Occupational Noise Exposure

- 29 CFR 1910.95
Objectives

- Distinguish between sound and noise
- Discuss types of hearing loss
- Become familiar with types of noise measuring equipment
- Understand the requirements of 29 CFR 1910.95
Sound Versus Noise

● Sound is a pressure change detectable by the human ear.
  – The pitch ranges between 20 to 20,000 Hz.
  – The volume ranges between 0 to 140 dB.

● Noise is a type of sound.
  – It carries no information.
  – It is random.
  – It is generally described as undesirable or unwanted sound.
An Ear’s Anatomy

1. Eardrum
2. Malleus
3. Incus
4. Stapes
5. Semicircular canals
6. Cochlear Nerve
7. Vestibular nerve
8. Endolymphatic sac
9. Eustachian tube
Types of Hearing Loss

- Middle ear hearing loss results from lack of conduction.
  - Impacted wax
  - Broken ear drum

- Inner ear hearing loss results from lack of neural connections.
  - Naturally due to aging
  - Loud noises
  - Disease
Occupational Hearing Loss

- Noise-Induced Hearing Loss or Noise-Induced Permanent Threshold Shift (NIPTS)
  - Permanent sensor neural condition
  - Cannot be treated or corrected medically
  - Initially effects high frequencies
    » Industrial trough
    » Speech recognition
  - Progresses to lower frequencies
Threshold Shifts

- **Temporary Threshold Shifts (TTS)**
  - Hearing returns to normal after noise exposure

- **Permanent Threshold Shifts (PTS)**
  - Repeated noise exposure without a return to normal

- **Standard Threshold Shifts (STS)**
  - $>10$ dB average loss in 2000, 3000, or 4000 Hz in either ear
Non-Auditory Effects of Noise

- Effects cardiovascular system
- Effects the nervous system
- Interferes with speech and concentration
- Causes annoyance, stress, and fatigue
- Reduces work efficiency
- Lowers morale
- Masks warning sounds
Noise Measuring Equipment

● Sound level meters
  - Basic instrument to measure sound pressure variations in air

● Noise dosimeter
  - Combines sound pressure and time for employee exposure monitoring
Noise Measuring Equipment

- Octave band analyzer
  - Diagnostic tool to help find appropriate engineering controls to reduce noise levels
Noise Limit

- No employee shall be exposed above the permissible exposure level (PEL).

- PEL = 90 dBA for a 8-hour time-weighted average (TWA)

- Feasible administrative or engineering controls are required.

- Hearing protection is required to protect the employee to the PEL.
Noise Action Limit

- Action Level (AL) = 85 dBA for a 8-hour TWA
  - Determined without regard to hearing protector attenuation

- Hearing Conservation Program (HCP) required

- Hearing protection devices must be available
Monitoring

- Strategy to identify all employees who could be exposed above AL (85 dBA)

- Conduct representative sampling
  - Each job classification
  - All shifts

- Repeat monitoring when:
  - Additional employees are exposed
  - Hearing protectors are inadequate
The employer shall notify each employee exposed at or above 85 dBA of the monitoring results.
Audiometric Testing

- A qualified person performs the hearing test, usually an audiologist.

- The audiometers are calibrated to determine your threshold of hearing and changes (threshold shifts).
  - Must meet strict specified criteria

- A qualified person interprets the results of the hearing test.
Audiometric Testing

- Provided at no cost to the employee
  - Within 6 months of first exposure
    » For mobile test van, within 12 months

- Provided annually and analyzed
  - Allowance for aging
  - STS notification
Example of Audiogram

Graph showing hearing level in dB against frequency in Hz. The graph compares normal hearing (solid line) with hearing impairment (dashed line) caused by noise exposure. The left ear is represented by an X, and the right ear by a circle.
STS Notifications

- Recall standard threshold shift definition
  - > 10 dB avg. loss 2–4 kHz

- The employer may retest within 30 days to verify the STS.

- An audiologist shall determine need for further evaluation.

- The employer shall notify the employee of the STS in writing within 21 days.
Audiogram with 2 STS, 1 PHL

Baseline

1 Yr: 15dB-STS

2 Yr: 10dB-STS, 25dB-HL

Frequency

2KHz 3KHz 4KHz
STS Requirements

- If STS is work-related:
  - Employee is fitted for hearing protection and trained
  - Refitted and retrained if already wearing hearing protection
  - Referred for audiological or otological exam, if necessary and appropriate
Hearing Protectors 1910.95(i)

- Shall be available to "action level" employees

- Shall be required for those employees:
  - Exposed at or above 90 dBA
  - Exposed at or above 85 dBA (without an audiometric baseline)
  - Who have an STS
Hearing Protectors

- Provided at no cost to the employee
- Selected from a variety of types and brands
- Properly fitted
- Replaced as necessary

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Protector Attenuation

● Hearing protectors shall:
  – For overexposed employees
    » Attenuate < 90 dBA 8-hr TWA
  – For employees with an STS
    » Attenuate < 85 dBA 8-hr TWA
  – Whenever noise exposures increase
    » Be reevaluated to determine adequacy
Noise Reduction Rating

- Defined as the maximum number of decibels (dB) that the hearing protector will reduce the sound level when worn.

- NRR must be on the hearing protector package.

- NRR example for A-weighted data:
  - Estimated exposure (dBA) = TWA (dBA) - (NRR - 7)
Training

- Must be annual

- Must include:
  - Effects of noise on hearing
  - Purpose of hearing protectors
  - Instruction in protector hearing protector selection, fitting, use and care
  - Purpose of audiometric test and explanation of the procedures and results
Posting the Standard

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- The employer shall make available to affected employees or their representatives copies of the standard.

- The employer shall also post a copy of the standard in the workplace.
Recordkeeping

- Provide employee and DOL access and transfer records to successor employer

- Noise measurements: ≥ 2 years

- Audiometric tests ≥ employment duration:
  - Name, job classification and dBA-TWA
  - Date, examiner’s name and calibration date
  - Background measurements of audiometric test room
Other Paragraphs

- (f) - Observation of monitoring
- (h) - Audiometric test requirements
- (l) - Access to information and training
- (o) - Exemptions

*Note: 1926.52 applies to construction*
Appendices

- A - Noise exposure computation
- B - Methods for establishing the adequacy of hearing protector attenuation
- C - Audiometric measuring equipment
- D - Audiometric test rooms
- E - Acoustic calibration of audiometers
- F - Calculations and application of age corrections to audiograms
- G - Monitoring noise levels

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Summary

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Thank You For Attending!

Final Questions?