

Chapter 16: Noise Standards

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OSHA Stds: 29 CFR 1910.95

- Protection **SHALL** be provided when sound levels **>90 dBA for 8 hr TWA (PEL)** as measured by a sound level meter on slow response
- Exposure to impulsive or impact noise should not exceed **140 dB peak SPL**
- Based on Table G-16 (next slide)

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G-16: (note: based on 5 dB exchange rate)

<u>Duration/day (hours)</u>	<u>Sound level (dB A)</u>
8	90
6	92
4	95
3	97
2	100
1 1/2	102
1	105
1/2	110
1/4 or less	115

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Engineering Controls

- When the employee is subjected to **≥PEL**, feasible administrative or engineering **controls shall be utilized**.
- If such controls fail to reduce sound levels <PEL, **PPE** shall be provided and used.

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Dose Calculations

$$Dose = \left[\sum_{i=1}^n \frac{T_{Observed}}{T_{Allowed}} \right] \quad \text{Dose is a fraction}$$

- $Dose = [C_1/T_1 + C_2/T_2 + \dots + C_n/T_n]$
 - Where:
 - C_n ~ Actual exposure time in minutes
 - T_n ~ Allowable time of exposure at particular dB in minutes
- $T_n = 480/[2^{(SPL-90)/5}]$
 - Where: SPL in dBA

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Time-Weighted Average Computed from Dose

$$L_{TWA} = 90 + \left[\frac{DoublingRateForDose}{\log(2)} \right] \times \log \left(Dose_{obs} \times \frac{480 \text{ min}}{T_{obs}} \right)$$

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Dose Calculations - 8hr TWA

$$Dose = \left[\sum_{i=1}^n \frac{T_{Observed}}{T_{Allowed}} \right] \quad T_n = 480/[2^{(L-90)/5}]$$

$$Dose = \left[\sum_{i=1}^n \frac{480}{480/2^{(L-90)/5}} \right] = \left[\sum_{i=1}^n 2^{(L-90)/5} \right] = 2^{(L_{8hr-avg}-90)/5}$$

$$\log(Dose) = (L_{8hr-avg} - 90) \left[\frac{\log(2)}{5} \right]$$

Dose is a fraction

$$L_{8hr-avg} = 90 + \left[\frac{5}{\log(2)} \right] \times \log(Dose)$$

$$L_{8hr-avg} = 90 + 16.61 \times \log(Dose)$$

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Dose Calculations – OSHA vs ACGIH

$$Dose = \left[\sum_{i=1}^n \frac{T_{Observed}}{T_{Allowed}} \right]$$

OSHA HCP	ACGIH TLV
$T_n = 480/[2^{(L-90)/5}]$	$T_n = 480/[2^{(L-85)/3}]$
$L_{8hr-avg} = 90 + \left[\frac{5}{\log(2)} \right] \times \log(Dose)$	$L_{8hr-avg} = 90 + \left[\frac{3}{\log(2)} \right] \times \log(Dose)$
Range: 80-130 dBA	Range: 80-130 dBA
Action Level: 85 dBA = 50%	Criteria: 85 dBA = 100%

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More on ACGIH

- The TLV recommends against using administrative controls--mainly employee rotation--to control worker exposures of 103 dBA or more, while OSHA allows it.
- The TLV, beginning in 1998, addresses concomitant exposure to noise and chemicals that may have the potential to cause hearing loss (e.g., toluene, lead, manganese, and butyl alcohol).
- The 1999 TLV includes a proposed addition which recommends abdominal exposure limits for pregnant workers, to protect the hearing of the developing fetus.
 - 8-hour TWA of 115 dBC and a ceiling limit of 155 dBC

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MSHA's Key Numbers

- Exposures
 - 85 dBA TWA Action Level
 - 90 dBA TWA PEL
 - 115 dBA Slow Response Ceiling Limit
- Hearing Protection
 - 105 dBA TWA Dual Hearing Protection Required
- MSHA Audiometric Testing – Threshold Shift
 - Standard: 10 dB Average of 2, 3, & 4 kHz
 - Reportable: 25 dB Average of 2, 3, & 4 kHz

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Hearing Conservation

Amended to OSHA standard in 1985

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Action level for hearing conservation program

- Action level
 - Dose – 50%
 - 85 dBA, 8-hr TWA
- Employer must:
 - Administer hearing conservation program
 - Implement a monitoring program

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Monitoring Program

- Sampling strategy to ID exposed employees
- Personal sampling (i.e., dosimetry) for *mobile* employees, or if area sampling is infeasible
 - implies that area sampling preferred over dosimetry – because of technology of dosimeters at the time
- Include all continuous, impulsive, or intermittent noise of 80-130 dBA
 - i.e., noise < 80 dBA counts as zero]
- Noise instruments must be calibrated

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Monitoring Program

- Monitoring shall be repeated if:
 - there is change in production, equipment, or controls
 - changes that may cause other employees to be overexposed
 - Noise may have increased to the point that PPE now inadequate

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Monitoring Program

- Employees exposed to ≥ 85 dBA shall be notified of their monitoring results
- Must provide employees opportunity to observe noise measurements
 - e.g., union representative

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Audiometric Testing

- Performed by:
 - 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 operates microprocessor audiometers does not need to be certified.
 - A technician who performs audiometric tests must be responsible to an audiologist, otolaryngologist or physician.

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Audiometric Testing

- Establish an audiometric testing program (@ no cost to employees)
- The employer shall maintain accurate records of the measurements of the background sound pressure levels in audiometric test rooms.
 - Must be posted on the booth

TABLE D-1 –
MAXIMUM ALLOWABLE OCTAVE-BAND SOUND PRESSURE LEVELS
FOR AUDIOMETRIC TEST ROOMS

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

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Audiometric Testing

- Testing to establish a baseline audiogram shall be
 - preceded by at least 14 hours without exposure to workplace noise.
 - Or employee must wear hearing protectors that day before testing.
- Must be done:
 - Within 6 months of starting exposure
 - Within 12 months if mobile test van used
 - employees shall wearing hearing protectors for any period exceeding six months after first exposure until the baseline audiogram is obtained.

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PPE

- PPE must be worn by:
 - overexposed employees
 - employees who have not yet had baseline
 - employees who have experienced STS
- Note: PPE can be worn by employee who is not overexposed, but employer must insure that kept sanitary, etc.

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

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PPE Effectiveness -2

- Hearing protectors must attenuate employee exposure at least to an 8-hour time-weighted average of 90 decibels as required by paragraph (b) of this section.
- For employees who have experienced a standard threshold shift, hearing protectors must attenuate employee exposure to an 8-hour time-weighted average of 85 decibels or below.

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PPE . . . 3

- Employer shall:
 - Provide appropriate PPE to employees
 - Reduce sound at ears to < 90 dBA
 - < 85 dBA, if have temporary threshold shift
 - Provide a variety of suitable PPE
 - Provide PPE at no cost to employees
 - Provide training on the use/care of PPE
 - Ensure initial fitting of PPE

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Record-Keeping

- Employer shall post OSHA noise standard in the workplace
- Employer shall maintain records

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Training Program

- Employer shall provide training
- Training shall be conducted **ANNUALLY**
- Training shall include:
 - Effects of noise on hearing
 - Information on PPE
 - Information on audiometric testing
- The employer shall provide, upon request, all materials related to the employer's training and education program pertaining to this standard to the Assistant Secretary and the Director.

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Record-Keeping

- Noise exposure records:
 - 2 yrs
- Audiometric testing records:
 - Duration of Employment

My advice: Keep all exposure and audiometric testing data forever

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Posting Requirement

- The employer shall make available to affected employees or their representatives copies of the noise standard and shall also post a copy in the workplace.
- The employer shall provide to affected employees any informational materials pertaining to the standard that are supplied to the employer by the Assistant Secretary.

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The End

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