used by NCAT. The close proximity method (CPX) is not recommended by the FHWA for measuring highway noise abatement and mitigation. CPX measures noise at the tire, providing measurements not suitable for environment impact analysis. The preferred method—standard pass-by method—measures noise at ground level near the receptors (surrounding buildings), providing a more realistic noise measurement.

**Wisconsin Research Points to Equality**

In 1999, a series of tests at 57 sites in six states measured noise levels of both concrete and asphalt pavements. Sponsored by the Wisconsin Department of Transportation and the FHWA and performed by Marquette University and HNTB Corporation, the study examined pavements in Colorado, Iowa, Michigan, Minnesota, North Dakota and Wisconsin.

Recognizing highway noise cannot be characterized by one single type of noise measurement, the study's authors conducted exterior, interior, subjective and prominent frequency noise analysis. They also measured surface textures with both a Road Surface Analyzer and sand patch tests.
The result? Simply put, concrete pavements matched asphalt pavements. Of the best four pavements for exterior noise, three were concrete: longitudinally tined, random skewed tined, and random transverse tined. The same four were considered among the best for interior noise.

According to the research, the similarity of noise results between asphaltic concrete (AC) and the longitudinally tined and skewed tined concrete pavements was “striking,” in measurements of both interior and exterior noise levels. Overall, differences in noise levels between most of the concrete and asphalt pavements were negligible.

Final Thoughts

Some proponents insist on making noise comparisons between concrete and asphalt, even though research shows they are comparable. Even organizations like the Noise Pollution Clearinghouse (a national, non-profit group that fights to reduce noise) argue that noise should not be addressed with “quick fixes” like asphalt overlays that offer fleeting results at a high cost. Instead, they argue, we should focus our efforts on bringing about lasting, measurable change, starting with reducing truck noise.

In their final report, authors of the Wisconsin research cite the comments of an FHWA Technical Work Group that concluded pavement” material type selection should not be based solely on noise considerations from the tire/pavement interaction.”

Even so, there are still those who feel the need to specify pavement materials using noise consideration as a major factor. Those individuals and organizations that specify concrete pavements can do so with confidence. As both the NCAT and Wisconsin research prove, when it comes to noise, concrete can match asphalt mile for mile.

The similarity between some asphalt and concrete samples is striking.

Resource List

- Tire/Pavement Noise Study for Michigan Department of Transportation, National Center for Asphalt Technology, October 2002.
- Special Report: Concrete Pavement Surface Textures, American Concrete Pavement Association, 2000.

Some of these reports, plus additional materials, are available at ACPA’s web site: www.pavement.com.