Acoustical Insulation for Residential Buildings

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TRB Summer Meeting,
Portsmouth, New Hampshire
July 2014

P a r s o n s

Different Applications

- Airport
- Train
- Highway
- Long term construction

I-405 Project

- Caltrans/Metro were adding HOV lanes
- Several bridges had to be demolished and rebuild
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This is not from a movie or generated by photo shop!!

Noise Issues

- Soundwalls had to be moved
- 23 House are located 30 feet higher than the freeway
- Noise levels would be 75 dBA or higher
- Unusual and extraordinary abatement may be required

Study Approach

Two-phase study was conducted to determine

(1) Conduct a week long continuous noise measurements to determine which of the 23 properties qualify for the unusual and extraordinary abatement

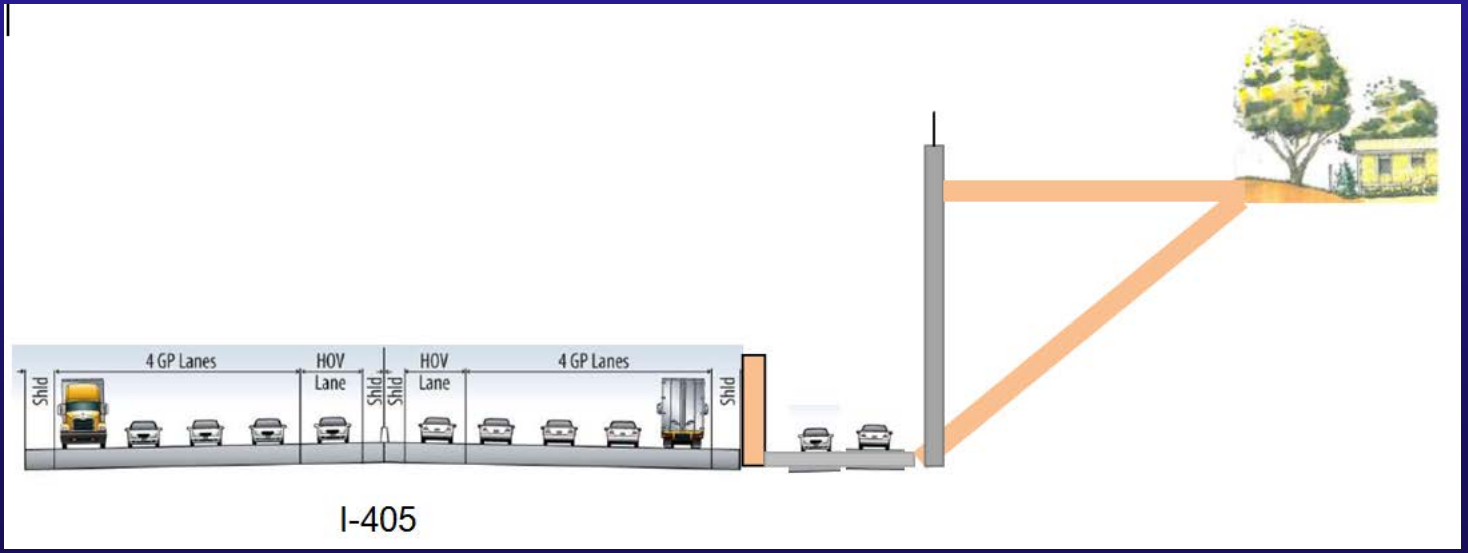
(2) Indoor-outdoor noise measurements to determine which of the qualifying properties could benefit by installing acoustical treatments so that interior traffic noise levels are significantly reduced

Measurement Results

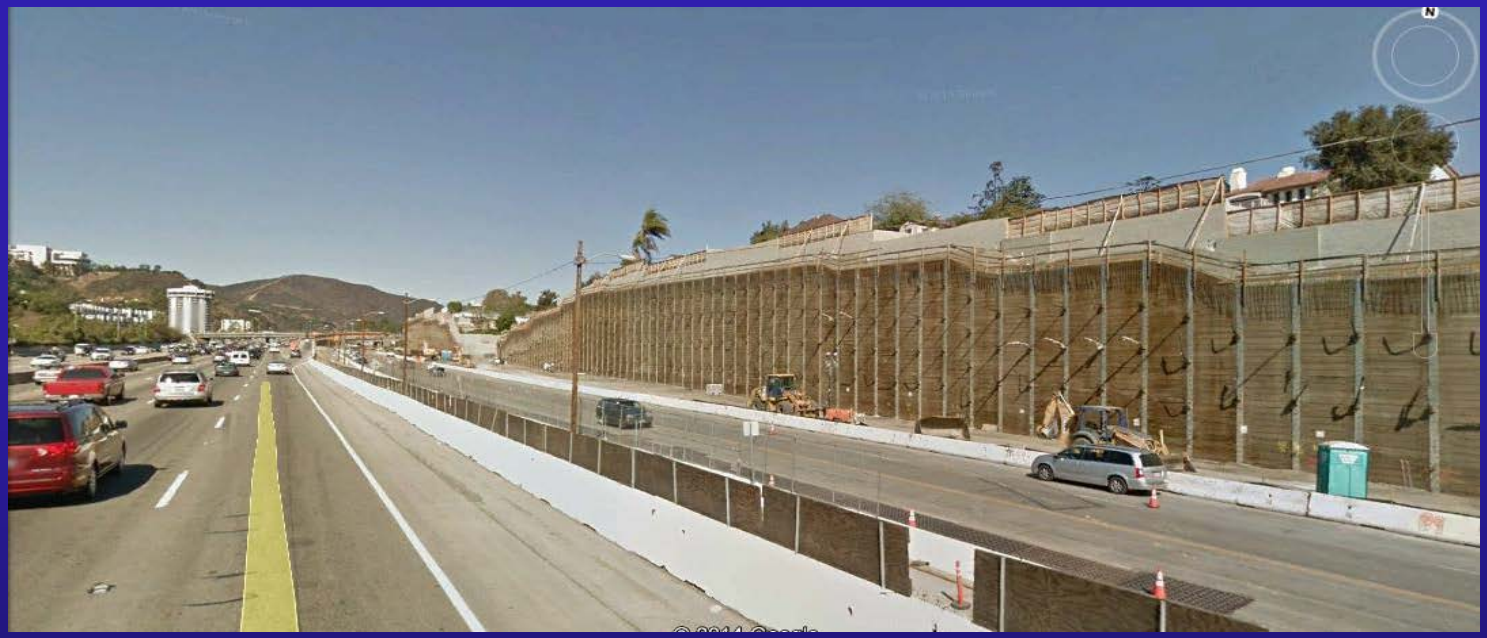
- The maximum future Leq levels were estimated to be more than the 75 dBA at nine properties
- The noise-reduction tests determined weaknesses in the building shell, such as walls, windows, doors as well as other noise flanking paths
- Changing windows and doors would result in noticeable noise reduction

Final Design

- A large retaining wall was constructed which extended backyards
- A solid/transparent soundwall was constructed on top



Replaced Soundwall



Soundwalls

Gold Line LRT

- Extension of the Gold Line to east from Pasadena, CA
- Soundwalls were recommended along the alignment near residential areas
- Near intersection soundwalls would not have been effective
- Soundwalls would not reduce train noise at second floors
- *Changing windows and doors was recommended for residential buildings in FEIS and in the design build contract*

Different Houses

- Few houses would benefit from replacing doors and windows
- New houses with good widows and doors would not get benefited
- Changing windows and doors would not benefit houses with other leaks

Houston Metro North Corridor

- FEIS had identified several houses in a residential neighborhood where LRT tracks will be in the middle of the street
- In order for sound insulation to be considered a cost effective mitigation measure, the noise reduction of the existing building structure must be able to be increased by 5 dB or more
- Sound insulation cost shall not exceed $25,000 per residences not including sound insulation design cost

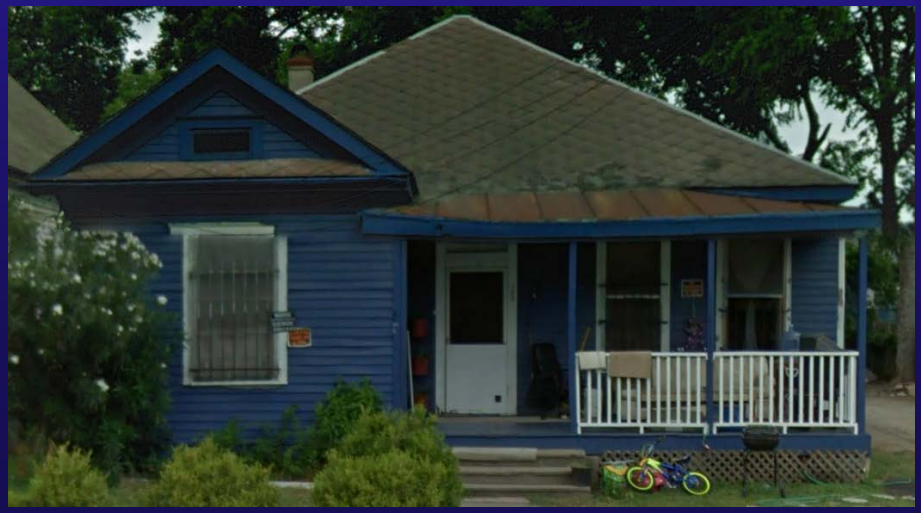
LRT on Boundary Street

Issues with Different Houses

Besides one new three story townhouse building, almost all houses that were built in 1920s were in poor condition

- None of these homes have been updated to improve their heating and cooling efficiency
- Most of the homes had wood paneling on the interior wall and wood shingles or slates on the exterior wall
- None had wall insulation
- All had open crawl spaces and single pane hung windows

Different Houses



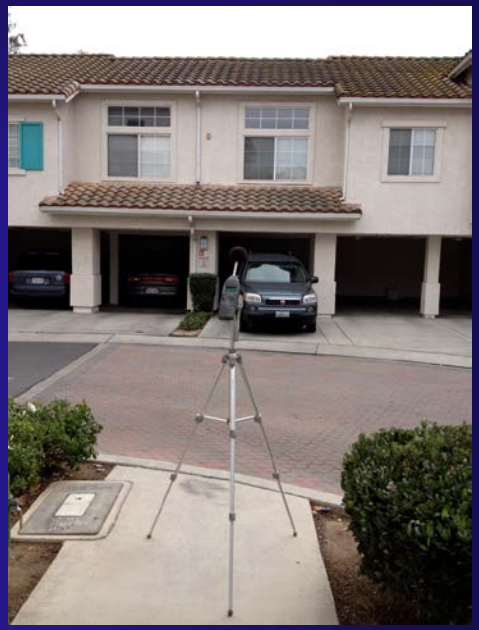
Interior of Houses

SR-91 CIP Project, Riverside, CA

- Adding new Express Lanes and other improvements to SR-91
- Soundwalls were recommended along the project area
- Combination of soundwalls and building acoustical improvements were recommended in FEIS for Villaggio condo complex

Measurements

- Measurement results indicated that only 15 units facing SR-91 would be exposed to noise levels of 75 dBA or more; therefore, qualifying for the building acoustical improvements



- Interior-exterior noise testing were conducted in five representative units

Building Features

- Interior noise levels measured 43 to 49 dBA, about 40 dBA lower than outside noise
- Interior noise must be at least 52 dBA to qualify for mitigation measures
- Buildings already block noise through good design:

Double-paned windows
Small and inoperable windows
Solid doors with weather stripping
Extra layer of plywood on the exterior walls

Soundwall

Soundwall for the exterior use areas

12-foot tall wall

6 feet block, 6 feet Plexiglass

Conclusions

When recommending building acoustical insulation make certain that such improvements will be effective.

Conducting a through field survey is necessary to identify what types of improvements should be considered.

Avoid make generalized recommendations such as changing windows and doors because in some buildings better doors and windows may not reduce the interior noise due to other weak components of the building.

QUESTIONS?