# Diamond Grinding- Cost/Carbon Neutral Pavement Remediation

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# Topics of Discussion

- Introduction video
- NGCS
- Pavement Smoothness and its benefits
- Pavement Noise

# Getting to know the audience

Have you ever heard of Diamond Grinding?

Have you ever heard of Next Generation Concrete Surface (NGCS)?

What role do you play? (DOT design staff, DOT field staff, Consultant Designer, Industry member)

# Introduction Video

[The Results Are In: The Next Generation Concrete Surface is a Sustainable Pavement Choice - YouTube]

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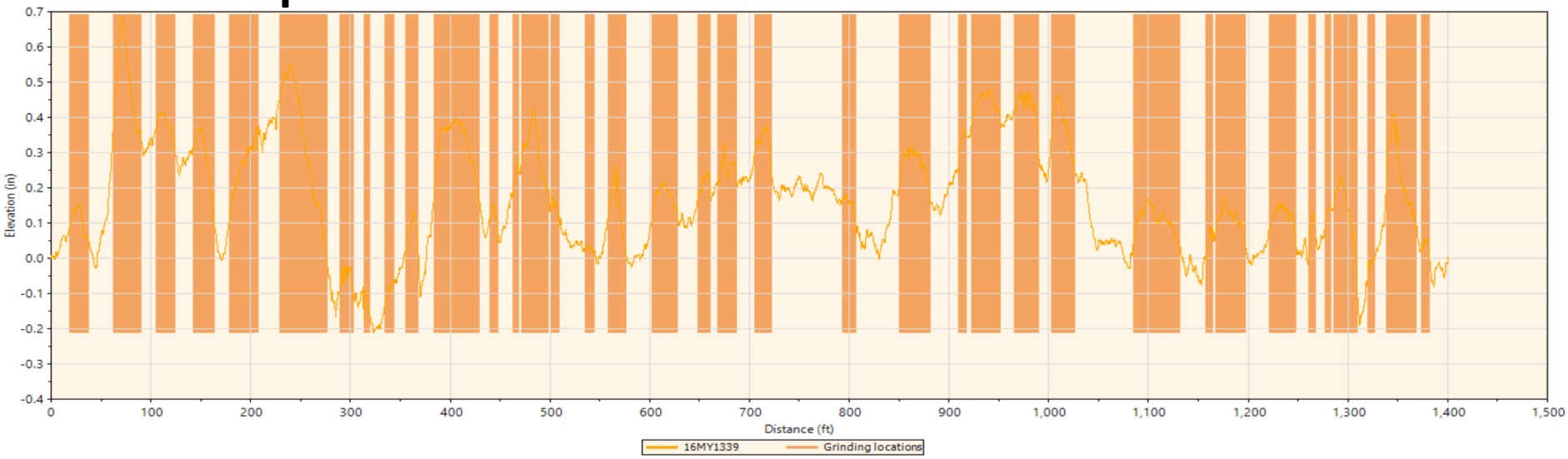
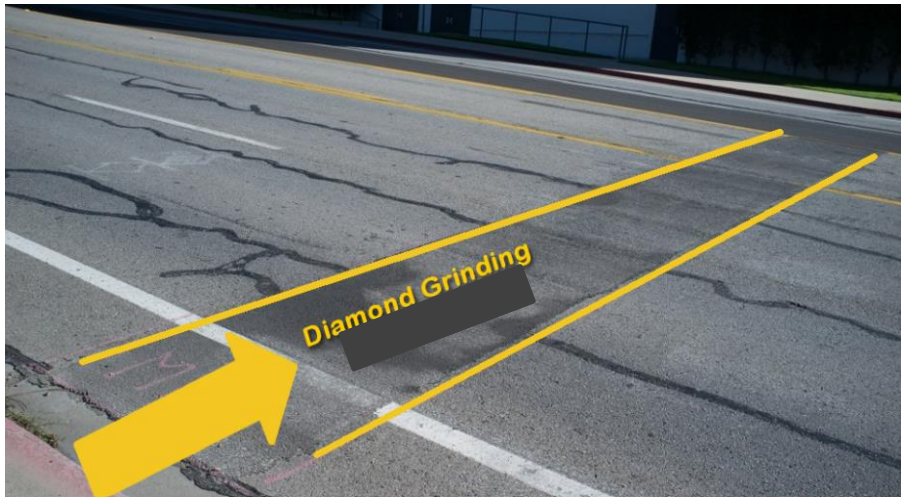
# NGCS- a 3 step process

## 1. Bump Grind




The goal is to remove all localized roughness and get our IRI to about 70 in/mile

# NGCS- a 3 step process

## 2. NGCS production grind

The goal is to remove all localized roughness and get our IRI to about 35-40 in/mile

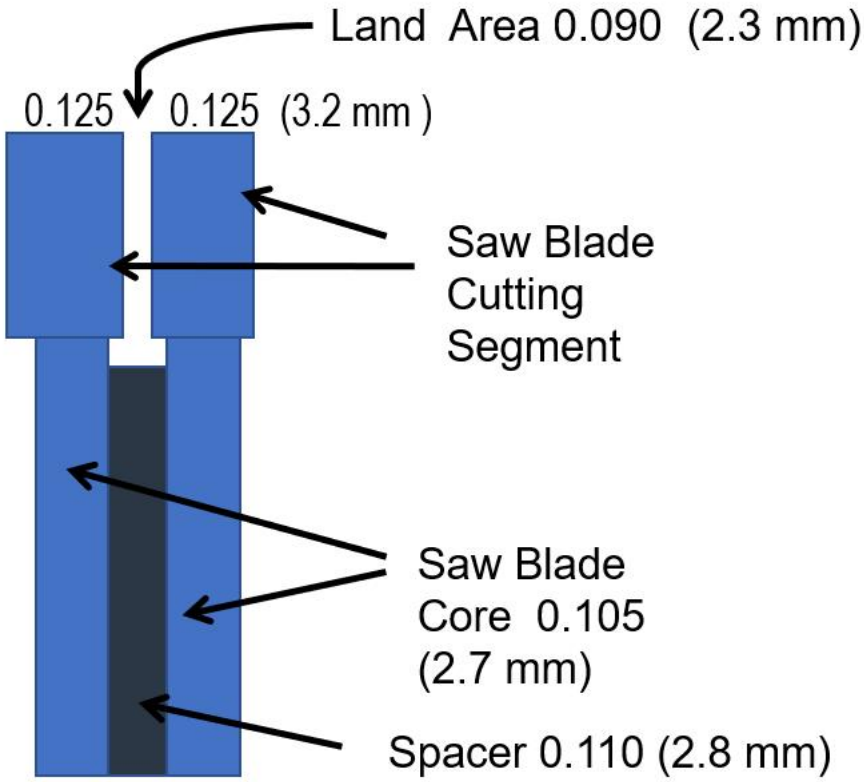
# NGCS- a 3 step process

**3. Groove pavement**

The goal is to create negative surface texture for drainage, macro texture, and sound mitigation

# Typical Diamond Grinding Blade

About 57 saw blades per foot



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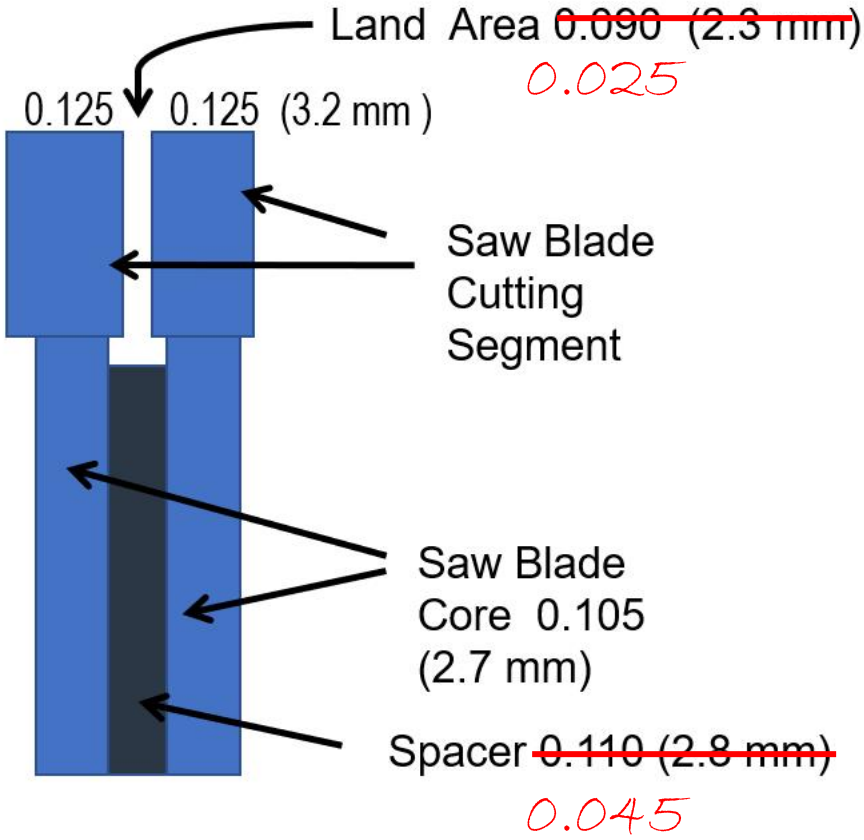
# ~~Typical Diamond Grinding~~ Blade

About 115-120 saw blades per foot




# Why Grind?-To Make Pavements Smoother

- Longer lasting pavements
- Safer
- Improved fuel economy
- Creates happy consumers
- Ultimate cost savings

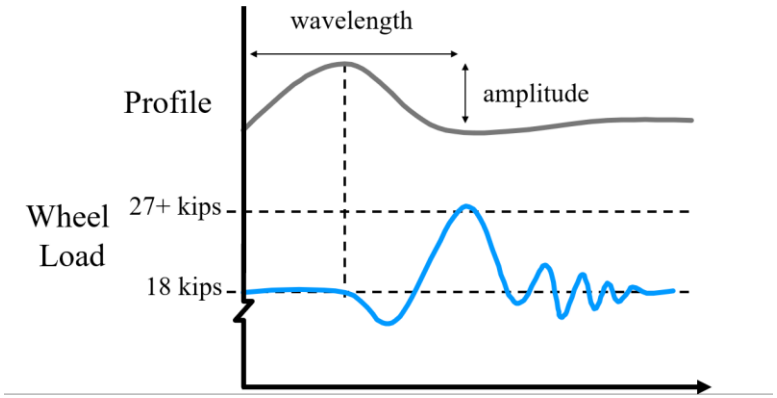

# Safety

## Diamond Grinding- Fun Fact

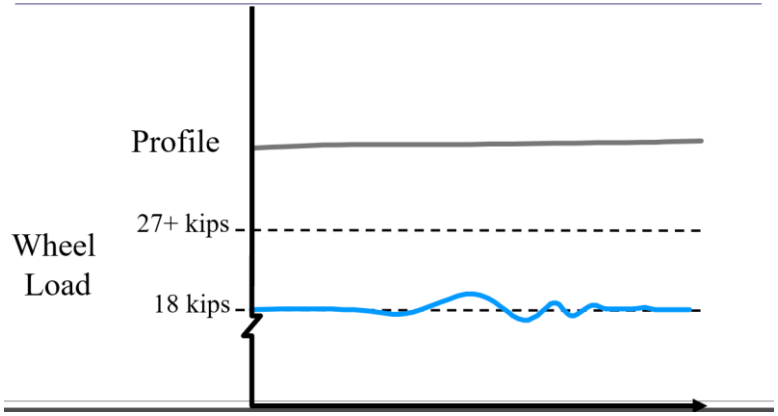
In Wisconsin, overall accident rates for ground surfaces were 40% less than for un-ground surfaces over a 6-year period, 57% in wet weather conditions

# Dynamic loads

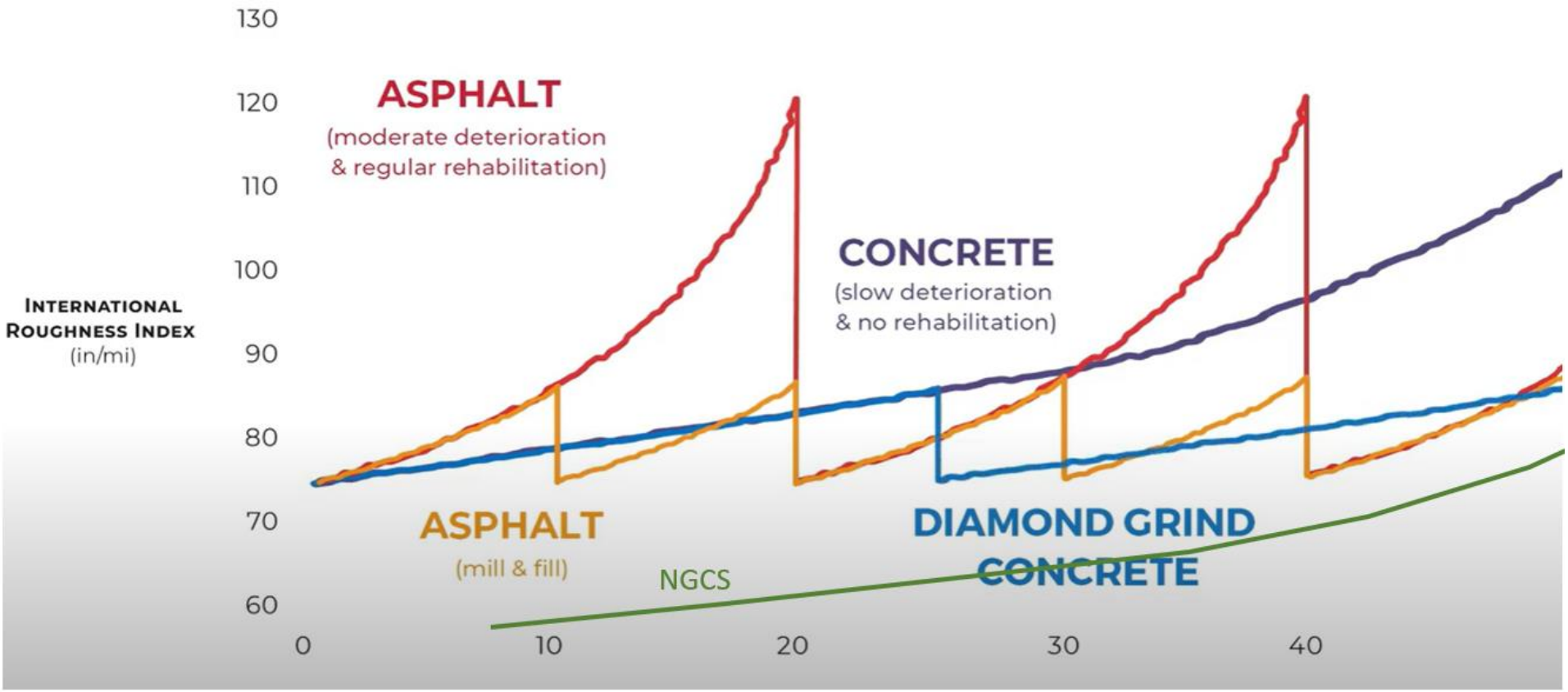
## Rough Pavement



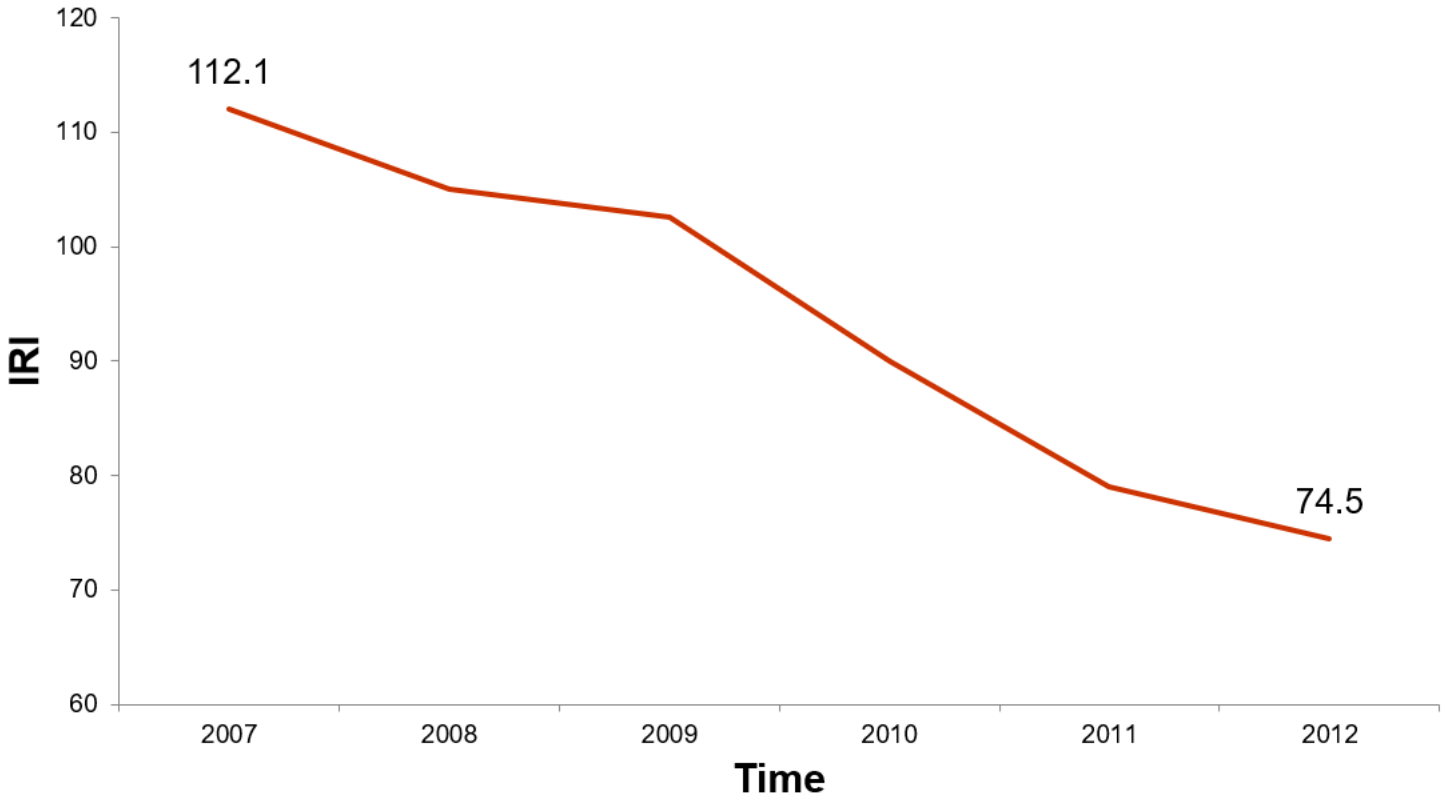

## Smooth Profile



# Ride quality in Summary



# IRI of Kentucky Interstate PCCP



# Impact of CPP Strategy in KY

- IRI Improved from 112.1 to 74.5 in 5 years
- Lowest recorded average IRI ever covering 536 miles
- $188,000 per lane mile
- Diamond grinding had an avg. cost of $2.75 per sq. yd. in KY over a 5-year period
- Reconstruction cost would have been $1.5 - $2.5 million/lane mile
- Preservation saved over $1 Billion

# MIT Caculators

- 57,000 AADT
- 17% Trucks
- Pre-grind IRI- average 95 in/mile
- Post-grind IRI- average 40 in/mile
- $3.50 per gallon of gasoline, $5.00 per gallon of diesel

Fuel/Carbon Savings Calculator - IGGA | The International Grooving and Grinding Association

IGGA International Grooving & Grinding Association

Per lane mile

**Cost Carbon Benefit Table** Print

| Category | 10 Year Benefit | | 20 Year Benefit | |
|---|---|---|---|---|
| | Cost ($) | Carbon (Metric Tons) | Cost ($) | Carbon (Metric Tons) |
| Fuel Savings for IRI | $904,783.92 | 1044.27 | $1,809,567.83 | 2088.53 |
| Carbon Sequestration | | 3.15 | | 4.45 |
| Cost of Grinding | ($49,280.00) | (9.50) | ($49,280.00) | (9.50) |
| **Total (savings)** | $855,503.92 | 1037.91 | $1,760,287.83 | 2083.48 |

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**Diamond Grinding is the ONLY Pavement treatment that is cost and carbon negative**

# Why Mitigate Noise?

- " Levels of highway traffic noise typically range from 70 to 80 dB(A) at a distance of 50 feet from the highway. These levels affect a majority of people, interrupting concentration, increasing heart rates, or limiting the ability to carry on a conversation." -FHWA

- Home builders are required to build homes that are 55 dB or less in the living space, during daytime hours, and 45 dB at night.

- Simply put: Reducing highway noise in urban areas is necessary.

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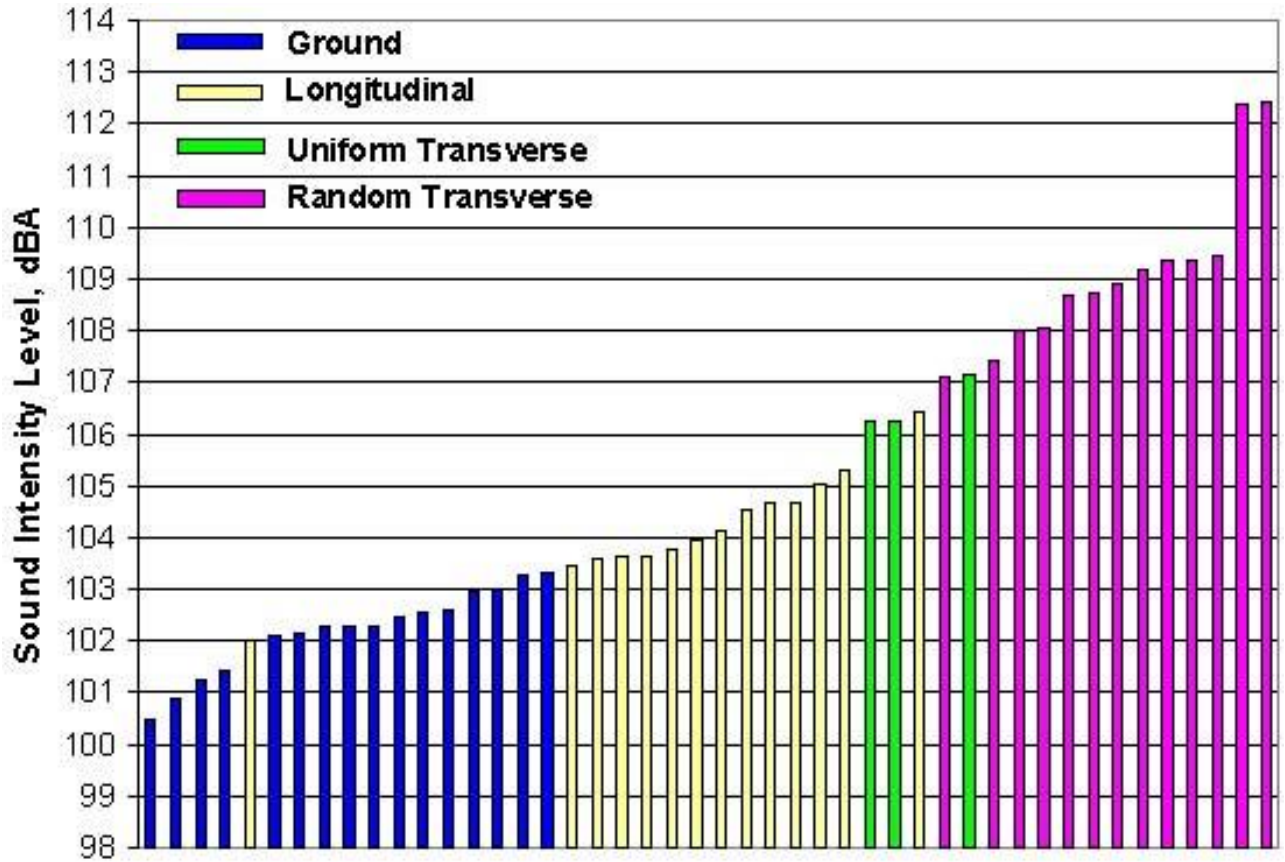
# Quietest Concrete Pavements?



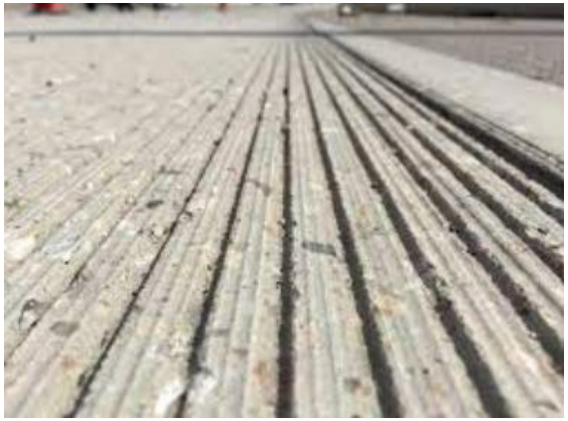
# How to mitigate highway noise?

## Block the noise with noise wall

Reduces noise by 5 to 10 dB

Costs roughly $51 per square foot of wall ( $3.9 million per mile)

## Prevent noise with NGCS

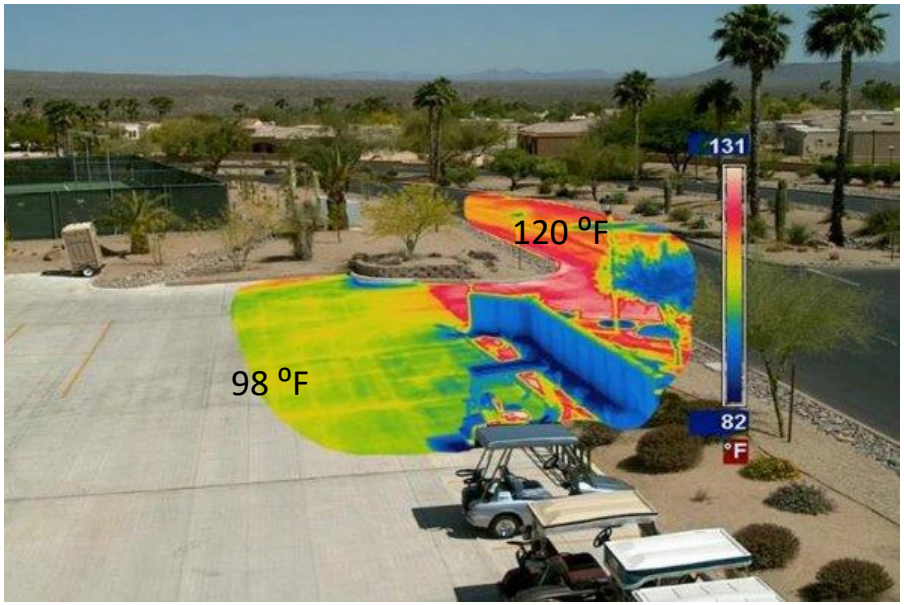


Reduces noise by 15% (10-12 dB)

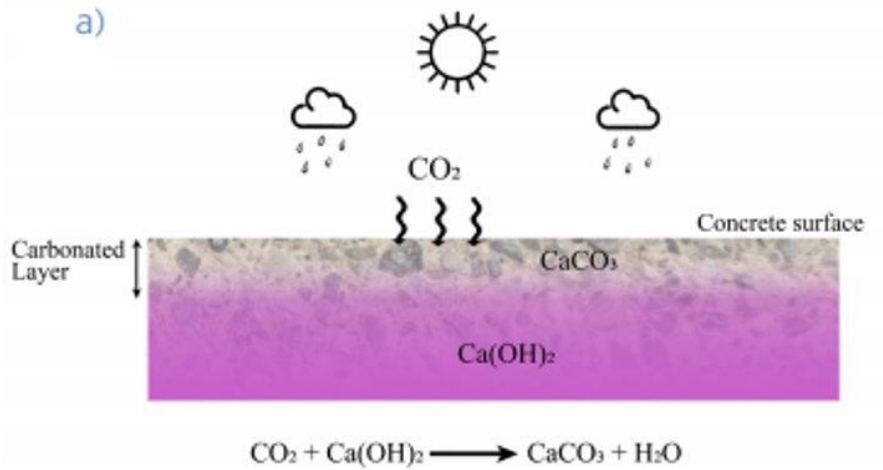
Costs roughly $10 per square yard of pavement ( <$100,000 lane mile)

# Bonus Benefits PCC Pavement?

- Surface Albedo (PCC pavements)
- Carbon sequestration




**Albedo** is the ability of surfaces to reflect sunlight




Year 0 to 10: 6298lbs of carbon sequestered

Year 10 to 20: 2609 lbs of carbon sequestered

# Why is Diamond Grinding the Most Effective Tool?

- Its environmentally conscious
  - Material mining and hauling
  - Fuel costs
- Its more cost effective than a full-scale replacement
- Minimized traffic disruption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# Diamond Grinding

**$3-5 Per square yard**
**$28,000 per lane mile**
**Moderately hard stone**
**100,000 sqyd**

# NGCS Grinding

**$6-10 Per square yard**

**$65,000 per lane mile**

**Moderately hard stone**

**100,000 sqyd**

# Alternative- Asphalt overlay?

**$100 per ton**

**$86,000 per lane mile**

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# Reflective cracking

# BIL/IIJA Bill

## Carbon Reduction Strategy

- Requires each State, in consultation with any MPO designated within the State, to– [§ 11403; 23 U.S.C. 175(d)]
  - develop a carbon reduction strategy not later than 2 years after enactment; [§ 11403; 23 U.S.C. 175(d)(1)] and
  - update that strategy at least every four years; [§ 11403; 23 U.S.C. 175(d)(3)]
- Requires the carbon reduction strategy to–
  - support efforts–and identify projects and strategies–to support the reduction of transportation emissions;
  - at the State's discretion, quantify the total carbon emissions from production, transport, and use of materials used in the construction of transportation facilities in the State; and
  - be appropriate to the population density and context of the State, including any MPO designated within the State. [§ 11403; 23 U.S.C. 175(d)(2)]
- Allows the carbon reduction strategy to include projects and strategies for safe, reliable, and cost-effective options to–
  - reduce traffic congestion by facilitating the use of alternatives to single-occupant vehicle trips, including public transportation facilities, pedestrian facilities, bicycle facilities, and shared or pooled vehicle trips within the State or an area served by the relevant MPO;
  - facilitate use of vehicles or modes of travel that result in lower transportation emissions per person-mile traveled as compared to existing vehicles and modes; and
  - facilitate approaches to the construction of transportation assets that result in lower transportation emissions as compared to existing approaches. [§ 11403; 23 U.S.C. 175(d)(2)(B)]
- Requires FHWA to–
  - review the State's process for developing its carbon reduction strategy and certify that the strategy meets statutory requirements; and
  - at the request of a State, provide technical assistance in the development of the strategy. [§ 11403; 23 U.S.C. 175(d)(4) and (5)]

# Diamond Grinding- the most cost effective option

- Diamond Grinding mitigates Dynamic loads which damage PCC pavements
  - Premature slab cracking
- Diamond Grinding can remove small surface blemishes that may become potholes or joint spalls
- Diamond Grinding makes a smoother, safer, and more quite pavement

# Conclusion

Invest in diamond grinding- It’s money well spent

**Thank You!**

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