

Quiet Pavement



ASPHALT: THE QUIET PAVEMENT

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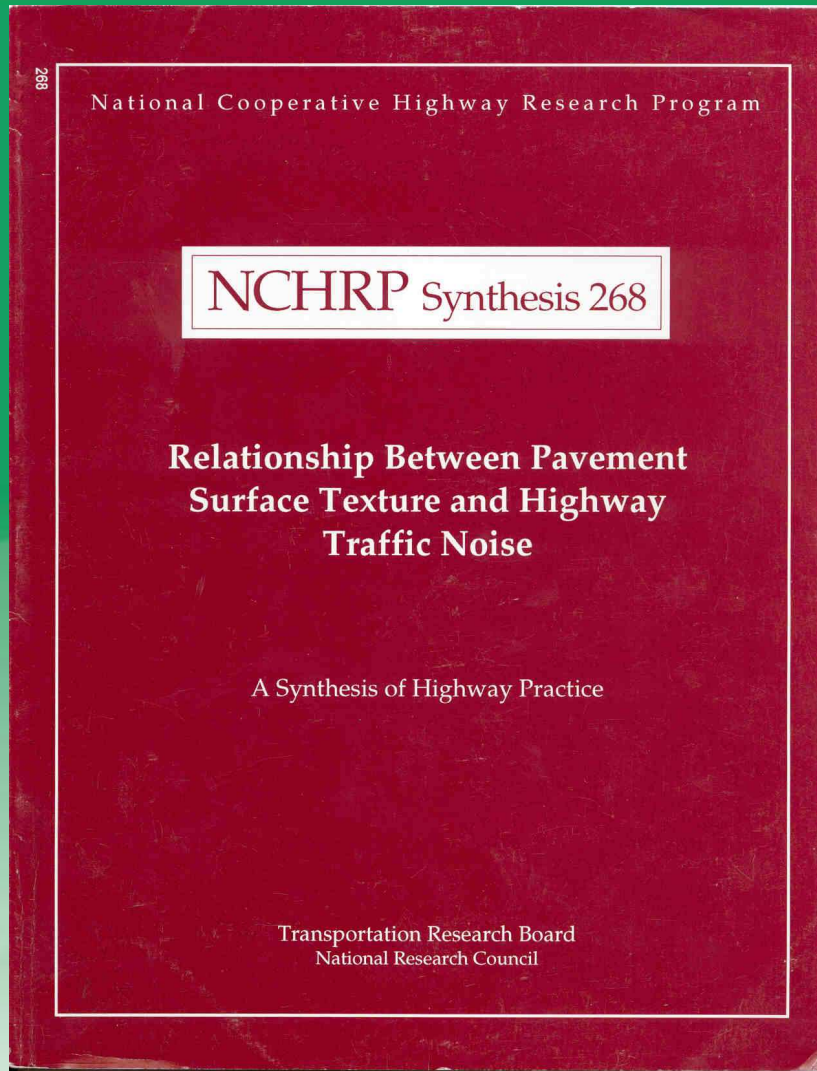


*Asphalt
Pavements
are Quiet*

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“Pavement/tire noise has been studied for well over 30 years and several large databases have been compiled in the last decade. NCHRP Synthesis 268 is a summary of the research findings of this extensively studied topic.”

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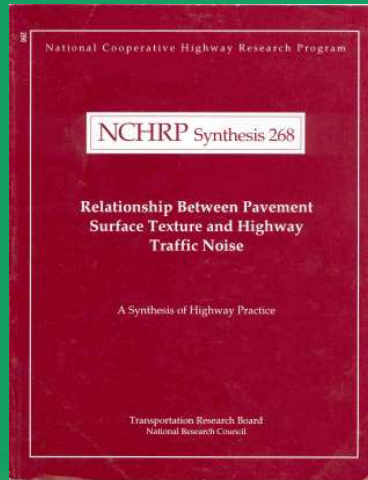
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- Vehicle-generated noise comes from:
 - engine,
 - exhaust system,
 - aerodynamic noise
 - tire noise.
- } **Power train noise**
- } **Coast- by noise**
- For ≥ 50 mph, pavement/tire noise dominates.

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FHWA - Noise Abatement Criteria

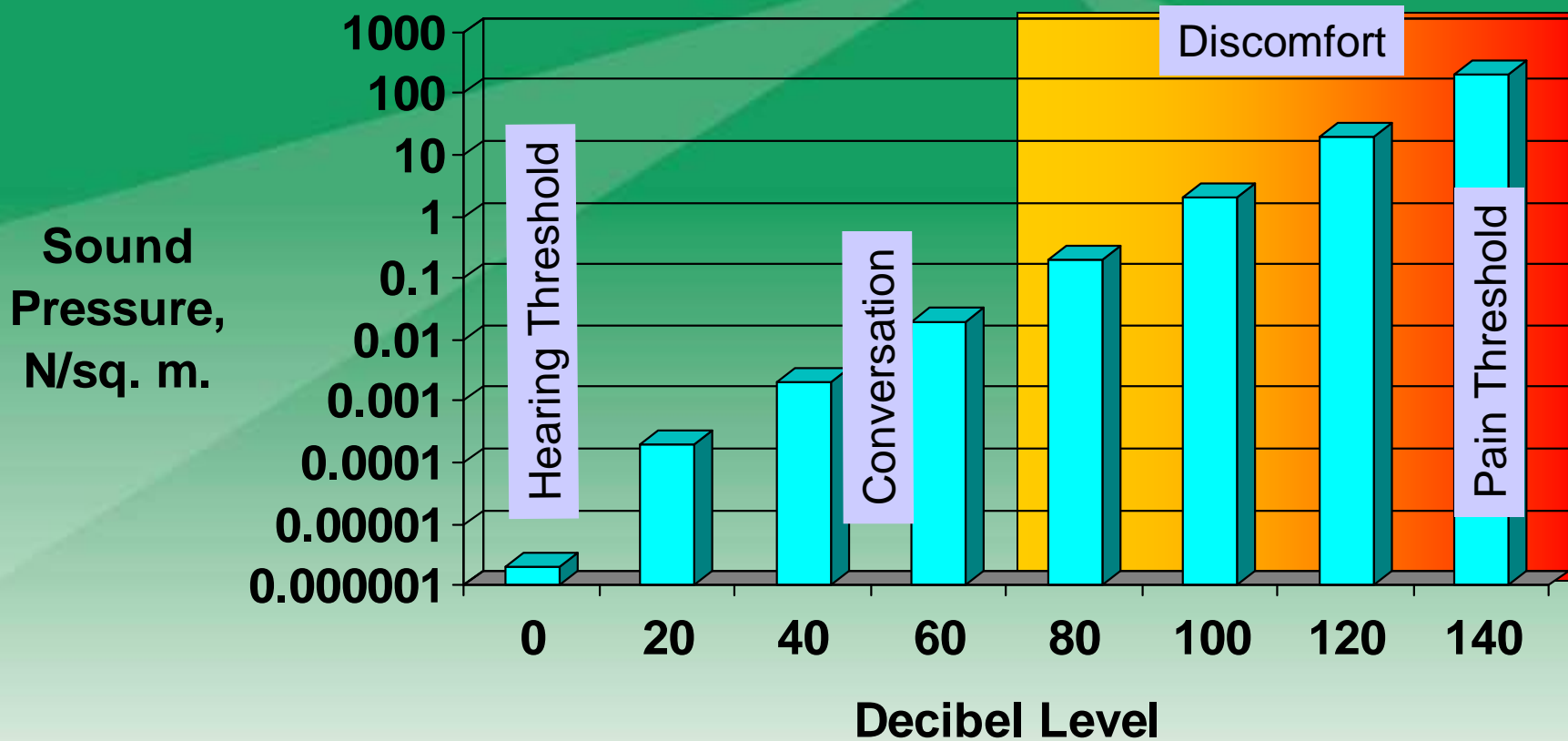
67 dB(A)

“this is not an absolute value or design standard, only a level where noise mitigation must be considered”

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The Decibel Scale



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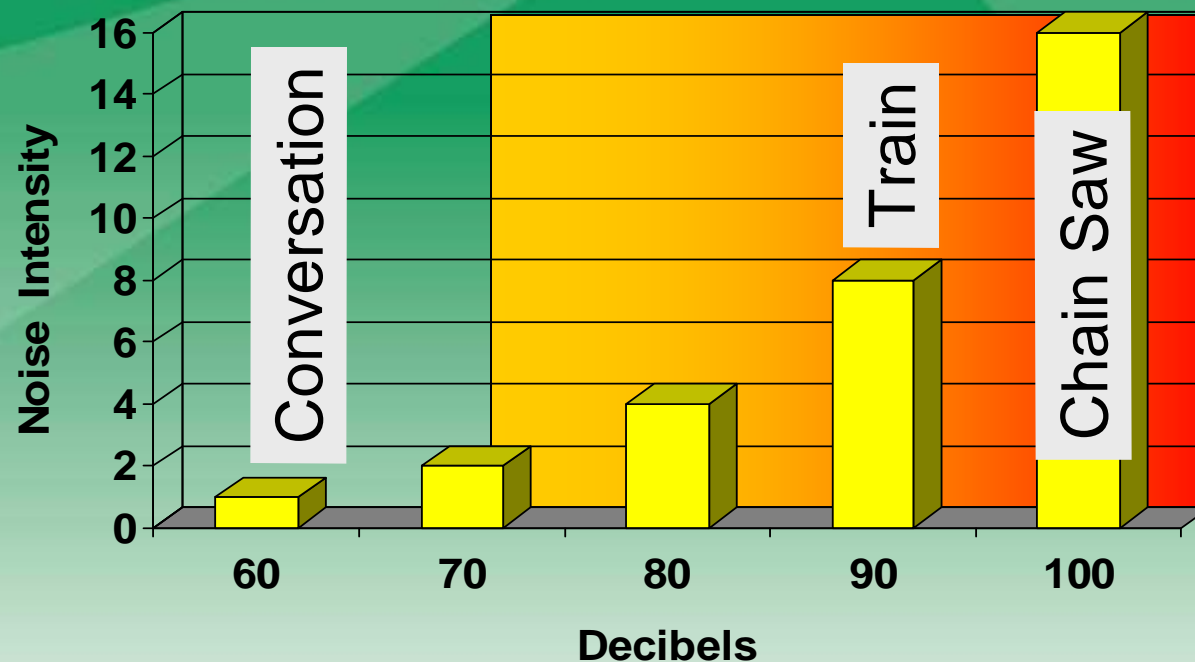
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The Decibel Scale

Increasing the decibel level by 10 doubles the noise intensity!



What Can Be Done ?

- Erect Noise Walls or Plant Trees/Shrubs
- Control Surface Texture

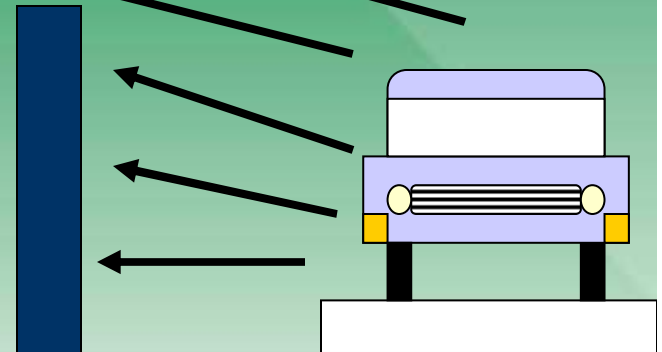
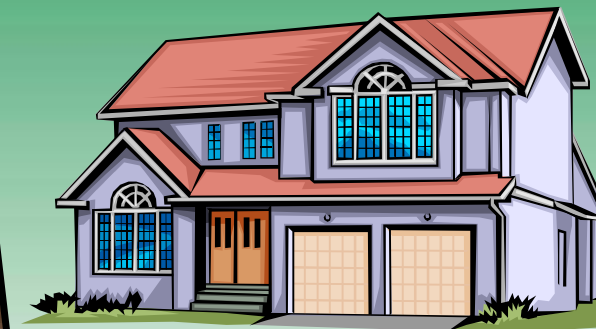
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Noise Walls

Effective only for those in line-of-sight.

Do not reduce noise at source.



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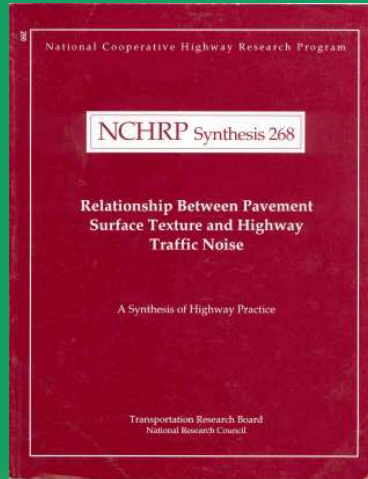
Noise Walls

- Effectiveness must justify expense.
- Cases:
 - I-40, Knoxville: >\$25,000/home
 - I-285, Atlanta: Requirements of ≥ 69 dB(A) and \leq \$50,000/home
 - U.S. 441, West Boca, FL: > 67dB(A), <\$30,000/home, reduction of ≥ 5 dB(A)
 - Nationwide (FHWA, 1998): >\$1M/mile

What Can Be Done ?

- Erect Noise Walls or Plant Trees/Shrubs
- **Control Surface Texture**

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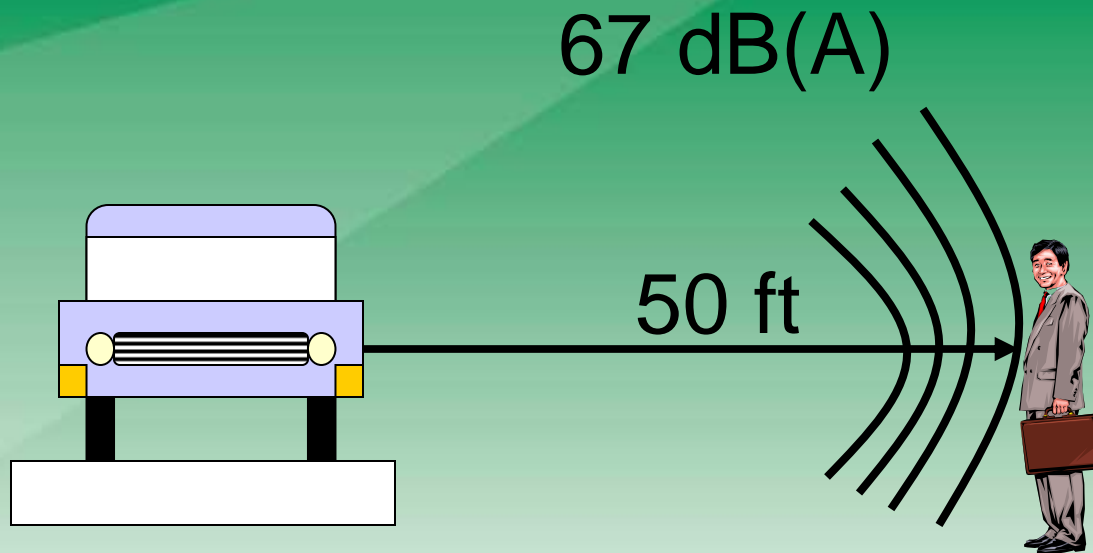
Surface Texture

Conclusions, “In general, when dense-graded asphalt and PCC pavements are compared, the dense-graded is quieter by 2 to 3 dB(A)”

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The Decibel Scale



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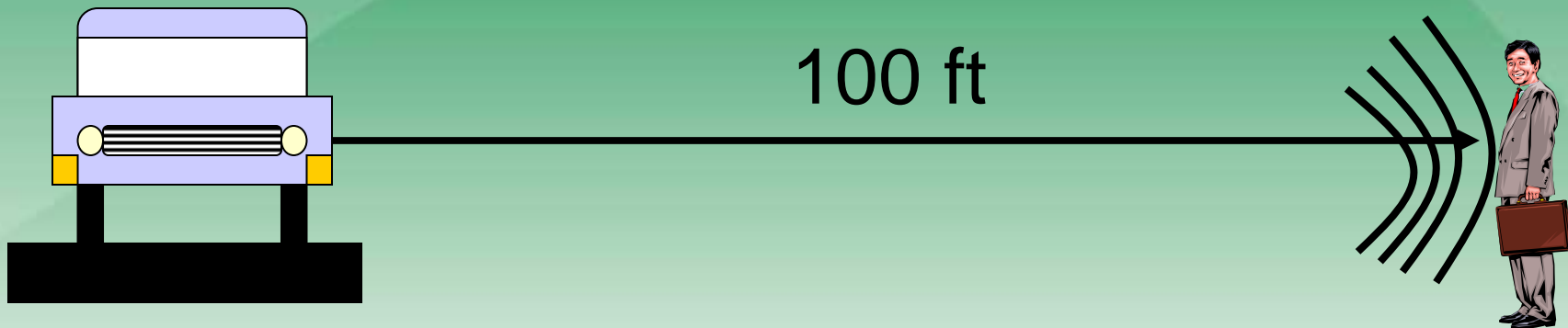
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A reduction of 3 dB(A) is like doubling the distance from the noise.

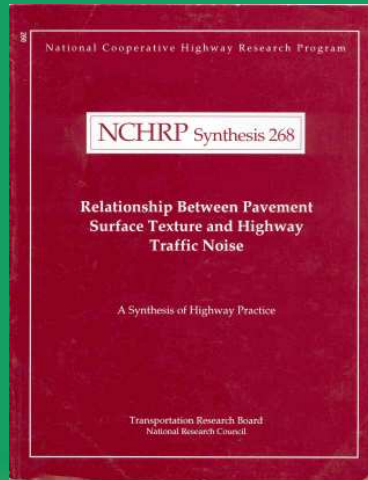
$$67 \text{ dB(A)} - 3 \text{ dB(A)} = 64 \text{ dB(A)}$$



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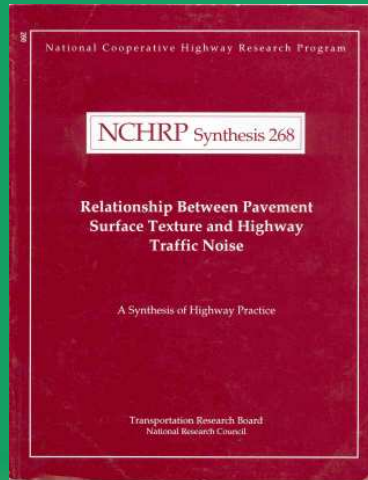


Conclusions: “In general, when dense-graded asphalt and PCC pavements are compared, the dense-graded is quieter by 2 to 3 dB(A)”

A 3dB(A) reduction corresponds to:

- doubling the distance
- **reducing traffic volume by 50%**
- **reducing traffic speed by 25%**

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Conclusions: “Open-graded asphalt shows the greatest potential for noise reduction for passby noise. Reduction when compared to dense-graded asphalt ranged from 1 to 9 dB(A).”

A 9dB(A) reduction corresponds to:
- a reduction in traffic noise by almost 50%!

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OGFCs Reduce Noise and Improve Visibility



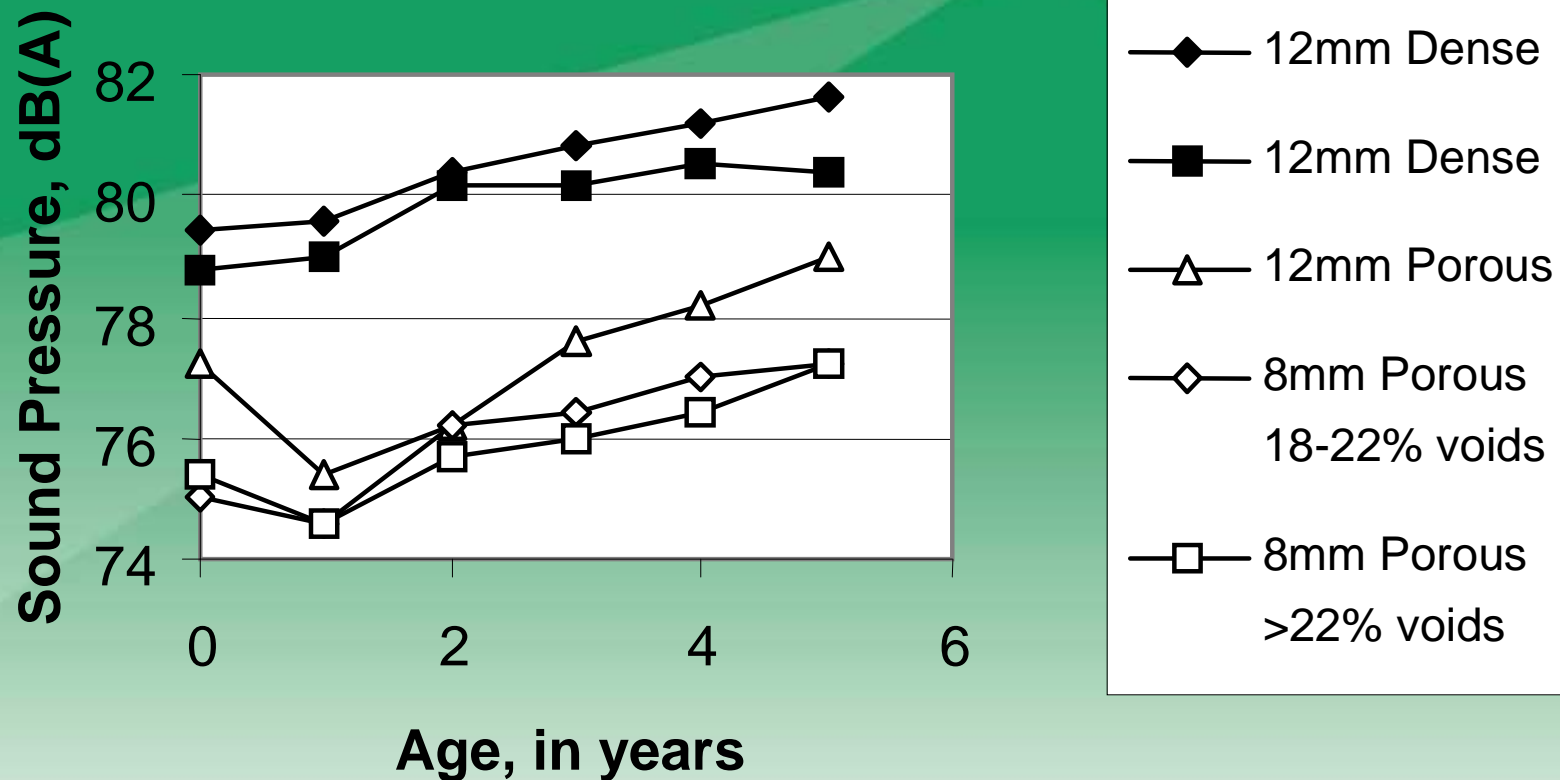
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Noise Reduction Open vs Dense Graded Mixes



Source: NCHRP 284

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What Can Be Done?

- DOTs indicate a strong need for pavement noise control strategies.
- Proper selection of pavement surface is the best method to reduce noise from pavement/tire interactions.

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Effect of Pavement Surface

- OGFC is the quietest surface type. *(Wayson, NCHRP Synthesis 268)*
- SMA has also proven to be a quiet surface. *(Wisconsin DOT, 1993)*
- Dense graded HMA surfaces are quieter than PCC pavements. *(Hibbs and Larson, Report FHWA-SA-96-068, May 1996)*

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Noise Makes News!

Families Near I-275 is lobbying the Michigan DOT for sound abatement. In 1999, MDOT rebuilt I-275 with concrete. Residents contend the project has increase noise levels. Levels have been registered upwards of 90 decibels.

Steve Phillips of Berkshire, England-based TRL Limited spoke about England's 10-year plan to install quieter surfaces on 60% of main trunk roads. The surfaces will be SMA or OGFC.

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Summary

- Highway noise is important to the public.
- Small changes in dB level are noticeable.
 - Decrease of 9 dB(A) reduces noise by 50%
 - Decrease of 3 dB(A) is like doubling distance

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Summary

- Noise walls can work, but:
 - They are expensive.
 - They don't work in all types of terrain.
 - Source of noise is still there.
- Asphalt pavements can reduce noise at the source by up to 9 dB(A).

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Summary

- Asphalt pavements for noise reduction in order of effectiveness:
 - OGFC
 - SMA
 - Dense-Graded HMA



Hot Mix Asphalt

PCC

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