9:15

5aNS6. Construction noise action area model. Larry J. Magnoni (Wash. St. Dept. of Trans., Env. Svs., Acoust., Air Quality, Energy Sec., 15700 Dayton Ave. N., PO Box 330310, Shoreline, WA 98133, magnonil@wsdot.wa.gov)

A model developed by the Washington State Department of Transportation to be used by biologists to determine the action area for highway construction projects is presented. The model conservatively estimates the distance at which construction noise would match ambient background sound levels. The model propagates the combined maximum sound level (Lmax) for project construction equipment spherically over the soft and hard site characteristics to a point where it would converge with the ambient hourly equivalent (Leq) sound level. The ambient Leq sound level can be input into the model from actual measurements, documented reference sources, or from a table based on population density [Federal Transit Authority (FTA) Noise Assessment Guidance (2006)]. The model then combines the ambient sound level with the traffic sound level based on the national mean emission curves. The input for traffic volume, vehicle type, and speed is propagated cylindrically from the source until the traffic source drops to the ambient level. A macro, that applies a general atmospheric and molecular absorption adjustment to the calculated distances, produces the action area circumference both graphically and numerically as it relates to each of the sound sources. [Work supported by the Federal Highway Administration (FHWA) (1978).]

9:30

5aNS7. Analysis of pile driver exhaust and impact noise. Edward Zechmann and Charles Hayden (Robert A. Taft Bldg., 4676 Columbia Pkwy., C-27, Cincinnati, OH 45226)

In July 2008, NIOSH accomplished a preliminary noise survey focused on gathering impulsive noise data from pile drivers. The purpose of the noise survey was to better understand the noise characteristics of pile drivers. NIOSH gathered time record data of H-beam piles being driven into hard rock. This data was used to characterize the frequency content of the major impulsive events (impact and exhaust cycles). Knowing the frequency content is necessary to apply existing or develop new noise controls, since many noise controls are frequency dependent. Gathering the frequency content of a pile driver's impulsive noise signal is typically difficult using off-the-shelf measurement and analysis equipment and software. Reliable time record data is necessary to confidently extract the frequency content from the signal. NIOSH has developed an Impulsive Noise Meter laptop program to properly gather and analyze these impulsive signals. By analyzing the third octave band peak levels of each impact and exhaust cycle of the pile driver operation, the frequency dependence was determined. Results of this analysis showed the frequency content varied as the pile was driven further into the ground. This implies that broad spectrum noise controls are necessary to control those noise emissions.

9:45

5aNS8. Are hybrid cars too quiet? Ryan L. Robart and Lawrence D. Rosenblum (Dept. of Psych., Univ. of California, Riverside, 900 University Ave., Riverside, CA 92521)

The increase in availability of alternative fuel vehicles has elicited concerns for pedestrians who might not hear the approach of these quieter cars. Three experiments tested the relative audibility of hybrid vehicles (in their electric mode) and internal combustion engine (ICE) cars. Binaural recordings were made of the cars approaching from either the right or left, at 5 mph. Subjects were asked to listen to these recordings over headphones and press one of two buttons indicating from which direction the car approached. Subjects' accuracies and reaction times were measured. The first experiment revealed that (sighted) subjects were able to determine the approach direction of the ICE cars substantially sooner than the hybrid cars. A second experiment added the natural background sounds of idling engines to the stimuli. The addition of background sound disproportionately hindered perception of the hybrid cars, so that they could not be localized until very close. A final experiment testing both sets of stimuli with blind subjects revealed the same pattern of results. Implications of these results for pedestrian safety will be discussed. [Work supported by a grant from the National Federation for the Blind.]

10:00—10:15 Break

10:15

5aNS9. Impulse noise reduction for hearing protectors. William Murphy (Natl. Inst. for Occupational Safety and Health, Div. Appllied Res. and Technol., Hearing Loss Prevention Team, 4676 Columbia Pkwy., MS C-27, Cincinnati, OH 45226-1998, wjm4@cdc.gov)

In 2009, the United States Environmental Protection Agency will propose a revision to the federal regulation for the labeling of hearing protection devices, 40 CFR 211 Subpart B. One of the new features of the proposed rule was the measurement of an impulse noise reduction rating for hearing protection devices. Measurement of impulsive sounds is challenging technically from an acoustics perspective. This paper will report on the performance of an acoustic shock tube used to generate impulses between 140 and 170 dB peak sound pressure level. The calibration methods for the microphones will be discussed and the measurements for a variety of hearing protectors will be presented. Typical earmuffs are capable of impulsive noise reduction ratings of between 20 and 35 dB. Earplugs provide similar range of performance. Combinations of earmuff and earplug have yielded impulse peak reductions of more than 50 dB. The reduction of the impulse peak level should provide a means to predict exposure at the ear when a hearing protector is worn in an impulsive noise environment.

10:30

5aNS10. Noise barriers based on recycled materials. Jose Sanchez-Dehesa, Victor Garcia-Chocano, Daniel Torrent, Francisco Cervera, and Suitberto Cabrera (Wave Phenomena Group, Polytechnic Univ. of Valencia, Camino de vera s.n., ES-46022 Valencia, Spain, jsdehesa@upvnet.upv.es)

Two-dimensional sonic crystals consisting of arrays of cylinders fabricated with recycled materials (rubber crumb) are proposed to reduce efficiently the noise. The attenuation by these barriers is produced by a combination of sound absorption by the rubber crumb and Bragg reflection by the ordered cylinders. Experiments performed in an anechoic chamber support the predictions by the multiple scattering theory. An optimization method is also reported to develop sound barriers for traffic noise. [Work supported by Spanish MICIIN.]

10:45

5aNS11. Quenching of bandgaps by flow noise. Jose Sanchez-Dehesa (Wave Phenomena Group, Polythecnic Univ. of Valencia, Camino de vera s.n., Spain, ES-46022, jsdehesa@upvnet.upv.es), Tamer Elnady, Adel Elsabbagh, Wael Akl, Osama Mohamady (Ain Shams Univ., Cairo, Egypt), Victor Garcia-Chocano, Daniel Torrent, and Francisco Cervera (Polythecnic Univ. of Valencia, ES-46022, Spain)

We report an experimental study of acoustic effects produced by wind impinging on noise barriers based on two-dimensional sonic crystals with square symmetry. We found that the attenuation strength of sonic-crystal-bandgaps decreases for increasing values of low speed. A quenching of the acoustic bandgap appears at a certain speed value that depends of the barrier filling ratio. For increasing values of low speed, the data indicate that the barrier becomes in a sound source because of its interaction with the wind. We conclude that flow noise has paramount importance in designing acoustic barriers based on sonic crystals. [Work supported by Spanish AECI.]

11:00

5aNS12. Leakage identification for a vehicle firewall sound transmission by beamforming technique. Yuri Ribeiro (GM do Brasil, Indaiatuba, Sao Paulo, Brazil), William Fonseca, and Gerges Samir (Fed. Univ. of Santa Catarina, Florianopolis, SC, Brazil)