RESEARCH PROJECT FACT SHEET

ACOUSTIC EFFECTIVENESS OF VINYL FENCE NOISE WALLS

Vinyl Noise Wall, Lima OH

The Problem

There is currently a lack of material options from which noise walls can be constructed, and there has been limited research on the vinyl material as a noise abatement option. So, this project studied the acoustic, aesthetic, and cost benefits of vinyl materials to guide future noise mitigation implementation strategies.

Research Approach

(1) Vinyl Material Literature Search & Evaluation

Existing information from previous studies on vinyl noise barriers was collected to identify best practices that could be incorporated in this research project, along with vinyl material characteristics.

(2) Acoustic Testing

Three locations (see map) were selected for acoustic testing, including a Lima, Ohio site where a Simulated Stone vinyl noise wall was constructed; a Richmond, Virginia site with an existing vinyl fence of the same material; and a Green, Ohio site with an existing vinyl fence constructed with Tahoe II vinyl material.

(3) Data Analysis & Modeling

Multiple analysis methods were used to fully assess the acoustic effectiveness of vinyl materials, including:

1. Aggregated Dropoff Performance Comparative Analysis
2. Aggregated Difference-in-Difference Comparative Analysis
3. Disaggregated Minute-by-Minute Descriptive Statistical Analysis
4. TNM Modeling Predictive Analysis
5. Cost-Benefit Comparative Analysis

(4) Recommendations & Conclusions

Recommendations and conclusions were prepared that included acoustic effectiveness of vinyl materials, information for ODOT's list of approved noise wall types and suppliers, ideal types of sites for the construction of vinyl noise walls, and best practices for the construction and installation of vinyl noise walls.

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Findings

Acoustic Effectiveness

The acoustic effectiveness of the vinyl materials was evaluated using the feasibility and reasonableness factors based on ODOT's existing noise program. For feasibility, the vinyl materials were evaluated based on how well they performed acoustically; and for reasonableness, the vinyl materials were evaluated based on their cost effectiveness and constructability. The results indicated that vinyl materials are an attractive and effective option for mitigating the impacts of traffic noise. A summary of the results is shown in the table below.

Vinyl materials can deliver 75% of the noise reduction performance of concrete materials for 50% to 75% of the cost.

Parameters	Lima, OH		Richmond, VA		Green, OH
	Standard Concrete	Simulated Stone Vinyl	Standard Concrete	Simulated Stone Vinyl	Tahoe II Vinyl
Sound Transmission Class [a]	45	26	45	26	N/A
Wall Height (feet)	15	8	14	12	7
Wall Length (feet)	2,900	400	1,150	1,100	120
Panel Thickness (inches)	4.0-6.0	2.0	4.0-6.0	2.0	0.875
Avg Vehicles Per Hour/Truck %	2,900/35%	2,500/38%	9,100/11%	11,000/10%	5,100/13%
Speed Limit (mph)	70	65	55	55	65
EOP Distance to Noise Meter A (feet)	54	80	33	19	97
Noise Meter A Average L_{eq} (dBA)	81.5	77.1	78.7	84.1	77.4
Noise Meter B Average L_{eq} (dBA)	63.8	63.6	61.9	71.1	67.5
Average Meter A to B Reduction (dBA/%)	17.7/22%	13.5/18%	16.8/21%	13.0/15%	9.9/13%
Acoustic Performance Coefficient	1.00	0.76	1.00	0.77	[0.66] [b]
Cost per square foot (2021 $)	$35	$19	$35	$26	[$14] [c]

(a) The current ODOT minimum STC is set at 30.
(b) The acoustic performance coefficient for the Tahoe II vinyl material (Green, Ohio location) was estimated from a TNM model in the predictive analysis section.
(c) Cost data not available so assumed Augusta vinyl material equivalency.


Vinyl Fence, Richmond VA

Construction Best Practices

Construction recommendations were identified to improve the vinyl noise wall installation process and included best practices related to equipment, materials, process, and manufacturer improvements.

Ideal Sites

Ideal site conditions were identified for vinyl materials, including relatively flat terrain, minimal obstructions, maintenance accessibility, and soil and ground conditions that are not sandy and do not have high water content.


Vinyl Fence, Green OH

Recommendations

The results can be used to guide future noise mitigation strategies. There is a possibility of providing noise mitigation to more Ohio communities while saving taxpayer dollars. As a result, the end users of this research could include, state DOTs, engineers, planners, and environmental specialists across the U.S. who are interested in more noise mitigation options. In the future, ODOT could consider integrating vinyl noise walls into its noise program in the following ways: integrate vinyl materials into existing programs, create a new vinyl noise wall program, consider a vinyl noise wall alternative on a case-by-case basis, or provide information on vinyl materials to local governments and private communities.

Vinyl materials could offer another attractive and effective noise mitigation option in Ohio.

To access copies of the final report, visit: *www.dot.state.oh.us/research*
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