



The Hearing Conservation Amendment (Part I)

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Since October of 1974, OSHA has been working on revisions to the occupational noise exposure standard. After years of oral and written public testimony, resulting in an unwieldy public record of almost 40,000 pages, OSHA promulgated revisions¹ to the noise standard in January, 1981. This was followed by deferrals, stays², revisions, further public hearings, and a multiplicity of lawsuits, all of which culminated in the *Occupational Noise Exposure; Hearing Conservation Amendment; Final Rule*³, issued March 8, 1983, with an effective date of April 7, 1983. The purpose of this EARLog, #11⁴, is to summarize briefly principal components of this important new noise regulation, elucidate its key aspects, and clarify issues it has raised that are often misunderstood.

Background Information

It is estimated by OSHA¹ that there are 2.9 million workers in American production industries with equivalent 8-hour noise exposures in excess of 90 dBA and an additional 2.3 million whose exposure levels exceed 85 dBA. The Hearing Conservation Amendment (HCA) applies to all those 5.2 million employees except for those in oil and gas well drilling and servicing industries which are specifically exempted. Additionally, the Amendment does not apply to those engaged in construction or agriculture, although a construction industry noise standard exists (29 CFR 1926.52 and 1926.101) which is essentially identical to paragraphs (a) and (b) of the general industry noise standard described below.

The Occupational Noise Standard

Prior to promulgation of the HCA, the existing noise standard [29 CFR 1910.95 (a) and (b)] set a permissible exposure level of 90 dBA for eight hours, and required the employer to reduce employee exposures to that level by use of feasible engineering or administrative controls. In all cases where the sound

levels exceeded the permissible exposure, regardless of the use of hearing protection, "a continuing, effective hearing conservation program" was required, but the details of such a program were never mandated.

Paragraphs (c) through (p) of the HCA supply OSHA's definition of an "effective hearing conservation program." They replace paragraph (b)(3) of 1910.95, but do not alter the law as defined in paragraphs (a), (b)(1), and (b)(2). As long as the permissible exposure level for unprotected ears is exceeded, feasible engineering and administrative controls must still be implemented regardless of the existence or quality of a company's other hearing conservation efforts.

Terminology

The noise standard and the HCA define the **permissible exposure level (PEL)** as that noise dose that would result from a continuous 8-hour exposure to a sound level of 90 dBA. This is a dose of 100%. Doses for other exposures, either continuous or fluctuating in level, are computed relative to the PEL based upon a 5 dB trading relationship of level vs. duration (see Table I).

The **8-hour time-weighted average sound level (TWA)** is the sound level that would produce a given noise dose if an employee were exposed to that sound level continuously over an 8-hour workday. This is true regardless of the length of the actual workshift. For example, workday exposures of 4 hours at 90 dB, 8 hours at 85 dB, or 12 hours at 82 dB, all correspond to a TWA of 85 dBA or a noise dose of 50%. If a noise level is constant for an entire 8-hour workshift the TWA is simply equal to the measured sound level. The procedure for converting doses to TWAs is demonstrated in Table II.

A noise dose of 50% is designated as the **action level**, or the point at which the HCA requires implementation of a con-

tinuing, effective hearing conservation program.

Summary of the HCA

All workers receiving noise exposures at or above the action level are to be included in a hearing conservation program comprised of five basic components: exposure monitoring, audiometric testing, hearing protection, employee training, and record keeping. The requirements of the standard are primarily performance oriented, allowing the employer to use judgement in selecting the best methods of compliance.

MONITORING: Employers shall monitor noise exposure levels in a manner that will accurately identify employees who receive daily noise doses at or above the action level. All continuous, intermittent and impulsive sound levels from 80 - 130 dBA must be integrated into the computation. Noise levels must be remeasured whenever any change relating to production is suspected of increasing exposures to the extent that additional employees may receive doses at or above the action level, or the attenuation provided by the selected hearing protectors is rendered inadequate.

Monitoring may be accomplished by an area survey technique in which sound level meter readings are combined with estimates of the length of exposure of individuals to particular sound levels in order to calculate the TWA (as in Table I, or may be measured by personal sampling methods via the use of a noise dosimeter. However, employers must justify the particular monitoring technique they choose to utilize. OSHA inspections will in most cases be conducted via the personal noise dosimetry approach. All initial noise surveys were to have been completed by April 7, 1983, but in general, properly executed and documented existing surveys are an acceptable alternative.

The noise dose that is to be reported for compliance purposes is the daily noise dose that could be measured by an OSHA inspector on a particular survey day. It is not permissible to average doses over a number of days to compute a long term average noise dose. Unless an employer can fully document the infrequent nature of particular exposures, and unless management wishes to rely upon the latitude that might be permitted by a particular inspector, the prudent course of action and the one that would be more protective of the employees' hearing, would be to account for infrequent higher level exposures by using such values to compute noise doses.

The noise standard [paragraphs (a) and (b) and Table G-16] does not permit exposures to steady sound levels above 115 dBA, regardless of duration (although the exact meaning of "steady sound" and the types of impulsive or impact noises that might be excepted from this prohibition are unclear⁹). OSHA still considers the 115 dBA limitation to

apply even though Table G-16a of the HCA, which is to be used for computation of employee noise exposures, incorporates levels up to 130 dBA. Those higher levels were listed in Table G-16a to indicate explicitly that they be accurately assessed and included in the dose computation, but they were italicized to avoid giving the impression that levels above 115 dBA are permitted.

AUDIOMETRIC TESTING: Audiometric testing not only monitors employee hearing acuity over time, but also provides an excellent opportunity to (re)educate employees about their hearing, (re)motivate them to protect it, and (re)train them in the use of their hearing protectors. The audiometric program consists of baseline audiograms against which future tests are compared, and annual audiograms which are the tests used to identify changes in hearing acuity in order to take protective actions.

All current employees must have baseline audiograms taken by March 1,

1984, or six months from their first exposure at or above the action level, whichever is longer. An exception is provided when mobile test vans are used to meet the audiometric testing obligation, in which case the employer has one year to obtain a valid baseline. When this exception is invoked, employees must wear hearing protectors for any period exceeding six months after their first exposure, until the baseline audiogram is obtained.

Baseline audiograms must be preceded by 14 hours without exposure to workplace noise; however, hearing protectors may be used as a substitute for this requirement. Annual audiograms may be obtained at any convenient time during the workday. Although an audiologist, otolaryngologist, or physician must supervise the audiometric testing and must review problem audiograms, testing and evaluation in general may be conducted by a technician who has been certified by the Council for Accreditation in Occupational Hearing Conservation, or who

TABLE I
Abbreviated version⁹ of Table G-16a
for computation of employee noise exposure.

Sound Level (dBA)	Permissible Time (hrs.)
80	32
85	16
90	8
95	4
100	2
105	1
110	0.5
115	0.25
120*	0.125*
125*	0.063*
130*	0.031*

*Exposures above 115 dBA are not permitted regardless of duration (see Table G-16), but should they exist, are to be included in computation of the noise dose.

Dose (D) = $100 [C_1/T_1 + C_2/T_2 + \dots + C_n/T_n]$ where C_n is the time exposed at a specific level and T_n is the time permitted at that level.

Example (1): Workday consists of 7 hours exposure to a constant level of 95 dBA; $D=100 [7/4]=175\%$

Example (2): Workday consists of 1 hour @ 95 dBA
2 hours @ 90 dBA
4 hours @85 dBA

$$D=100 [1/4 + 2/8 + 4/16] = 75\%$$

TABLE II
Abbreviated version⁹ of Table A-1
for conversion from Dose to TWA.

Dose (%)	TWA (dBA)*
10	73
25	80
50 (action level)	85
75	88
100(PEL)	90
115	91
130	92
150	93
175	94
200	95
400	100

*Values rounded to the nearest dB. The exact conversion from Dose to TWA is given by:

$$TWA=16.61 \log_{10}[D/100]+90$$

has otherwise demonstrated competency to the supervising professional.

Changes in hearing sensitivity that equal or exceed an average of 10 dB or more at 2000, 3000, and 4000 Hz in either ear, relative to the baseline audiogram, are considered to be a standard threshold shift (STS). In determining whether an STS has occurred, allowance may be made for the contribution of aging to the change in hearing level (presbycusis) by correcting the annual audiogram as described in Appendix F of the Amendment. When an STS is detected, the employee must be notified, and unless a physician determines that the shift is not work related or aggravated by occupational noise exposure, the employee must be fitted or refitted with hearing protection as needed, and referred for a clinical evaluation as appropriate.

It is important to distinguish between an STS and a compensable hearing loss, the latter being defined according to each state's workers' compensation formula. The presence of an STS indicates a change in hearing acuity as defined by the HCA, but it has no relevance with respect to the determination of hearing impairment or handicap. It is possible for an STS to develop for employees whose hearing threshold levels are still considered "normal," and conversely, it is possible for persons to develop considerable hearing loss at the frequencies of 4000 and 6000 Hz before being detected by the STS criterion.

The necessity of reporting STSs on OSHA Form 200 is unclear at this time. Although 29 CFR 1904.2 clearly specifies that "work related" injuries and illnesses are to be recorded on Form 200, OSHA has not stated whether an STS is to be considered a work related injury, and the HCA has specifically relieved the employer of the burden of determining the "work relatedness" of particular hearing losses.

HEARING PROTECTORS: Hearing protectors must be made available to all workers exposed at or above the action level. Additionally, for those exposed at or above the PEL, and for

those exposed at or above the action level who either incur an STS or who have been exposed in excess of six months without having had a baseline audiogram established (due to the mobile test van exception), hearing protector utilization is mandatory. Hearing protectors must reduce exposures to 90 dBA, or to 85 dBA for those exhibiting an STS. Attenuation is calculated according to methods outlined in Appendix B of the Amendment.

The employer must provide a "variety of suitable hearing protectors" from which the employee can choose, and must provide training in the use and care of those devices, as well as ensuring proper initial fitting and supervision of continued correct use. OSHA interprets "variety" to mean at least one type of plug and one type of muff, although a somewhat larger selection is considered preferable^{1,6}. The hearing protectors are to be furnished to the employees at no cost, and replaced as necessary. However, employers are not expected to pay for an unlimited supply of protectors or to replace devices that are lost or damaged due to employee negligence or irresponsibility.

TRAINING: Employees exposed at or above the action level must be trained at least annually regarding the effects of noise; the purpose, advantages, disadvantages and attenuation of the hearing protectors being offered; the selection, fitting, and care of protectors; and the purpose and procedures of audiometric testing. This training does not have to be accomplished all in one session, and in fact portions of it may be ideally reviewed during the employee's annual audiometric test.

RECORDKEEPING: Noise exposure records must be retained for two years, but data older than two years should not be discarded unless remonitoring has been performed. Audiometric test records are to be retained for the duration of the employee's service. However, consideration of future possible compensation claims suggests the advisability of maintaining such data for an indefinite duration.

Comments

An alternative, but still nontechnical summary of the HCA, may be found in the 1983 Federal Register³ on pages 9738-9739, and in a similar, but separate document^{7,8} which is available from OSHA and from Aearo Company. Additionally, E-A-R® has prepared a single sided reproduction of paragraphs (a) through (p) of the Standard⁸ so that they may easily be posted in order to comply with the Amendment's requirements for access to information [paragraph(l)(1)].

In the next EARLog we will conclude this review of the HCA with additional discussions of the hearing protector portions of the Amendment, especially Appendix B and the often misunderstood "7 dB correction."

References and Footnotes

1. Occupational Safety and Health Administration (1981a). "Occupational Noise Exposure; Hearing Conservation Amendment," Fed. Regist. 46(11), 4078-4181.
2. Occupational Safety and Health Administration (1981b). "Occupational Noise Exposure; Hearing Conservation Amendment," Fed. Regist. 46(162), 42622-42639.
3. Occupational Safety and Health Administration (1983). "Occupational Noise Exposure; Hearing Conservation Amendment," Fed. Regist. 48 (46), 9738-9783.
4. Berger, E.H. - The EARLogs, complete series available upon request from Aearo Company.
5. See OSHA Bulletin 334 (1970), "Guidelines to the Department of Labor's Occupational Noise Standards for Federal Supply Contracts," for additional discussion.
6. Berger, E.H. (1981) "EARLog #7 - Motivating Employees to Wear Hearing Protection Devices," available upon request from Aearo Company.
7. Occupational Safety and Health Administration (1983). "Hearing Conservation," OSHA 3074, U.S. Dept. of Labor, Washington, D.C.
8. Noise Standard/Hearing Conservation Amendment Poster, and Reproductions of OSHA 3074, are available free from Aearo Company.
9. For actual computation with respect to compliance, see Table G-16a and Table A-I of Appendix A of the Amendment (footnote 3, above)

