

**MINING HEARING LOSS**

**PREVENTION WORKSHOP**

**SEPTEMBER 26, 2006  
SALT LAKE CITY, UTAH**



# **Introduction to Noise-Induced Hearing Loss**

## **R. J. Matetic**

*The findings and conclusions in this presentation have not been formally disseminated by the National Institute for Occupational Safety and Health and should not be construed to represent any agency determination or policy.*



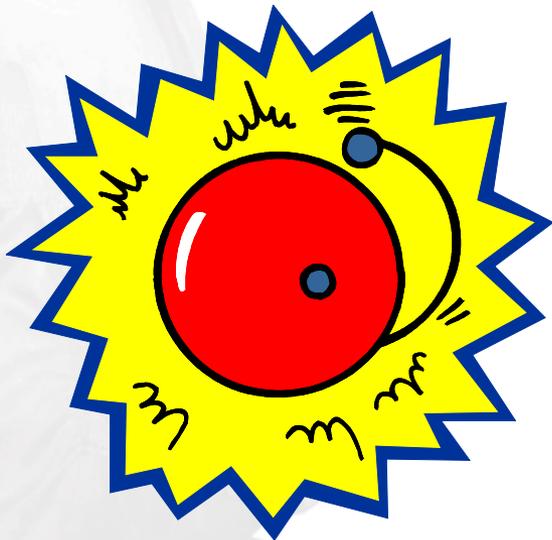
**SAFER • HEALTHIER • PEOPLE™**

# Overview

- The problem: Noise-Induced Hearing Loss
- Engineering noise controls (and the rest of the hierarchy)
- Workshop plan
  - Practical, effective noise control principles  
*Industry, NIOSH, MSHA*
  - Apply the principles to real problems  
*Hands-on exercises*

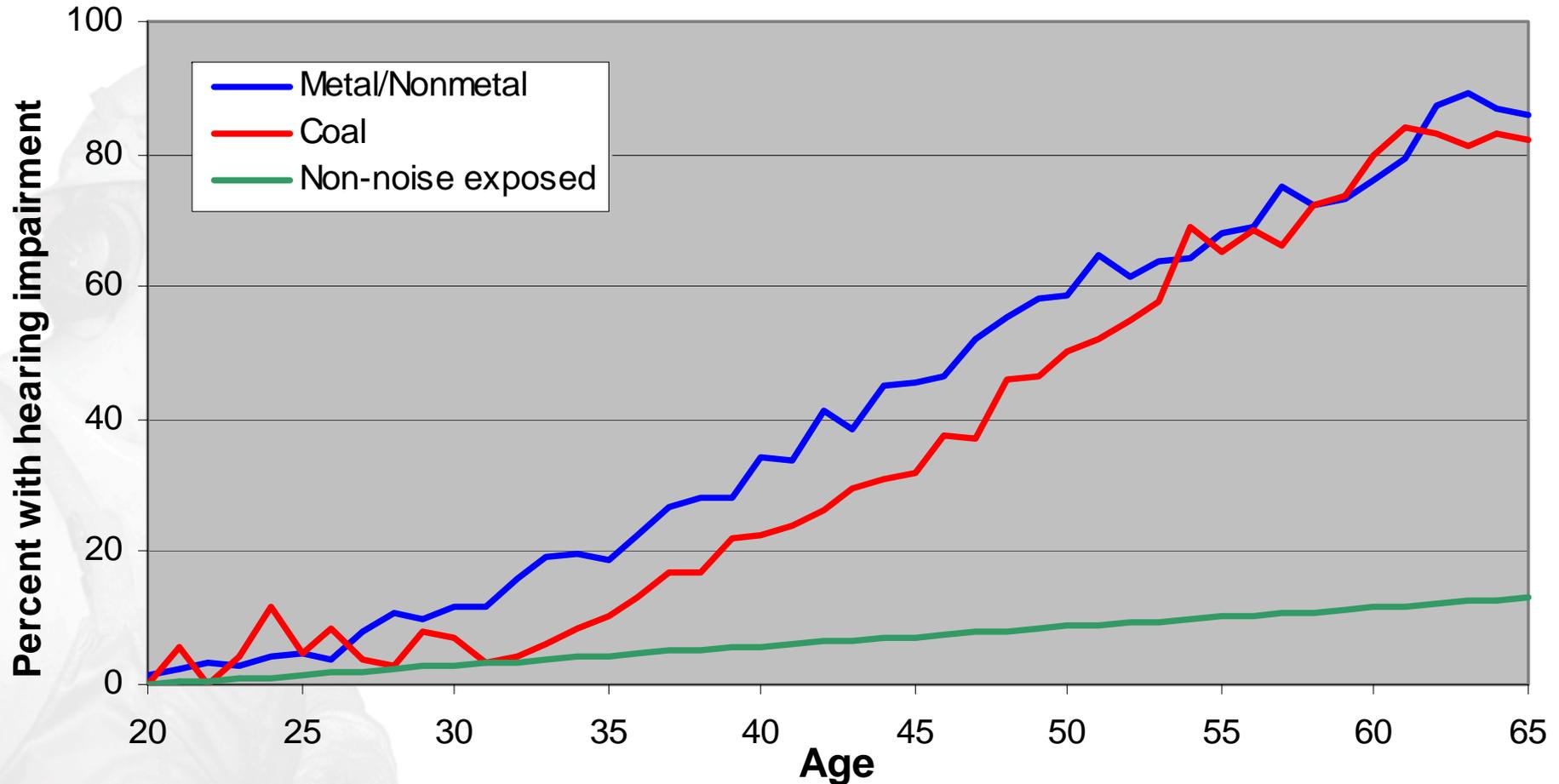
# Why Noise is Bad for You

- It causes *permanent* hearing loss



- It makes your ears **ring** all the time

# Miners Suffer Higher Rates of Hearing Impairment than Non-exposed Males



Impairment: > 25 decibel hearing loss (averaged over 4 frequencies in each ear)

**Source: John Franks, NIOSH**

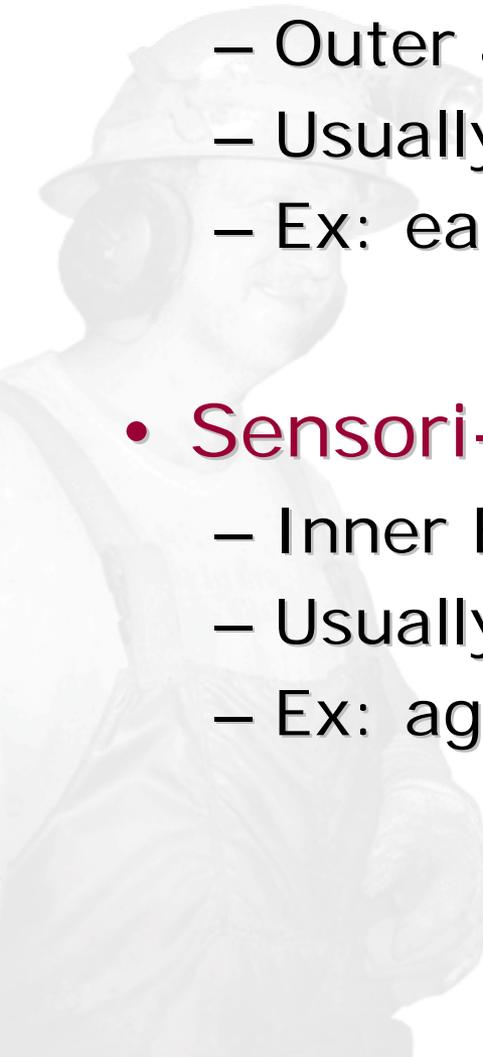
# Hearing Loss Types

- Conductive

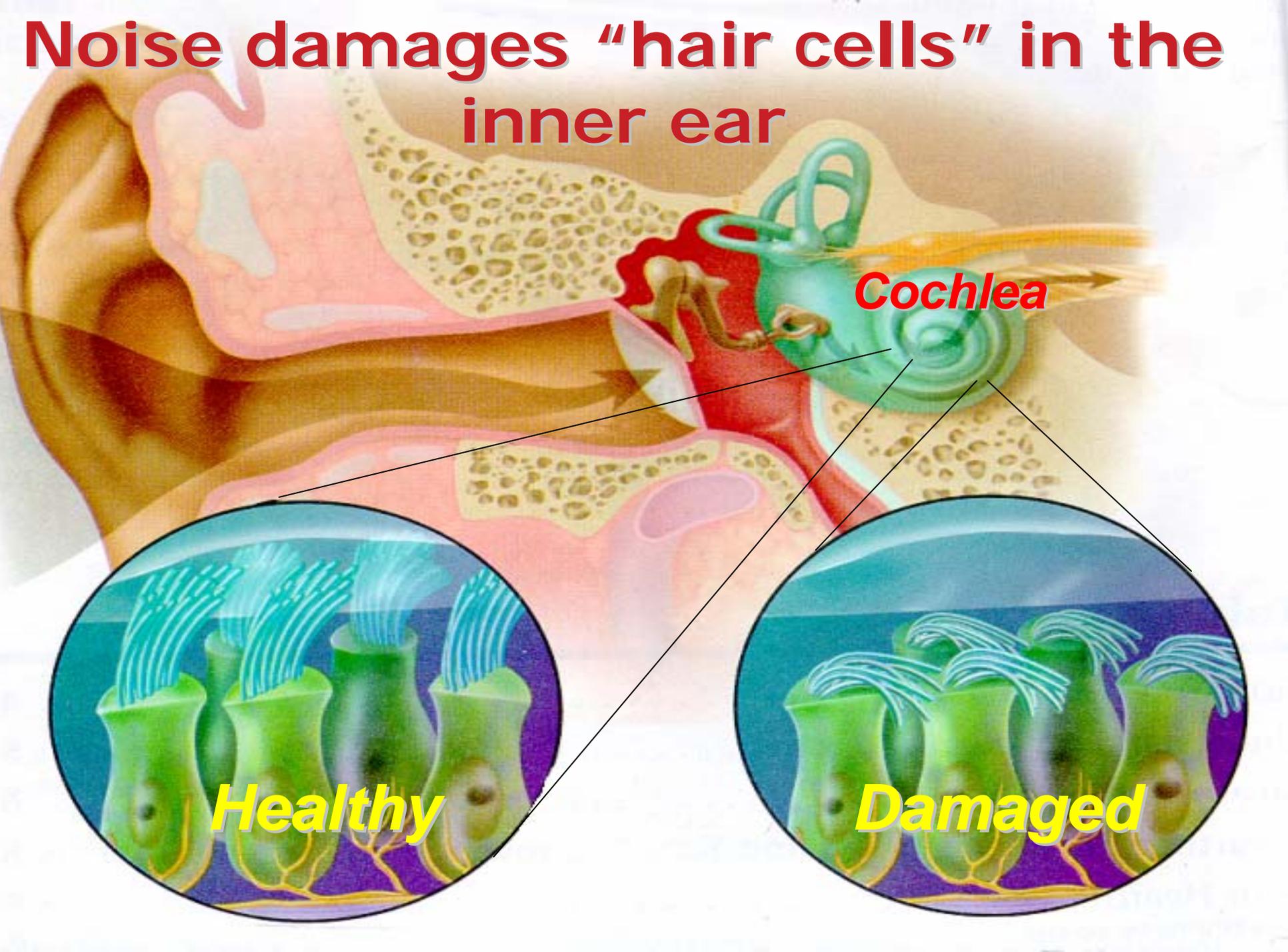
- Outer and Middle Ear
- Usually low frequency, correctable
- Ex: earwax, hole in eardrum, head cold

- Sensori-neural

- Inner Ear
- Usually high frequency, not correctable
- Ex: aging, diseases, medications, **noise**



# Noise damages "hair cells" in the inner ear



**Cochlea**

**Healthy**

**Damaged**

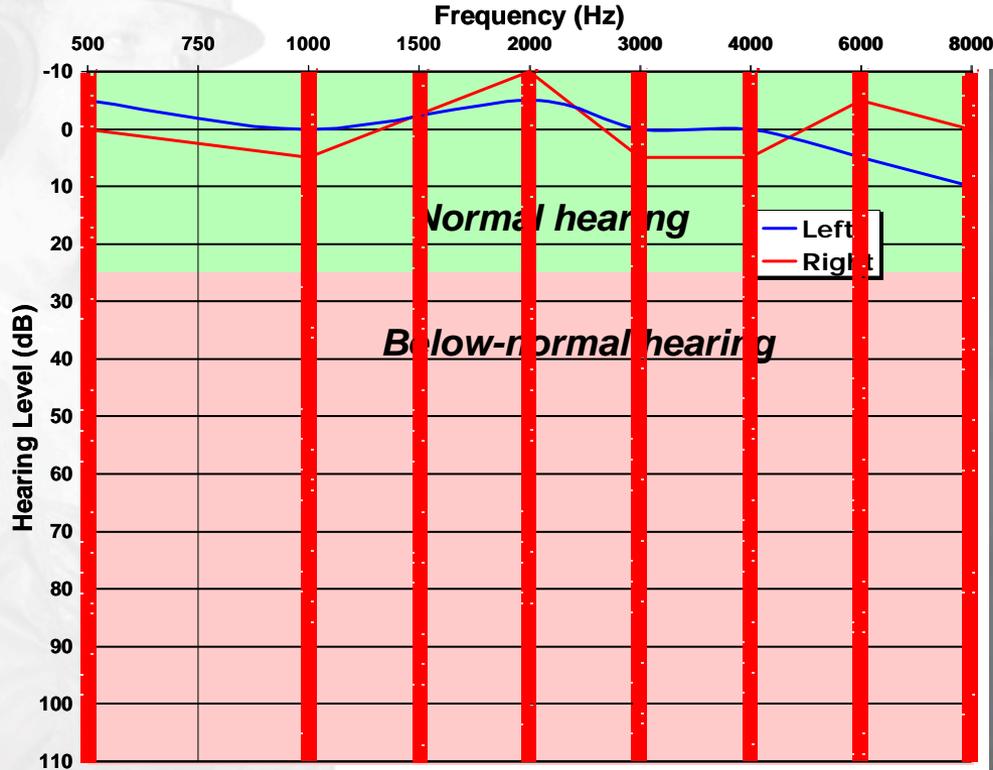
# This Is Your Ear...



# This Is Your Ear on Noise...

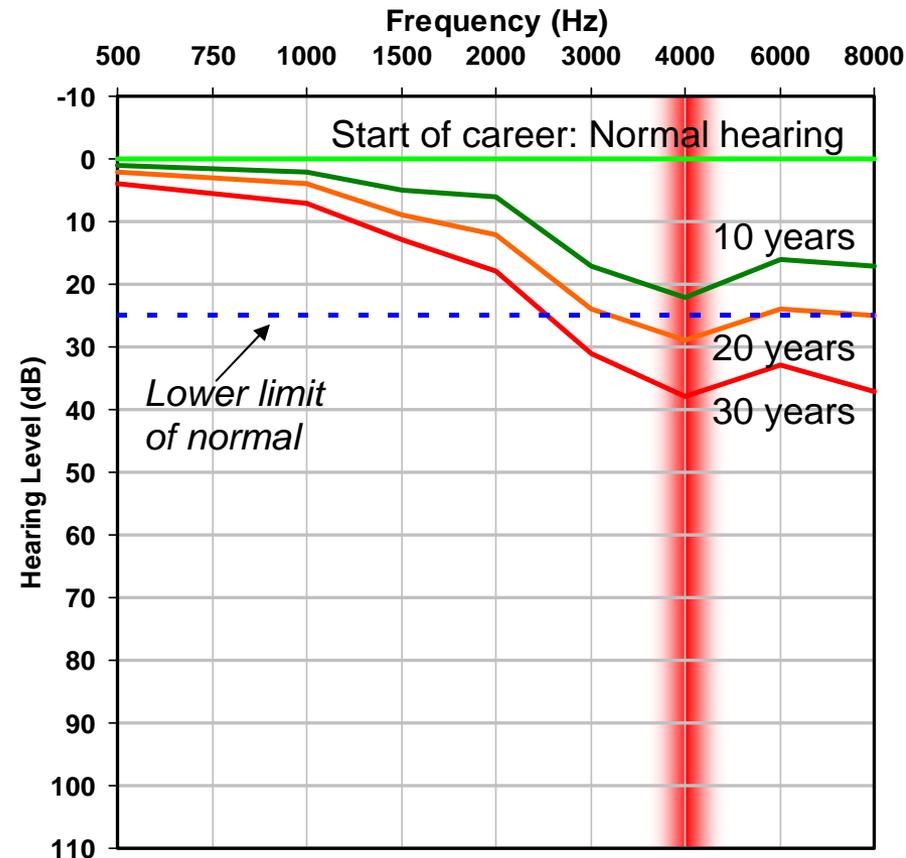


# Hearing is measured with an *audiogram*



# Effect of loud [95dB(A)] noise over a career\*

- Noise-induced loss greatest at 4000 Hz
- *Some* of this hearing loss is due to aging, but **most** is due to **noise**

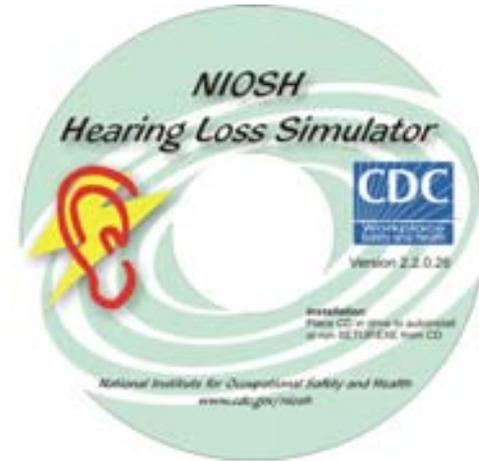


\*(estimated based on ANSI S3.44 standard)

# What Does a Noise-Induced Hearing Loss Sound Like?

## NIOSH Hearing Loss Simulator

- Windows-based software
- Trainees can hear the effect of noise exposure

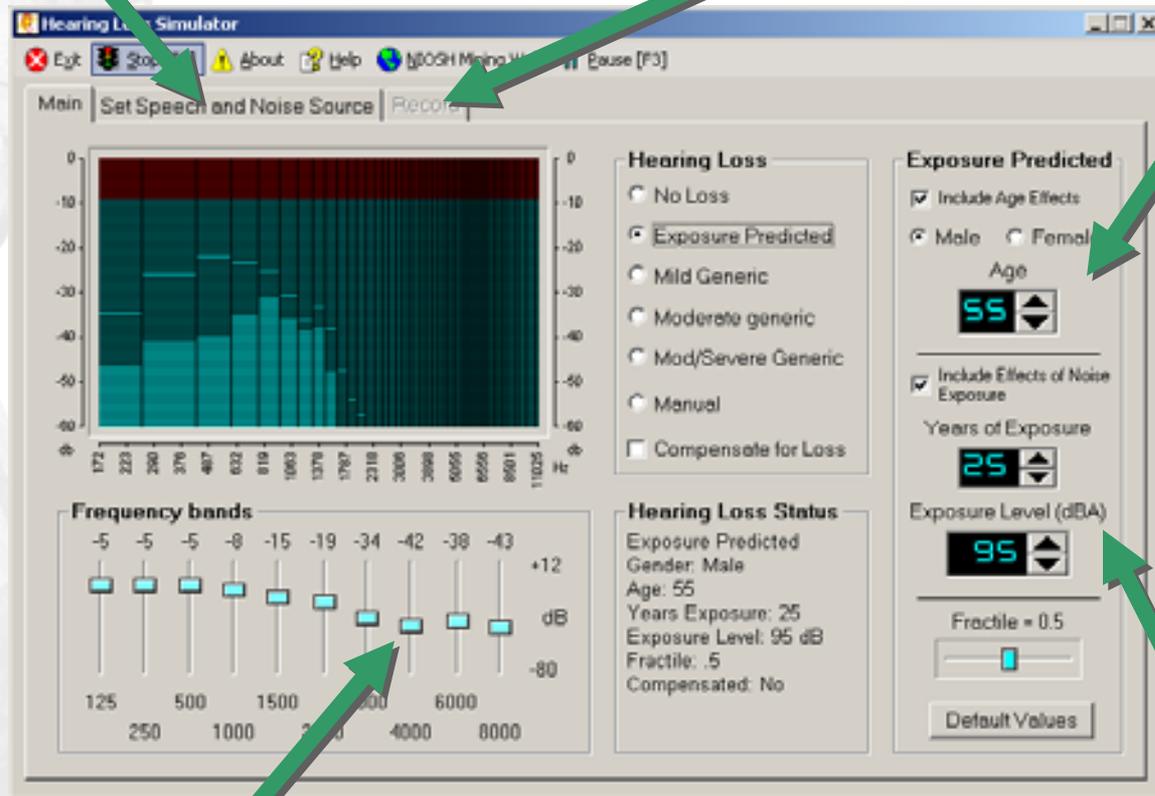


# NIOSH Hearing Loss Simulator Features

Select voice, background noise

Record your own sounds

Adjust age effects



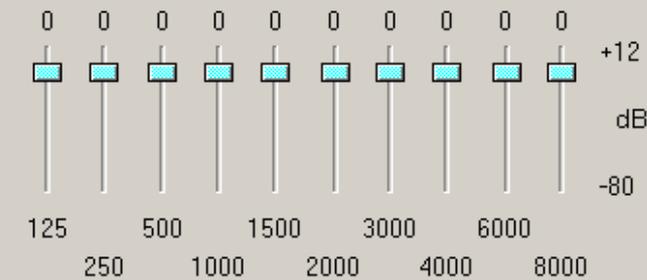
Predicted hearing level – Shows noise “notch”

Adjust exposure time and sound level

# NIOSH Hearing Loss Simulator

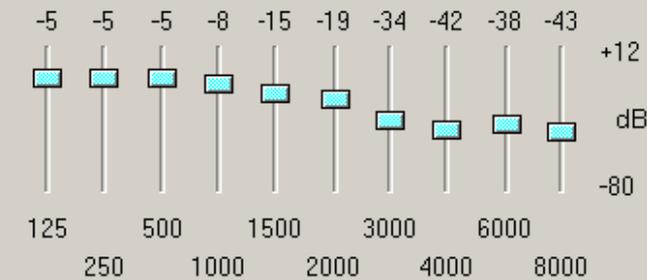
Simulates effects of exposure, age, sex based on ANSI S3.44 method

Frequency bands



***Normal***

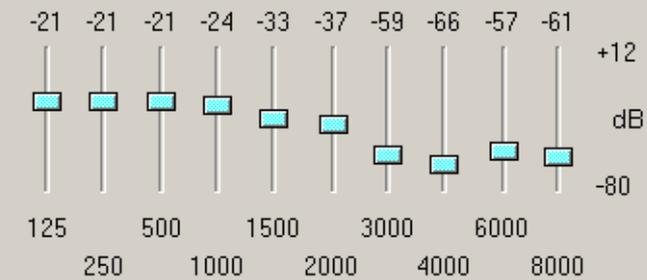
Frequency bands



***Impaired***

**25 years of 95 dB(A) exposure, 55-year old worker – noise “notch” at 4,000Hz**

Frequency bands



***Severely Impaired***

**25 years of 105 dB(A) exposure, 55-year old worker – noise “notch” at 4,000Hz**



Click to stop sound

# What workers tell us:

***"My dad worked at [company] for thirty-something years and I hope I don't end up like him. You got to scream for him to hear you."***

***"It's almost like you're mad at yourself because why can he hear? He works in the same atmosphere; why can he hear and I can't?"***

***"...machine backing up, beeping the safety alarm or something, you might not hear"***

***"...you can't hear that little whistling noise, something that's a little bit out of the ordinary, it could be very dangerous."***

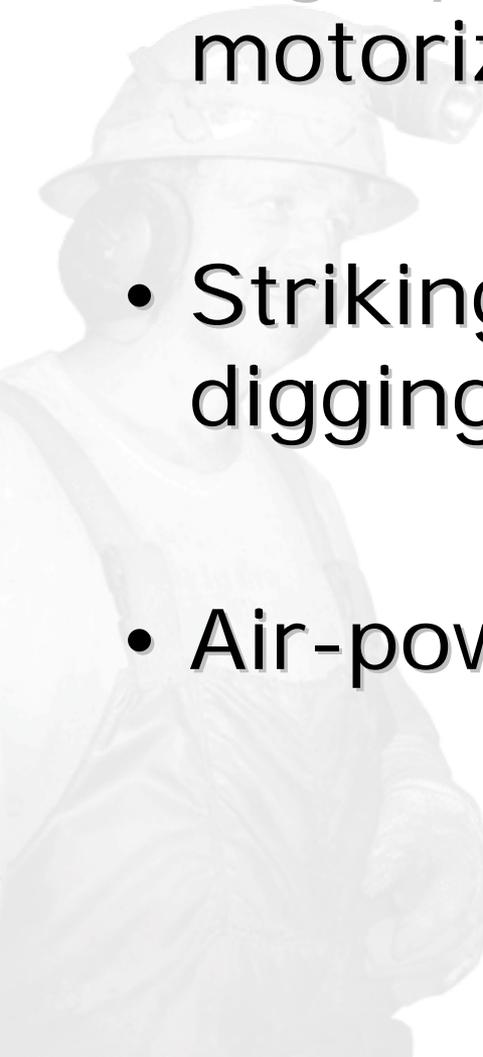
***"It seems like new people...they're the ones that might get hurt"***

***"Loss of hearing could put you or maybe your buddy in jeopardy if you don't see something or hear something"***



# Where Hazardous Noise Comes From

- High-powered motorized equipment
- Striking, drilling, digging
- Air-powered tools



# When is Loud TOO LOUD?

- Risk of damage starts at **85 decibels** (dB(A)) or higher
- Longer exposure times increases your risk
- Measure with instruments or....
- Look for warning signs
  - Too loud for conversation 3' away
  - Everything sounds "dull"
  - Ears "ring"

# Typical Noise Levels



Heavy duty dozer

**99 dB(A)**

Light duty: **96dB(A)**



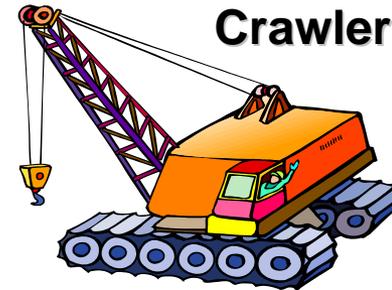
Continuous  
mining  
machine

**102 dB(A)**



Air rotary drill rig  
(no cab)

**99 dB(A)**



**Crawler crane**

Over 35 ton, non-insulated cab: **97 dB(A)**

Under 35 ton, non-insulated cab: **94 dB(A)**

insulated cab: **84 dB(A)**

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# Practical Hearing Loss Prevention

## *Using the hierarchy of controls*

- ***First:*** Get rid of the noise  
***Engineering controls***
- ***Second:*** Stay away from the noise  
***Administrative controls***
- ***Third:*** Protect yourself from the noise  
***Personal protective equipment***

***How can workers and manager use these controls?***



# *First:* Get rid of the noise

## *“Engineering controls”*

- Keep doors SHUT
  - *Reduces noise by 10-20 dB(A)*
- Maintain cab seals
- Take care of mufflers and other controls
- Report worn or broken noise controls



## *Then: Stay away* from noise



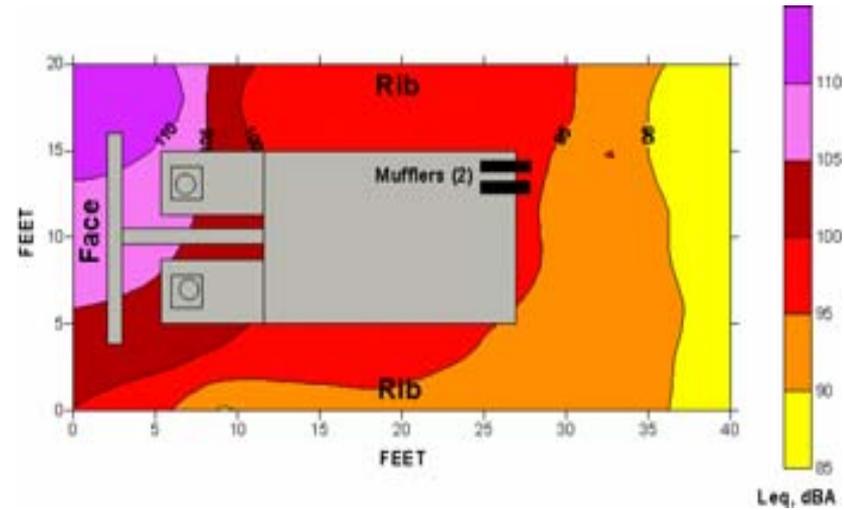
- Have a hearing conservation program? *Ask for list of “**administrative controls**”.*
- Noisy and you don't have to be there?  
*Leave!*
- Have a noisy task?  
*Break it up!*

# NIOSH Studies for Administrative Controls

## Identification of...

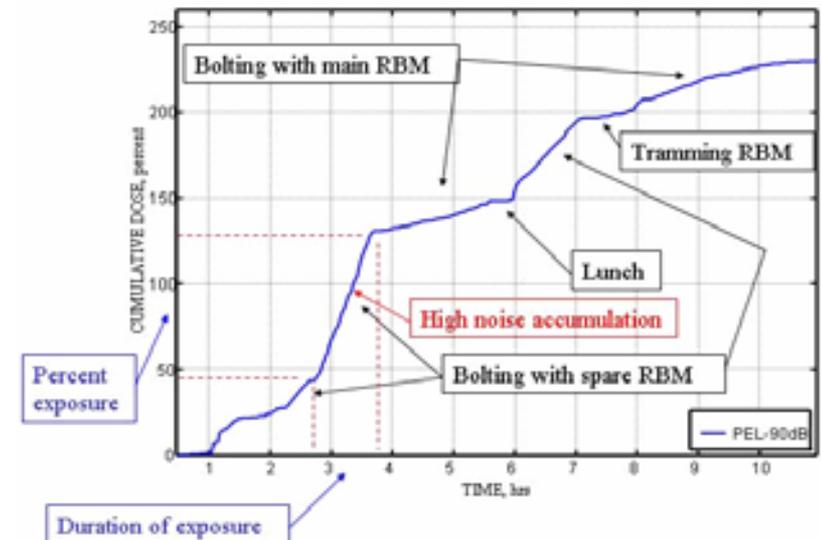
### Hazardous areas

*Sound level contour plot for a dual-boom roof bolting machine*



### Hazardous tasks

*Cumulative dose plot for a roof bolter operator*



# *Finally: Protect your ears:*

- Noise high, but hearing protection low:  
For instance: only **48%** of sand & gravel miners *ever* use it! (*Deborah Landen, 2004*)
- Find comfortable hearing protection
  - Muffs, plugs, canal caps
- Learn to wear them correctly
- Practice listening through protection
  - Hard, but easier than listening through damaged ears!
- ***Don't go into noise without it!***



# NIOSH Roll-Pull-Hold earplug technique

You've heard of: ***Stop, Drop, Roll***

Now there's ***Roll, Pull, Hold***



**Roll**



**Pull**



**Hold**

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# For more information

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**[www.cdc.gov/niosh/mining](http://www.cdc.gov/niosh/mining)**

**[www.cdc.gov/niosh/topics/noise](http://www.cdc.gov/niosh/topics/noise)**



The screenshot shows a web browser window displaying the NIOSH website. The page title is "Noise and Hearing Loss Prevention". The header includes the CDC and NIOSH logos, along with navigation links like "CDC Home", "CDC Search", and "CDC Health Topics A-Z". The main content area features a large image of a worker wearing a hard hat and earplugs, with the text "Approximately 30 million workers are exposed to hazardous noise on the job". Below this image is a table with three columns: "About H&LP", "What's New in H&LP", and "Workplace Solutions". The "About H&LP" column lists topics like "Common Hearing Loss Prevention Terms", "How do I choose a hearing protector?", and "How loud is a environment? Is the noise there?". The "What's New in H&LP" column lists "National Toxicology Agency News, Mar. 15-17, 2004" and "American Academy of Audiology Presents Position Statement on NPL". The "Workplace Solutions" column lists "Hearing Conservation Programs" and "Hearing Protector Lens Comparison". To the right of the table is a sidebar with the heading "Noise and Hearing Loss Prevention" and the acronym "H&LP". Below this is a "Topic Index" section with links for "H&LP Home", "What's New in H&LP", "Learn More about Hearing Loss Prevention", "Workplace Solutions for Noise", "Recently Asked Questions", "Current Research on Noise and Hearing Loss", "Publications and Resources", "Site Map", and "Questions & Comments?". At the bottom of the page, there is a footer with links for "NIOSH Home", "NIOSH Search", "Site Index", "Topics A-Z", and "Contact Us".