NOISE AND ACOUSTICS

on the job ..... and off the job.
NOISE AND 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 over-exposure
- Takes years to diagnose

Is permanent and 100% preventable
## NOISE AND ACOUSTICS

<table>
<thead>
<tr>
<th>Household Noise</th>
<th>Occupational Noise</th>
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</thead>
<tbody>
<tr>
<td>170 dB</td>
<td>160 dB Immediate Physical Damage</td>
</tr>
<tr>
<td>120 dB</td>
<td>115 dB Unprotected Noise Exposure of Any Duration Not Permitted Above This Level</td>
</tr>
<tr>
<td>94 dB</td>
<td>90 dB Hearing Protection Required by OSHA</td>
</tr>
<tr>
<td>74 dB</td>
<td>85 dB Ear Damage Possible</td>
</tr>
<tr>
<td>58 dB</td>
<td>50 dB Comfortable</td>
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</tbody>
</table>
How do I know if the noise levels are hazardous?

If you must shout to be understood over the background noise when standing about one arm-length away from somebody, that background noise is hazardous.
Time-Weighted Average

Permissible Exposure Limits

90 dB  8 hrs
OSHA STANDARD

Time-Weighted Average

Permissible Exposure Limits

95 dB

4 hrs
HOW WE HEAR
HOW WE HEAR

- Sound waves cause the eardrum to vibrate
- Bones in middle ear transmit vibrations to cochlea
- Receptors (hair cells) in cochlea convert vibrations to electrical energy
- Brain interprets these electrical impulses as sound
HOW WE HEAR

- Nerve cells in the cochlea are tuned to specific frequencies
- Base of the cochlea is sensitive to high frequency sounds
- Tip of the cochlea is sensitive to low frequency sounds
HOW WE HEAR

17-year old girl
• Low noise exposure
• Normal cochlea
• Receptors intact

76-year old man
• Low noise exposure
• Fewer receptors but still intact

59-year old man
• High noise exposure
• Damaged cochlea
• Receptors destroyed
HOW WE HEAR

High-frequency
HPD SELECTION
HPD SELECTION
Common Objections to Wearing HPDs

“I already lost some of my hearing, so why should I wear them?”

“Can I hurt my eardrums if I insert a plug to deeply.”

“I don’t need them, I am used to the noise.”

“My machine sounds different.”

“I can’t hear my co-workers if I wear them.”

“Hearing protectors are uncomfortable.”

“Won’t I get an ear infection?”

“I can always get a hearing aid.”
FITTING TIPS
Find the Right Size

Maximum protection is only accomplished when an earplug acoustically seals in the ear canal.

No earplug fits all ear canals, so manufacturers have responded with a variety of sizes.

It is important to find your right size to obtain an acoustic seal.
FITTING TIPS
ROLL-DOWN FOAM

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
If properly fitted, the end of the earplugs should not extend beyond the tragus (flap of the ear canal).
NO-ROLL FOAM EARPLUGS

1. Reach
   over head with free hand, pull ear up and back and insert earplug well inside ear canal.

2. Earplugs
   should be inserted as shown in these drawings. Stop pushing earplug when finger touches the ear.

3. If properly fitted, the end of the earplugs should not be visible to someone looking at you from the front.
MULTIPLE-USE EARPLUGS

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

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

3. If properly fitted, only the stem of the earplugs should be visible to someone looking at you from the front.
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.
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
EARMUFF INSTRUCTIONS – DON’TS

For best results, remove all hair from underneath earcup.

Ensure that the earcup creates a seal and covers the ear completely.
PRODUCTS
PRODUCTS
Types of Hearing Protectors

Earplugs
- Single-Use
- Multiple-Use
- Detectable

Banded Protectors
- Banded Earplugs
- Canal Caps

Earmuffs
- Standard (Headband)
- Cap-Mounted
- Electronic
- Special Application
PROS AND CONS OF HPDs – EARPLUGS

**PRO**
- Comfortable for extended use
- Disposable earplugs available
- Cooler in hot/humid environments

**CON**
- Attenuation highly dependent upon good fit
- Hygiene issues in dirty environments
CARE & MAINTENANCE OF HPDs – EARPLUGS

• Dispose of single-use earplugs daily
• Clean multiple-use earplugs with mild soap and water, dry thoroughly
• Inspect multiple-use earplugs for dirt, cracks or hardness, replace if damaged
PROS AND CONS OF HPDs – BANDED EARPLUGS

PRO
• Very convenient for intermittent noise
• Readily available around neck when not in use

CON
• Lower attenuation than most earplugs
• Some noise transmission through band
CARE & MAINTENANCE OF HPDs – BANDED EARPLUGS

• Clean and replace pods regularly
PROS AND CONS OF HPDs – EARMUFFS

PRO
• Easy to get proper fit
• Good for intermittent noise
• Radio & electronic options

CON
• Can feel hot/heavy with extended wear
• Compatibility with other PPE?
CARE & MAINTENANCE OF HPDs – EARMUFFS

- Clean ear cushions and headband regularly with mild soap and water
- Replace ear cushions and foam inserts every 6 months with normal wear, more often with heavy use or under humid/extreme conditions
Hearing Loss Due To Noise Exposure Is …

Painless
Permanent
Progressive

... and very PREVENTABLE!
THE END