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Sent: Friday, March 16, 2012 10:20 AM
To: Hart, Marley@DIR
Subject: Hearing Standard age correction factor
Attachments: Cal Osha hearing poster Regs.pdf

Follow Up Flag: Follow up
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Good morning,

I had the opportunity to speak with you Sacramento Regional Safety Forum on February 2 about the hearing standard and the aging workforce.

The age correction values have not been updated since the inception of the hearing standard in the early 1980's, when employees were retiring between the ages of 55 -60 years of age.

Since that time, not only has the retirement age been raised to the upper 67-68 range, but older workers are working longer due to the severe impact of the economy over the last five years, and in general people are living longer. It is no longer uncommon to see employees working into their seventies or re-entering the workforce.

The hearing standard correction value ends at age 60 even though hearing continues degenerate the longer they live.

The age correction values should be updated and the values increased to age 75. To leave it as it is, is unfair to businesses who are required accept OSHA recordable threshold hearing shifts for older worker because of an antiquated standard where correction values stop and does not reflect the current and future workforce.

I have attached a copy of the standard poster provided by the Center of Hearing and Health and highlighted the affected section (appendix F) on the bottom right of page two and an OSHA link to appendix F.

Subchapter 7. General Industry Safety Orders
Group 15. Occupational Noise
Article 105. Control of Noise Exposure

<http://www.dir.ca.gov/title8/sb7g15a105apf.html>

Your time and effort on the standards board is very much appreciated

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OCCUPATIONAL NOISE EXPOSURE STANDARD AND HEARING CONSERVATION AMENDMENT

Article 105. Control of Noise Exposure

§5095. General.

(a) Scope and Application. Article 105 establishes requirements for controlling occupational exposure to noise. Agriculture, construction, and oil and gas well drilling and servicing operations are exempt from the provisions of Sections 5097 through 5100.

(b) Definitions.

Action Level. An 8-hour time-weighted average of 85 decibels measured on the A-scale, slow response, or equivalently, a dose of fifty percent.

Audiogram. A chart, graph, or table resulting from an audiometric test showing an individual's hearing threshold levels as a function of frequency.

Audiologist. A professional, specializing in the study and rehabilitation of hearing, who is certified by the American Speech, Hearing and Language Association or licensed by a state board of examiners.

Baseline Audiogram. The audiogram against which future audiograms are compared.

Criterion Sound Level. A sound level of 90 decibels.

Decibel (dB). Unit of measurement of sound level.

dBA (Decibels-A-Weighted). A unit of measurement of sound level corrected to the A-weighted scale, as defined in ANSI S1.4-1971 (R1976), using a reference level of 20 micropascals (0.00002 Newton per square meter).

Hertz (Hz). Unit of measurement of frequency, numerically equal to cycles per second.

Medical Pathology. A disorder or disease. For purposes of this regulation, a condition or disease affecting the ear, which should be treated by a physician specialist.

Otolaryngologist. A physician specializing in diagnosis and treatment of disorders of the ear, nose and throat.

Representative Exposure. Measurements of an employee's noise dose or 8-hour time-weighted average sound level that the employer deems to be representative of exposures of other employees in the workplace.

Sound Level. Ten times the common logarithm of the ratio of the square of the measured A-weighted sound pressure to the square of the standard reference pressure of 20 micropascals. Unit: decibels (dB). For use with this regulation, SLOW time response, in accordance with ANSI S1.4-1971 (R1976), is required.

Sound Level Meter. An instrument for the measurement of sound level.

(a) Protection against the effects of noise exposure shall be provided when the sound levels exceed those shown in Table N-1 of this section when measured on the A-scale of a standard sound level meter at slow response.

(b) When employees are subjected to sound levels exceeding those listed in Table N-1 of this section, feasible administrative or engineering controls shall be utilized. If such controls fail to reduce sound levels within the levels of the table, personal protective equipment shall be provided and used to reduce sound levels within the levels of the table.

Table N-1 Permissible Noise Exposure¹

Permitted Duration per Workday			Permitted Duration per Workday		
Sound Level (dBA)	hours-minutes	hours	Sound Level (dBA)	hours-minutes	hours
90	8-0	8.00	103	1-19	1.32
91	6-53	6.96	104	1-9	1.15
92	6-4	6.06	105	1-0	1.00
93	5-17	5.28	106	0-52	0.86
94	4-36	4.60	107	0-46	0.76
95	4-0	4.00	108	0-40	0.66
96	3-29	3.48	109	0-34	0.56
97	3-2	3.03	110	0-30	0.50
98	2-38	2.63	111	0-26	0.43
99	2-18	2.30	112	0-23	0.38
100	2-0	2.00	113	0-20	0.33
101	1-36	1.73	114	0-17	0.28
102	1-31	1.52	115	0-15	0.25

¹ When the daily noise exposure is composed of two or more periods of noise exposure of different levels, their combined effect should be considered, rather than the individual effect of each. If the sum of the following fractions: $C_1/T_1 + C_2/T_2 + \dots + C_n/T_n$ exceeds unity, then, the mixed exposure should be considered to exceed the limit value. C_n indicates the total time of exposure at a specified noise level, and T_n indicates the total time of exposure permitted at that level.

(c) If the variations in noise level involve maxima at intervals of 1 second or less, the noise is to be considered continuous.

(d) Exposure to impulsive or impact noise should not exceed 140 dB peak sound pressure level.

§5097. Hearing Conservation Program.

(a) General. The employer shall administer a continuing, effective hearing conservation program, as described in this section, whenever employee noise exposures equal or exceed an 8-hour time-weighted average sound level (TWA) of 85 decibels measured on the A-scale (slow response) or, equivalently, a dose of fifty percent. For purposes of the hearing conservation program, employee noise exposures shall be computed in accordance with Appendix A and Table A-1 and without regard to any attenuation provided by the use of personal protective equipment.

(b) Monitoring.

(1) When information indicates that any employee's exposure may equal or exceed an 8-hour time-weighted average of 85 decibels, the employer shall obtain measurements for employees who may be exposed at or above that level. Such determinations shall be made by December 1, 1982.

(2) The monitoring requirement shall be met by either area monitoring or personal monitoring that is representative of the employee's exposure.

(A) The sampling strategy shall be designed to identify employees for inclusion in the hearing conservation program and to enable the proper selection of hearing protectors.

(B) Where circumstances such as high worker mobility, significant variations in sound level, or a significant component of impulse noise make area monitoring generally inappropriate, the employer shall use representative personal sampling to comply with the monitoring requirements of this section unless the employer can show that area sampling produces equivalent results.

(C) All continuous, intermittent and impulsive sound levels from 80 dB to 130 dB shall be integrated into the computation.

(D) Instruments used to measure employee noise exposure shall be calibrated to ensure measurement accuracy.

(3) Monitoring shall be repeated whenever a change in production, process, equipment or controls increases noise exposures to the extent that:

(A) Additional employees may be exposed at or above the action level; or

(B) The attenuation provided by hearing protectors being used by employees may be rendered inadequate to meet the requirements of Section 5098(b).

(4) The employer shall provide affected employees or their representatives with an opportunity to observe any measurements of employee noise exposure which are conducted pursuant to this section.

(5) The employer shall notify each employee exposed at or above the action level of the results of the monitoring.

(c) Audiometric Testing Program.

(1) The employer shall establish and maintain an audiometric testing program as provided in this section by making audiometric testing available to all employees whose exposures equal or exceed the action level.

(2) The program shall be provided at no cost to employees.

(3) Audiometric tests shall be performed by a licensed or certified audiologist, otolaryngologist, or other physician, or by a technician who is certified by the Council of Accreditation in Occupational Hearing Conservation, or who has satisfactorily demonstrated competence in administering audiometric examinations, obtaining valid audiograms, and properly using, maintaining and checking calibration and proper functioning of the audiometers being used. A technician who performs audiometric tests must be responsible to an audiologist, otolaryngologist or physician.

(4) All audiograms obtained pursuant to this section shall meet the requirements of Appendix B: Audiometric Measuring Instruments.

(5) The employer shall establish for each employee exposed at or above the action level a valid baseline audiogram against which subsequent audiograms can be compared for evaluation.

(6) Testing to establish a baseline audiogram shall be preceded by at least 14 hours without exposure to workplace noise. This requirement may be met by wearing hearing protectors which will reduce the employee's exposure to a sound level of 80 dBA or below.

(7) The employer shall notify employees of the need to avoid high levels of non-occupational noise exposure during the 14-hour period immediately preceding the audiometric examination.

(8) Audiometric tests shall be made available to employees by June 1, 1983 or within 6 months of an employee's first exposure at or above the action level, except that where a mobile test van is used to conduct the audiometric test, the test shall be made available within one year of an employee's first exposure at or above the action level provided that all such employees are given the opportunity for testing.

NOTE: This requirement may be met by an audiogram available to the employer upon the effective date of this section provided the conditions under which the audiometric test was performed were the same as prescribed by this section.

(9) Where an employer chooses to have audiometric tests performed by a mobile test van in accordance with Section 5097(c)(8) and an employee's baseline audiogram has not been obtained within 6 months of the employee's first exposure at or above the action level, the employer shall make hearing protectors available to the employee in accordance with Section 5098 and require that the hearing protectors are worn by the employee until the baseline audiogram is obtained.

(10) At least annually after obtaining the baseline audiogram, the employer shall obtain a new audiogram for each employee exposed at or above the action level.

(d) Evaluation of Audiogram.

(1) Each employee's annual audiogram shall be compared to that employee's baseline audiogram to determine if the audiogram is valid and if a standard threshold shift, as defined in Section 5097(d)(8), has occurred. This comparison may be done by a technician.

(2) If the annual audiogram shows that an employee has suffered a standard threshold shift, the employer may obtain a retest within 30 days and consider the results of the retest as the annual audiogram.

(3) An audiologist, otolaryngologist or physician shall review problem audiograms and shall determine whether there is a need for further evaluation. The employer shall provide to the person performing this evaluation the following information:

(A) A copy of the requirements for hearing conservation as set forth in Sections 5097, 5098, 5099 and 5100.

(B) The baseline audiogram and most recent audiogram of the employee to be evaluated.

(C) Measurements of background sound pressure levels in the audiometric test room as required in Appendix C, Audiometric Test Rooms.

(D) Records of audiometric calibrations required by paragraph (f) of this section.

(4) If a comparison of the annual audiogram to the baseline audiogram indicates a standard threshold shift as defined by Section 5097(d)(8), the employee shall be informed of this fact, in writing, within 21 days of the determination.

(5) Unless a physician determines that a standard threshold shift is not work related or aggravated by occupational noise exposure, the employer shall ensure that the following steps are taken when a standard threshold shift occurs:

(A) An employee not using hearing protectors shall be fitted with hearing protectors, trained in their use and care, and required to use them; and

(B) An employee already using hearing protectors shall be refitted and retrained in the use of hearing protectors and provided with hearing protector offering greater attenuation if necessary.

(C) Refer the employee for a clinical audiological evaluation or an otological examination, as appropriate, if additional testing is necessary or if the employer suspects that a medical pathology of the ear is caused or aggravated by the wearing of hearing protectors.

(D) Inform the employee of the need for an otological examination if a medical pathology of the ear which is unrelated to the use of hearing protectors is suspected.

(6) If subsequent audiometric testing of an employee whose exposure to noise is less than an 8-hour time-weighted average of 90 decibels indicates that a standard threshold shift is not persistent, the employer:

(A) Shall inform the employee of the new audiometric interpretation; and

(B) May discontinue the required use of hearing protectors for that employee.

(7) An annual audiogram may be substituted for the baseline audiogram when in the judgment of the audiologist, otolaryngologist or physician who is evaluating the audiogram:

(A) The standard threshold shift revealed by the audiogram is persistent;

(B) The hearing threshold shown in the annual audiogram indicates significant improvement over the baseline audiogram.

(8) As used in this section, a standard threshold shift is a change in hearing threshold relative to the baseline audiogram of an average of 10 dB or more at 2000, 3000 and 4000 Hz in either ear.

(9) In determining whether a standard threshold shift has occurred, allowance may be made for the contribution of aging (presbycusis) to the change in hearing level by correcting the annual audiogram according to the procedure described in Appendix F: Determination and Application of Age Correction to Audiograms.

(e) Audiometric Test Requirements.

(1) Audiometric tests shall be pure tone, air conduction, hearing threshold examination at test frequencies including a minimum 500, 1000, 2000, 3000, 4000 and 6000 Hz. Tests at each frequency shall be taken separately for each ear.

(2) Audiometric tests shall be conducted with audiometers (including microprocessor audiometers) that meet the specifications of, and are maintained and used in accordance with, ANSI S3.6-1969.

(3) Pulsed-tone and self-recording audiometers, if used, shall meet the requirements specified in Appendix B, Audiometric Measuring Instruments.

(4) Audiometric examinations shall be administered in a room meeting the requirements listed in Appendix C, Audiometric Test Rooms.

(f) Audiometer Calibration.

(1) The functional operation of the audiometer shall be checked before each day's use by testing a person with known, stable hearing thresholds, and by listening to the audiometer's output to make sure that the output is free from distorted or unwanted sounds. Deviations of 10 dB or greater shall require an acoustic calibration.

(2) Audiometer calibration shall be checked acoustically at least annually in accordance with Appendix D, Acoustic Calibration of Audiometers. Test frequencies below 500 Hz and above 6000 Hz may be omitted from this check. Deviations of 15 dB or greater necessitate an exhaustive calibration.

(3) An exhaustive calibration shall be performed at least every two years in accordance with Sections 4.1.2, 4.1.3, 4.1.4.3, 4.2, 4.4.1, 4.4.2, 4.4.3, and 4.5 of ANSI S3.6-1969. Test frequencies below 500 Hz and above 6000 Hz may be omitted from this calibration.

§5098. Hearing Protectors.

(a) General.

(1) Employers shall make hearing protectors available to all employees exposed to an 8-hour time-weighted average of 85 decibels or greater at no cost to the employees. Hearing protectors shall be replaced as necessary.

(2) Employers shall ensure that hearing protectors are worn by all employees:

(A) Who are required by Section 5096(b) to wear personal protective equipment; or

(B) Who are exposed to an 8-hour time-weighted average of 85 decibels or greater, and who:

1. Are required by Section 5097(c)(9) to wear hearing protectors because baseline audiograms have not yet been established; or

2. Have experienced a standard threshold shift.

(3) Employees shall be given the opportunity to select their hearing protectors from a variety of suitable hearing protectors provided by the employer.

(4) The employer shall provide training in the use and care of all hearing protectors provided to employees.

(5) The employer shall ensure proper initial fitting and supervise the correct use of all hearing protectors.

(b) Hearing Protector Attenuation.

(1) The employer shall evaluate hearing protector attenuation for the specific noise environments in which the protector will be used. The employer shall use one of the methods described in Appendix E, Methods for Estimating the Adequacy of Hearing Protector Attenuation.

(2) Hearing protectors must attenuate employee exposure at least to an 8-hour time-weighted average of 90 decibels as required by Section 5096(b).

(3) For employees who have experienced a standard threshold shift, hearing protectors must attenuate employee exposures to an 8-hour time-weighted average of 85 decibels or below.

(4) The adequacy of hearing protector attenuation shall be reevaluated whenever employee noise exposures increase to the extent that the hearing protectors provided may no longer provide adequate attenuation. The employer shall provide more effective hearing protectors where necessary.

§5099. Training Program.

(a) General.

(1) The employer shall institute a training program for all employees who are exposed to noise at or above an 8-hour time-weighted average of 85 dBA, and shall ensure employee participation in such program.

(2) The training program shall be repeated annually for each employee included in the hearing conservation program. Information provided in the training program shall be updated to be consistent with changes in protective equipment and work processes.

(3) The employer shall ensure that each employee is informed of the following:

(A) The effects of noise on hearing;

(B) The purpose of hearing protectors, the advantages, disadvantages, and attenuation of various types, and instructions on selection, fitting, use, and care; and

(C) The purpose of audiometric testing, and an explanation of the test procedures.

(4) Access to Information and Training Materials.

(1) The employer shall make available to affected employees or their representatives copies of Article 105 and shall also post a copy in the workplace.

(2) The employer shall provide to affected employees any informational materials pertaining to this standard that are applied to the employer by U.S. Department of Labor, Occupational Safety and Health Administration.

(3) The employer shall provide, upon request, all materials related to the employer's training and education program pertaining to this standard to authorized representatives of the Chief of the Division and the Director, National Institute for Occupational Safety and Health.

§5100. Recordkeeping.

(a) Exposure Measurements.

The employer shall maintain an accurate record of all employee exposure measurements required by Section 5097(b).

(b) Audiometric Tests.

(1) The employer shall retain all employee audiograms obtained pursuant to Section 5097(c) and (d).

(2) This record shall include:

(A) Name and job classification of the employee.

(B) Date of the audiogram.

(C) The examiner's name.

(D) Date of the last acoustic or exhaustive calibration of the audiometer.

(E) Employee's most recent noise exposure assessment.

(c) Audiometric Test Rooms.

The employer shall maintain accurate records of the measurements required by Appendix C, Audiometric Test Rooms, of the background sound pressure levels in audiometric test rooms.

(d) Record Retention.

The employer shall retain records required in this section for at least the following periods: (1) Noise exposure measurement records shall be retained for 2 years; (2) Audiometric test records shall be retained for the duration of the affected employee's employment.

(e) Access to Records. All records required by this section shall be provided upon request to employees, former employees, representatives designated by the individual employee and any authorized representative of the Chief of the Division. The provisions of Sections 320(a)-(g) and (h) shall apply to access to records required by this section.

(f) Transfer of Records. If the employer ceases to do business, the employer shall transfer to the successor employer all records required to be maintained by this section, and the successor employer shall retain them for the remainder of the period prescribed in Section 5100(d).

NOTE: Authority and reference cited: Section 142.3, Labor Code.

Appendix A

Noise Exposure Computation

1. Computation of Employee Noise Exposure
 - (a) Noise dose is computed using Table A-1 as follows: $D = 100 \text{ CT} / T$ where C is the total length of the work day, in hours, and T is the reference duration corresponding to the measured sound level, L, as given in Table A-1 or by the formula shown as a footnote to the table.
 - (b) When the workshift noise exposure is composed of two or more periods of noise at different levels, the total noise dose over the work day is given by: $D = 100 (C1/T1 + C2/T2 + \dots + Cn/Tn)$, where Cn indicates the total time of exposure at a specific noise level, and Tn indicates the reference duration for that level as given by Table A-1.
 - (c) The eight-hour time-weighted average sound level (TWA), in decibels, may be computed from the dose, in percent, by means of the formula: $TWA = 16.61 \log 1.0 (D/100) + 90$. For an eight-hour workshift with the noise level constant over the entire shift, the TWA is equal to the measured sound level.
 - (d) A table relating dose and TWA is given in Section II.

Table A-1

A-weighted sound level, L (decibel)	Reference Duration, T (hour)	A-weighted sound level, L (decibel)	Reference Duration, T (hour)
80	32.0	106	0.87
81	27.9	107	0.76
82	24.3	108	0.66
83	21.1	109	0.57
84	18.4	110	0.50
85	16.0	111	0.44
86	13.9	112	0.38
87	12.1	113	0.33
88	10.6	114	0.29
89	9.2	115	0.25
90	8.0	116	0.22
91	7.0	117	0.19
92	6.1	118	0.16
93	5.3	119	0.14
94	4.6	120	0.125
95	4.0	122	0.11
96	3.5	123	0.095
97	3.0	124	0.082
98	2.6	125	0.072
99	2.3	126	0.063
100	2.0	127	0.054
101	1.7	128	0.047
102	1.5	129	0.041
103	1.3	130	0.036
104	1.1	131	0.031
105	1.0		

In the above table, the reference duration, T, is computed by $T = \frac{D}{100}$

where L is the measured A-weighted sound level.

II. Conversion Between "Dose" and "8-Hour Time-Weighted Average" Sound Level.

Noise exposure is usually measured with an audiosimeter which gives a readout in terms of "dose." Dosimeter readings can be converted to an 8-hour time-weighted average sound level (TWA).

In order to convert the reading of a dosimeter into TWA, use Table A-2. This table applies to dosimeters that are set to calculate dose or percent exposure according to the relationships in Table A-1. So, for example, a dose of 91 percent over an eight hour day results in a TWA of 89.3 dB, and a dose of 50 percent corresponds to a TWA of 85 dB.

If the dose as read on the dosimeter is less than or greater than the values found in Table A-2, the TWA may be calculated by using the formula:

$$TWA = 16.61 \log 1.0 (D/100) + 90$$

where TWA = 8-hour time-weighted average sound level and D = accumulated dose in percent exposure.

Table A-2

Conversion from "Percent Noise Exposure" or "Dose" to "8-Hour Time-Weighted Average Sound Level" (TWA)

Dose or Percent Noise Exposure	TWA	Dose or Percent Noise Exposure	TWA	Dose or Percent Noise Exposure	TWA
10	73.4	116	91.1	510	101.8
15	76.3	117	91.1	520	101.9
20	78.4	118	91.2	530	102.0
25	80.0	119	91.3	540	102.2
30	81.3	120	91.3	550	102.3
35	82.4	125	91.6	560	102.4
40	83.4	130	91.9	570	102.6
45	84.2	135	92.2	580	102.7
50	85.0	140	92.4	590	102.8
55	85.7	145	92.7	600	102.9
60	86.3	150	92.9	610	103.0
65	86.9	155	93.2	620	103.2
70	87.4	160	93.4	630	103.3
75	87.9	165	93.6	640	103.4
80	88.4	170	93.8	650	103.5
81	88.5	175	94.0	660	103.6
82	88.6	180	94.2	670	103.7
83	88.7	185	94.4	680	103.8
84	88.7	190	94.6	690	103.9
85	88.8	195	94.8	700	104.0
86	88.9	200	95.0	710	104.1
87	89.0	210	95.4	720	104.2
88	89.1	220	95.7	730	104.3
89	89.2	230	96.0	740	104.4
90	89.2	240	96.3	750	104.5
91	89.3	250	96.6	760	104.6
92	89.4	260	96.9	770	104.7
93	89.5	270	97.2	780	104.8
94	89.6	280	97.4	790	104.9
95	89.6	290	97.7	800	105.0
96	89.7	300	97.9	810	105.1
97	89.8	310	98.2	820	105.2
98	89.9	320	98.4	830	105.3
99	89.9	330	98.6	840	105.4
100	90.0	340	98.8	850	105.4
101	90.1	350	99.0	860	105.5
102	90.1	360	99.2	870	105.6
103	90.2	370	99.4	880	105.7
104	90.3	380	99.6	890	105.8
105	90.4	390	99.8	900	105.8
106	90.4	400	100.0	910	105.9
107	90.5	410	100.2	920	106.0
108	90.6	420	100.4	930	106.1
109	90.6	430	100.5	940	106.2
110	90.7	440	100.7	950	106.2
111	90.8	450	100.8	960	106.3
112	90.8	460	101.0	970	106.4
113	90.9	470	101.2	980	106.5
114	90.9	480	101.3	990	106.5
115	91.1	490	101.5	999	106.6
500	101.6	500	101.6		

NOTE: Authority and reference cited: Section 142.3, Labor Code.

HISTORY

1. Editorial correction of Table A-1 filed 3-22-84; effective thirtieth day thereafter (Register 84, No. 12).
2. Amendment of Table A-1 filed 8-28-84; effective thirtieth day thereafter (Register 84, No. 35).

Appendix B

Audiometric Measuring Instruments

- I. In the event that pulsed-tone audiometers are used, they shall have one-time-of at least 200 milliseconds.
- II. Self-recording audiometers shall comply with the following requirements:
 - (a) The chart upon which the audiogram is traced shall have lines at positions corresponding to all multiples of 10 dB hearing level within the intensity range spanned by the audiometer. The lines shall be equally spaced and shall be separated by at least 1/4 inch. Additional increments are optional. The audiogram pen tracings shall not exceed 2 dB in width.
 - (b) It shall be possible to set the stylus manually at the 10-dB increment lines for calibration purposes.
 - (c) The slowing rate for the audiometer attenuator shall not be more than 6 dB/sec except that an initial slowing rate greater than 6 dB/sec is permitted at the beginning of each new test frequency, but only until the second subject response.
 - (d) The audiometer shall remain at each required test frequency for 30 seconds (+ 3 seconds). The audiogram shall be clearly marked at each change of frequency and the actual frequency change of the audiometer shall not deviate from the frequency boundaries marked on the audiogram by more than 3 seconds.
 - (e) It must be possible at each test frequency to place a horizontal line segment parallel to the time axis on the audiogram, such that the audiometric tracing crosses the line segment at least six times at that test frequency. At each test frequency, the threshold shall be the average of the midpoints of the tracing excursions.

Appendix C

Audiometric Test Rooms

Rooms used for audiometric testing shall not have background sound pressure levels exceeding those in Table C-1 when measured by equipment conforming at least to the Type 2 requirements of ANSI S1.4-1971 (R1976), and to the Class II requirements of ANSI S1.11-1971 (R1976).

Table C-1

Maximum Allowable Octave-Band Sound Pressure Levels for Audiometric Test Rooms

Octave band center frequency (Hz)	500	1000	2000	4000	8000
Sound pressure level (dB)	40	40	47	57	62

NOTE: Authority and reference cited: Section 142.3, Labor Code.

HISTORY

1. Amendment filed 10-3-83; effective thirtieth day thereafter (Register 83, No. 41).

Appendix D

Acoustic Calibration of Audiometers

I. Audiometer calibration shall be checked acoustically, at least annually, according to the procedures described in this Appendix. The equipment necessary to perform these measurements is a sound level meter, octave-band filter set, and a National Bureau of Standards 9A coupler. In making these measurements, the accuracy of the calibrating equipment shall be sufficient to determine that the audiometer is within the tolerances permitted by ANSI S3.6-1969.

- (a) Sound Pressure Output Check
 - (1) Place the earphone coupler over the microphone of the sound level meter and place the earphones on the coupler.
 - (2) Set the audiometer's hearing threshold level (HTL) dial to 70 dB.
 - (3) Measure the sound pressure level of the tones at each test frequency from 500 Hz through 6000 Hz for each earphone.
 - (4) At each frequency the readout on the sound level meter should correspond to the levels in Table D-1 or Table D-2, as appropriate, for the type of earphone, in the column entitled "sound level meter reading."
- (b) Linearity Check
 - (1) With the earphone in place, set the frequency to 1000 Hz and the HTL dial on the audiometer to 70 dB.
 - (2) Measure the sound levels in the coupler at each 10dB decrement from 70 dB to 10 dB, noting the sound level meter reading at each setting.
 - (3) For each 10-dB decrement on the audiometer, the sound level meter should indicate a corresponding 10 dB decrease.
 - (4) This measurement may be made electrically with a voltmeter connected to the earphone terminals.
- (c) Tolerances

When any of the measured sound levels deviate from the levels in Table D-1 or Table D-2 by 3 dB at any test frequency between 500 and 3000 Hz, 4 dB at 4000 Hz, or 5 dB at 6000 Hz, an exhaustive calibration is advised. An exhaustive calibration is required if the deviations are 15 dB or greater at any test frequency.

Table D-2

Reference Threshold Levels for Telephonics TDH-39 Earphones

Frequency, Hz	Reference Threshold Level for TDH-39	
	Earphones, dB	Sound Level Meter Reading, dB
500	11.5	81.5
1000	7	77
2000	9	79
3000	10	80
4000	9.5	79.5
6000	15.5	85.5

Table D-2

Reference Threshold Levels for Telephonics-TDH-49 Earphones

Frequency, Hz	Reference Threshold Level for TDH-49	
	Earphones, dB	Sound Level Meter Reading, dB
500	13.5	83.5
1000	7.5	77.5
2000	11	81.0
3000	9.5	79.5
4000	10.5	80.5
6000	13.5	83.5

NOTE: Authority and reference cited: Section 142.3, Labor Code.

Appendix E

Methods for Estimating the Adequacy of Hearing Protector Attenuation

- I. For employees who have experienced a standard threshold shift, hearing protector attenuation must be sufficient to reduce employee exposure to a TWA of 85 dB. Employers must select one of the following methods by which to estimate the adequacy of hearing protection attenuation:
 - (a) The most convenient method is the Noise Reduction Rating (NRR) developed by the Environmental Protection Agency (EPA). According to EPA regulation, the NRR must be shown on the hearing protector package. The NRR is then related to an individual worker's noise environment in order to assess the adequacy of the attenuation of a given hearing protector. This Appendix describes four methods of using the NRR to determine whether a particular hearing protector provides adequate protection within a given exposure environment. Selection among the four procedures is dependent upon the employer's noise measuring instruments.

III. Instead of using the NRR, employers may evaluate the adequacy of hearing protector attenuation by using one of the three methods developed by the National Institute for Occupational Safety and Health (NIOSH), which are described in the List of Personal Hearing Protectors and Attenuation Data, "HEW Publication No. 76-120, 1975, pages 21-37. These methods are known as NIOSH methods #1, #2 and #3. The NRR described below is a simplification of NIOSH method #2. The most complex method is NIOSH method #1, which is probably the most accurate method since it uses the largest amount of spectral information from the individual employee's noise environment. As in the case of the NRR method described below, if one of the NIOSH methods is used, the selected method must be applied to an individual's noise environment to assess the adequacy of the attenuation. Employers should be careful to take a sufficient number of measurements in order to achieve a representative sample for each time segment.

NOTE: The employer must remember that calculated attenuation values reflect realistic values only to the extent that the protectors are properly fitted and worn.

IV. When using the NRR to assess hearing protector adequacy, one of the following methods must be used:

- (a) When using a dosimeter that is capable of C-weighted measurements:
 - (1) Obtain the employee's C-weighted dose for the entire workshift, and convert to TWA (see Appendix A).
 - (2) Subtract the NRR from the C-weighted TWA to obtain the estimated A-weighted TWA under the ear protector.
 - (b) When using a dosimeter that is not capable of C-weighted measurements, the following method may be used:
 - (1) Convert the A-weighted dose to TWA (see Appendix A).
 - (2) Subtract 7 dB from the NRR.
 - (3) Subtract the remainder from the A-weighted TWA to obtain the estimated A-weighted TWA under the ear protector.
 - (c) When using a sound level meter set to the A-weighting network:
 - (1) Obtain the employee's A-weighted TWA.
 - (2) Subtract 7 dB from the NRR, and subtract the remainder from the A-weighted TWA to obtain the estimated A-weighted TWA under the ear protector.
 - (d) When using a sound level meter set on the C-weighting network:
 - (1) Obtain a representative sample of the C-weighted sound levels in the employee's environment.
 - (2) Subtract the NRR from the C-weighted average sound level to obtain the estimated A-weighted TWA under the ear protector.

NOTE: Authority and reference cited: Section 142.3, Labor Code.

HISTORY

1. Amendment filed 10-3-83; effective thirtieth day thereafter (Register 83, No. 41).

Appendix F

Determination and Application of Age Corrections to Audiograms

As permitted by Section 5097(d)(9), increases in an employee's hearing thresholds, as evidenced by an audiogram taken subsequent to a baseline audiogram, may be adjusted (lowered) for presbycusis (hearing loss due to aging). The applicable correction values at various ages and sound frequencies are included in Table F. If the employer chooses to adjust an employee's audiogram pursuant to Section 5097(d)(9), the employer shall follow the procedure described below.

- (a) Obtain from Table F the age correction values at each audiometric test frequency of interest (the hearing losses at 2000, 3000, and 4000 Hz are relevant to the determination of whether a standard threshold shift, as defined by Section 5097(d)(8)(B), may exist) for the employee by:
 - (1) Finding the age at which the most recent audiogram was taken and recording the corresponding age correction values; and
 - (2) Finding the age at which the baseline audiogram was taken and recording the corresponding age correction values.
- (b) Subtract the values found in (a)(2) from those found in (a)(1). (The remainders from these subtractions represent the values (in decibels) which may be attributed to aging and are the values by which the most recent audiogram may be adjusted at the respective audiometric test frequencies.)
- (c) Subtract the values found in (b) from the hearing threshold values of the most recent audiogram.

When the adjustment of an audiogram for hearing loss due to aging is performed for the purpose of determining whether a standard threshold shift has occurred, the above-described calculation may be restricted to the 2000, 3000, and 4000 Hz frequencies. If the average of the hearing threshold values at 2000, 3000, and 4000 Hz found in step (c), above, is equal to or greater than 10, then the employee has exhibited a standard threshold shift, and the employer must comply with various provisions of Section 5097(d) as well as certain other requirements such as Sections 5098(a)(2)(B)(2) and (b)(3).

Table F
Age Correction Values in Decibels for Males (M) and Females (F)

Age	Audiometric Test Frequencies (Hz)								
	1000		2000		3000		4000		
	M	F	M	F	M	F	M	F	
20 or Younger	5	7	3	4	4	3	5	3	8
21	5	7	3	4	4	4	5	3	8
22	5	7	3	4	4	4	5	4	8
23	5	7	3	5	4	4	6	4	9
24	5	7	3	5	5	4	6	4	9
25	5	8	3	5	5	5	7	4	10
26	5	8	4	5	5	5	7	4	10
27	5	8	4	5	6	5	7	5	11
28	6	8	4	5	6	5	7	5	11
29	6	8	4	5	6	5	8	5	12
30	6	8	4	6	6	5	9	5	12
31	6	8	4	6	7	6	9	5	13
32	6	9	5	6	7	6	10	6	14
33	6	9	5	6	7	6	10	6	14
34	6	9	5	6	8	6	11	6	15
35	7	9	5	6	8	7	11	7	15
36	7	9	5	7	9	7	12	7	16
37	7	9	6	7	9	7	12	7	17
38	7	10	6	7	9	7	13	7	17
39	7	10	6	7	10	8	14	8	18
40	7	10	6	7	10	8	14	8	19
41	7	10	6	8	10	8	14	8	20
42	8	10	7	8	11	9	16	9	20
43	8	11	7	8	12	9	16	9	21
44	8	11	7	8	12	9	17	9	22
45	8	11	7	8	13	10	18	10	23
46	8	11	8	9	13	10	19	10	24
47	8	11	8	9	14	10	19	11	24
48	8	12	8	9					