Welding Health and Safety
Hearing Protection

3M Occupational Health and Environmental Safety Division
Welding Health and Safety

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Did You Know?

- Noise is one of the Most Common Hazard Faced by US Workers
  - Every year, approximately 30 million people in the United States are occupationally exposed to hazardous noise.
  - Noise, or unwanted sound, is one of the most common health problems in American workplaces.
  - Exposure to high levels of noise may cause:
    - Hearing loss, create physical and psychological stress, reduce productivity, interfere with communication, and contribute to accidents and injuries by making it difficult to hear warning signals.

Destruction of Hearing is Often Less Dramatic than other Injuries

- Tends:
  - Not to result from a single traumatic incident
  - Not to be painful
  - To happens slowly over time
  - To be invisible and not obvious or apparent to other people
Inner Ear Destruction

Before Noise

After Noise
Noise
Potential Sources of Hazardous Levels of Noise

Noise generated by pulsed/high current welding processes:
- Carbon arc welding and gouging
- TIG (pulsed)
- Plasma

Noise generated by associated activities:
- Grinding & sanding
- Generators
How Loud is Too Loud?

- Noise over 85 decibels (dBA) is considered to be hazardous!
- At higher dBA levels, hearing is damaged faster:
  - 4 hours at 88 dBA
  - 2 hours at 91 dBA
  - 1 hour at 94 dBA
  - 30 minutes at 97 dBA
  - 15 minutes at 100 dBA
  - 7.5 minutes at 103 dBA
  - <4 minutes at 106 dBA
  - <2 minutes at 109 dBA
  - <1 minute at 112 dBA

- Rule of thumb:
  - It’s too loud if you have to shout to be heard by someone less than 3 feet away from you.
For example, a chain saw has a sound intensity of about 110 dB. Without proper hearing protection, running a chain saw for only 2 minutes can become dangerous to the human ear!

Source: NIOSH, 2009: http://www.cdc.gov/niosh/topics/noise/aboutLp/Noisemeter_flash/soundMeter_flash.html
Noise Induced Hearing Loss

- **Symptoms of exposure**
  - Hearing Loss
  - Tinnitus
    - Ringing or buzzing sound in ears
- **Short term exposure**
  - Symptoms may improve with rest
- **Long term exposure**
  - Symptoms become permanent

- **Non-Auditory Effects**
  - Stress reaction
  - Sleep disruption
  - Low morale
  - Reduced efficiency
  - Annoyance
  - Interference with concentration
  - Fatigue
Noise Regulations
Five Required Elements of OSHA’s Hearing Conservation Standard (29 CFR 1910.95)

1. **Noise Monitoring**
   - TWA 85 dBA and higher
     - Employer must implement hearing conservation program
   - Higher than 90 dBA TWA
     - Exposed workers must wear hearing protectors to reduce exposure to <90 dBA

2. **Annual Hearing Testing**
   - Provide employees with baseline hearing test and annual evaluation

3. **Provide Hearing Protectors**
   - Employer must provide a suitable variety of hearing protection devices (2 types or more)

4. **Annual Training**
   - Effects of Noise on Hearing
   - Hearing Protectors
     - Advantages/disadvantages, noise reduction, selecting, use, care and fitting
   - Audiometric Testing
     - Purpose and Procedures

5. **Recordkeeping**
Hearing Protection Devices (HPD)
Hearing Protection

• The best hearing protector is the one that is:
  - *Worn correctly (fit)*
  - *Worn consistently (wear time)*
Critical Factors Hearing Protection Device (HPD) Effectiveness

HPD

Protection

Human Factors

HPD Fit

Wear Time
Hearing Protectors
Noise Reduction Rating (NRR)

- Every hearing protector has a noise reduction rating (NRR) listed on the packaging.
  - NRR is required by U.S. EPA
  - NRR is an average noise reduction in laboratory test
  - NRR only reflects noise reduction for a perfect fitting HPD
    - Most wearers will get far less noise reduction in real world

- In the workplace, most people get much less protection because:
  - Hearing protectors are not worn perfectly
  - Hearing protectors are not worn during all noise exposures
Using the NRR

\[ \text{dBA} - \text{NRR} - 7 \text{ dB} = \text{dBA} \]

workplace noise

effective employee exposure

Apply 50% “de-rating” when HPDs are used in place of noise controls

\[ \text{NRR} \div 2 \]
Hearing Protection Choices
What to Look for in Hearing Protection Devices (HPD)

- **Performance**
  - Noise reduction (attenuation)
  - Effect on communication
    - Can you hear effectively while wearing HPD

- **Comfort**
  - Throughout the wearing period

- **Ease-of-use**
  - Convenience
  - Insertion in ear
  - Compatibility with other PPE

- **Physical properties**
  - Durability
Foam Earplugs

- **Advantages**
  - Comfort
    - Soft foam conforms to shape of each ear
  - High Noise Reduction Ratings (NRR)
    - High noise reduction when worn correctly
  - Wide variety to choose from
  - Corded and uncorded versions available
  - Low Profile
  - Inexpensive
Pre-Molded Earplugs

- **Advantages**
  - Easy to use
    - No need to roll down like foam ear plugs
  - Reusable
  - Various materials
    - Silicone
    - Vinyl
    - Thermoplastic
  - Washable
  - Wide variety to choose from
  - Corded and uncorded versions available
Push-in Earplugs

- Advantages
  - Easy to use
    - Quick and easy fit
    - No need to roll down like foam ear plugs
  - Reusable
  - Stem allows for better hygiene
    - Good for dirty environments since don’t touch part that goes in ear
  - Wide variety to choose from
  - Corded and uncorded versions available
Banded Hearing Protectors

- **Advantages**
  - Convenience
    - Ideal for people who take hearing protectors on/off
  - Easy to use
    - No need to roll down plugs
  - Economical
    - Reuse the band; replace the ear pads
  - Fits wide range of ear sizes
  - Hygiene benefits
Earmuffs

- Advantages
  - Easy to use
    - Few instructions needed
    - Easy to clean
  - Fit
    - Muffs fit nearly everyone
  - Convenience
    - Ideal for people who take HPDs on & off frequently
  - Comfort
    - Nothing inserted into ear
  - Multiple band options
    - Over-the-head, behind-the-head, helmet attached and folding
Earmuffs with Communications

- **Advantages**
  - Combines Hearing Protection and 2-Way Communication
  - Use alone or with existing radios.
  - Options
    - Listen only
    - 2-way communication
    - AM/FM Music player (limited to 82 dBA)
    - Bluetooth
    - Enhance ambient sound (2-5 dBA)
    - Military/Police tactical models
    - Fire Department
Fitting Hearing Protection Devices (HPD)
Fitting Foam Earplugs

Roll down earplug so it is:

*As small as possible*

*Crease free*
Fitting Ear Plugs

1. Reach over with opposite hand
2. Pull outer ear upwards to straighten out ear canal
3. Insert properly rolled down plug
Proper Insertion
Proper Fit
Inadequate Roll Down
Improper Insertion
Improper Fit
Improper Fit
Verifying Earplug Fit

- Remove plug and observe shape
  - $\frac{1}{2}$ to $\frac{3}{4}$ of plug should be curved like ear canal
Fitting a Pre-molded Earplug

- Move outer ear up while inserting plug
- Listen to noise-breaking seal
- Cup hands on/off
Checking Fit

- Fit plugs then step into noisy environment
- Cup your hands and place them over your ears making a seal against the side of the head
  - If the cupped hands over your ears reduce the sound level, then step out of the noise and refit the earplug.
Myth #1: “Hearing protectors prevent me from hearing important sounds.”

- Without hearing protectors, your hearing gets worse during the day.
- You can still see with sunglasses and you can still hear with hearing protectors
  - Hearing protectors allow you to hear sounds at a more comfortable level
Myth #2: “I’m used to loud noise, it doesn’t bother me.”

- Your hearing may be damaged already
  - It’s not too late to start wearing hearing protection

- The risk of damaging your hearing is unrelated to how sensitive you are to loud sounds
  - You can’t “toughen up” your ears
Myth # 3: “Wearing Hearing Protectors Part-Time is Better than Nothing.”

- Your risk of damaging your hearing due to noise increases dramatically after only a few minutes without hearing protection
  - There is no such thing as, “Partial Protection”
What is the Best Hearing Protector for You?

- The one you wear:
  - Correctly (fit)
  - Consistently (wear time)
Hearing Protection

Review Questions

1) Who is responsible for developing and implementing a hearing conservation program?
   a) OSHA
   b) Employer
   c) NIOSH
   d) Employee

2) What is the best hearing protector to use for welding?
   a) One worn correctly
   b) Ear plug
   c) Ear Muff
   d) One worn consistently
   e) A and D
Hearing Protection
Review Questions

3) True or False—Wearing hearing protectors part-time is better than nothing

4) What three things should you look for in a hearing protector?
   Performance, Comfort, Ease of Use

5) True or False—Hearing protectors prevent you from hearing important sounds.
Thank you!

Welding Health and Safety Topics

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