CENTER FOR TRANSPORTATION RESEARCH

PROJECT SUMMARY

Texas Department of Transportation

# 0-6804: Life Cycle Cost and Performance of Lightweight Noise Barrier Materials along Bridge Structures

## Background

Highway noise has become a concern for residential communities adjacent to roadways in urban areas. Transportation agencies have become more environmentally sensitive and have had to implement noise mitigation measures.

The most frequently used noise abatement measure has been the construction of noise barriers on the side of the road. Such barriers are normally solid wall structures built between the highway and the impacted activity area to reduce noise levels. Barriers do not eliminate the noise; they only reduce the noise levels perceived by certain benefitted receivers, normally those in proximity to the road. In order to be effective the barrier must be high enough and long enough to block the view of the road. Common materials for barrier construction are concrete and masonry; other materials are metal and acrylic.

Noise barriers can reduce visibility and lighting for both the receivers behind the barrier and the drivers using the facility. Barriers can also present a problem for businesses along the road by restricting views and access by customers. However, barriers constructed with transparent materials can address these problems.

Two roadways and their adjacent neighborhoods in the Dallas area became the subject of this study when the Dallas District of TxDOT needed to address this problem. These roadways had existing concrete noise walls, initially built when the roadways were constructed, but those walls were apparently insufficient to mitigate the current noise levels. Therefore, the project investigated the implementation of transparent lightweight material to retrofit the existing walls. A segment of Interstate Highway 30 (I-30), west of downtown Dallas, became the first transparent noise barrier in Texas as part of this pilot project. Subsequently, an adjacent segment of I-30 was retrofitted with a similar wall. Building upon the success of these walls, a section of the President George Bush Turnpike (main lanes), and the State Highway 190 (frontage roads) in Rowlett, east of Dallas, was investigated as a candidate for a similar solution.

## What the Researchers Did

The main objective of this study was to assess the feasibility and effectiveness of transparent lightweight noise barriers on IH-30 in Dallas, and to serve as a pilot project for TxDOT for future similar projects. An opportunity to implement similar research and extend the project arose with the noise study on SH 190. The research team undertook these activities:

- Conducted a feasibility study for lightweight traffic noise walls.
- Selected barrier material types and vendors.
- Performed the noise modeling and the acoustical design of the barriers.
- Performed sound measurements before and after the barriers' installation.
- Conducted periodic inspections of the barriers condition.
- Analyzed noise measurements and evaluated the walls' performance.

**Research Performed by:**
Center for Transportation Research

**Research Supervisor:**
Manuel Trevino, CTR

**Project Completed:**
12-31-2020

## What They Found

This research determined the materials and the acoustic design of this type of walls, as well as existing noise levels prior to any noise wall modification. The study led to the installation of two adjacent transparent highway noise barriers in 2013 and 2018, respectively, on I-30. The success of that project brought about the possibility of similar installations at other locations in the Dallas District and elsewhere. SH 190 represented a similar noise problem; the study designed new transparent extensions to the existing wall in 2018, and these were installed in the summer of 2019.

The researchers found, after an extensive data collection, that the barriers are as effective as other solid structures are in mitigating noise, but they have the advantages of being lightweight and transparent. As with other barriers, these walls are effective only for receivers located behind them and in proximity to them. The effectiveness of the walls is determined by the location of the receivers and by whether there is a clear line of sight to the traffic.

High levels of tire-pavement noise generated by aging pavements on the roadway likely diminished the apparent effectiveness of the original walls on I-30. The neighbors at both locations are satisfied with the transparent walls' performance and their aesthetic appearance.

## What This Means

The outcome of this pilot project indicates that this type of noise barrier is a feasible solution for retrofitting existing noise walls on highway projects facing high noise levels due to traffic volume increases. The lighter weight of the acrylic panels compared to that of a traditional concrete wall makes it possible to provide benefits to the adjacent communities in terms of noise reductions, without having to retrofit existing structures, such as bridges and overpasses.

The transparent noise barrier also represents a feasible solution when the aesthetic concerns associated with opaque barriers—such as those made of concrete, wood, or masonry—are an issue for a project. These concerns could be related to visibility, light, or scenic views, all of which are preserved when using acrylic panels. These walls are as effective in blocking the noise as any other solid wall material that complies with the density requirements specified by the FHWA.

This project has demonstrated the effectiveness of this solution at two different locations and it serves as an example for future installations at locations with similar problems.

## For More Information

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