



# **NOISE-INDUCED HEARING LOSS IN THE CONSTRUCTION INDUSTRY**

**For ACCSH Meeting 3/15/01**

**Carol Merry Stephenson, Ph.D.**

**Mark Stephenson, Ph.D.**

**National Institute for Occupational Safety & Health  
Centers for Disease Control & Prevention**



# OVERVIEW

- **Review of the problem**
- **Highlights from recent and ongoing research**
- **What's new in technology and at NIOSH?**

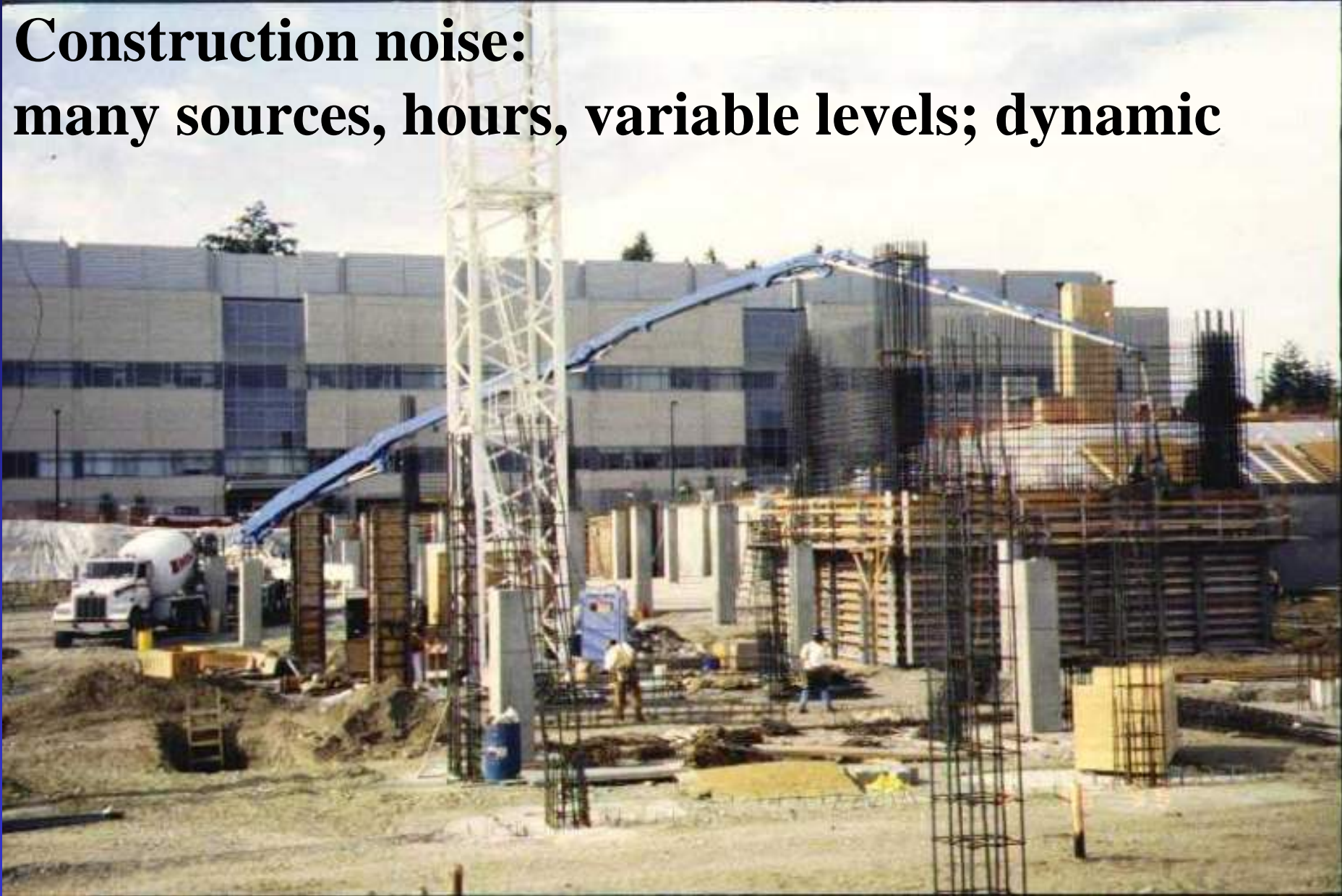
# HOW BIG IS THE PROBLEM?

**Hearing loss from noise is the most common occupational illness (NIDCD), and the 2nd-most self-reported occupational illness for American workers.**

**NIHL accounts for about 1 in 5 losses severe enough for a person to report trouble hearing (AAA).**



**Construction noise:  
many sources, hours, variable levels; dynamic**

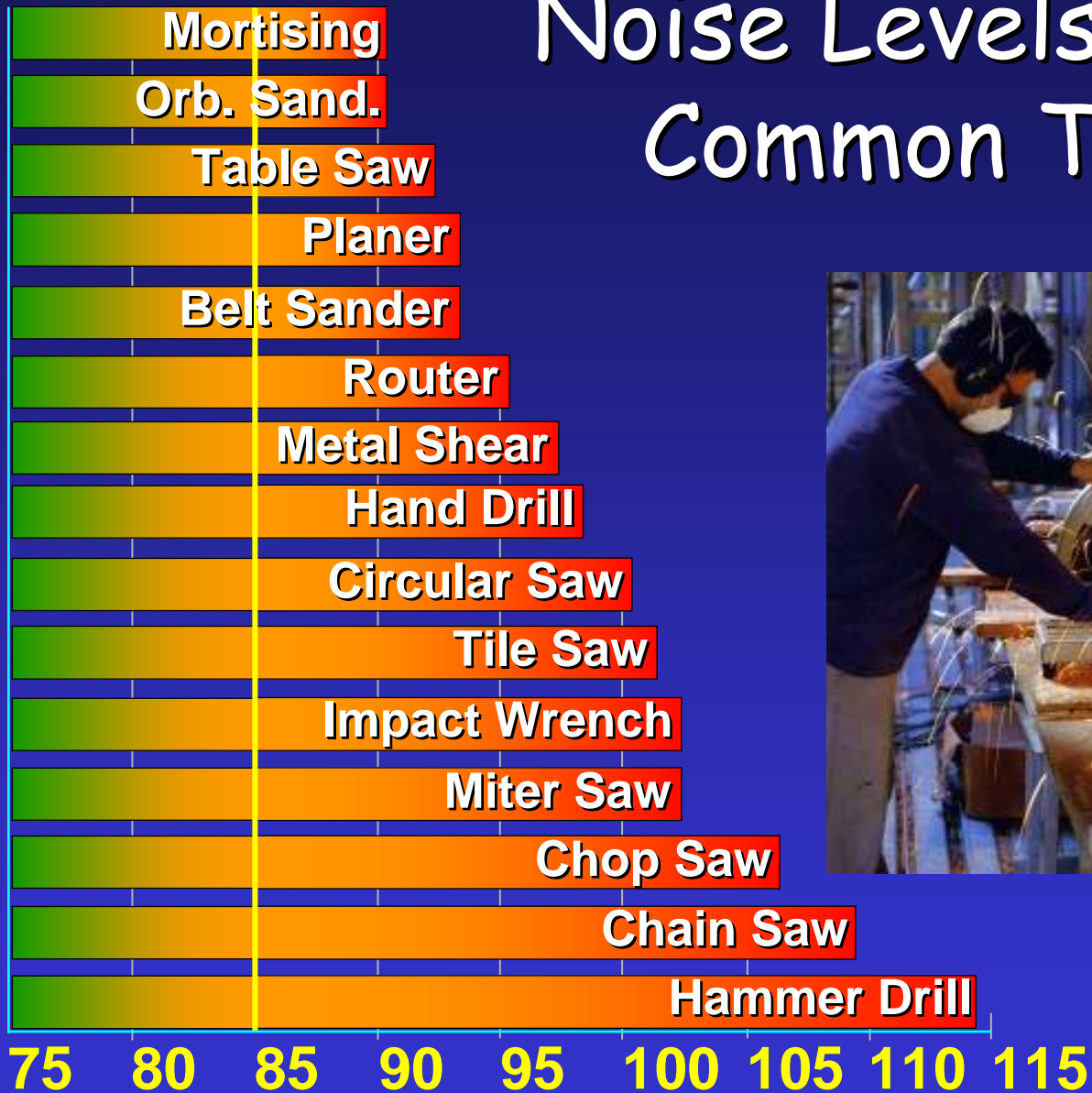


# Which Construction Workers are at Risk?

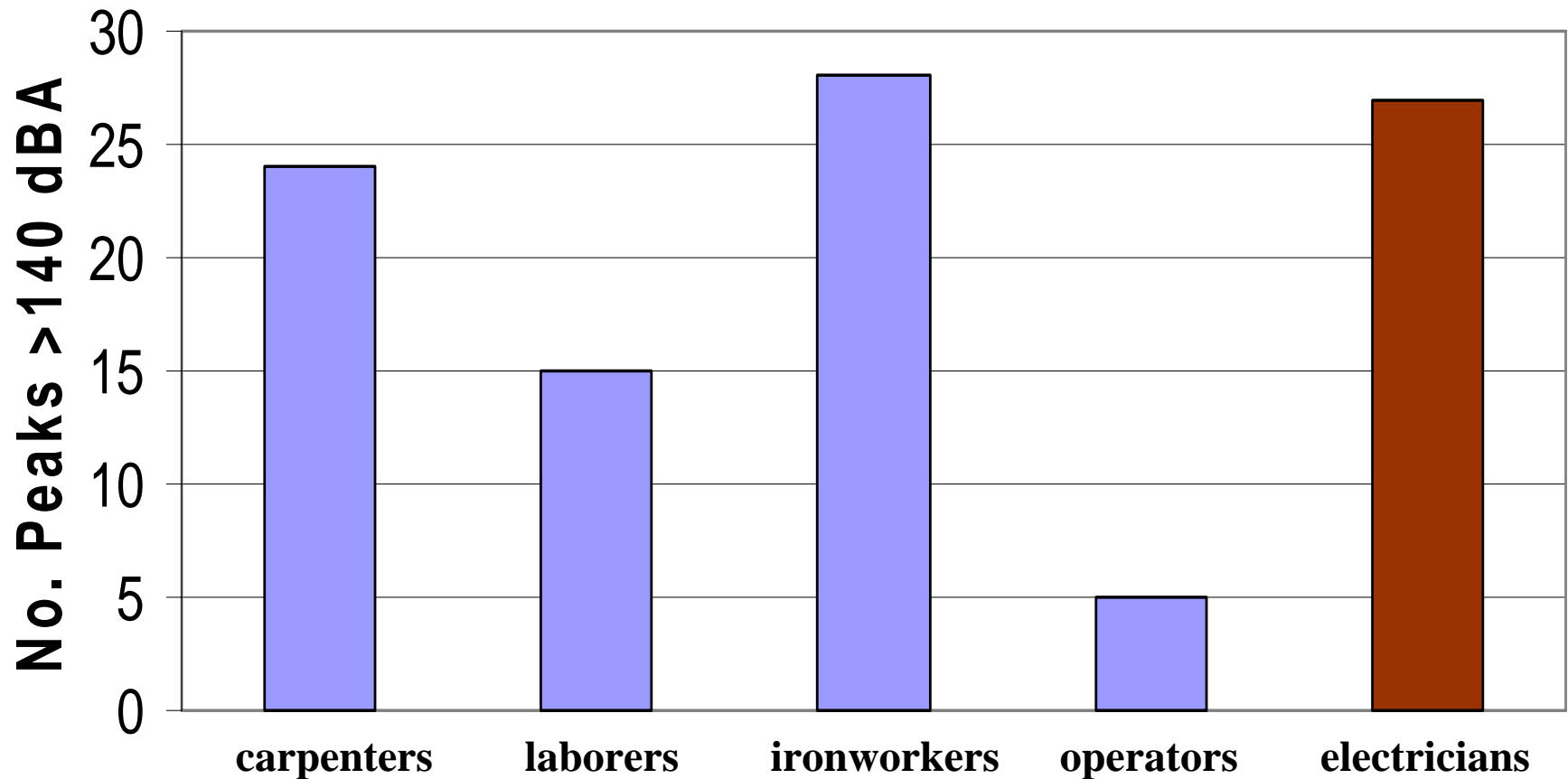
- **Highest Risk:**
  - **Projects:** road construction, carpentry, concrete
  - **Trades:** carpenters, laborers, operators, ironworkers, sheet metal workers
  - **Stage:** excavation, erection, finish
- **Studies small; need comprehensive assessments**

# Noise Levels for Common Tools

Task/Tool

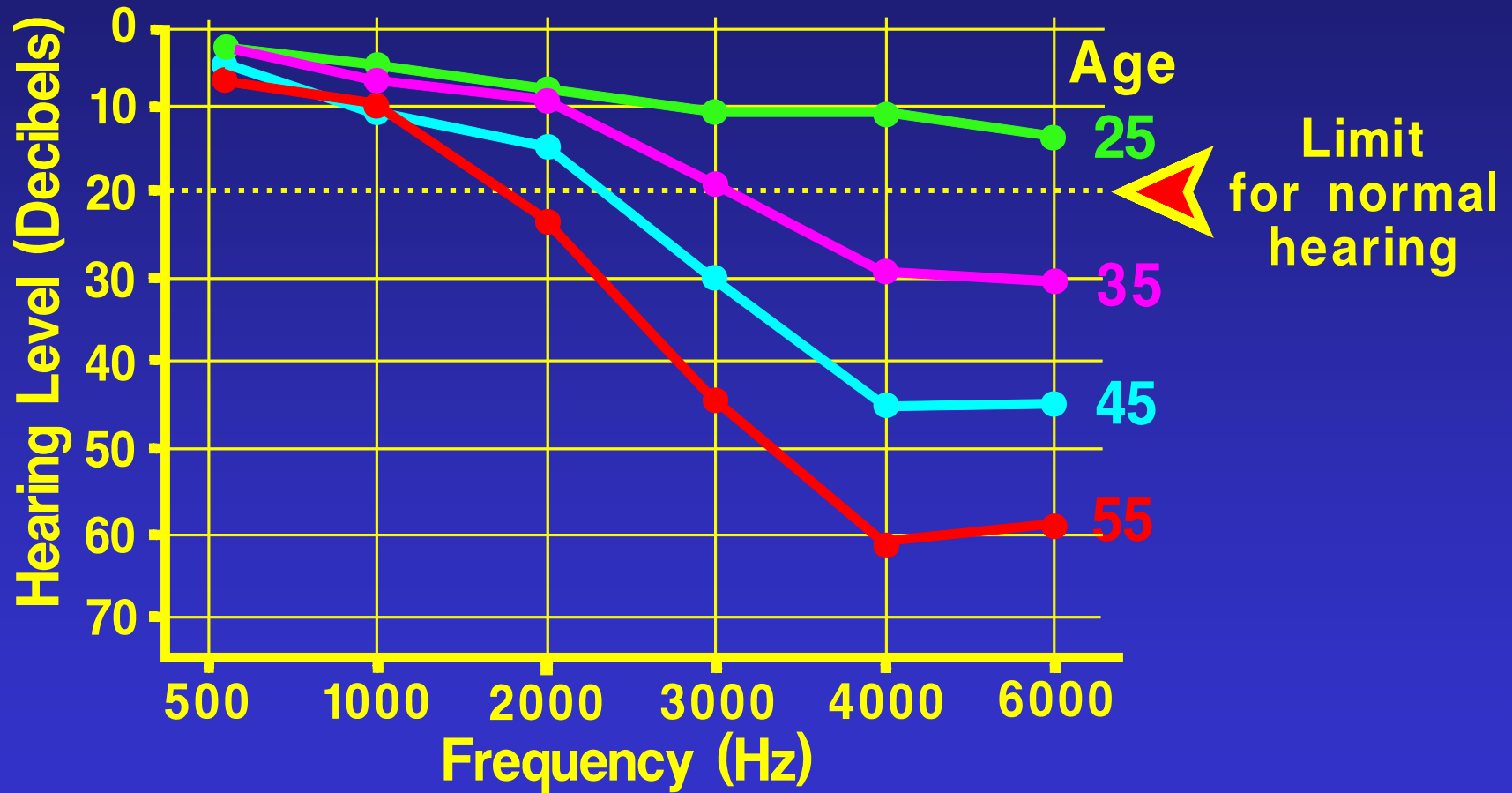


# Impulsive Peaks by Trade





# Hearing Loss Among Male Carpenters as a Function of Age

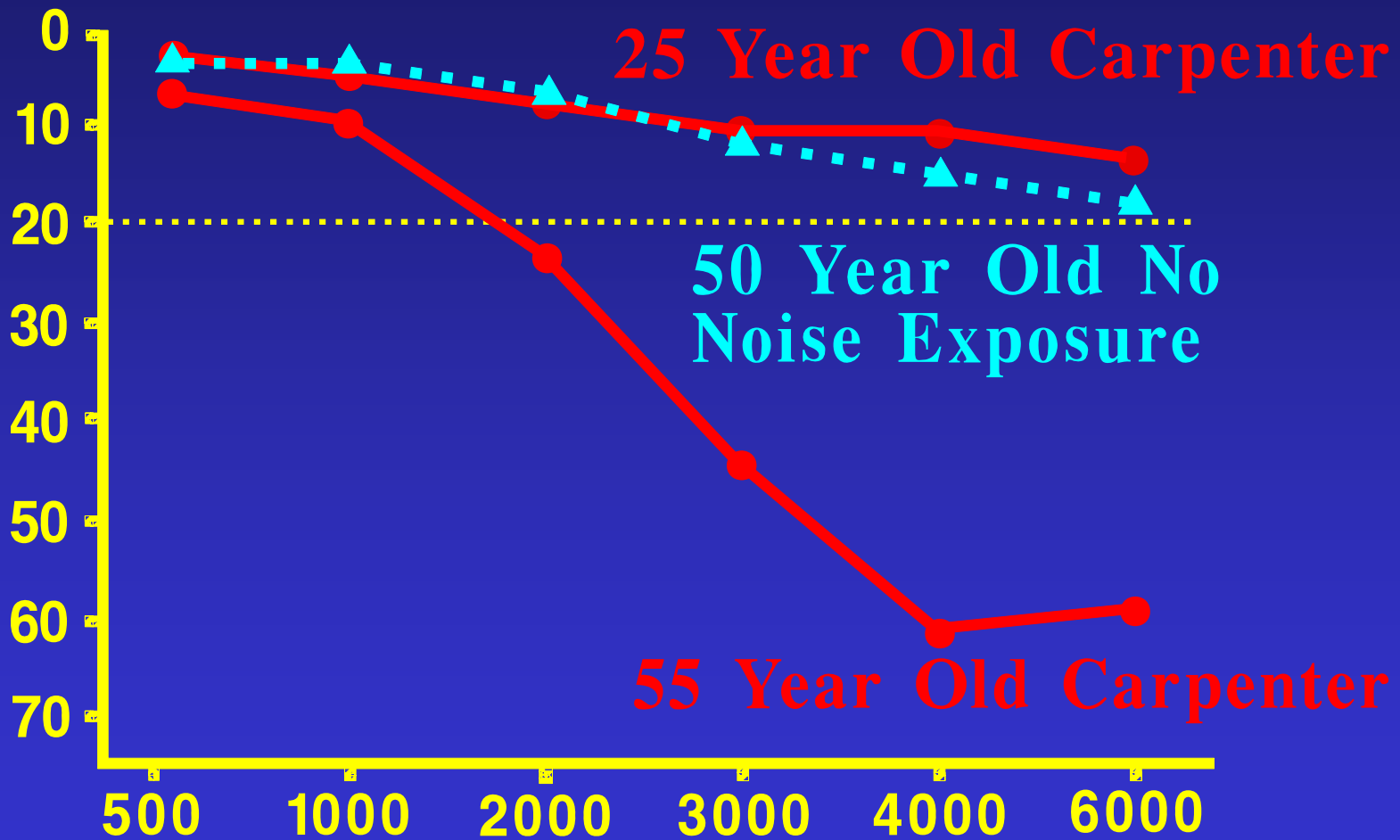




**So what...  
People lose their hearing  
anyway as they age.**



# The Average 25 Year Old Carpenter Has 50 Year Old Ears!



**OSHA Standard for Construction: 29 CFR 1926.52  
PEL of 90 dBA**

**What Constitutes A Hearing Conservation Program?**

**OSHA  
06/29/1992  
Compliance  
Letter**

- **Noise monitoring**
- **Controlling excessive noise**
- **Individually fitted protection**
- **Education/Training**
- **Baseline & annual audiometry**
- **Procedures for preventing additional hearing loss**
- **Record Keeping**



## THE CHALLENGE:

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How can hearing conservation programs be developed for construction that follow prevention guidelines and regulations without ignoring the concerns of labor and management?

# NIOSH HIERARCHY OF CONTROLS

**Remove the hazard**

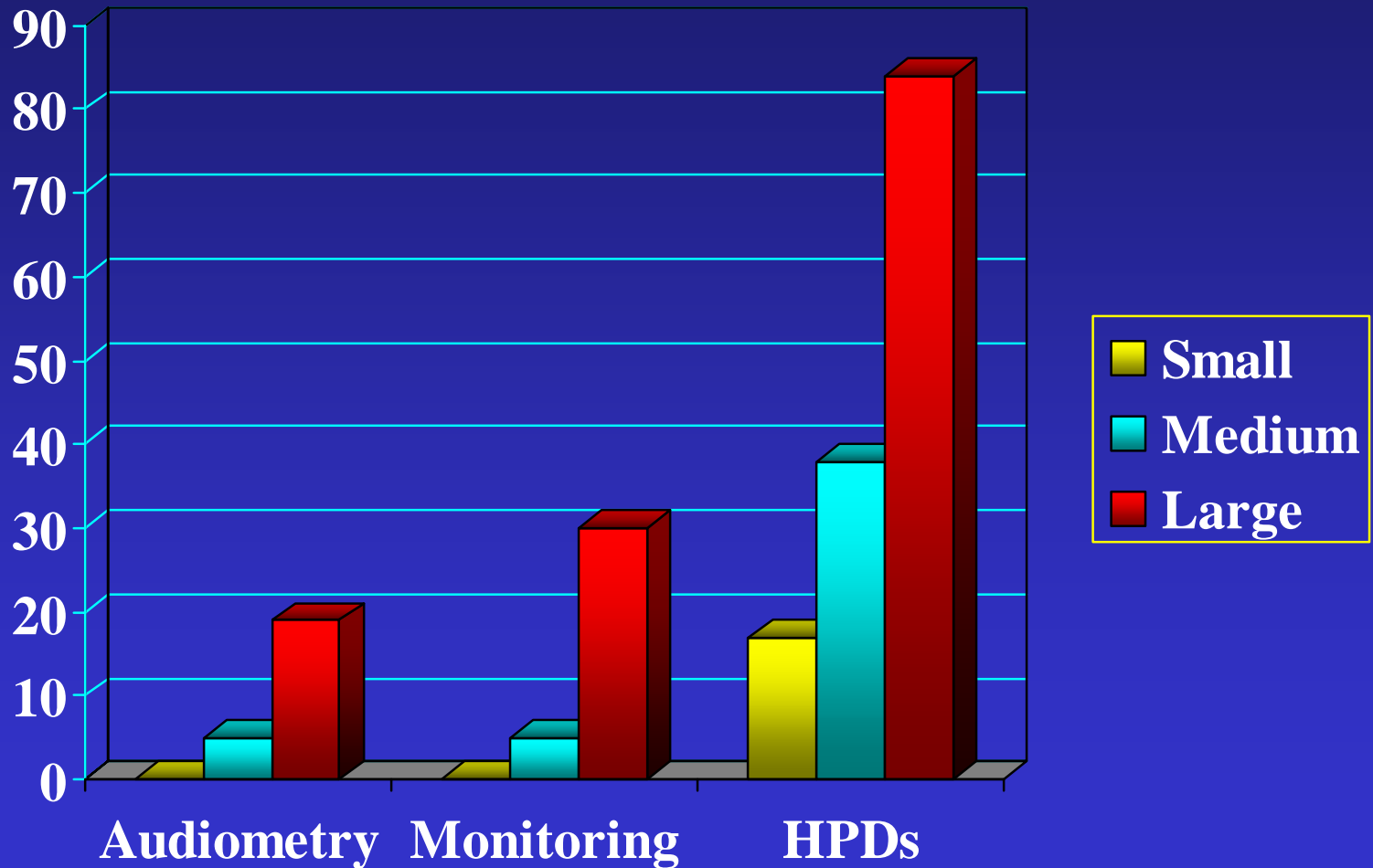
**Remove the worker**

 **Protect the worker**

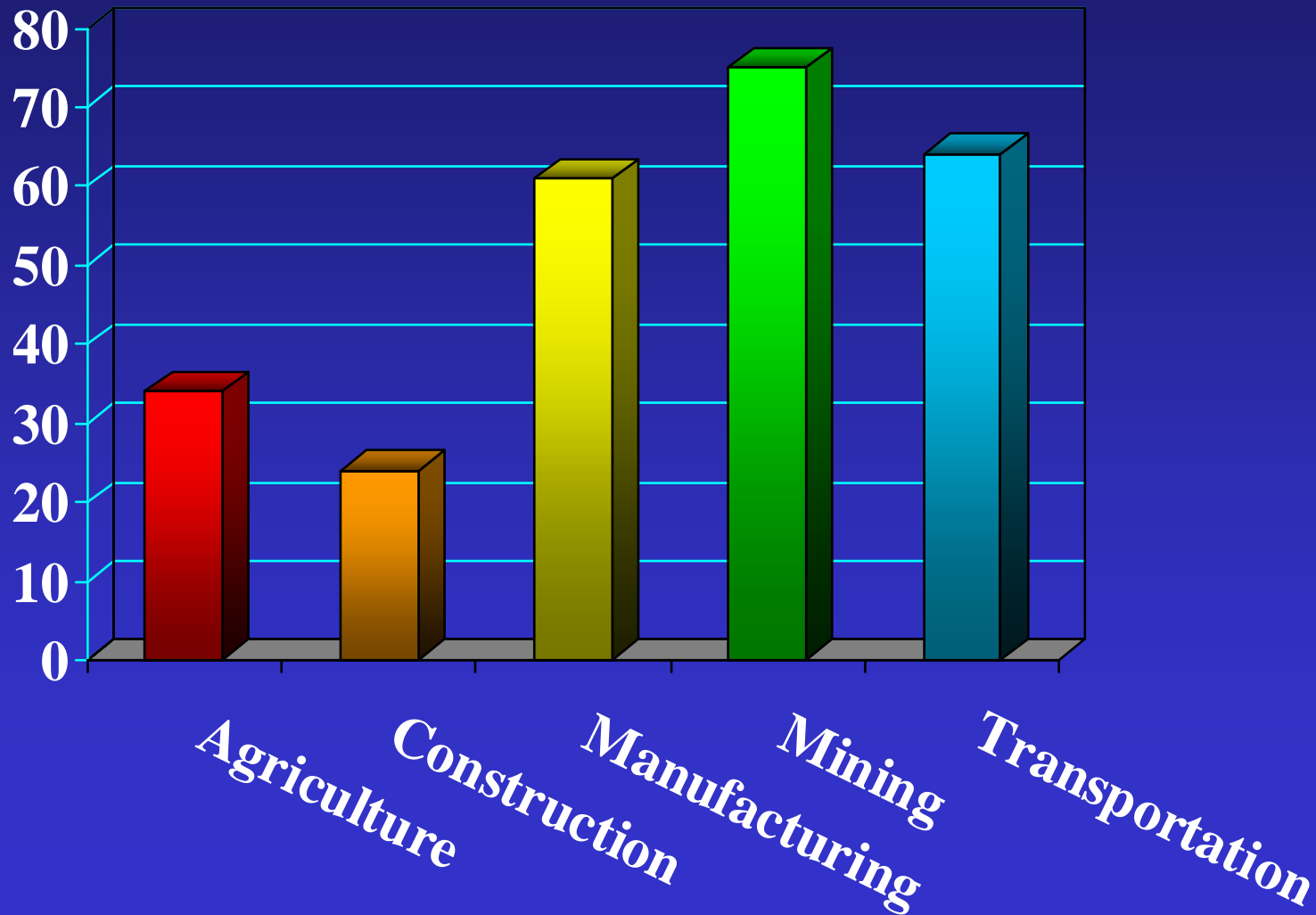


Photo Courtesy of Rick Neitzel

# PREVALENCE OF PROGRAM ASPECTS BY COMPANY SIZE

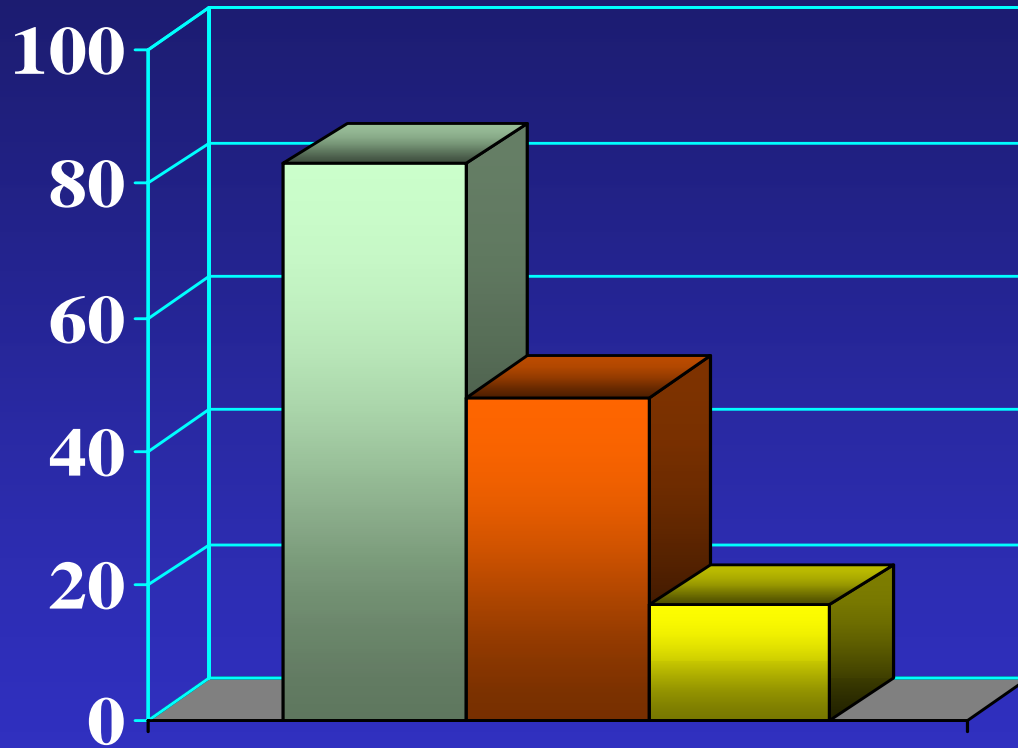


# Percent of Companies in Michigan That Provided Monitoring Hearing Tests - 1999



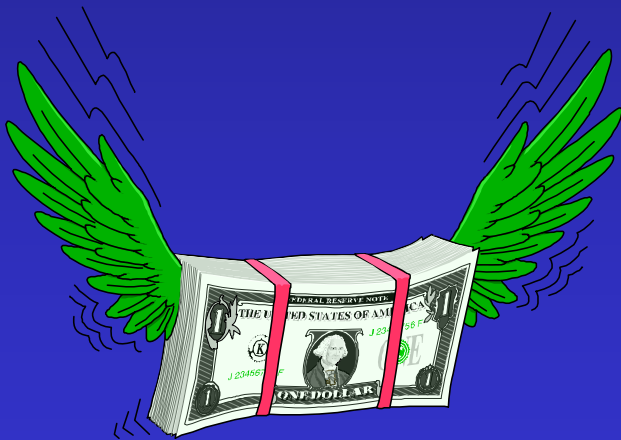


# Percentage of Time Hearing Protectors are Worn “Most of the Time” When Working in Loud Noise



-  Hearing Conservation Professionals
-  Carpenter Safety Trainers
-  Carpenters

**Don't make the mistake of thinking your job is over if you simply provide hearing protection and periodic hearing tests.**



**Without training workers how to recognize noise hazards, utilize noise controls, and use hearing protectors, you may be wasting your money.**

# Factors Affecting Behavioral Change:

## Individual Level

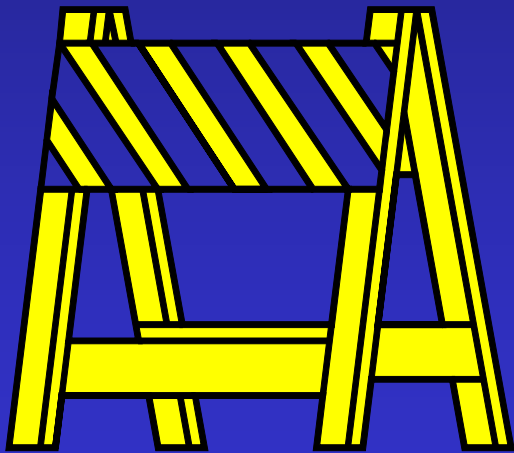
- Knowledge/beliefs
- Attitudes/values
- Readiness for change
- Decision-making style
- Skills/ Self-efficacy

## Organizational Level

- Worksite norms- safety culture
- Union/ management priorities (**TIME!**)
- Modeling by trainers & foremen
- OSH curricula during apprenticeship
- Environmental support

# **INFLUENCING HEARING HEALTH BEHAVIOR AMONG WORKERS**

**Studies utilizing a health communication/ promotion approach indicate that education and training must address two concepts:**



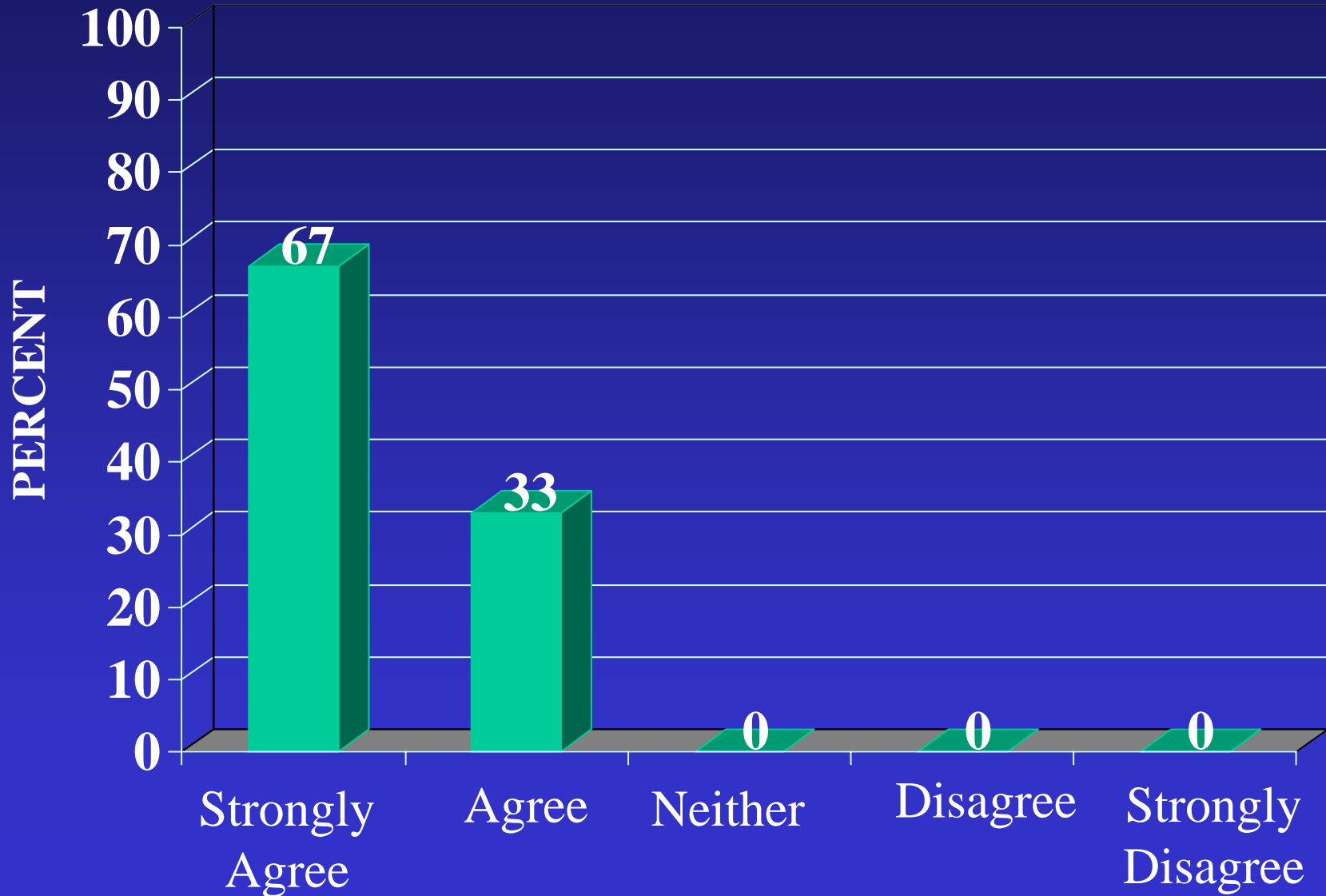
**Remove Barriers**



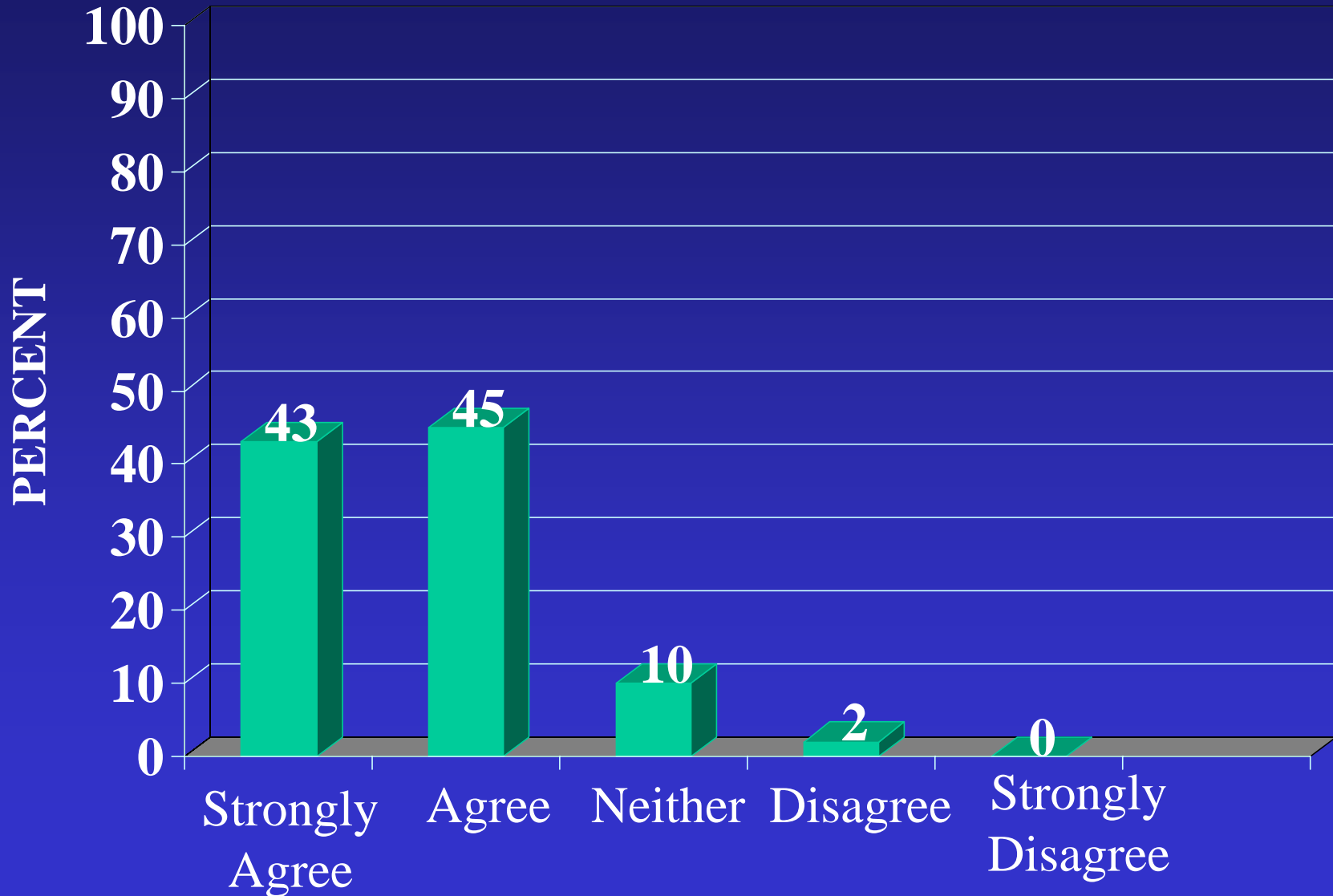
**Develop Self-Efficacy**

**Research by NIOSH, Drs. Lusk, Kerr, Lankford & others!**

# I believe exposure to loud noise can hurt my hearing.



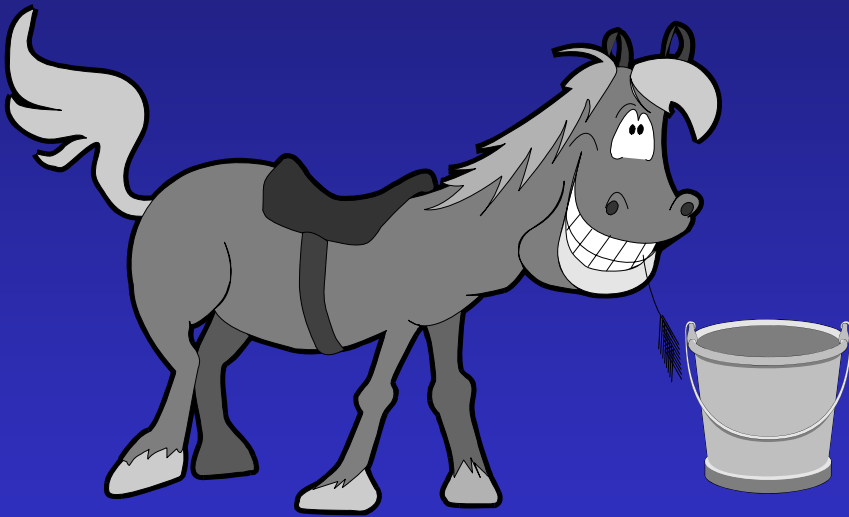
I think my hearing is being hurt by exposure to loud noise at work.



# What are some of the barriers cited by construction workers and their supervisors?

## THE FOUR C's

- Comfort
- Convenience
- Cost (personal & \$)
- Communications / hear important sounds

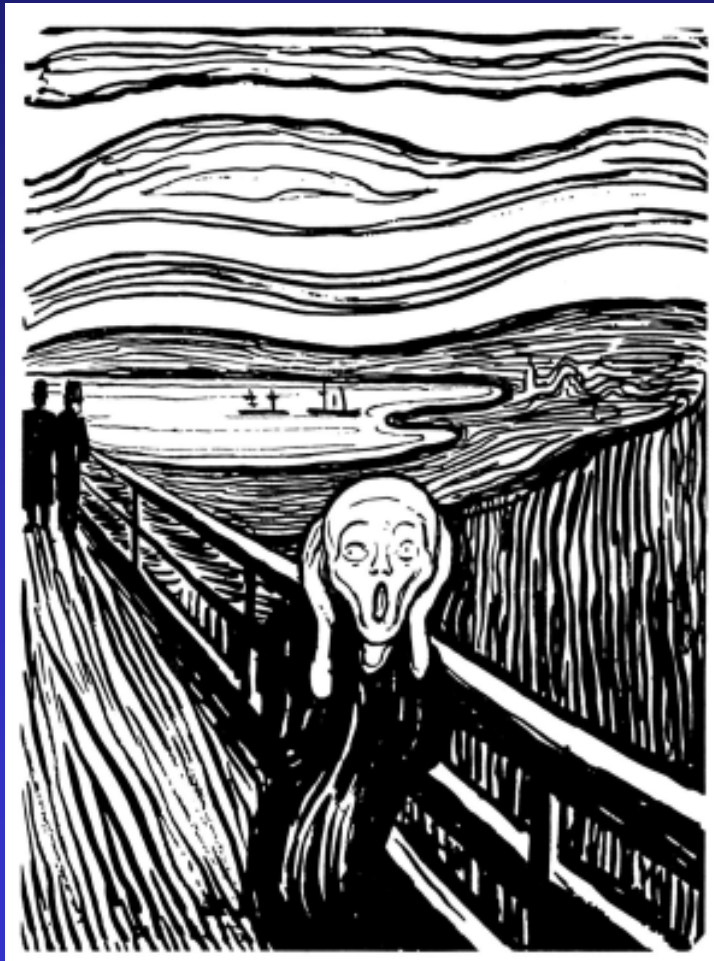


THERE ARE OVER 200 DIFFERENT HEARING PROTECTORS.  
EVERYONE CAN FIND A PROTECTOR THAT MEETS THEIR NEEDS.

**THE BEST HEARING PROTECTOR IS THE ONE THAT'S  
WORN!**



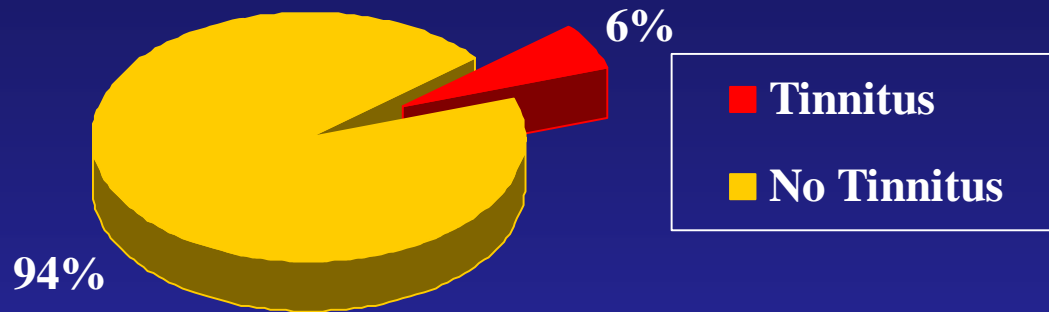
# RESULTS OF FOCUS GROUPS



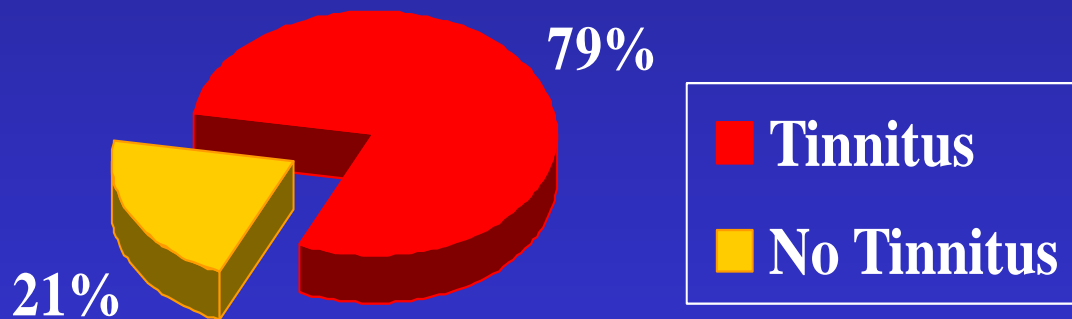
**Workers may be less concerned about getting a hearing loss than about developing tinnitus.**

**“I expected to lose my hearing. But, I thought it would be quiet.”**

# Percent of People With Tinnitus



## Non-Noise Exposed Worker

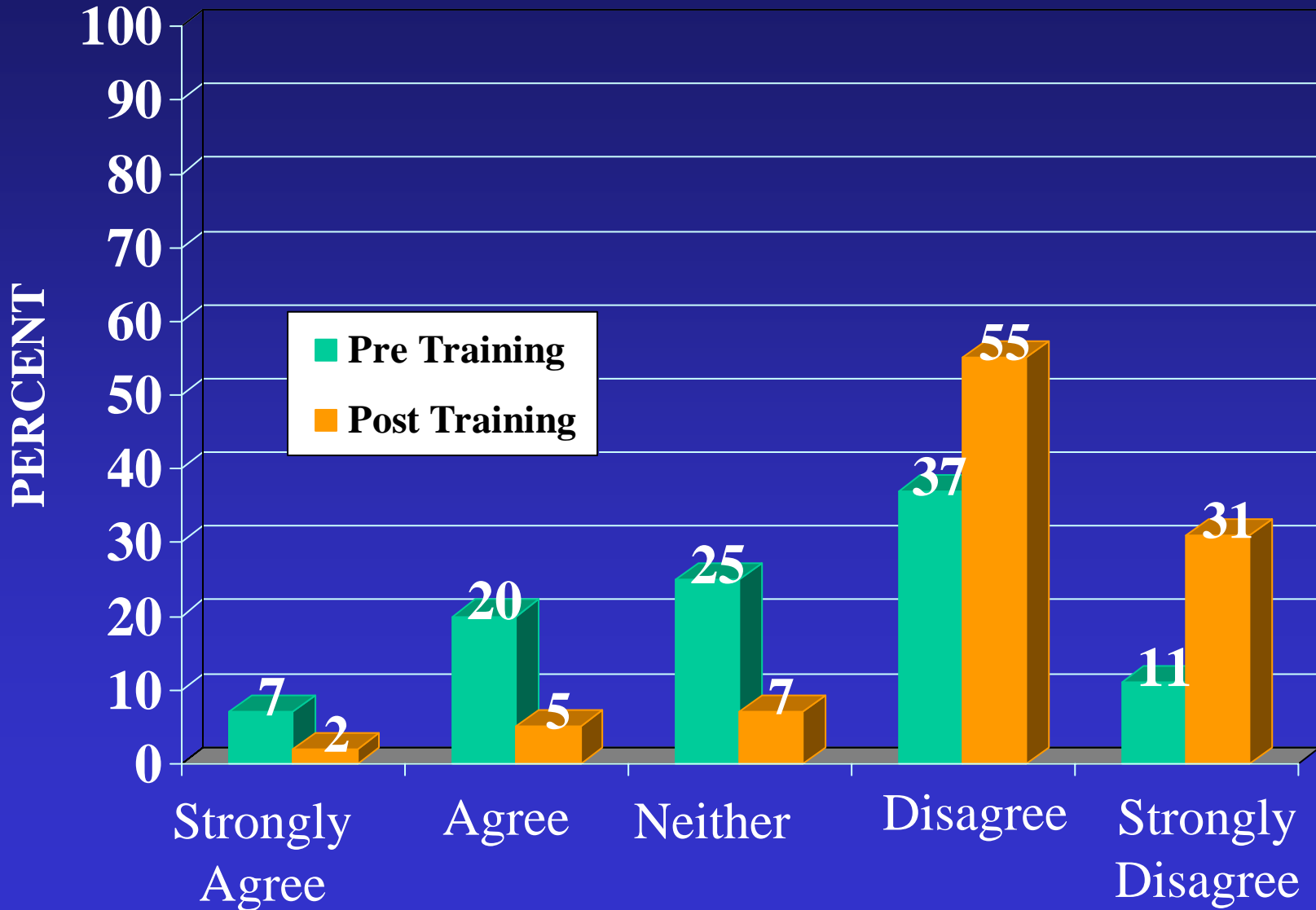


## Noise Exposed Workers

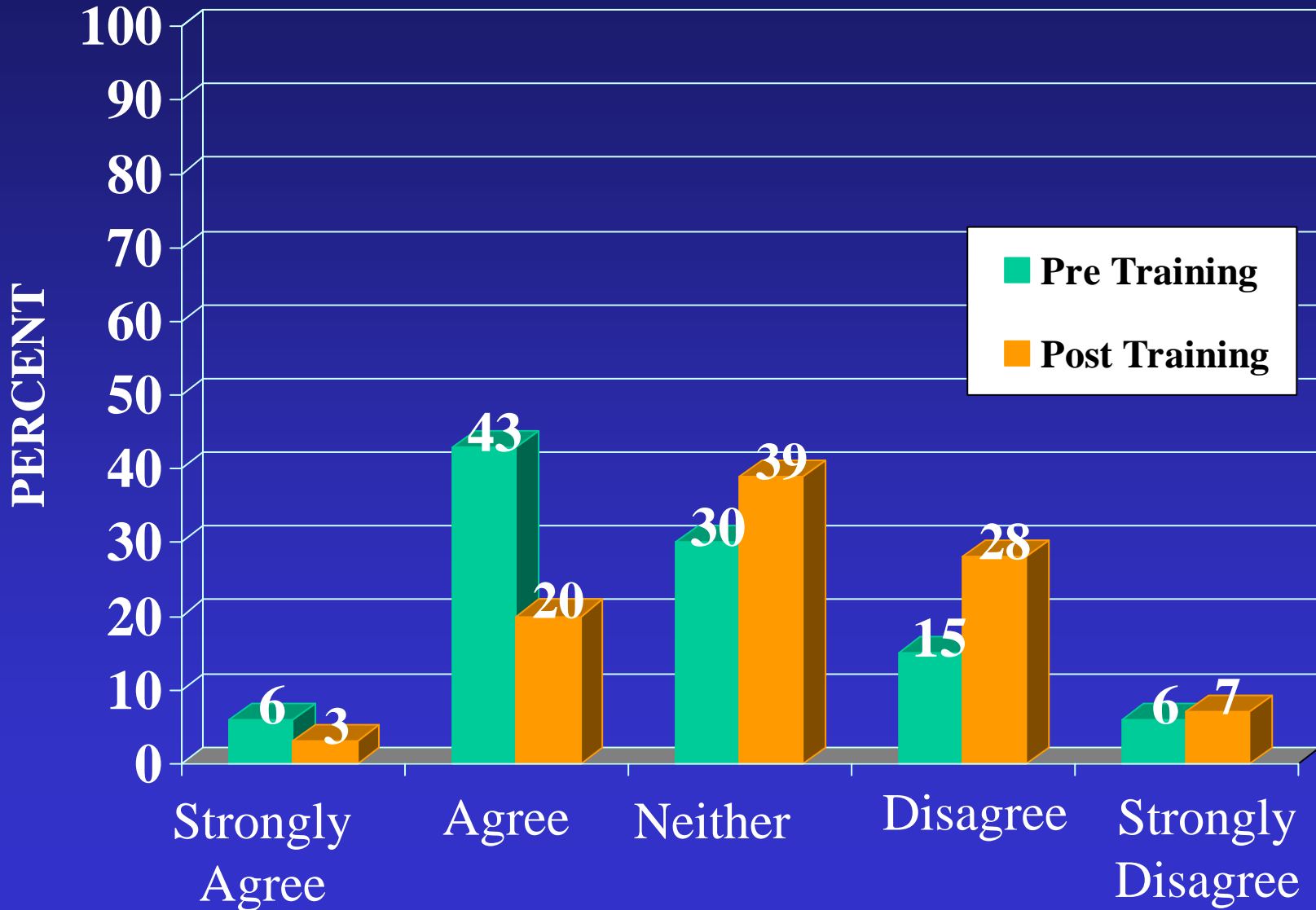
Does this research-based communication stuff result in education & training programs that really work? You bet!



I think it will be hard to hear warning signals (like back-up beeps) if I am wearing hearing protectors.



# Wearing hearing protectors is annoying.



# **What Training Approaches & Messages Make Sense to Construction Workers/ Managers?**

- **Get their attention**
- **Raise their consciousness**
- **Provide Information that enables people to do the right thing**

# Engage All Stakeholders

**“Engage persons  
having an investment  
in what will be  
learned ...and what  
will be done with the  
knowledge”**





**Agree on expected effects of the training:**

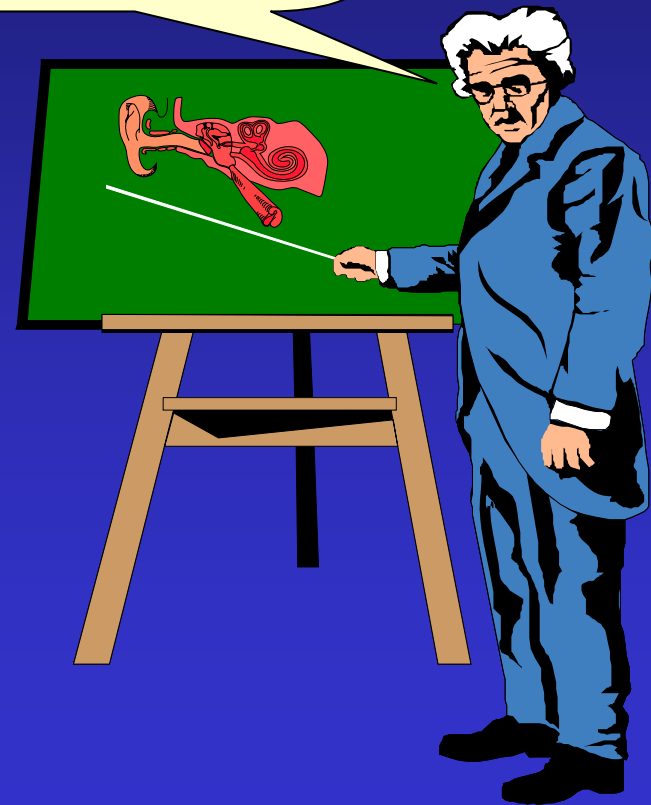


- **Increase use of controls**
- **Increase use of HPDs**
- **Decreased incidence of hearing loss**

# Use Credible Data- Site Specific If Possible

- Perceived by stakeholders as *believable*
- Useful, feasible, accurate, & representative of crafts at site

Blah, blah, blah...  
Blah, blah, blah...

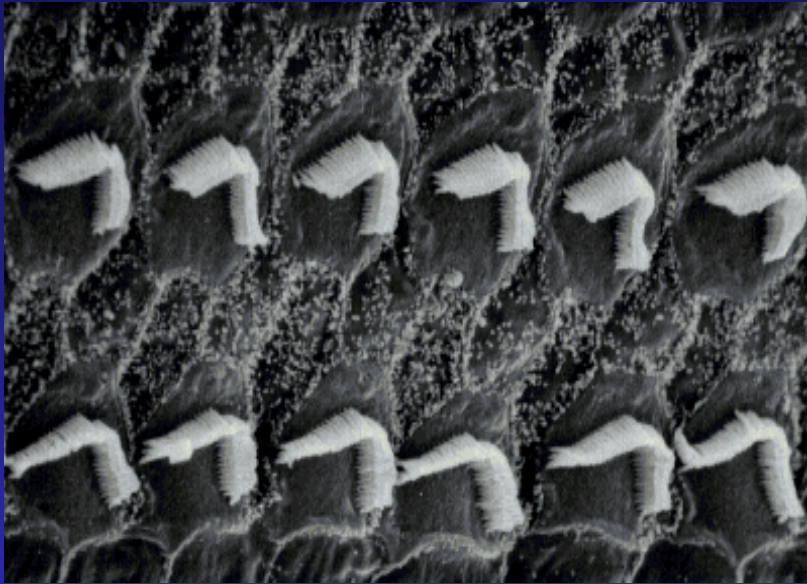


# Share and Apply Lessons Learned

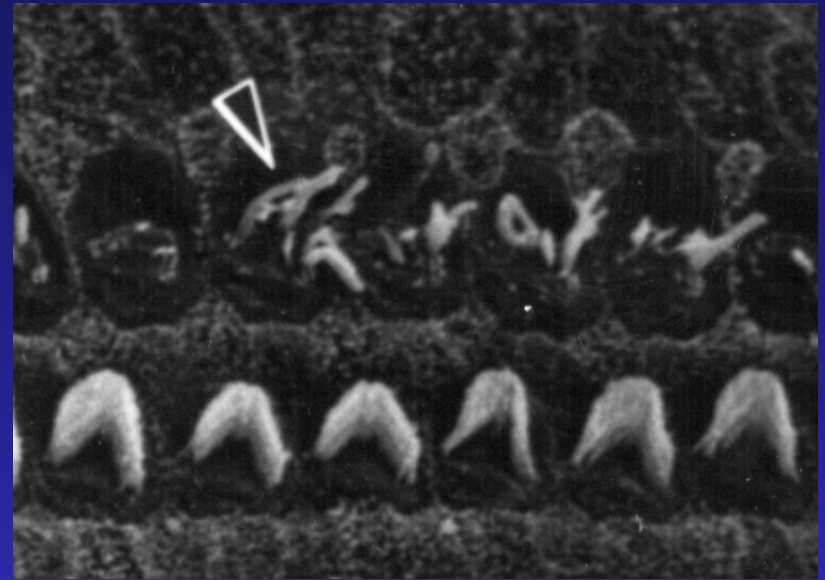
Training does not automatically translate into action--it takes effort.

- All stakeholders need feedback.
- Need a “Champion” to actively follow-up





**This is your ear.**



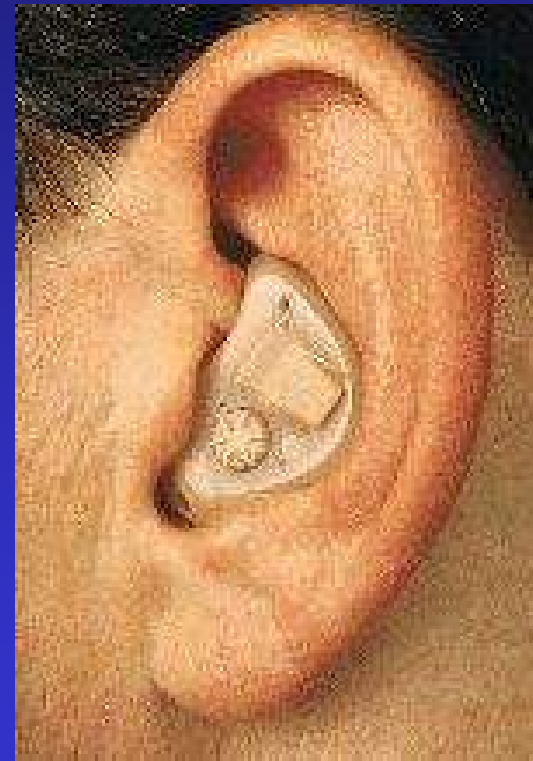
**This is your ear on noise.**

**Any questions?**

Raise Awareness

# It's Really Pretty Simple.....

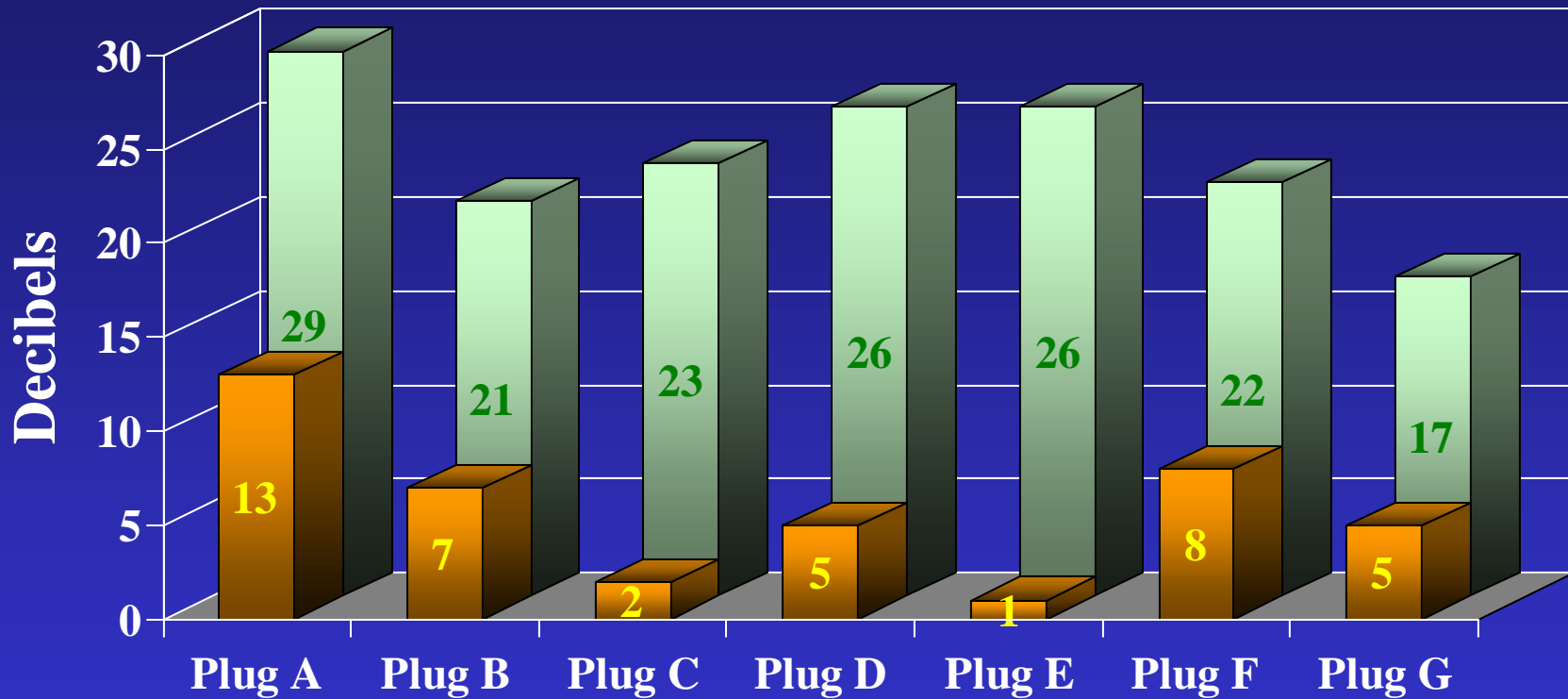
- Wear this now...
- Or wear this later!



Get their attention



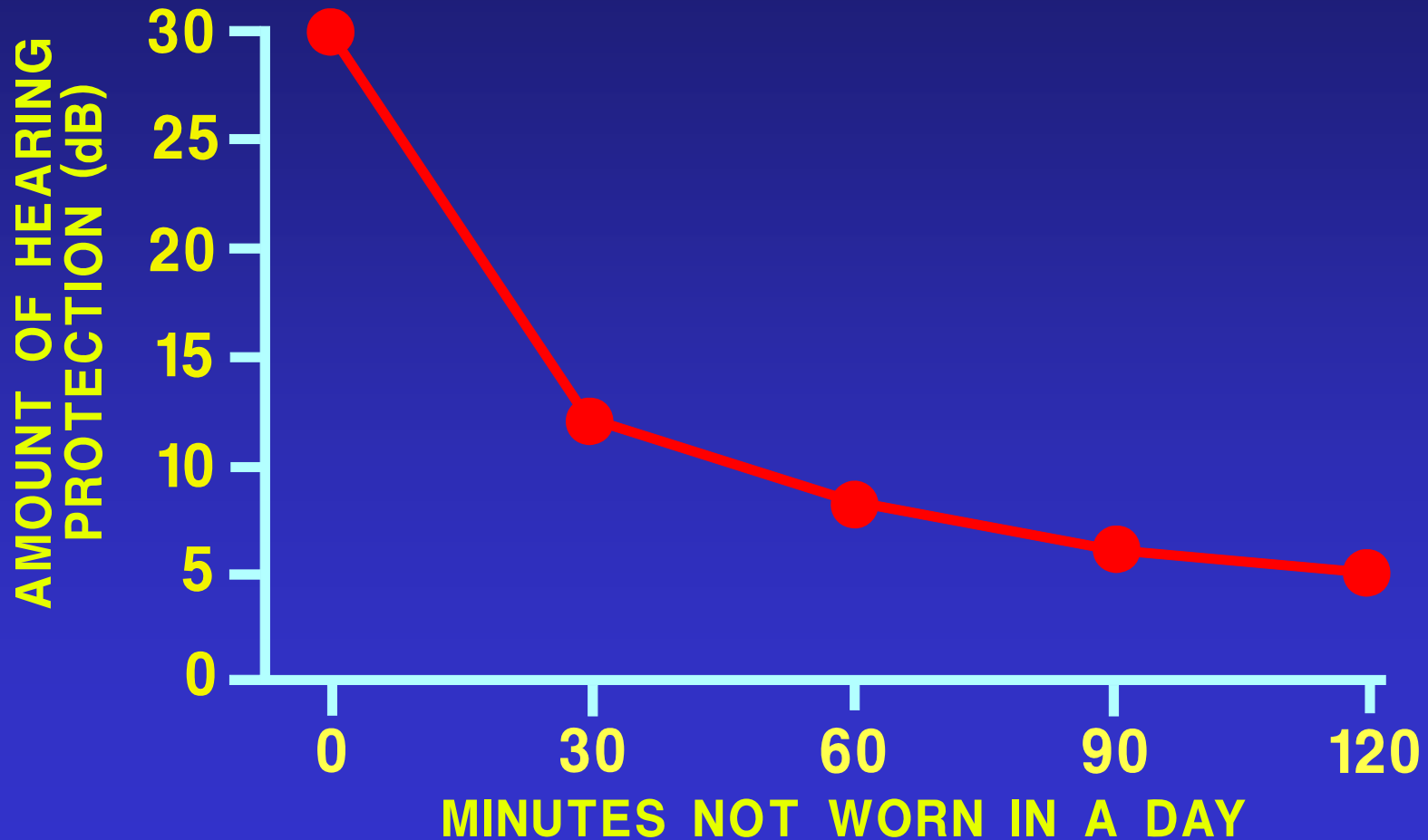
# Available protection vs. the amount of protection obtained by untrained workers.



■ Likely protection as worn by untrained worker

■ Amount of protection listed on the box

# Effect of not wearing your hearing protector on the amount of effective noise reduction





# TRAINING HELPS YOU AND YOUR WORKERS MAKE SMART CHOICES ABOUT HPDs.

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**UNDER PROTECTION**

**OVER PROTECTION**

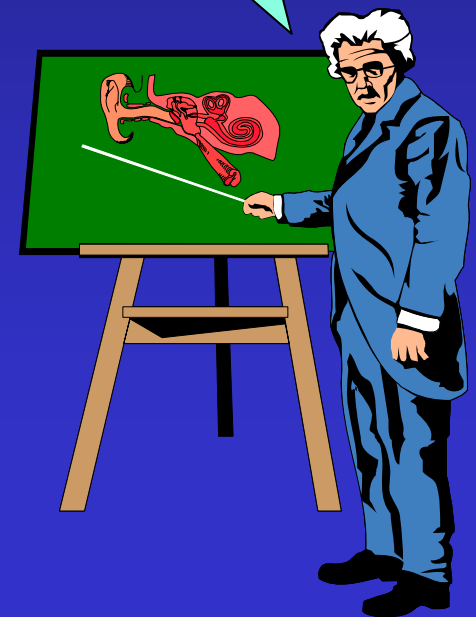


**Perhaps Best of ALL--**

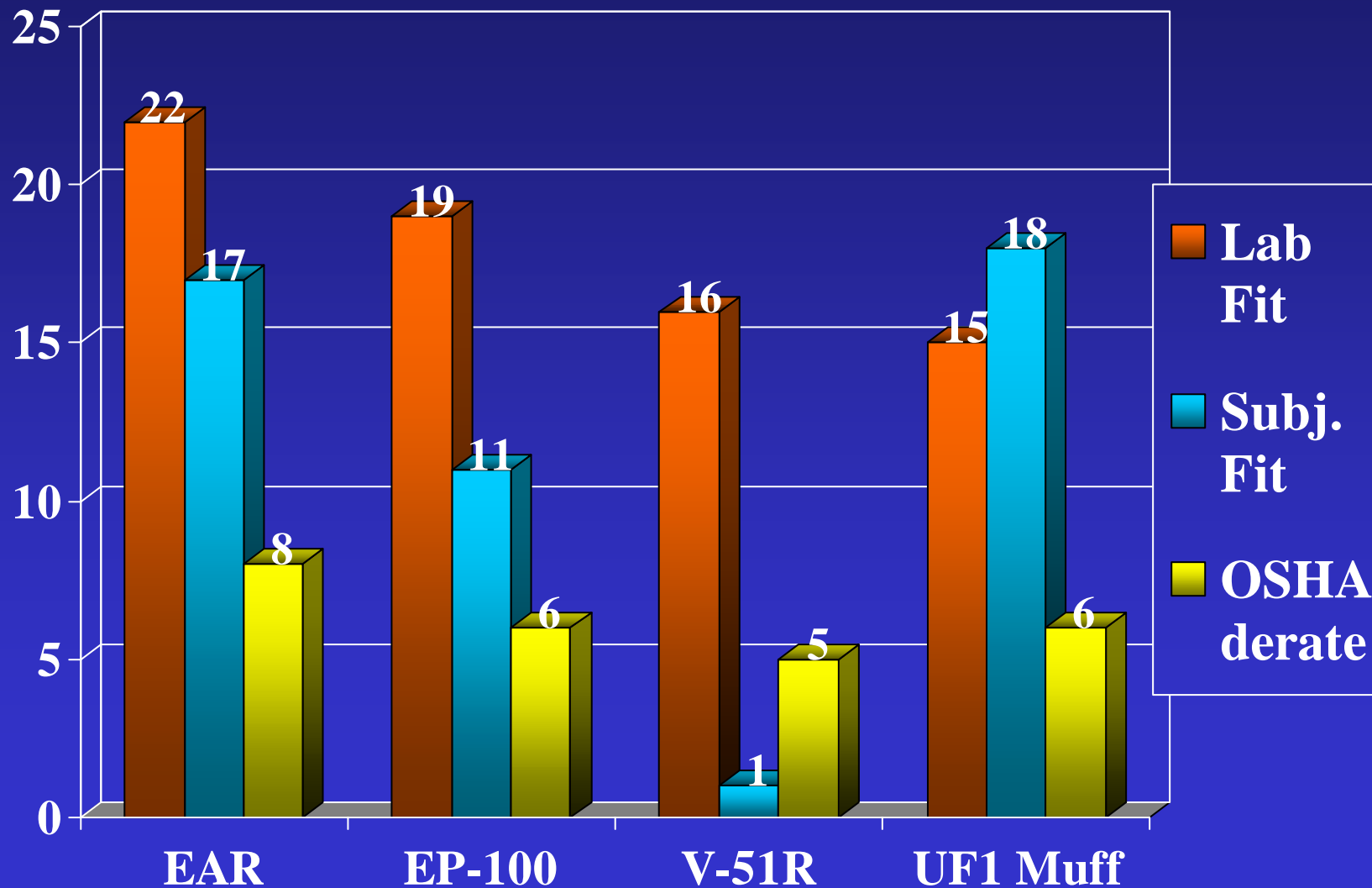
**Education & training will enable you to take advantage of exciting new and emerging technologies.**

- **HPD rating methods**
- **“Flat” attenuation HPDs**
- **Communication devices**
- **Fit-testing**
- **TTS monitors**
- **Personal noise monitors**
- **Records/Information management**

$$\text{Dose} = \left( \sum_{i=1}^n \frac{C_i}{T_i} \right) \times 100$$



# Estimated Hearing Protection in an A-Weighted Noise Environment as a Function of Rating Method



**New Flat Attenuation  
&  
Communication Devices**

# New Methods for Estimating Actual Performance



## FIT-TEST METHOD

- Fit-test system feasible for field use
- Using fit-test enabled workers to learn to correctly fit a new plug
- Knowledge gained and consciousness raised

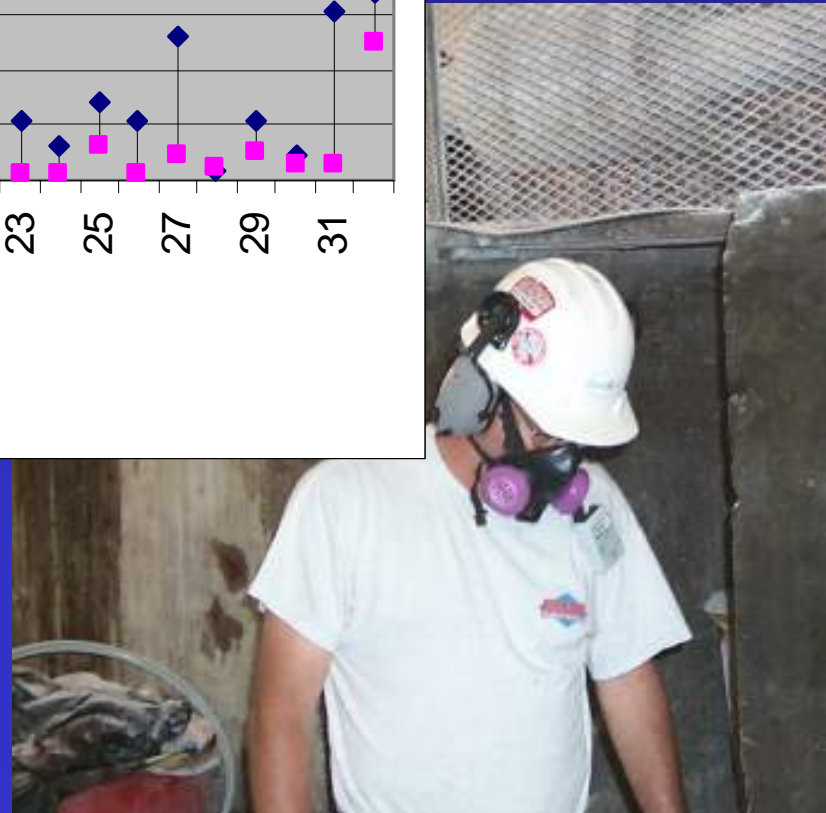
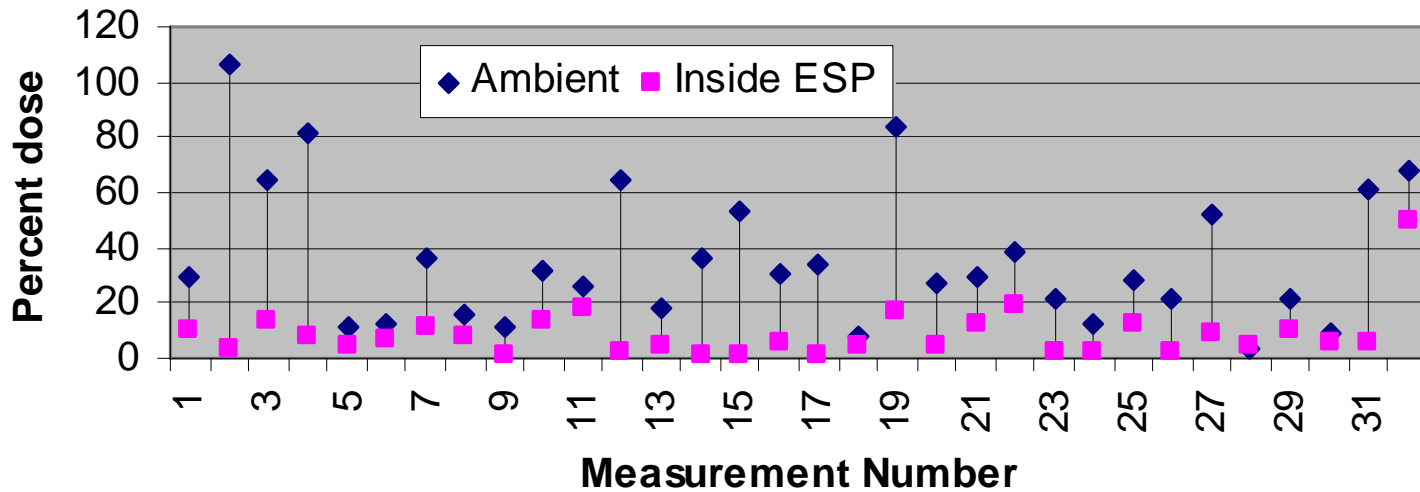
# TTS Monitoring

- New Devices
- Training exercises to teach self-monitoring (RADIO exercise)



# PERSONAL NOISE MONITORING

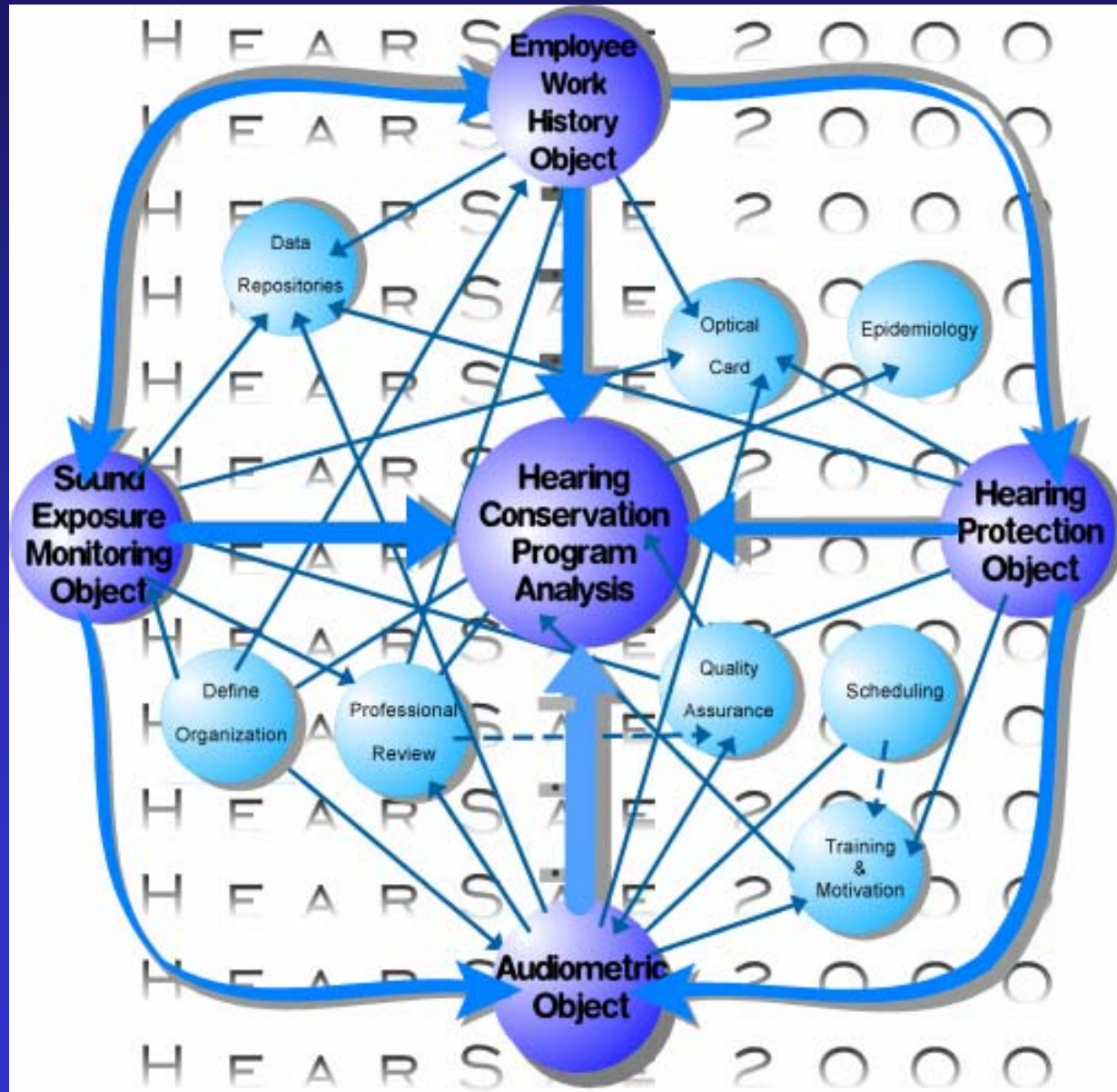
Noise dose: Ambient vs. Inside ESP  
Industrial Sand Mine





# HearSaf 2000 Information Management System

<http://www.safe-at-work.com>





# New NIOSH Noise Efforts Relevant to Construction

- Developed with input from NORA Hearing Loss Team
- Involves cross-division collaborations with staff from Pittsburgh, Cincinnati, and Spokane.



# Possible External Partners:

## We Are Seeking Others!

- **LABOR**
  - UMWA
  - USWA
  - UAW
  - UBC&J
- **Equipment Manufacturers**
  - JOY
  - Fletcher
  - Others ...
- **Operators & Trade Associations**
  - BCOA, NMA, NSA
  - CONSOL, Newmont, others



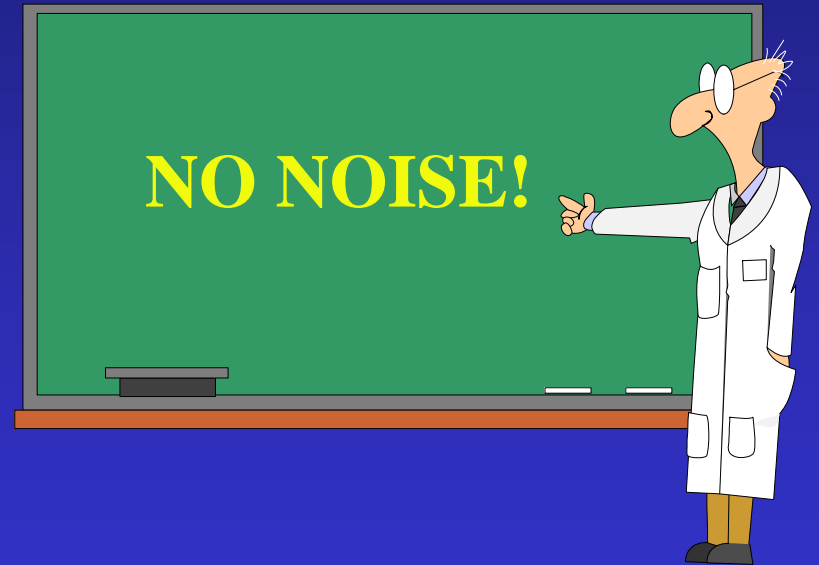
# OVERALL EMPHASIS OF NIOSH NOISE PROGRAM

- **Assess workplace factors and existing knowledge**
- **Conduct and evaluate intervention efforts**
- **Disseminate information and evaluate efforts**



# ADDITIONAL SPECIFIC AIM

Convene workshops, meetings, and symposia to obtain input, facilitate collaboration, and disseminate findings.



# PROGRAM SUMMARY

- Individual projects capitalize on the strengths of existing facilities and expertise throughout the Institute
- Strong linkages to existing projects and external partners from labor, industry, academia, etc.
- Data collection activities will support multiple projects
- Projects are designed to take advantage of unique opportunities and to address historic barriers
- Outcomes from projects satisfy both short and long term needs in hearing loss prevention

# The New NORA Projects

- 1) National Surveillance of Noise Exposure and Hearing Loss/ **John Franks**
- 2) Definition and Assessment of Engineering Noise Controls/ **David Podobinski**
- 3) Web-based outreach to small construction and mining/  
**Carol Merry Stephenson**
- 4) Accommodation of Noise-Exposed, Hearing-Impaired Workers/ **Thais Morata**
- 5) Noise Sampling strategies and Exposure-Response Models/ **Mary Prince**

# Web-Based Outreach to Small Construction & Mining

## Noise Control and Hearing Loss Prevention

- ▶ Assess the quality and availability of current information.
- ▶ Determine new information needs.
- ▶ Create an appropriate web-site to meet identified needs & coordinate on-going output from all aspects of NIOSH noise program.
- ▶ Evaluate the web-site & products

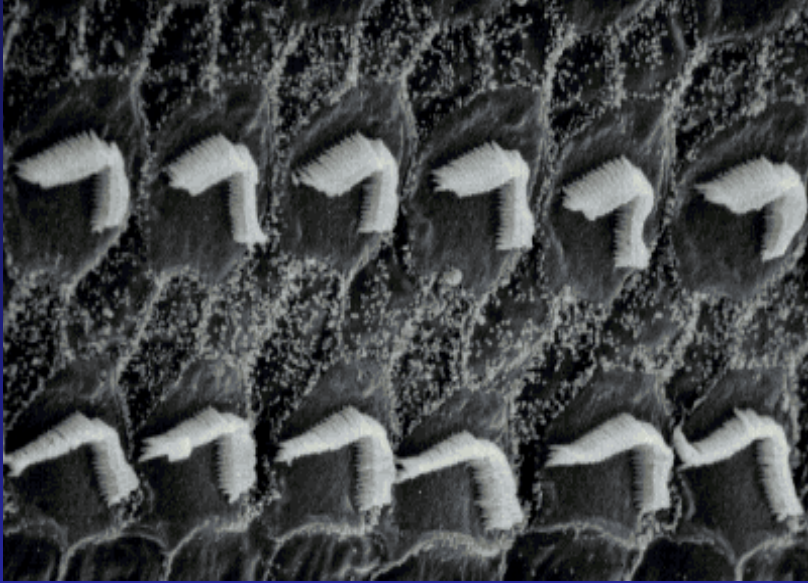


[www.nidcd.nih.gov](http://www.nidcd.nih.gov)

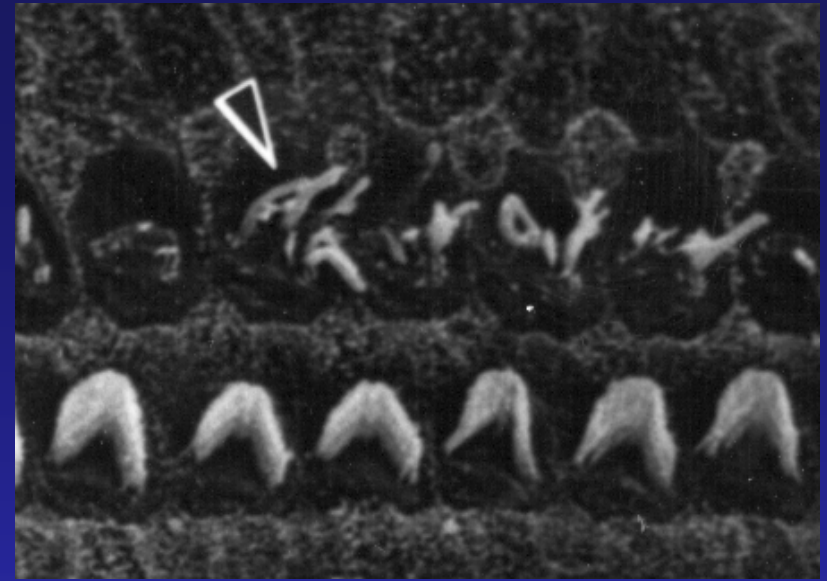


[www.hearingconservation.org](http://www.hearingconservation.org)





**This is your ear.**



**This is your ear on noise.**

**Any questions?**

**NIOSH Toll-Free Number: (800) 35-NIOSH**

**<http://www.cdc.gov/niosh/homepage.html>**

**Mark R. Stephenson, Ph.D.**

**(513) 533-8144**

**mos9@cdc.gov**

**Carol M. Stephenson, Ph.D.**

**(513) 533-8581**

**cem3@cdc.gov**





# Just a Few *Wise-Ears* Web Links

[www.nidcd.nih.gov](http://www.nidcd.nih.gov)



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



[www.aearo.com](http://www.aearo.com)



[www.3m.com](http://www.3m.com)



[www.howardleight.com](http://www.howardleight.com)



[www.hearnet.com](http://www.hearnet.com)



[www.hearingconservation.org](http://www.hearingconservation.org)