Determination of occupational noise exposure limits for very high intensity impulses when hearing protection is used

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counterparts (E-A-R 9000 and BILSOM 2390). Three groups of 20 subjects, two with normal hearing, aged 20 to 35 yr and 40 to 60 yr, and one with moderate bilateral sensorineural hearing loss, in the older age category, are being assessed. The measurements include detection thresholds for one-third octave bands within the audible frequency range, consonant discrimination, and the recognition of words in sentences, in quiet and in a background sound pressure level of 75 dB cable swager noise. Speech items are presented at 80 dB SPL. The results obtained thus far for normal subjects indicate that, except for the BILSOM 2390 at 4000 Hz, detection in noise remains the same or is slightly enhanced in the occluded relative to the unoccluded condition. While speech intelligibility decreases precipitously in noise, the wearing of three of the devices, the E-A-R muffs and BILSOM 2315, mitigates the effect. Aging, without concomitant hearing loss, is not a statistically significant factor. [Work supported by Ont. Min. Labour.]

9:45

2NS3. Assessment of insert earphones for the use in occupational hearing conservation program monitoring audiometry. Julia Doswell Royster (Environmental Noise Consultants, Inc., Box 144, Cary, NC 27512-0144), Elliott H. Berger (Cabot Safety Corp., Indianapolis, IN 46268), and Larry H. Royster (NC State Univ., Raleigh, NC 27695)

The application of insert earphones for annual audiometry was evaluated in an on-going occupational hearing conservation program. For four consecutive years employees were given an extra left-ear audiogram using a 3A-type insert earphone immediately after completing their standard annual audiograms using TDH-49 earphones in supra-aural cushions. For the final 3 yr an additional left-ear audiogram using the TDH-49 earphone was given last, to control for order effects. Sixty employees participated all 4 yr. Analysis of thresholds obtained each year using each earphone indicated that small threshold correction factors for the insert earphone are necessary at each frequency (not just at 6 and 8 kHz) to allow results to be compared directly to supra-aural earphone thresholds. The manufacturer's suggested 10-dB correction factor at 8 kHz appeared too small for the particular combination of TDH-49 and insert earphones used. Standard deviations of thresholds between individuals were similar for both earphones. Year-to-year repeatability of thresholds within individuals was equivalent with both earphones. As long as absolute calibration is accounted for, insert earphones are a viable alternative transducer for audiometry in hearing conservation.

10:15

2NS4. Determination of occupational noise exposure limits for very high intensity impulses when hearing protection is used. James H. Patterson, Jr. (U.S. Army Aeromedical Res. Lab., P.O. Box 577, Fort Rucker, AL 36362) and Daniel L. Johnson (EG&G Special Projects, Albuquerque, NM 87119)

The U.S. Army needs validation of safe limits for exposure to impulse noise produced by heavy weapons. Current impulse noise limits are based on data from small arms. Recent studies indicate these standards may be overly conservative. In order to define new limits, a systematic study of the effects of high-intensity impulse noise on human volunteers is underway. The number of impulses, the peak pressure level, and spectral distribution of energy are being varied systematically. Four groups of at least 60 volunteers will be given a series of exposures to one of four impulse types. The impulse spectrum is varied by changing the distance between the volunteer and an explosive detonation. The peak pressure level is varied in 3-dB steps by changing the weight of the explosive charge. The number of impulses is 6, 12, 25, 50, or 100. Volunteers wear hearing protection for all exposures. After each exposure, TTS is determined. Each volunteer starts with an exposure of six impulses at the lowest intensity. If the TTS is less than 15 dB, the subject receives six impulses at the next higher level the next day. This continues through all intensities. Then the number of impulses is increased using the maximum intensity permitted by nonauditory injury limits. The first group, using an earmuff as a protective device, has completed all exposures at the first impulse detonation distance of 5 m. The peak sound pressure levels varied from 172 to 192 dB with A durations of approximately 3 ms and B durations of approximately 20 m. No TTS in excess of 15 dB was observed for any condition. The percentages of volunteers unwilling to undergo the higher intensity exposures also will be presented.