



# Session 11

## Noise Barrier Materials, Design and Costs

- ▶ Facilitator: Noel Alcala, Ohio DOT
- ▶ Participants:
  - ▶ Noel Alcala, Ohio DOT
  - ▶ Rose Waldman, Colorado DOT
  - ▶ Jay Waldschmidt, Wisconsin DOT

# Noise Barrier Materials, Design, And Costs

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AASHTO CEE Noise Practitioner Summit

October 2015

Noel Alcala, OhioDOT

# Noise Barrier Materials, Design, And Costs

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1. What Is Your State's Material Selection, Review And Approval Process?
2. What Is Your State Experience With Different Materials/Textures, Etc?
3. What Are Your State's Design And Construction Costs?
4. Material Innovations?
5. What Is Your State's Qualified Products Approval/Evaluation Of Products/Contractor Selection?
6. What Is Your State's Construction Inspection Process?
7. How Do States Account For Abatement Costs When The Level Of Design Is Very Preliminary And The Potential For Hidden Costs Is Great?
8. How Does Your State Dot Noise Specialist Encourage Your Agency To Try New Wall Materials?
9. What Are Your State's Experiences, Lessons Learned?

# What Is ODOT's Material Selection, Review And Approval Process

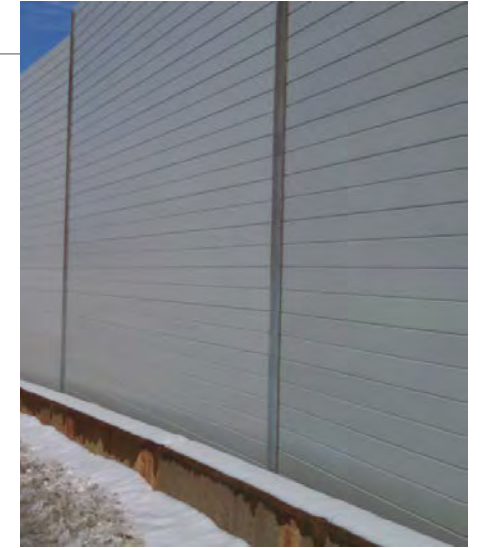
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- ❑ Survey Public For Resident's Side. Include Concrete And Fiberglass Options. Berm, If Feasible.
- ❑ In Some Cases, ODOT Makes The Material Decision Up Front
- ❑ Involve The Locals For The Highway Side Aesthetics



# What Has OhioDOT Experienced With Different Materials/Textures, Etc.

- ❑ Concrete (Several Standard Colors And Textures)
- ❑ Colored And Clear Sealers
- ❑ 24' Max Post Spacings
- ❑ Steel
- ❑ Fiberglass Panels, Post Caps, Post Covers
- ❑ Wood (Special From Brazil)



# What Has OhioDOT Experienced With Different Materials/Textures, Etc.

- ❑ Clear
- ❑ Fiberglass/Wood Composite
- ❑ Earthen Berm
- ❑ Concrete And Steel Posts
- ❑ Concrete T-tops
- ❑ Sound Absorptive Materials (SAM) (2 Types)
- ❑ Graffiti Guard



# What Are OhioDOT's Design And Construction Costs

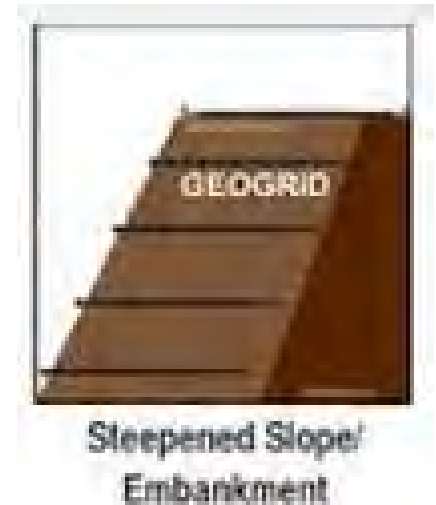
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- ❑ Design Costs Are ~7%-10% Of The Construction Cost. Some Designs Done Internally
- ❑ Estimated Construction Costs Are \$25/Sf Or \$1.5 Million/Mile For Ground Mounted
- ❑ \$100/Sf For Structure Mounted



# Material Innovations?

- ❑ Concrete Waterproofing Admixtures Using Crystalline Technology
- ❑ Seeking Living Sound Wall (Berm) Opportunities With Steep Slopes (1:1)
- ❑ Reinforced Fiberglass Design (New!!)



# What Is OhioDOT's Qualified Products Approval/Evaluation Of Products/Contractor Selection Process

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- ❑ Review and Approvals Required From Office Of Environmental Services (Me), Office Of Structures, And Office Of Material Management For All Products Associated With Noise Walls.
- ❑ Prequalified Products Go Out To Bid And Are Selected By The Contractor



# What Is OhioDOT's Construction Inspection Process

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- ❑ Construction Project Engineers And Inspectors
- ❑ OES (Me) And District Environmental Staff Conduct Inspections When Available And As Needed
- ❑ Control Panel Requirement
- ❑ Noise Barrier Spec (NBS-1-09) Contains Acceptance Requirements
- ❑ PPT Of Unacceptable Noise Wall Images



## How Does ODOT Account For Abatement Costs When The Level Of Design Is Very Preliminary And The Potential For Hidden Costs Is Great?

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- ☐ Err (Estimate) On The Higher Side Of Costs. Extra \$ goes back in the pot.
- ☐ Do The Best We Can With What We Know At That Time
- ☐ Spend The Money Up Front To Lower The Risk



# How Does The Ohio Dot Noise Specialist Encourage Their Agency To Try New Wall Materials?

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- ❑ Educate Executive Management On The Benefits Of The New Material
- ❑ Have The Material Supplier Conduct A “Dog And Pony” With Key DOT Personnel



# What Are ODOT's Experiences, Lessons Learned?

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- ❑ No Major Issues With Sound Absorptive Material (SAM) In Central And Southern Ohio. Issues Occurred In Harsh Freeze Thaw Areas In Ne Ohio.
- ❑ Noise Wall Posts And Panels Must Be Thoroughly And Frequently Inspected During Construction.
- ❑ Issues With Colored Sealer Adhering To Our Concrete Posts. No Issues On Panels.
- ❑ Our Existing Steel Walls Are Abating Noise Well.
- ❑ Stay Away From Dark Colors
- ❑ Less Is More. Keep It Simple. This Is What The Suppliers Want. Less Pieces And Parts = Less Issues



# Open Discussion

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**COLORADO**  
Department of  
Transportation



Noise Wall Material Guidelines:  
2016 Revision Underway



# Overview: Noise Wall Material Guideline Review

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What?

Why?

When?

Who?

How?



# What?

## Revising guidelines in two phases

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- Original Guidelines: Nine requirements
  - Four were objective but two needed clarification
  - Five were subjective
- Phase I: Clarifications, reorganized, minor changes
- Phase II: Expect substantive changes and more objectivity



## Why? Remove subjectivity

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- Guidance used to determine if material can be added to Approved Products List
- Approving subjective criteria is....subjective
- Federal requirements do not exist



## When?

## Phase I completed; Phase II underway

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- Original: Written after 1999 and by 2006
- Phase I: Completed August 2015
- Phase II: Timeline not established



## Who? Teamed with diverse disciplines

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- Noise specialist
- Materials specialist
- Resident engineer
- Staff Bridge engineer
- Roadway Design specialist



## How? Online Research

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- 2000/2001 NV DOT study and guidelines
- 2007 MN DOT guidelines
- 2008 national survey by NCHRP
- AASHTO specifications
- FHWA Highway Noise Barrier Design Handbook
- CDOT guidance



## Issue 1: Change existing objective guidelines?

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- Noise Reduction Coefficient of 0.65? 0.70? Higher?
- Transmission Loss vs. Sound Transmission Coefficient?
- Freeze-thaw test: 50, 250, or 300 cycles?



## Issue 2: How to address subjective guidelines?

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- Resistant to impact/easily replaceable
- Graffiti: difficult to place/easy to remove
- Absorptive surface must resist degradation



## Issue 3: Many or few requirements?

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- Structural (e.g., wind pressure, seismic loads, density)
- Durability (e.g., flame spread, smoke development, cracking)
- Aesthetics (e.g., color, texture, patterns)
- Should requirements cover only panels or entire noise wall system?



## Next Steps

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- Gather more information
- Determine how to resolve issues
- Establish which document(s) will house requirements



# Questions???

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# Session 11 - Questions

- ▶ Waldman, CO: Colorado DOT has formed a committee to revise noise barrier material guidance. An online review shows that guidance varies from limited to comprehensive requirements.
- ▶ Tedford, CT: What are some of the costs that other states include in noise barrier cost effectiveness calculations? Are only the costs associated with the noise wall direct costs or are other costs that are indirect attributed the noise wall included (i.e. landscaping, additional protection, clearing and grubbing, traffic control, etc.)?
- ▶ Are any other states terminating the noise barrier ends abruptly or “feathering” for a cleaner ending? And if so; is this “feathering” added to the cost of the noise barrier even if no noticeable reduction is achieved? If landscaping is used is this cost also included?
- ▶ Runkle, IL: Methods used for experimental design approvals?



# Session 11 - Questions

- ▶ Hanf, MI: Are states inspecting and/or replacing old structure mounted barriers for safety reasons such as falling material due to vehicle impacts?
- ▶ Are replacement structures required to have an abatement analysis before reconstruction?
- ▶ Burcham, MO: What are common maintenance issues with noise walls that can be addressed?
- ▶ Moch, ND: NDDOT would like to hear other states' experience with snow accumulation and roadway maintenance issue/resolutions.



# Session 11 - Questions

- ▶ Duncan, NM: NMDOT's art and aesthetic treatment policy letter
- ▶ Newvine, OR: How does the noise specialist encourage their agency to try new wall materials?"
- ▶ Smith, NC: What have other states experienced with different materials, textures, innovations, etc.?
- ▶ Berrios, FL: Qualified products approval/evaluation of products/contractor selection.
- ▶ Noise Barrier Standard Specifications – absorptive and reflective