Noise Wall Overhang Design

Research Conducted by: Benjamin R. Sperry, Blake Staley, Issam Khoury (Ohio Research Institute for Transportation and the Environment), Karel Cubick, Bill Ruggles, and Jonathan Hren (ms consultants, inc.)

Background

One potential option to achieve noise reduction at a lower cost is to add a roadway-side overhang component to the top of an existing or proposed noise wall. Broadly, a noise wall "overhang" modification is an additional structural element or fixture attached along the top edge of a traditional or "plain-top" noise wall. The acoustical benefit of an overhang is that the distance traveled between the traffic noise source and a listener behind the wall is increased relative to a traditional plain top wall. Most applications of noise wall overhang designs are characterized by the shape that is assumed by the wall's cross-section after the modification is deployed. For example, an overhang design in which the overhang is at a 90° angle with respect to the vertical wall face is known as a "T-Top" noise barrier while any overhang with an angle between 0° and 90° is termed a "Y-Top" noise barrier.

The ODOT noise program is continually seeking opportunities to deploy new and innovative options to reduce the impacts of highway traffic noise in a manner that is both cost-effective and within the structural design practices of the Department.

Research Approach

- Comprehensive review of existing literature and research studies related to noise wall overhang design options and the impacts of different designs on factors including acoustical performance, air quality impacts, life cycle cost requirements, constructability, durability, maintenance, safety, and aesthetics.
- Acoustical testing of various noise wall overhang design options using a full-scale noise wall section to determine the overhang length and angle combination that provides the greatest noise reduction relative to a plain-top noise wall design. Images showing the acoustical testing are displayed to the right.
- Preliminary structural analysis of up to four noise wall overhang design options to assess the compatibility of different overhang design options with AASHTO and ODOT design loads for noise walls, considering both new construction and "retro-fit" of existing walls.

Research Context

- Federal law requires that ODOT construct noise walls or other projects designed to reduce highway traffic noise levels on nearby homes and businesses.

ODOT Noise Wall Facts:

- Statewide: 150+ wall locations
- Length: 230+ total miles of wall
- Average Cost: $2.0 million per mile
- Average Height: 12 to 16 feet

Research Objective:

The objective of this research was to determine if a roadway side overhang component would provide meaningful noise reduction and air quality benefits for ODOT noise walls in a manner that is cost-effective and meets all of ODOT's structural design requirements.

This research project was sponsored through the Ohio Department of Transportation and Federal Highway Administration.

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COMPARISON MATRIX OF NOISE WALL OVERHANG DESIGN OPTIONS

	"Y-Top" Angle = 45°	**"Inverted L" Angle = 90°**	**"T-Top" Angle = "T"**
Acoustical Performance (Impact of Overhang Length)	Similar to Plain Top; ≈ 1.5 dBA of Add'l IL for each 1 Ft. Length		
Acoustical Performance (Impact of Overhang Angle)	Similar to Plain Top	≈ 3.0 dBA Additional IL	Similar to Plain Top
Structural Loading (Additional Bending Moment on Posts)	Double	Double	Half
Construction Costs	Double; $110 per SF	Double; $98 per SF	Not Estimated; Likely Double
Air Quality Benefits (Potential for Pollutant Reduction)	Unknown based on literature review; however, some pollutant reduction may be realized with overhang fixture.		
Constructability	Likely more complex than traditional wall as contractors do not have experience in overhang construction. Overhangs could reduce potential utility conflicts if any exist.		
Drainage/Debris Collection Concerns	None/Limited Issues Expected	Drainage or debris collection issues may occur unless panels are angled slightly.	
Aesthetics	Some views may be blocked.	Existing views from residential properties will be retained.	
Note: Assessment of the performance of various noise wall overhang design options as determined by the ORITE research team and presented relative to plain top wall of similar length.			

RECOMMENDATIONS AND IMPLEMENTATION:

- Recommendation #1: ODOT should consider the use of the 90-degree overhang options (either the "Inverted L" or "T-Top" shape) for deployment on its traffic noise walls.
- Recommendation #2: ODOT should not consider the use of the "Y-Top" overhang shape.
- Recommendation #3: ODOT should examine the 90-degree overhang options in more detail to determine which option may be best for its needs.

The 90-degree "Inverted L" overhang shape has the greatest potential for deployment on existing ODOT noise walls. Barrier locations where the wall height cannot be increased due to utility conflicts, foundation issues, aesthetics, or community feedback are the ideal locations where an overhang could be of the greatest benefit.

FOR MORE INFORMATION:

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Benjamin R. Sperry, Ph.D., P.E., Principal Investigator
Ohio Research Institute for Transportation and the Environment
- Phone: 740.593.0426
- E-Mail: sperry@ohio.edu

Noel Alcala, Technical Liaison
Noise and Air Quality Coordinator, ODOT Office of Environmental Services
- Phone: 614.466.5222
- E-Mail: Noel.Alcala@dot.ohio.gov

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