*Noise walls are expensive—about $1.25 million per mile—and not always effective.*

*Asphalt pavements offer additional as well as noise*

# What You Should Know About Noise

Traffic noise is becoming a critical issue for residents and business people that live and work near streets, roads and highways. The whine of tire noise from cars and trucks makes speaking and hearing at a conversational level difficult or impossible near the roadway.

Such roadway noise can be significantly reduced by barriers or certain types of pavement that absorb and mitigate noise. Currently, most transportation agencies are using sound-barrier walls to reduce noise. But they are not always effective, and they are costly. Also, these sound barriers must be built high enough to actually reduce the noise. If they are built higher, they cost more. Walls that are low in height, no matter how aesthetically pleasing, will reduce very little tire noise. And sound walls do little or nothing to impede the noise that the average motorist experiences while traveling on noisy pavements.

Federal and state agencies are currently testing noise-reducing pavement to determine the degree of reduction the test sections provide. Noise reduction on pavements has been studied by the U.S. Department of Transportation's Volpe National Transportation Systems Center in Cambridge, Massachusetts. FHWA guidelines currently require noise levels of 67 decibels or less at roadside residences.

## International Clamor for Quiet

Tire and traffic noise is not just an issue in the United States; it has gotten the attention of residents and business people around the world. Stringent complaints from residents in the United Kingdom have encouraged transportation agencies there to reduce noise by overlaying all their major highways with asphalt by 2010. And agencies in the Danish government plan to reduce the number of dwellings exposed to noise levels above 65 decibels by two-thirds by the year 2010.

## Noisy Concrete

Studies by the U.S. DOT show that Portland cement concrete (PCC) pavements are louder than dense-graded hot mix asphalt (HMA) by approximately three decibels for cars. The noise level at 200 feet from a PCC pavement can equal the noise level at 100 feet from an HMA pavement.

## Disadvantages of Walls

At this point in time, noise-barrier walls are the accepted means of reducing road noise. However, walls are not the perfect solution. They are very expensive—about $1.25 million per mile—and they are not always effective. Road noise can diffract over the top and

*benefits, such as safety and durability, reduction.*

*A 4–6 decibel reduction in noise was measured after placing a HMA overlay over the existing PCC pavement.*

# Reducing Asphalt Pavements

around the end of walls, rendering some wall barriers almost useless. In many cases, however, noise walls can be eliminated by reducing the noise at the pavement.

## Open-Graded Friction Mixes

Asphalt pavement surface types such as dense-graded asphalt, stone-matrix asphalt (SMA) or open-graded friction courses (OGFC) can reduce roadway noise by several decibels. Recent years have seen a turnaround in the performance and use of porous asphalt surface mixes such as OGFC. Today, a number of states are taking a renewed interest in open-graded friction mixes. These improved OGFCs use polymer-modified binders and fibers to add pavement durability and control draindown of the binder.

## Better Visibility, Quieter Pavement

These new OGFCs also have higher air voids, typically 18 to 22 percent. Because tire noise is absorbed into the air voids, OGFCs are quieter. Additionally, the air voids in OGFCs are interconnected to provide maximum permeability. As a result, water enters the pavement and is quickly removed from the surface. By draining the pavement surface, splash and spray are reduced and visibility and safety are dramatically improved.

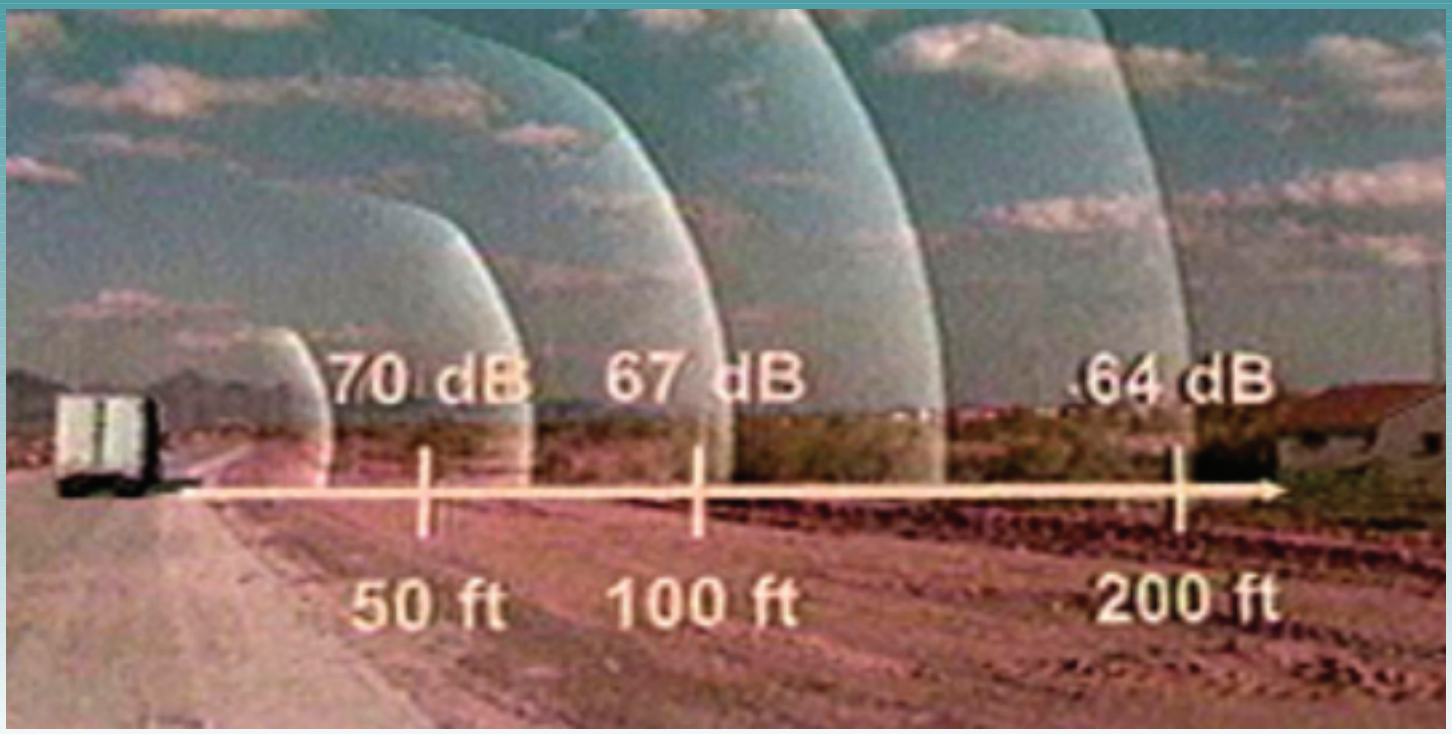
## Environmental Coup

Besides OGFCs, rubberized asphalt is another smooth and quiet asphalt mix that can eliminate millions of used tires. Rubberized asphalt consists of regular asphalt cement mixed with ground "crumb rubber" from used tires. Used tires are processed by separating the casings, fabric and steel. The recovered rubber then is granulated to the consistency of ground coffee. Rubberized asphalt contains about 20 percent tire rubber that is blended into the liquid asphalt. Approximately 1,500 tires are used for every lane-mile of rubberized asphalt paving.

Noise readings show rubberized asphalt generally reduces road noise by an average of 4 decibels, and in some cases by as much as 10 decibels.

## Durable and Silent

The city of Phoenix and the state of Arizona have used rubberized asphalt to reduce road and street noise for nearly 40 years. Phoenix pioneered the use of rubberized asphalt in 1964, when it applied a rubberized asphalt chip seal to city streets. In 1971, as a temporary measure to delay reconstruction, rubberized asphalt was applied to Indian School Road from Central Avenue to Seventh Street. It performed so well that the street lasted 20 years without reconstruction.




*The noise level at 200 feet from a PCC pavement can equal the noise level at 100 feet from an HMA pavement.*

## Several Advantages

Despite the success of the chip seal program, it was discontinued in 1989 because of potential damage to cars by loose chips. But in the same year, the city began using a one-inch rubberized asphalt hot mix overlay to prolong the life of city streets. The overlay had several advantages:

- There was no reflective cracking from the existing pavement.
- It was more durable and skid-resistant than conventional asphalt.
- It reduced traffic noise and provided a smooth, quiet ride.

## 90 Percent Noise Reduction

Noise test on chip seal and rubberized asphalt pavements on Seventh Street showed a noise reduction of about 10 decibels, or about a 90 percent reduction. Noise tests on other streets showed a reduction in noise levels of 50 to 75 percent.

During the 1990s, Phoenix resurfaced more than 200 miles of city streets with 450,000 tons of rubberized asphalt, which had the added benefit of using about 1.1 million scrap tires. The city reports that rubberized asphalt used on Dobbins Road in 1989 performed without maintenance for 14 years and has an estimated life of 18 years.

Along with Phoenix, the Arizona Department of Transportation (ADOT) has been a pioneer in using rubberized asphalt. ADOT has used more than 4.2 million tons of rubberized asphalt on state highways since 1988, at a cost of about $225 million, while recycling about 15 million tires.

## Superstition or Truth

After ADOT overlaid the concrete-paved Superstition Highway (U.S. 60) with rubberized asphalt OGFC, motorists using the highway as well as nearby residents noticed a dramatic reduction in noise level. When the people found that it was the rubberized asphalt surface that made the difference, they demanded more of the same surface.

ADOT responded with a plan to resurface 115 miles of existing urban concrete freeways in the Phoenix metro area with asphalt rubber OGFC. The agency resurfaced the first 21 miles of freeways in September 2003.

## A Better Investment

By using a specialized asphalt mixture, states and municipalities have a means of managing noise concerns. Rather than spending money on expensive noise-barrier walls that may not work, they can build pavements that offer safety benefits, durability, and noise relief. ▲

*Part of the material for this article was taken from ADOT's website, www.quietroads.com.*