

Chapter Ind 11

OCCUPATIONAL NOISE EXPOSURE

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Ind 11.01 Scope. (1) This code establishes rules and standards for the control of exposure to occupational noise to conserve employee hearing.

History: Cr. Register, July, 1971, No. 187, eff. 8-1-71.

Ind 11.02 Definitions. (1) **AIR CONDUCTION.** Transmission of air molecules through an air medium as machinery noise conducted through an air pathway as received by the hearing mechanism.

(2) **ANSI.** American National Standards Institute.

(3) **AUDIOGRAM.** A written or printed record of hearing loss or hearing level showing the sensitivity of hearing ability as a function of frequency.

(4) **AUDIOMETER.** An electronic signal generator or instrument for measuring objectively sensitivity of hearing; audiometers are manual or self-recording.

(5) **DECIBEL (dB).** A dimensionless unit used to express a logarithmic ratio between a measured quantity and a reference quantity. (A level of zero decibels represents roughly the weakest sound that can be heard by a person with undamaged hearing.)

(6) **dba.** Sound level in decibels read on the A scale of a sound level meter. The A scale discriminates against very low frequencies as does the human ear and is, therefore, better for measuring general sound levels.

(7) **FREQUENCY, CPS, OR Hz.** The time rate of repetition of a periodic phenomenon. High frequencies are higher pitched tones usually above 2000 cycles per second.

(8) **HEARING PROTECTIVE EQUIPMENT.** Usually some type of ear plug, muff, canal cap or glass down fibre designed to obstruct sound energy from entering the ear canals.

(9) **OCTAVE BAND.** Arbitrary spreads of frequencies (Hz). A band whose upper limit is twice the lower limit: example 3000-6000 Hz.

(10) **PURE TONE.** A sound sensation characterized by a singleness of pitch.

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(11) **SUPERVISING PHYSICIAN.** A medically trained person usually an ear specialist or general physician possessing specialized knowledge and experience enabling him to administer a function hearing conservation program.

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Ind 11.03 Occupational noise exposure. (1) When employes are subjected to noise exceeding the times and intensities listed in table 1, feasible administrative or engineering controls shall be utilized.

TABLE 1
PERMISSIBLE NOISE EXPOSURE

Duration Per Day Hours	Sound Level, dBA Slow Response	Duration Per Day Minutes	Sound Level, dBA Slow Response
8	90	52	106
7	91	45	107
6	92	37	108
5	93	33	109
4½	94	30	110
4	95	26	111
3½	96	22	112
3	97	18	113
2½	98	16	114
2¼	99	15	115
2	100	No exposure permitted	Greater than 115
1¾	101		
1½	102		
1¼	103		
1½	104		
1	105		

History: Cr. Register, July, 1971, No. 187, eff. 8-1-71

Ind 11.04 Surveys. (1) Noise surveys shall be conducted in accordance with "accepted practices."

Note: Accepted practices should include those stated in references 6, 7, 8 and 9 where they apply.

(2) The level of noise shall be determined by a sound level meter meeting the standards and specifications of the department of industry, labor and human relations and shall be made on the "A" weighted network for "slow response." Noise levels reaching maxima at intervals of 1 second or less are classified as being continuous.

Note: A sound level meter meeting the ANSI standard S1.4-1961 is acceptable.

(3) All records of surveys shall be kept on file by the employer and shall be available on request to the department of industry, labor and human relations and the department of health and social services.

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Ind 11.05 Noise levels above 90 dBA. (1) Where the noise level exceeds 90 dBA, the employer shall be prepared to furnish evidence that the employes are not exceeding the exposure time period listed in table 1 as corresponding to the existing measured noise level.

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Ind 11.06 Noise exposure at different levels. (1) Noise exposures at different levels shall be combined by adding the fraction of the allowable time used at each exposure. The sum of such fractions shall not

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exceed unity. If the fractional exposures exceed unity, this mixed exposure shall be considered to exceed the limit. If the measured noise level is less than 90 dBA, the period of noise exposure shall be considered to be 0.

Note: The following example illustrates the combining of noise exposures at different levels.

Example: If a mixed exposure consisted of 1 hour at 97 dBA (3 hours permitted) 4 hours at 90 dBA (8 hours permitted) and 3 hours at less than 90 dBA (no limit) the sum of the fractions of the allowable time used would be $1/3 + 1/2 + 0 = 5/6$. Since this does not exceed 1, the combined exposure is within the permissible limits

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Ind 11.07 Hearing conservation program. (1) Until the feasibility of engineering or administrative controls is determined, hearing protective equipment shall be provided by the employer and shall be worn by employees subjected to noise exceeding exposures listed in table 1.

(2) If administrative or engineering controls fail to reduce the exposure times or sound levels within the limits set in table 1, a continuing, effective hearing conservation program, acceptable to the department of industry, labor and human relations shall be administered. Minimum requirements for such a program shall be as required by the provisions of Ind 11.07 through Ind 11.11 inclusive.

Note: Acceptable hearing conservation programs are found in documents 1 and 2 listed in reference section.

History: Cr. Register, July, 1971, No. 187, eff. 8-1-71.

Ind 11.08 Hearing protective equipment. (1) Personal hearing protective equipment acceptable to the department of industry, labor and human relations shall be provided and its use enforced.

(2) Employees shall wear the hearing protective equipment.

(3) Exempt from subsection (2) are those employees who for medically certified local ear conditions, cannot wear protective equipment.

Note: Hearing protection equipment whose attenuation has been determined in accordance with the requirements of ANSI standard Z24.22-1957 is acceptable, provided that the attenuation affords adequate protection against the existing noise exposures.

History: Cr. Register, July, 1971, No. 187, eff. 8-1-71.

Ind 11.09 Instructions to employees. (1) Employees shall be informed of locations where personal hearing protective equipment must be worn.

(2) Employees shall be instructed in the purposes, proper fitting and required maintenance of personal hearing protective equipment.

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Ind 11.10 Audiometric measurements required. (1) Hearing acuity of employees being exposed to noise levels exceeding permissible exposures as listed in table 1 shall be determined and recorded. Employees wearing ear protection as required in section 11.07 (1) and 11.08 shall be included. Determination of hearing acuity shall be by pure tone, air conduction audiometry.

(2) Subsequent audiograms shall be made as deemed necessary by the supervising physician, but at intervals not to exceed 2 years.

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(3) Audiograms shall be obtained only in environments that meet the background noise level requirements acceptable to the department of industry, labor and human relations. (See table 2.)

Note: Background noise level requirements of American National Standards Institute S3.1—1960 are acceptable.

TABLE 2
ALLOWABLE BACKGROUND NOISE LEVELS FOR HEARING
CONSERVATION AUDIOMETRY ROOMS

It is assumed that (1) no frequencies below 500 Hz will be measured and (2) well-fitted binaural earphones will be worn.

Octave band center frequency.....	500	1000	2000	4000	8000
Level in dB re 0.0002 dyne/cm ²	40	40	47	52	62

(4) Audiograms shall include hearing thresholds for both ears at frequencies of 500, 1000, 2000, 3000, 4000 and 6000 Hz.

(5) Audiograms shall be kept on file and retained for 6 years following termination of employment.

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Ind 11.11 Audiometers. (1) Audiometers shall meet the standards and specifications acceptable to the department of industry, labor and human relations.

Note: An audiometer meeting the ANSI standard 53.6—1969 (4) will be acceptable.

(2) The performance and accuracy of audiometers shall be determined as follows:

(a) At least once per month a complete audiogram shall be taken on one or two persons having a known and stable audiometric curve. If monthly test deviations exceed 5dB the audiometer shall be calibrated electronically.

(b) Audiometers shall be calibrated electronically at least every 12 months and be so certified.

(3) Records of all audiometric calibrations shall be kept on file by the employer.

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Ind 11.12 Audiometric personnel. (1) Persons administering audiograms shall have been trained in air conduction audiometry either by formal course work at audiological centers of accredited educational institutions or by individual instruction by an otologist.

(2) Audiograms shall be interpreted by the employer's regular or consulting physician.

REFERENCES:

1. *Guidelines for noise exposure control.* Intersociety Committee Recommendations (Revised 1969).

a. American Industrial Hygiene Association, 25711 Southfield Road, Southfield, Michigan 48075.

b. Industrial Medical Association, 55 East Washington Street, Chicago, Illinois 60602.

c. American Speech and Hearing Association, 1001 Connecticut Avenue, Northwest, Washington, D. C. 20036.

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d. American Association of Industrial Nurses, 79 Madison Avenue, New York, New York 10016.

2. *Guide for conservation of hearing in noise* (1969 Edition). American Academy of Ophthalmology and Otolaryngology, 15 Second Street, S. W., Rochester, Minnesota, 55901.

3. *Criteria for background noise in audiometer rooms S8.1—1960*. American National Standards Institute, Inc., 1430 Broadway, New York, New York 10018.

4. *Specification for audiometers for general diagnostic purposes 53.6—1969*. ANSI, Inc., 1430 Broadway, New York, New York 10018.

5. *Guide for training of industrial audiometric technicians for instructors*. Industrial Medical Assn., 150 North Wacker Drive, Chicago, Illinois 60606.

6. *Method for the physical measurement of sound S1.2—1962*. ANSI, Inc., New York, New York (1962).

7. *Industrial noise manual, Second Edition*. AIHA Noise Committee, Southfield, Michigan (1966).

8. *Society of automotive engineers standards (J919)*, 2 Pennsylvania Plaza, New York, New York 10001.

9. *National machine tool builders' association noise measurement techniques*. June 1970. 2139 Wisconsin Avenue, Washington, D. C. 20007.

Note: Audiometric technique and training procedures should meet the guidelines established by the "Intersociety Committee on Industrial Audiometric Technician Training." See Reference 5. Information regarding facilities for specialized training for industrial audiometric technicians may be obtained from the Wisconsin Department of Health and Social Services and the Wisconsin Department of Industry, Labor and Human Relations.

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