



**Washington State  
Department of Transportation**

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Memorandum

DATE: March 25, 2008

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<b>APPROVED</b>	
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Date	<i>4/3/2008</i>

SUBJECT: Proprietary Item Request and Justification  
XL-2979 SR16  
New TNB, West Anchor Noise Wall

The Region requests approval to utilize the following proprietary item in the subject project: "Soundsorb™", acoustical panels by Concrete Solutions, Inc.

**Project Description:** The Tacoma Narrows Bridge (TNB) office has been receiving complaints about the noise coming from the bridge as vehicles pass over the expansion joints that connect the bridge's approach to the deck. This is the first time that this type of expansion joint has been used in Washington State, so there was no way of predicting this problem in advance. Although the area around the expansion joint did not qualify for traffic noise abatement when it was analyzed before construction, WSDOT is considering abatement at this time because of the unique nature of the expansion joint noise.

A number of constraints limit the available options for mitigating the expansion joint noise.

- **Structural** – vertical and wind loading
- **Safety** – crash worthy, visual distraction
- **Aesthetic** – maintain iconic profile, view for drivers and general public
- **Acoustic** – abatement of the unique expansion joint noise

Therefore, a collaborative process among WSDOT specialists and private industry was initiated to develop a possible solution to the problem. The result of this group effort is the design of concrete walls coated with a sound absorbing material flanking both sides of the joint. Despite the confidence of all the groups involved in the designed abatement, there is still some uncertainty because this strategy has never before been used in Washington State.

As highway-related noise continues to be a source of annoyance to residents and cause of complaints to WSDOT, new solutions need to be developed. **This project is pursuing research designation** because it is a seminal project in many ways, including WSDOT's first use of absorptive materials to mitigate an atypical highway-related noise and WSDOT's first retro-fitting of a bridge for noise abatement

The four noise walls, for this research proposal, will be constructed on the new Tacoma Narrows Bridge. The walls will be located at all four corners of the structure from the cable splay chamber to the beginning of the approach slab. All 4 walls will have the Soundsorb™ material attached to the roadway side, along with the existing traffic barrier and the roadside portion of the splay chambers. Due to this unique type of construction, the performance of the noise absorption material will be evaluated along the relatively short sections of road.

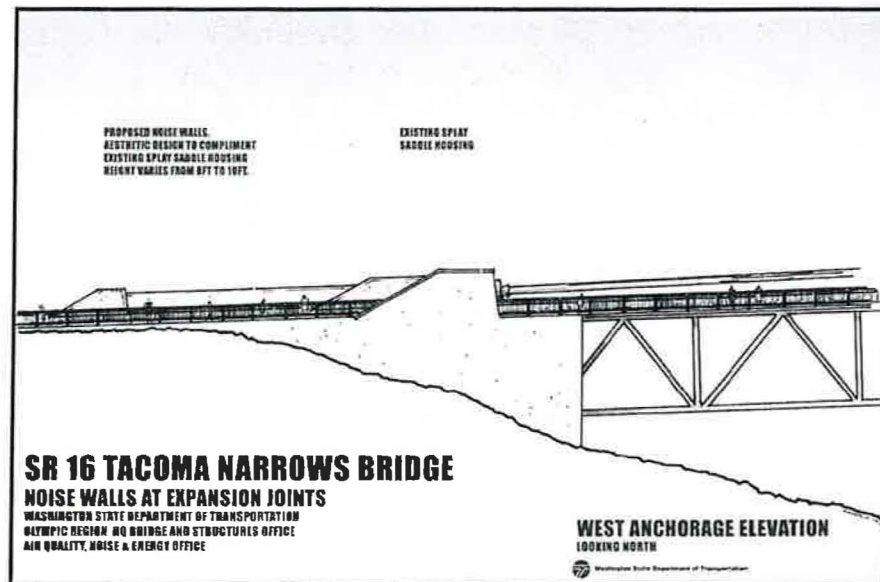
Concrete Solutions, Inc. is the manufacturer of the Soundsorb™ product. They have a local manufacturing and support facility in Kent, Washington. This is an added benefit for this research project to have the supplier local.

**Justification:** In addition to satisfying all the needs of the project, Soundsorb™ is being recommended for the following reasons:

- 1) Produced and supported locally – Because WSDOT and its contractors have very limited experience with absorptive products, there is some concern that problems could arise during the installation of an absorptive product.
- 2) Known to effectively reduce absorptive sound – ASTM test results show the product absorbs between 95% and 100% of all the sound energy that hits the panel.
- 3) Context sensitive - Soundsorb™ is versatile enough that it can be textured to maintain the bridge's aesthetic vision and blends with the current design.

Soundsorb™ is marketed as an easily installed material that can be manufactured in multiple shapes and sizes to accommodate installation on any surface. Another potential advantage to Soundsorb™ is that it is composed of a water-resistant, light weight, cementitious material and can be easily placed on existing concrete using Qualified Product List approved epoxy or glue.

**Proposed Abatement:** The result of this informal public-private partnership was the design of concrete walls that could flank the joint on both sides of the road and be coated with a sound absorbing material. The designed walls are tall enough, approximately 10 feet high, and coated with Soundsorb™, an absorptive finish, to mitigate any noise being reflected off the opposite side wall.



Early artistic rendering (Kinderman, 2007): The above drawing depicts the proposed noise wall only on the inside of SR 16. The proposed abatement has a similar wall design on both sides of the roadway.

**Research Designation:** As mentioned, this project is unique because of the noise being produced by the expansion joint and because of the structural, safety, and aesthetic limitations to construction. To address these challenges, the proposed abatement will incorporate a new type of absorptive material (Soundsorb™) that has not before been used by WSDOT.

Although the proposed abatement has a number of features specific to this project only, there are many more lessons that could be learned from this project and transferred to other WSDOT projects, which make it in the best interest of the public. For example:

- 1) How effectively do absorptive materials mitigate traffic noise in general and the TNB expansion joint noise in particular?
- 2) What are the best practices for installing an absorptive finish on a high volume highway? What are the final material and installation costs and cost breakdown? Do/can installation practices affect the product's final installed appearance?
- 3) There are a number of structural and safety questions related to noise abatement on a bridge and bridge approach that will be addressed in this design. The relatively small amount of area proposed for abatement of the Tacoma Narrows Bridge could provide valuable data to help inform future abatement on the I-5 Ship Canal Bridge, the SR 520 floating bridge, and the SR 99 Alaskan Way Viaduct.
- 4) Is the proposed monitoring plan for the TNB adequate? If not, what improvements can be made to ensure that the most accurate and informative statistics are collected?

However, the many limitations on the TNB (safety, structural, aesthetic, etc) restrict the number of products that satisfy all the project's constraints. Therefore, to both mitigate the noise on the TNB and generate useful data for use with other WSDOT projects, the project office would like to use the Soundsorb™ product.

**Methodology:** This project will be the first chance for WSDOT to evaluate the performance of the material and constructability under real world conditions. The WSDOT Northwest Region's Air Quality, Noise and Energy Office have committed to monitoring and evaluating the performance of Soundsorb™ at this location and will be able to present WSDOT with a report of their findings. The proposed research methodology would include the following:

- 1) Measuring noise levels prior to construction
- 2) Measuring noise levels after construction on each side of the joint shielding
- 3) Measuring noise levels after construction of the noise walls, at each of the completed walls
- 4) Measuring all areas at some time period - possibly 6 months - following completion to ensure product's durability

A series of measurements are proposed to assess the efficacy of the abatement described previously. The project area has been divided into quadrants reflecting the four areas affected by the expansion joint noise: 1) north of SR 16 in Gig Harbor, 2) south of SR 16 in Gig Harbor, 3) north of SR 16 in Tacoma, and 4) south of SR 16 in Tacoma.

Up to 10 locations in each quadrant will be measured before construction of the abatement, at least once during construction (depending on how the wall construction is phased), once immediately following completion of the proximal side (Gig Harbor), and, finally, after three to six months to assess any degradation. These locations will be selected to represent the area as a whole and the same locations will be measured in each quadrant during all phases of construction.

All measurements will be for 10 – 15 minutes and include a 1/3 octave band measurement. The 1/3 octave band measurement will capture the time-weighted traffic sound levels in the format used by WSDOT to measure traffic noise, and will also divide the sound by frequency. Understanding the frequency is an important step, because the goal of the abatement is to reduce the low frequency noise coming from the bridge's expansion joints.

RS/MS/ms

cc:

File: XL2979, 2.04

Serial File:08-0095