Listen Up

Safety Awareness Training for Noise and Hearing for the Construction Industry
What you will learn today

- Why awareness of noise hazards is important
- How to recognize loud noise levels
- How to reduce noise hazards
- The effects of noise on hearing
- Noise reduction techniques
- Hearing Protector Selection and Fitting
Noise at work

- 30 million workers are exposed to harmful levels
- 2nd most reported occupational illness
- Noise-induced hearing loss is irreversible – but 100% preventable
Noise + Acoustics

- Noise-Induced Hearing Loss
  - Causes no pain
  - Causes no visible trauma
  - Leaves no visible scars
  - Is unnoticeable in its earliest stages
  - Accumulates with each overexposure
    - Takes years to notice a change
How Loud is Too Loud?

Use a “2–3 Foot Rule”

If you have to raise your voice to have a conversation with someone an arms length away, it’s probably above the OSHA standard of 85 decibels.
Sound Measurement

- Sound Intensity – measured in decibels
- Small increases (3 decibels) doubles amount of noise and halves exposure time

Measuring devices:
- Sound Level Meter (SLM)
- Dosimeter
Exposure Limits

- 90 decibels during an 8 hour workday (permissible exposure limit – PEL)

- Exposure time allotted decreases with elevated exposure levels

<table>
<thead>
<tr>
<th>Duration per day (hours)</th>
<th>Decibels</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>90</td>
</tr>
<tr>
<td>6</td>
<td>92</td>
</tr>
<tr>
<td>4</td>
<td>95</td>
</tr>
<tr>
<td>3</td>
<td>97</td>
</tr>
<tr>
<td>2</td>
<td>100</td>
</tr>
<tr>
<td>1 1/2</td>
<td>102</td>
</tr>
<tr>
<td>1</td>
<td>105</td>
</tr>
<tr>
<td>1/2</td>
<td>110</td>
</tr>
<tr>
<td>1/4 or less</td>
<td>115</td>
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</table>
# Noise + Acoustics

<table>
<thead>
<tr>
<th>Household Noise</th>
<th>Occupational Noise</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>170 dB</strong></td>
<td><strong>160 dB</strong></td>
</tr>
<tr>
<td><strong>120 dB</strong></td>
<td><strong>115 dB</strong></td>
</tr>
<tr>
<td><strong>94 dB</strong></td>
<td><strong>100 dB</strong></td>
</tr>
<tr>
<td><strong>74 dB</strong></td>
<td><strong>85 dB</strong></td>
</tr>
<tr>
<td><strong>58 dB</strong></td>
<td><strong>60 dB</strong></td>
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</table>

**50 dB**
Comfortable
Can you Hear Me Now?

• Hearing Loss affects:
  – Quality of Life – family, listening to music, other activities
  – Ability to hear speech, warning signals, and sounds

• Cannot be cured

Hearing Loss is Totally Preventable!
Have You Had Hearing Loss?

- Warning signs:
  - Difficulty hearing people in groups or with background noises
  - People seem to be mumbling
  - Asking people to repeat what they have said
  - Trouble understanding people on the phone
  - Ringing or noises in the ears
  - Back-up alarms or cell phone are difficult to hear
Recognizing Non-Occupational Hazardous Noise

- Noisy Hobbies
  - Loud music
  - Firearms
  - Car/motorcycle race track
  - Sporting events
  - Loud speakers

- Household noises
  - Crying babies
  - Vacuum
  - Lawn mower
  - Power tools
  - Ipod/Boom box
How We Hear Sounds

- Sound waves enter the ear canal striking the eardrum.
- When eardrum vibrates, ossicles conducts vibrations to the cochlea.
- Tiny hairlike cells in cochlea respond to vibrations by generating nerve impulses.
- Brain interprets nerve impulses as sound.

Note: Healthy hair cells are the key to good hearing. Although, some die off naturally as you age, many more are killed early, from unprotected exposure to hazardous noise.
Anatomy and Physiology of Healthy Ear
Effects of Noise on Hearing

Note: How quickly hearing loss takes place depends on the **intensity** of the noise, its **duration**, and **how often** the exposure occurs.
How Hearing is Damaged

- Hairlike cells are flattened.
- You do not get used to noise; you gradually lose your hearing.
- Once hearing is damaged, it cannot be repaired or replaced.
How Does It Occur?

- Cilia (hairs) that receive the highest frequencies are damaged first
Anatomy and Physiology of Damaged Ear

Healthy Hair Cells

Damaged Hair Cells
Construction Work Sites – Noise

Saws
Jackhammers
Nailguns
Hand Tools
Grinders
Sanders

Generators
Find Quieter Ways

Examples:

- Maybe you can use a hydraulic cutter or Porta-band in place of an abrasive saw, especially when cutting metal.
- Or, instead of punching holes in decking or sheet metal, use a drill.
- Consider alternative types of fasteners to powder actuated tools.
Move Noisy Equipment

- An air compressor does not have to be within arms length. It can be placed hundreds of feet away. All it takes is one extra length of air hose.
What could be done here?
Problems in getting hearing conservation into construction

- Mobile work force
- Companies mandate hard hats & safety glasses, not as consistent about ear plugs & muffs
- The ears do not bleed, can not see the injury
Reasons workers do not use hearing protectors:

- Fear of not hearing warning signals & voices (especially if hearing protection is more than needed)
- Uncomfortable to wear all day
- Benefit not readily apparent (hearing loss is gradual)
- More immediate hazards on job site
Hearing Protection Selection

- Convenience
- Comfort
- Communication needs
- Hygiene
- Noise Reduction
- Hearing ability
- Noise Level
Care and Maintenance

- **Foam plugs**: Use them when they look like they are new, or get new ones.
- **Earmuffs**: Wipe down with a damp cloth, or remove the cushions and wash in soapy water. Cushions should be replaced if torn or cracked. Replace entire muff if headband is sprung.
- **Custom**: Replace every 3–5 years. Wash in mild soapy water.
- **Pre-molded**: Replace the earbuds if they are dirty or damaged.
How much protection?

0 dB
EAR #1

0 dB
EAR #2

33 dB
EAR #3

Fitting Tips
Fitting Tips

Roll-Down Foam Earplugs

1. Roll
   entire earplug into a crease-free cylinder

2. Pull Back
   pinna by reaching over head with free hand, gently pull top of ear up and out

3. Insert
   earplug well into ear canal and hold until it fully expands
Fitting Tips

Multiple-Use Earplugs

1. Reach
While holding the stem, reach hand overhead and gently pull top of ear up and back.

2. Insert
Insert earplug so all flanges are well inside the ear canal.

3. Fit
If properly fitted, only the stem of the earplugs should be visible to someone looking at you from the front.
Fitting Tips
Visual + Acoustical Checks

1. Visual Check
The earplug should sit well inside the ear canal and not stick out.

2. Acoustical Check
Cup hands over ears and release. Earplugs should block enough noise so that covering your ears with hands should not result in a significant noise difference.
Video Training

- Watch Video on proper method of inserting earplugs
  - [http://www.youtube.com/watch?v=0LR0MDg9fIM&noredirect=1](http://www.youtube.com/watch?v=0LR0MDg9fIM&noredirect=1)
Fitting Tips

Earmuff Instructions

1. Place earcups over each outer ear
2. Adjust the headband by sliding the headband up or down at the attachment buttons
3. The ear cushions should seal firmly against the head
Noise Reduction Rating (NRR)

- A hearing protector's ability to reduce noise.
- The greater the NRR, the better the noise reduction.
- Listed on the hearing protector box.

<table>
<thead>
<tr>
<th>Noise Reduction Rating</th>
<th>29 DECIBELS</th>
</tr>
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<tbody>
<tr>
<td>(When used as directed)</td>
<td></td>
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</table>

THE RANGE OF NOISE REDUCTION RATINGS FOR EXISTING HEARING PROTECTORS IS APPROXIMATELY 0 TO 30 (HIGHER NUMBERS DENOTE GREATER EFFECTIVENESS)

<table>
<thead>
<tr>
<th>NMC Company</th>
<th>Model Earplug</th>
</tr>
</thead>
</table>

Federal Law prohibits removal of this label prior to purchase. EPA LABEL REQUIRED BY U.S. EPA REG. 40 CFR PART 211 Subpart B
OSHA NRR Adjustment Calculation

**NRR – 7**

**For example...**

**Ear plugs with a listed NRR of 29...**

**29 – 7 = 22**
## NIOSH NRR Adjustment Calculation

<table>
<thead>
<tr>
<th>Type</th>
<th>Adjustment Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earmuffs</td>
<td>Subtract 25% from the manufacturer’s adjusted NRR</td>
</tr>
<tr>
<td>Formable Ear Plugs</td>
<td>Subtract 50% from the manufacturer’s adjusted NRR</td>
</tr>
<tr>
<td>All Other Ear Plugs (Canal Caps)</td>
<td>Subtract 70% from the manufacturer’s adjusted NRR</td>
</tr>
</tbody>
</table>

*Note: NRR stands for Noise Reduction Rating.*
Dual Hearing Protection

Formable Ear Plugs
Listed NRR = 29
Adjusted NRR (29 – 7) = 22

Earmuffs
Listed NRR = 16
Adjusted NRR for Dual Protection = 5

22
(Adjusted NRR)

+ 5 = 27
(Dual Protection NRR)
How Do You Protect Employees?

- Plan Ahead
- Communicate with employees and contractors
- Identify task and tools where high noise may be generated
- Try to engineer out loud noise (ex. tools, generator)
- Schedule tasks when fewer people are working
- Tool maintenance
NOISE AND HEARING LOSS PREVENTION

Occupational hearing loss is the most common work-related illness in the United States. Approximately 22 million U.S. workers are exposed to hazardous noise levels at work, and an additional 9 million are exposed to ototoxic chemicals. An estimated $2.42 billion is spent annually on workers’ compensation for hearing loss disability.

NIOSH recommends removing hazardous noise from the workplace whenever possible and using hearing protectors in those situations where dangerous noise exposures have not yet been controlled or eliminated.

Learn About Workplace Noise and Hearing Loss

- Facts and Statistics
- Hearing Loss Prevention
- Publications and Tools
- National Goals, Policies, and Standards
NOISE AND HEARING LOSS PREVENTION

Noise Meter
Play around with the Noise Meter and hear the different sounds and sound intensities of everyday objects. The red bar below shows how long it takes before a particular sound level becomes dangerous to the human ear. 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!

Weakest Sound Heard
Whisper
Normal Conversation
Ringing Telephone
Power Lawn Mower
Belt Sander
Tractor
Hand Drill
Impact Wrench
Bulldozer
Spray Painter
Continuous Miner
Chain Saw
Jackhammer
Ambulance Siren
Jet Engine at Takeoff
12-Gauge Shotgun
Rocket Launch

Exposures > 85 dB may cause hearing loss

Download Noise Meter (.exe file)
Download and play the Noise Meter file on any computer, even if Flash is not installed.
Order your free booklet from OSHA.gov or download it directly from the “Publications” page.

Summary

- Constant exposure to loud noise can cause hearing damage.
- Hearing loss can not be cured or repaired.
- Hearing protection devices include ear plugs, ear muffs, and canal caps.
Thank You

- It is important that these trainings meet your needs so we ask that you complete one 10-question course evaluation for each facility, location, or organization that participated.

- Course evaluation can be located at:
  - [https://www.surveymonkey.com/s/KWS7GR5](https://www.surveymonkey.com/s/KWS7GR5)
“Listen Up”
Noise and Hearing Awareness
QUIZ

If you have to raise your voice to be heard more than __2__ or __3__ feet away, it is probably too loud.

Hearing damage can easily be repaired with surgery.

True or False

2
3
Name two off–work activities that may expose you to high–noise levels:

- Shooting/firearms
- Listening to loud music

Name two types of hearing protection:

- Ear plugs
- Ear Muffs
A noise dosimeter is used to test an employee’s hearing capability. 

True / False – Doisimeters are used to measure sound levels

Describe one of the ways noise impacts the workplace. Employees may not be able to hear warning signals
Noise induced hearing lose is usually very painful?
   True    /    False

Name one way to control noise exposure:
  __Enclose or wrap equipment_________
“Listen Up”
Noise and Hearing Awareness
QUIZ

Describe a sign of hearing loss: ________________
Difficulty hearing people in groups or with background noises

Name one tool/equipment that is very loud: 
Compressor, Chop Saw, Generator, Jackhammer, Grinders