



Use of Insert Earphones in Occupational Audiometric Testing

Technological advances have resulted in the increased use of insert earphones for audiometric testing. Insert earphones perform the same function as a standard “supra aural” audiometric headset earphones. Inserts are simply comprised of a foam earplug with tubing that carries the test signal to the external ear canal.

Insert earphones are not intended for all test circumstances and environments. On the up side, insert earphones afford greater attenuation of low frequency background noise than do their supra aural counterparts, due in part because the foam plug occludes the opening to the ear more effectively. Insert earphones also prevent a common test condition referred to as the “collapsing ear canal”. Certain people, either due to aging or physiological makeup, have very pliable or weak cartilage contained within the auricle and adjacent ear canals. When a “tight” supra aural headset is placed on the ears of such individuals, the ear canal may partially or fully collapse, creating an artificial conductive hearing loss. The use of insert earphones “shores up” the canal opening thus eliminating any potential for canal collapse.

The foam portion of insert earphones is disposal. For some, disposability may be cost effective and afford lower overall maintenance. The use of insert earphones in mobile testing operations, however, is neither cost effective nor low maintenance.

OSHA has addressed the use of insert earphones and their use is permissible only if certain procedures are adhered to, outlined in a letter written by an OSHA Directorate of Compliance Programs in 1991:

August 31, 1993

Fredrik Lindgren, Ph.D. Director,
Research and Development
Cabot Safety Corporation
5457 West 79th Street
Indianapolis, Indiana 46268

Dear Dr. Lindgren:

Thank you for your letters of October 25, 1991, addressed to Mr. Gail Brinkerhoff of my staff, concerning the use of insert earphones in establishing the audiometric testing program that is required by the Occupational Safety and Health Administration's noise standard, 29 CFR 1910.95. We regret the delay in this response.



In your letter, you expressed concern regarding the conditions specified by OSHA, under which the use of insert earphones for audiometric testing would be treated as a de minimis violation of 29 CFR 1910.95(h)(2). A de minimis violation is one which has no direct or immediate relationship to safety or health. The violation is documented in the case file, but the employer is not issued a citation.

We consulted with the National Institute for Occupational Safety and Health (NIOSH) and with its assistance re-evaluated the appropriate conditions to place on the use of insert earphones giving consideration to the fact that this is a newer approach to industrial audiometric testing that has not been subjected to extensive field evaluation. As a result of this re-evaluation, OSHA has revised the conditions for which the use of insert earphones by employers would constitute a de minimis violation of 29 CFR 1910.95(h)(2). The following conditions must be implemented by employers who intend to use insert earphones in order to meet the criteria of a de minimis violation of OSHA'S noise standard. Failure to implement any of these conditions abrogates the basis of a de minimis violation, and may result in the issuance of a citation. The specific conditions are as follows:

- The audiologist, otolaryngologist, or other physician responsible for conducting the audiological testing, shall identify ear canals that prevent achievement of an acceptable fit with insert earphones, or shall assure that any technician under his/her authority who conducts audiometric testing with insert earphones has the ability to identify such ear canals.
- Insert earphones shall not be used for audiometric testing of employees with ear canal sizes that prevent achievement of an acceptable insertion depth (fit). The manufacturer's guidelines for proper use of insert earphones must be followed.
- Technicians who will be conducting audiometric tests must be trained to insert the earphones correctly into the ear canals of test subjects and to recognize conditions where ear canal size prevents achievement of an acceptable insertion depth (fit).
- The audiometer to be used with supra-aural earphones must be calibrated, by using the reference equivalent threshold pressure levels (RETSPLs) for the NBS-9A coupler presented in Table 6 of ANSI S3.6-1989. The audiometer used with insert earphones must be calibrated using the interim RETSPLs for either the HA-1 coupler or the occluded ear simulator presented in Appendix G to ANSI S3.6-1989. This acoustical calibration shall be conducted on an annual basis, and functional calibration must be conducted before each day's use of the audiometer.
- Testing shall be conducted in a room where the background ambient noise octave-band sound pressures levels meet OSHA's requirements in 29 CFR 1910.95(h)(4).
- At the time of conversion from supra-aural to insert earphones, testing must be performed with both types of earphones. The test subject must have a quiet period of at least 14 hours before testing. Hearing protectors may be used as a substitute for this requirement. The supra-aural- earphone audiogram shall be compared to the baseline

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audiogram, or the revised baseline audiogram if appropriate, to check for a Standard Threshold Shift (STS). In accordance with 29 CFR 1910.95(g)(7)(ii), if the audiogram shows an STS, retesting with supra-aural earphones may be performed within 30 days and the resulting audiogram adopted instead of the prior one. If retesting with supra-aural earphones is performed, then retesting with insert earphones must be performed in conjunction.

- If an STS **is** indicated by the test with supra-aural earphones, the audiogram may become the revised baseline audiogram per the requirements of 29.CFR 1910.95(g)(9) for all future hearing tests with supra-aural earphones. The insert-earphone audiogram will become the **new** reference audiogram for all future hearing tests performed with insert earphones.
- If an STS is **not** indicated by the test with supra-aural earphones, the baseline audiogram remains the reference audiogram for all future supra-aural earphone tests, until such time as an STS is observed.

Please bear in mind that employers must account for the workers who are in the process of developing an STS (e.g. demonstrate a 7 dB average shift), but who at the time of the conversion to insert earphones do not have a 10 dB average shift. Employers who want to use insert earphones must enter the 7 dB shift information in the employee's audiometric test records although it is not an "STS". When the next annual audiogram using insert earphones shows an average threshold shift at 2000, 3000 and 4000 Hz of 3 dB, completing the full shift (7 dB + 3 dB), employers must then label that average shift as an STS. This triggers the follow-up procedures at 29 CFR 1910.95(g)(8).

o **All** audiograms (both the insert and supra-aural types), calculations, pure-tone individual and average threshold shifts, full STS migrations, and audiometric acoustical calibration records, are to be preserved as **records** and maintained for the duration of the affected employee's employment and, upon request, are to be provided for review to employees, representatives designated by the individual employee, and the Assistant Secretary of Labor for Occupational Safety and Health, or a designee.

We hope this information is useful to you. Please feel free to contact Ms. Ruth McCully, Director, Office of Health Compliance Assistance at (202) 219-8036, should you have further questions.

Sincerely,

Roger A. Clark, Director
Directorate of Compliance Programs

T K Group does not anticipate the use of insert earphones due to associated expense and



length of time in fitting the inserts.

Authored by: Robert Williams, Au.D. | Director Audiology | T K Group, Inc.