



# CONSTRUCTION NOISE & HEARING LOSS PREVENTION

## 2023 Trainer Enhancement Program

Gary Gustafson, Director, Environmental Hazard  
Training

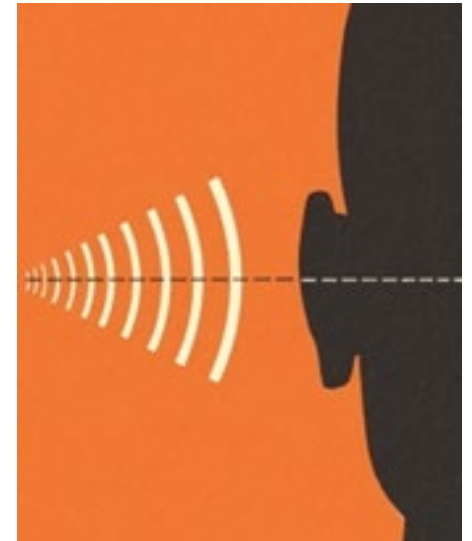
Jessica Bunting, Director, Research to Practice



May 4, 2023

# BACKGROUND

- **Conducted surveys of trainers and workers to identify:**
  - Awareness of noise hazards
  - Use of controls and hearing protection
  - Barriers to use of controls and hearing protection
  - Gaps in the types of training conducted & received



# TRAINER PERSPECTIVE

- **9** unions out of **14** national unions participated
- **248** trainers – **21%** response rate
- Question categories:

Demographics

Sources of Noise

Training

Hearing Loss

Challenges

# WORKER PERSPECTIVE

- **49 trainers** administered the survey
- **4,195 union workers** responded from multiple trades -- **84%** response rate
- Question categories:

Demographics

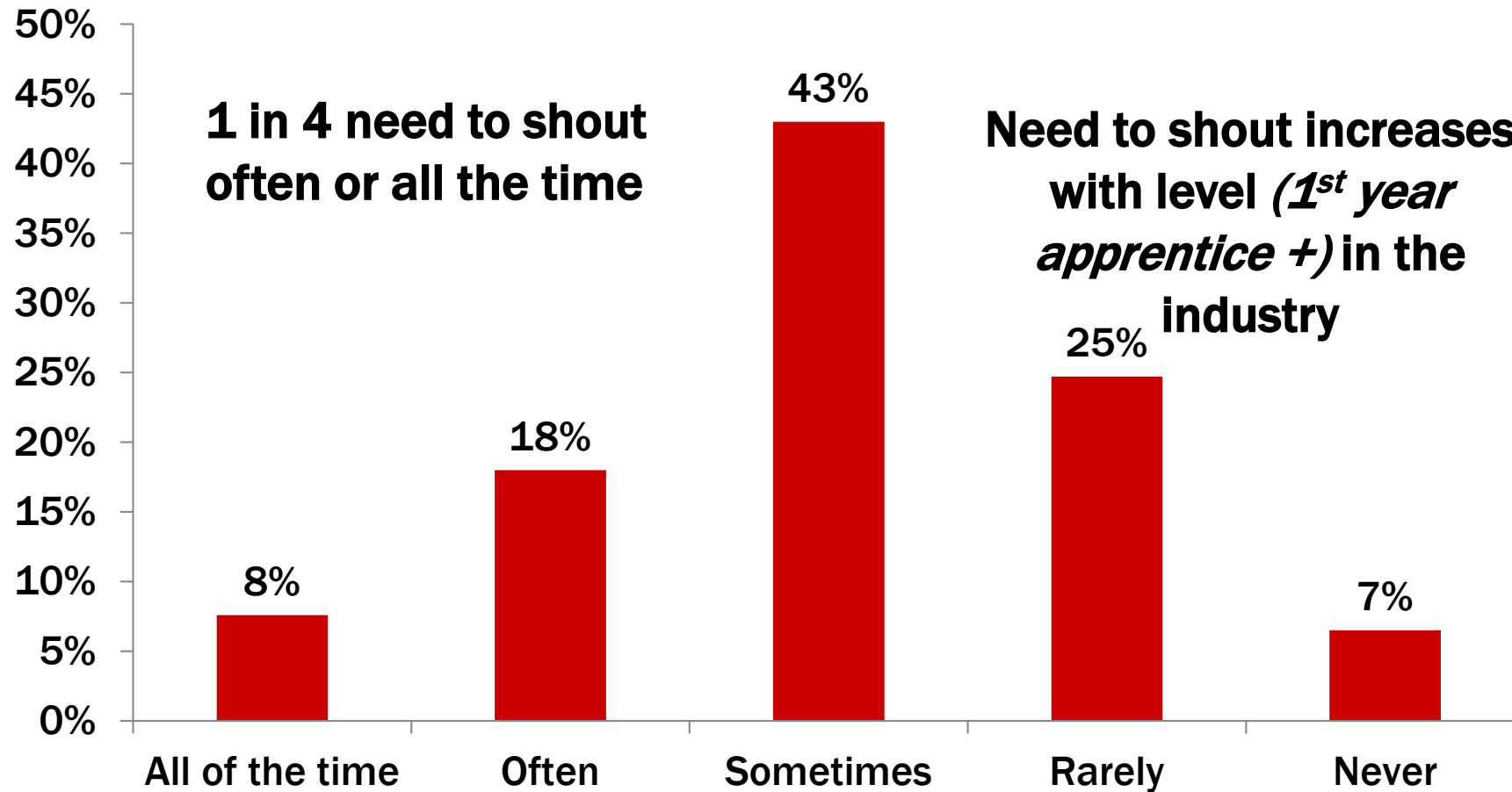
Noise Levels of  
Jobsites

Hearing Loss

Training

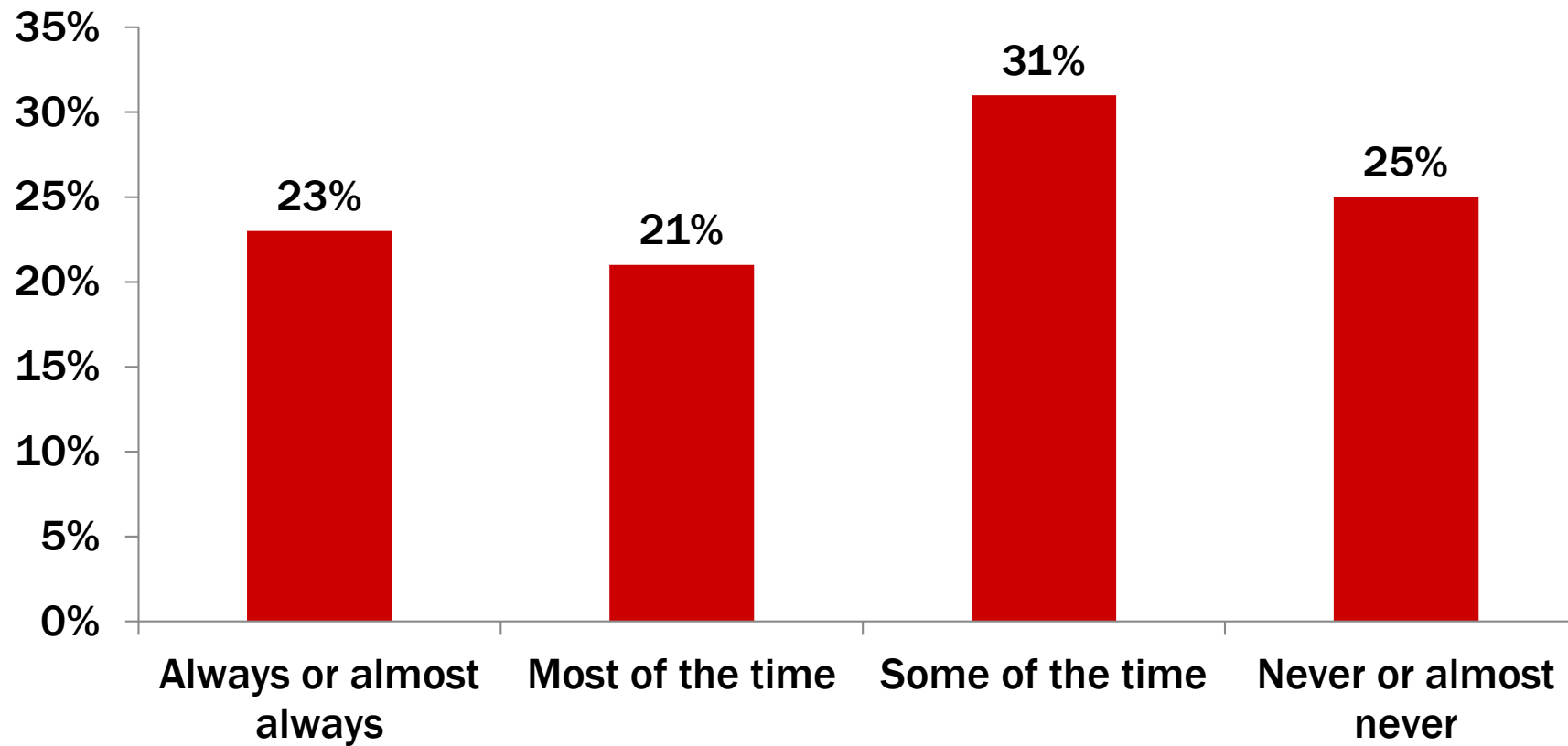
Use of Hearing  
Protection

# NOISE ON THE JOBSITE – HOW OFTEN WORKERS NEED TO SHOUT TO BE HEARD



# USE OF HEARING PROTECTION

**56% do not wear PPE most or all of the time when working around noise**





# CHALLENGES

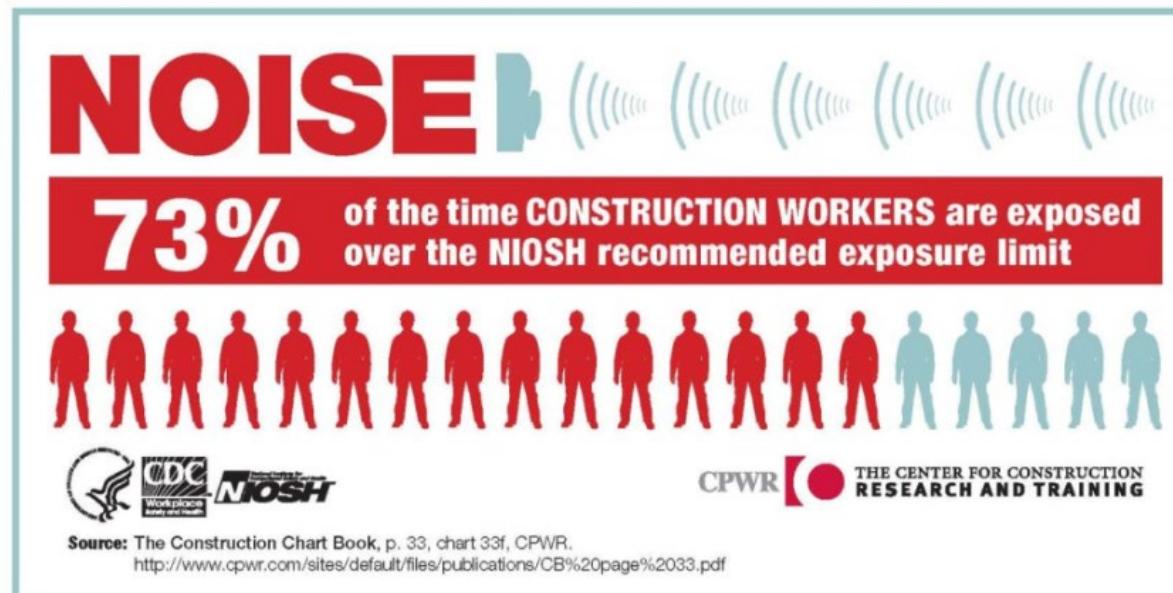
**Reducing the risk of  
hearing loss**

**Training about hearing  
loss & prevention**

- 1. Convincing workers of the hazard**
- 2. Raising awareness of noise sources**
- 3. Getting workers to apply what they learned**

# SURVEY CONCLUSIONS

- Workers benefit from noise training
- Workers are not always retaining what they learn
- Workers need ongoing & repetitive training and hearing loss
- Trainers need more noise training resources





# CONSTRUCTION NOISE & HEARING LOSS PREVENTION TRAINING PROGRAM

**Goal** – Respond to trainer needs for flexibility and ready access to materials that could be used for refresher training

**Result – 3 Part Program:**

- **1 Hour Module** to satisfy OSHA 30-Hour health hazard module requirement
- **30 Minute Module** to satisfy OSHA 10-Hour or part of the OSHA 30-Hour health hazard module
- **In-Class & Hands-On Refresher Exercises**

# NEXT STEPS: PROGRAM EVALUATION

**Goal:** Work with trainers to evaluate use of the program in the classroom.

**Process:**

- 1) Administer **baseline survey** at the start of the class to assess trainees' knowledge of noise hazards and practices to prevent hearing loss;
- 2) **Deliver Noise Program**
- 3) Administer a **survey at the end of the class** to assess trainees' reaction to the program and what they learned
- 4) Administer a **survey during a future class** to capture self-reported use of preventative measures introduced during the program and to determine whether practices have changed.

# COMPONENTS

- **1 Hour Elective Module.** Provides instructors with materials to fulfill 1 hour of the 2 hours training requirement for Health Hazards in the OSHA 30. See additional training resources available on RF Radiation and Silica exposure to help fulfill the remaining hour.
  - [Instructor Manual](#)
  - [Presentation](#)
- **30 Minute Elective Module.** Designed to fulfill the OSHA 10-hour training program requirement for a ½ hour training module on a health hazard. Alternatively, it can be used for a portion of the OSHA 30-hour health hazard training requirement.
  - [Instructor Manual](#)
  - [Presentation](#)

# COMPONENTS

- **In-Class & Hands-On Refresher Exercises.** A series of short (5-10 minutes) exercises designed to reinforce and apply lessons learned about noise hazards and hearing loss prevention. It includes materials that can be incorporated into safety and health training modules (e.g., PPE, power tools, etc.) or as part of a hands-on skills training program.
  - Instructor Manual
  - Presentations for Noise Training Exercises for use in OSHA 10- & 30-Hour Modules
    - Exercise A-1: The Impact of Hearing Loss
    - Exercise A-2: Are you talking to me?
    - Exercise A-3: What does hearing loss sound like?
    - Exercise A-4: How to Properly Use Ear Plugs
    - Exercise A-5: How loud is too loud?
    - Exercise A-6: Self-assessment of Hearing
  - Presentations for Noise Training Exercises for use in In-class for Skills Training Programs
    - Exercise B-1 – Cumulative Presentation: Noise and Hearing Loss – The risk and prevention
    - Exercise B-2 (A) – Stand Alone Slide: Noise – What are the risks?
    - Exercise B-2 (B) – Stand Alone Slide: The Cost of Hearing Loss
    - Exercise B-2 (C) – Stand Alone Slide: Noise – How Loud is Too Loud?
    - Exercise B-2 (D) – Stand Alone Slide: Preventing Hearing Loss?
  - Noise Training Exercises For Use In The Hands-On Portion Of Skills Training Programs
    - Exercise C-1: Identifying Noise Levels of Equipment (Group Activity)
    - Exercise C-2: Measuring Noise Levels Throughout the Day (Individual Activity)
    - Exercise C-3: Choosing the Right Hearing Protection



# Construction Noise & Hearing Loss Prevention

<https://www.cpwr.com/research/research-to-practice-r2p/r2p-library/other-resources-for-stakeholders/preventing-hearing-loss/>

**1 Hour Elective Module**



# Introductions

☐ Name

☐ Trade

☐ Years in construction



# Goal

Provide the necessary training to identify a noise hazard, understand the risk for hearing loss, and know what steps should be taken to work safely to prevent hearing loss



# After completing this training you will be able to:

1. Explain why noise and hearing loss is an important issue for construction workers
2. Recognize the signs and effects of hearing loss and tinnitus
3. Identify hazardous noise, types of noise, and common noise sources





# **After completing this training you will be able to:**

4. Know how to measure noise using common indicators and free mobile applications (apps)
5. Describe several ways to control noise exposure
6. Understand the different types of hearing protection devices used in construction and how to use them correctly

# How big is the problem?

**Did you know** that hearing loss is one of the most common work-related illnesses in the United States?



**50%**  
of construction workers have some job-related hearing problem, including hearing loss or (((ringing, whistling, buzzing, or humming))) in the ears (tinnitus).

You can do something to prevent hearing loss. **Buy Quiet!**



<http://www.cdc.gov/niosh/topics/buyquiet>

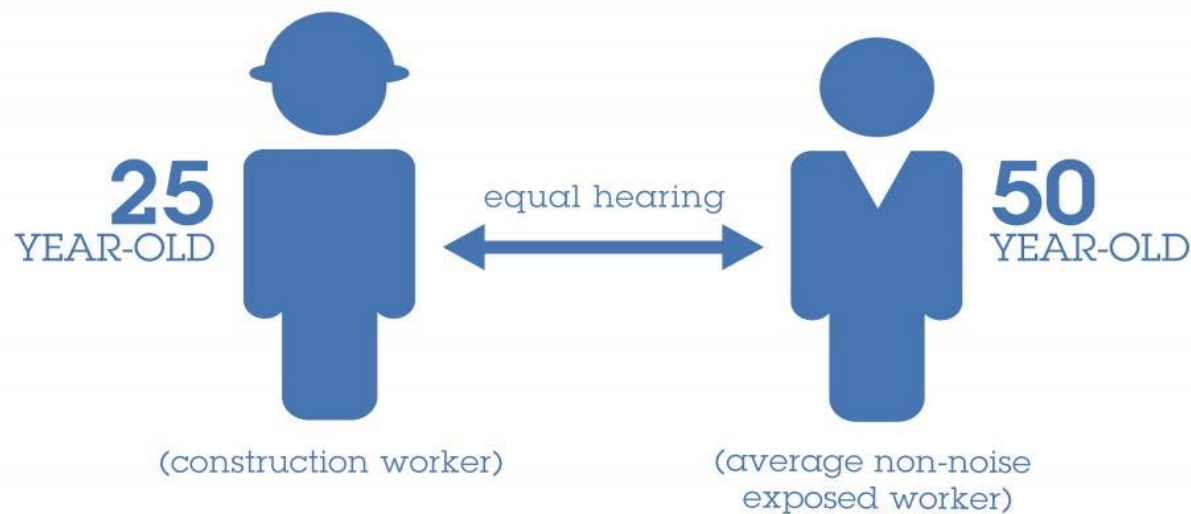




**Why care about hearing loss?**

# Why care about hearing loss?

**It's common** for construction workers to have the hearing of workers twice their age.



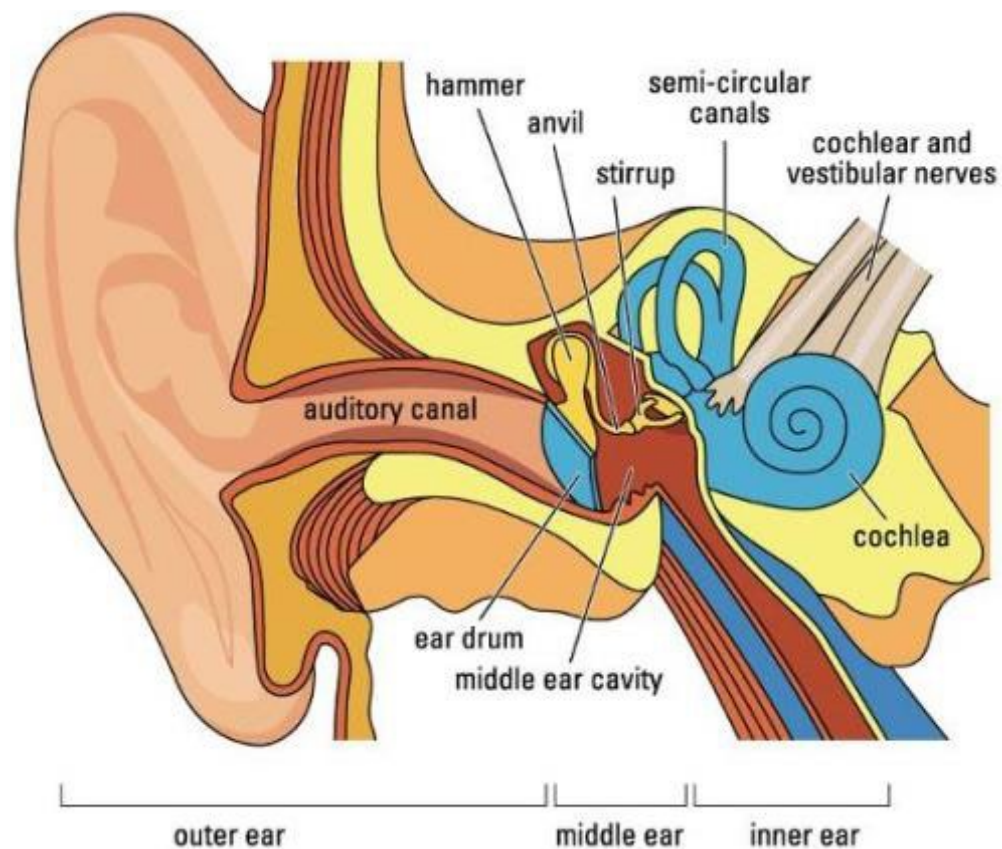
**Is it too loud at work?** Talk to your employer about quieter tools and machinery.



<http://www.cdc.gov/niosh/topics/buyquiet>



# How You Hear



Source: State Building & Construction Trades Council of California, AFL-CIO: Construction Noise & Hearing Loss Prevention training program, Funded by Federal OSHA, 2015 (courtesy of Howard Leight, Honeywell).



# Have you experienced the following...

- ☐ Have trouble hearing people talk when there is background noise
- ☐ People sound like they are mumbling
- ☐ Often have to ask people to repeat what they say
- ☐ Turn up the radio or TV a lot
- ☐ Have difficulty hearing people on the phone
- ☐ Have constant ringing in your ears



# Tinnitus

- ❑ Ringing in ears (or hissing, buzzing, roaring, chirping, or whistling sound)
- ❑ 50 million people in the U.S. have tinnitus



# Are You Talking to Me?

**What it's like to lose your hearing**





## HANDOUT - ARE YOU TALKING TO ME?

	Exercises				
	1	2	3	4	5
Word 1					
Word 2					
Word 3					
Word 4					
Word 5					
Word 6					
Word 7					
Word 8					
Word 9					
Word 10					



HANDOUT - ARE YOU TALKING TO ME?

	Exercises				
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Word 1					
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Word 3					
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# HANDOUT - ARE YOU TALKING TO ME?

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Word 5					
Word 6					
Word 7					
Word 8					
Word 9					
Word 10					





## ARE YOU TALKING TO ME?

31

	1	2	3	4	5
Word 1	star	star	star	star	dust
Word 2	few	few	few	few	stiff
Word 3	bathe	bathe	bathe	bathe	nest
Word 4	cap	cap	cap	cap	then
Word 5	west	west	west	west	camp
Word 6	thin	thin	thin	thin	smooth
Word 7	farm	farm	farm	farm	knees
Word 8	pie	pie	pie	pie	few
Word 9	three	three	three	three	else
Word 10	gave	gave	gave	gave	flat



# Effects of Hearing Loss

- ❑ Difficulty hearing warning signals on the jobs
- ❑ Contribute to loneliness and depression
- ❑ Increase stress, blood pressure, hypertension and cardiovascular disease
- ❑ Lead to nervousness, sleeplessness and fatigue



# What causes hearing loss?

- ☐ Exposure to loud noise
- ☐ Certain drugs and chemicals
- ☐ Aging
- ☐ Heredity
- ☐ Head injury
- ☐ Ear infection



Photo courtesy of the International Masonry Institute & OSHA

# Noise Induced Hearing Loss (NIHL)

- ❑ Most common work-related illness
- ❑ Damage to hearing depends how **loud** the noise is, and
- ❑ How **long** you are exposed to it





# How do you know if it's too loud at work?

## You have to:

- ☐ Shout to be heard an arm's length away (2-3 feet)
- ☐ Turn equipment off to be heard
- ☐ Move to another location to talk & be heard
- ☐ Turn up the car radio at the end of the day



# How Sound Is Measured

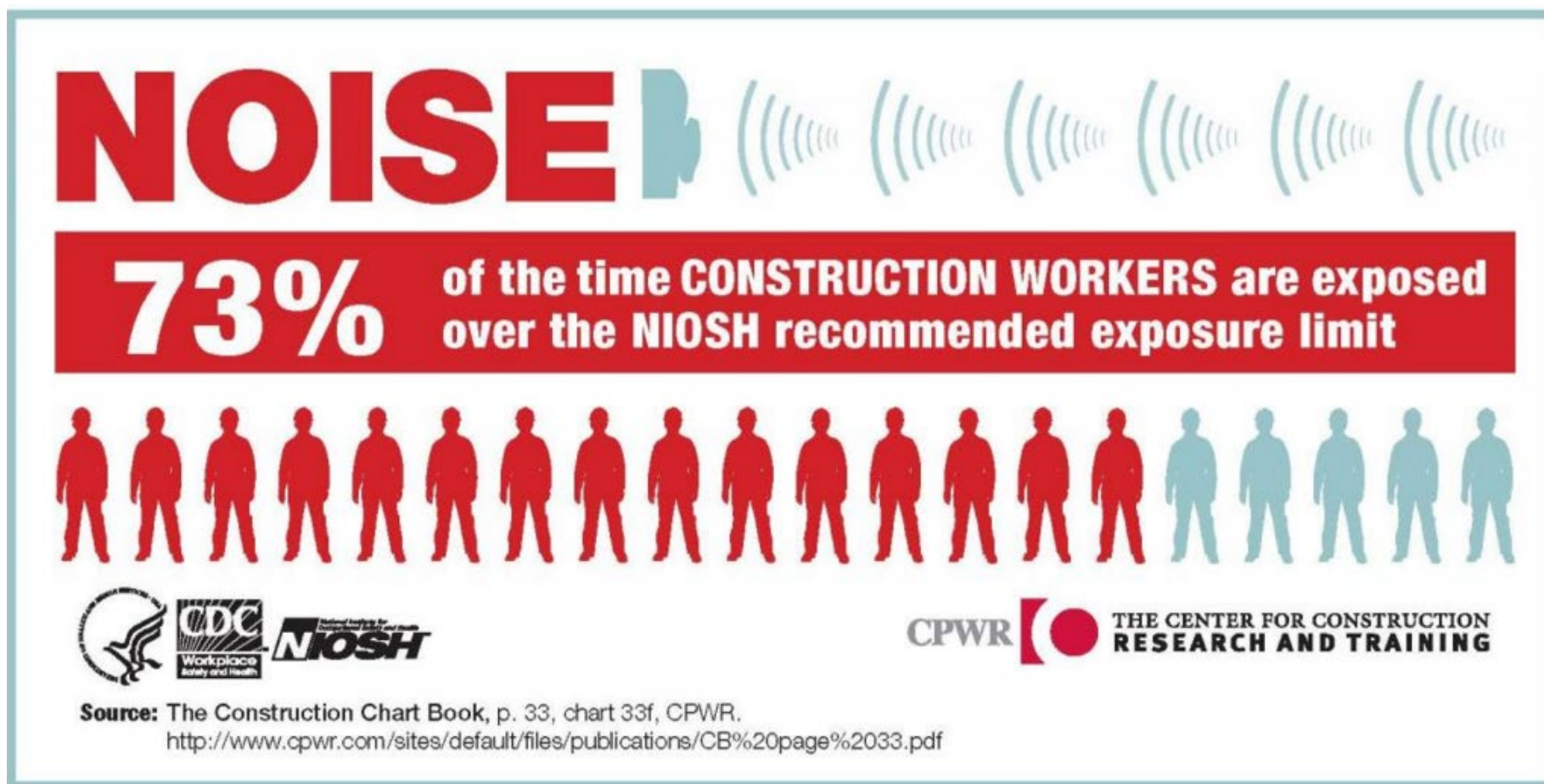
- ❑ Sound is measured in units called **decibels** (dB) using A-weighted sound levels (dBA)
- ❑ A reduction of 3 dBA cuts the noise energy in half

# OSHA Noise Limits In Construction

Permissible Noise Exposure Limits (dBA)		
Duration per day in hours	NIOSH (recommended)	OSHA (Construction Standard)
<b>8</b>	<b>85</b>	<b>90</b>
4	88	<b>95</b>
2	91	<b>100</b>
1	94	<b>105</b>
1/2	97	<b>110</b>
1/4	100	<b>115</b>

Source: NIOSH, Occupational Noise, Revised Criteria, 1998. Table 1-1, and OSHA, 1910.95 (b)(2); Table G-16-

# How frequently are construction workers exposed to dangerous noise levels?





# Noise Levels

39

## NOISE LEVELS BY DECIBELS

Pneumatic Precision Drill	119
Hammer Drill	114
Chain Saw	110
Spray Painter	105
Hand Drill	98
<b>NIOSH Recommended Exposure Limit</b>	<b>85</b>
Normal Conversation	60
Whisper	30



Sources: NIOSH Noise Meter [http://www.cdc.gov/niosh/topics/noise/noisemeter\\_html/hp98.html](http://www.cdc.gov/niosh/topics/noise/noisemeter_html/hp98.html)  
NIOSH Power Tools Data Base <http://www.cdc.gov/niosh-sound-vibration/>



# Noise Sources At Work

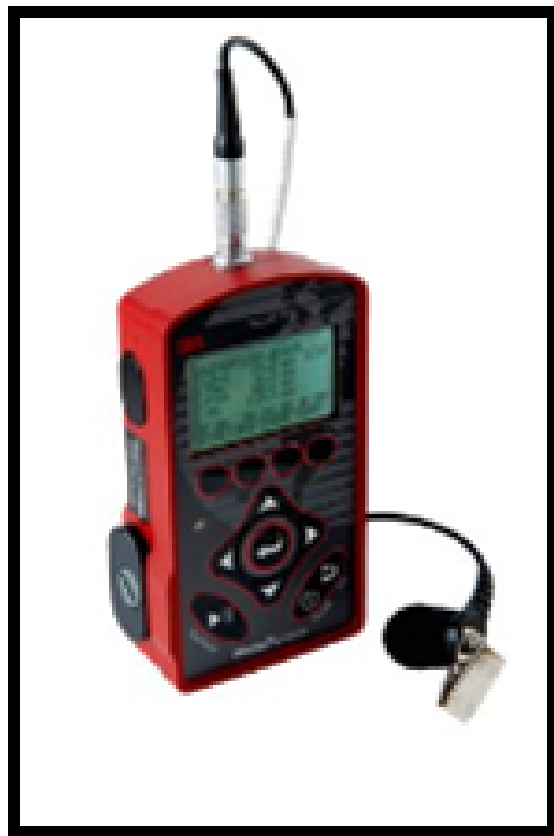
- ☐ Noise you create
- ☐ Noise your trade creates
- ☐ Noise from other trades



Photo courtesy of the International Masonry Institute & OSHA



# Measuring Noise



Source:

3-M Company website :

[https://www.3m.com/3M/en\\_US/company-us/all-3m-products/~/3M-NoisePro-Dosimeter-Kit-NP-DLX-AC3-AC300-Calibrator?N=5002385+8709322+8711405+3293843541&rt=rud](https://www.3m.com/3M/en_US/company-us/all-3m-products/~/3M-NoisePro-Dosimeter-Kit-NP-DLX-AC3-AC300-Calibrator?N=5002385+8709322+8711405+3293843541&rt=rud)

# Noise Measurement Devices



**PERSONAL  
DOSIMETER**

Source:  
3-M Company website :  
[https://www.3m.com/3M/en\\_US/company-us/all-3m-products/~3M-NoisePro-Dosimeter-Kit-NP-DLX-AC3-AC300-Calibrator?N=5002385+8709322+8711405+3293843541&rt=rud](https://www.3m.com/3M/en_US/company-us/all-3m-products/~3M-NoisePro-Dosimeter-Kit-NP-DLX-AC3-AC300-Calibrator?N=5002385+8709322+8711405+3293843541&rt=rud)



**IN-EAR  
DOSIMETER**

Source: State Building & Construction Trades Council of California, AFL-CIO: Construction Noise & Hearing Loss Prevention training program, Funded by Federal OSHA, 2015 (courtesy of Howard Leight, Honeywell).



**SOUND LEVEL  
METER**

Source: State Building & Construction Trades Council of California, AFL-CIO: Construction Noise & Hearing Loss Prevention training program, Funded by Federal OSHA, 2015 (courtesy of Howard Leight, Honeywell).

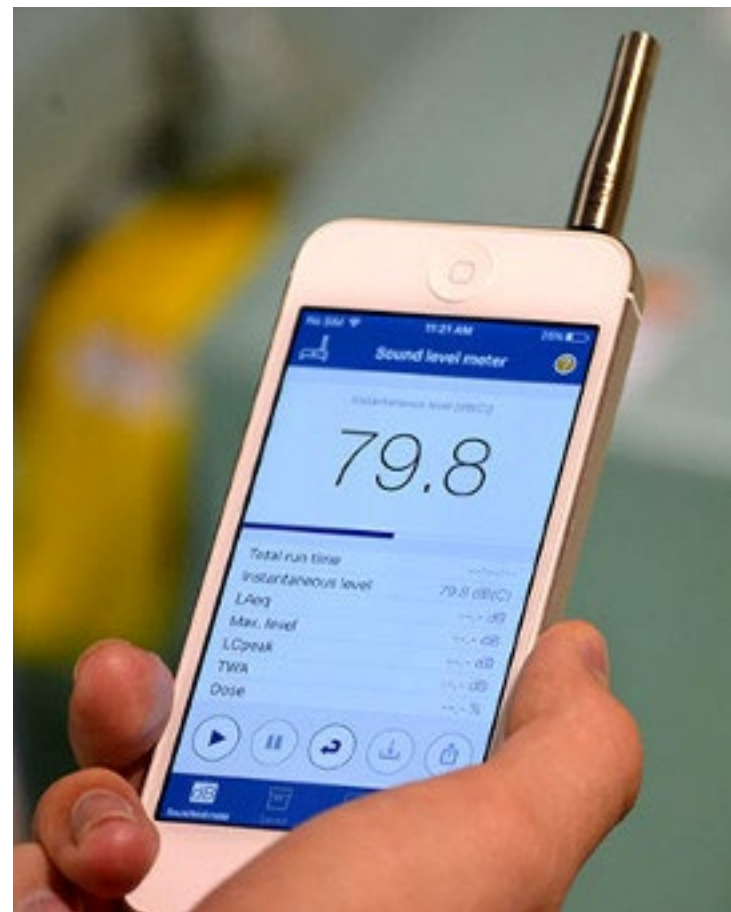
# Sound Level Meter Apps

## NIOSH SLM for iPhones

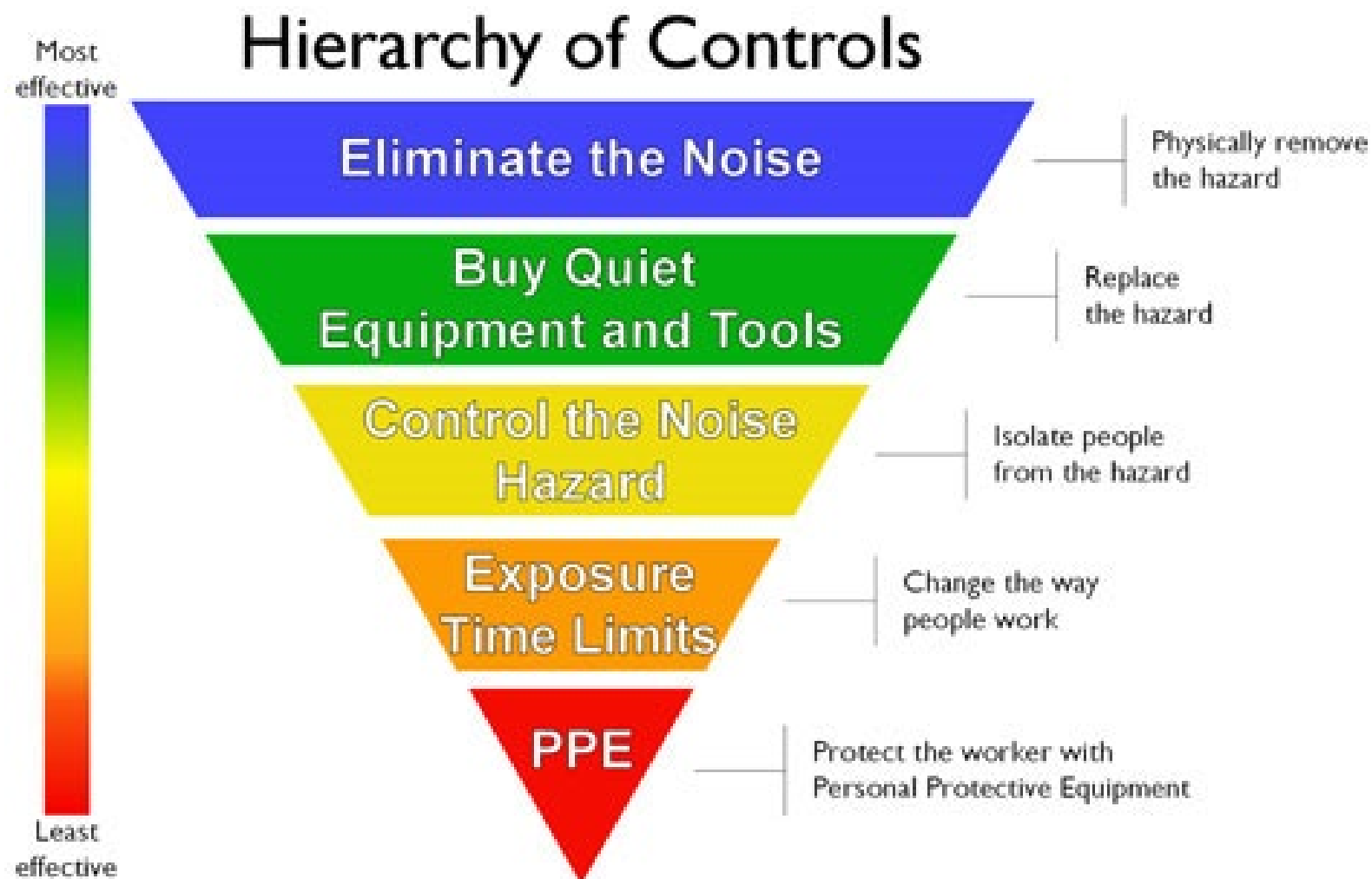
<https://itunes.apple.com/us/app/niosh-slm/id1096545820?mt=8iphone> app

## Sound Meter for android

<https://play.google.com/store/apps/details?id=com.gamebasic.decibel>



# Ways To Control Construction Noise





# Examples of Engineering and Administrative Controls for Noise

## Engineering controls

- ☐ Low noise equipment
- ☐ Barriers and enclosures
- ☐ Noise suppression on equipment
  - ✓ Mufflers
- ☐ Maintain equipment
  - ✓ Belts
  - ✓ Lubrication

## Administrative controls

- ☐ Signs
- ☐ Designated areas for noisy tasks
- ☐ Strategic placement of loud equipment



# What Employers Should Do to Protect You

- ☐ Plan: Before the job starts identify noisy tasks and equipment and plan for controlling noise – including buying or renting quieter equipment.
- ☐ Each day - do a walk-around inspection to make sure the plan is being implemented
- ☐ Monitor noise levels
- ☐ Provide different types of hearing protection - one size or style may not fit all workers
- ☐ Conduct training on each type of hearing protection provided

# "Buy Quiet" Now, Hear Later

Repeated exposures to noise above 85 decibels  
OR one exposure above 140 decibels can lead  
to irreversible hearing loss

**BUY QUIET**



Buying a tool just 3 decibels lower will cut  
the noise energy reaching your ear in half!



<http://www.cdc.gov/niosh/topics/buyquiet>



# Hearing Protection Devices (HPDs)



Source: 3M Company -  
[https://www.3m.com/3M/en\\_US/company-us/all-3m-products/~/3M-Diamond-Grade-Safety-Signs-200-299-Series?N=5002385+3294571656&rt=rud](https://www.3m.com/3M/en_US/company-us/all-3m-products/~/3M-Diamond-Grade-Safety-Signs-200-299-Series?N=5002385+3294571656&rt=rud)



# Types of Hearing Protection

- ☐ Foam (formable) plugs
- ☐ Reusable earplugs
- ☐ Custom molded plugs
- ☐ Banded or semi-aural
- ☐ Earmuffs



Source: State Building & Construction Trades Council of California, AFL-CIO: Construction Noise & Hearing Loss Prevention training program, Funded by Federal OSHA, 2015 (courtesy of Build It Smart )

# Selecting Hearing Protection

- ☐ Convenience
- ☐ Comfort
- ☐ Communication needs
- ☐ Hygiene
- ☐ Hearing ability of worker
- ☐ Noise level
- ☐ **Noise reduction needed**



# Advantages & Disadvantages of Different Types of Hearing Protection

Type	Noise Reduction	Advantages	Disadvantages
Foam Plugs/ Moldable	High	Readily Available	-Hygiene Issues -Take Time to Fit
Reusable (Pre-formed Plugs)	Mid	Quick Fit	-Costly to replace
Banded/ Semi-aural	Low	Quick Fit	-Uncomfortable -If the band is hit it transfers sound to the ear
Earmuffs	High	Quick Fit	-Hot, heavy, cumbersome
Custom	Low to Mid	Quick Fit	-Costly -Replace in 3-5 yrs

Source: State Building & Construction Trades Council of California, AFL-CIO: Construction Noise & Hearing Loss Prevention training program, Funded by Federal OSHA, 2015.



# Care and Maintenance

## **Foam roll plugs**

- ✓ dispose of foam roll plugs after each use

## **Reusable plugs**

- ✓ clean with soap and water, replace when damaged

## **Custom plugs**

- ✓ wash in mild soapy water



# Care and Maintenance

## **Banded or semi-aural**

- ✓ Clean and replace pods regularly

## **Earmuffs**

- ✓ Wipe down with damp cloth, or remove cushions and wash in soapy water
- ✓ Replace cushions if torn or cracked

# Noise Reduction Rating (NRR)

- NRR is measured in decibels
- The **NRR** is found on the earmuff or earplug package
- The higher the NRR number, the greater the protection
- Calculating the level of protection:



$$(NRR - 7)/2 = \text{NRR reduction}$$

$$\text{Exposure level} - \text{NRR reduction} = \text{level of protection}$$

$$(33-7)/2 = 13 \qquad 95\text{dBA} - 13 = 82 \text{ dBA (level of protection)}$$

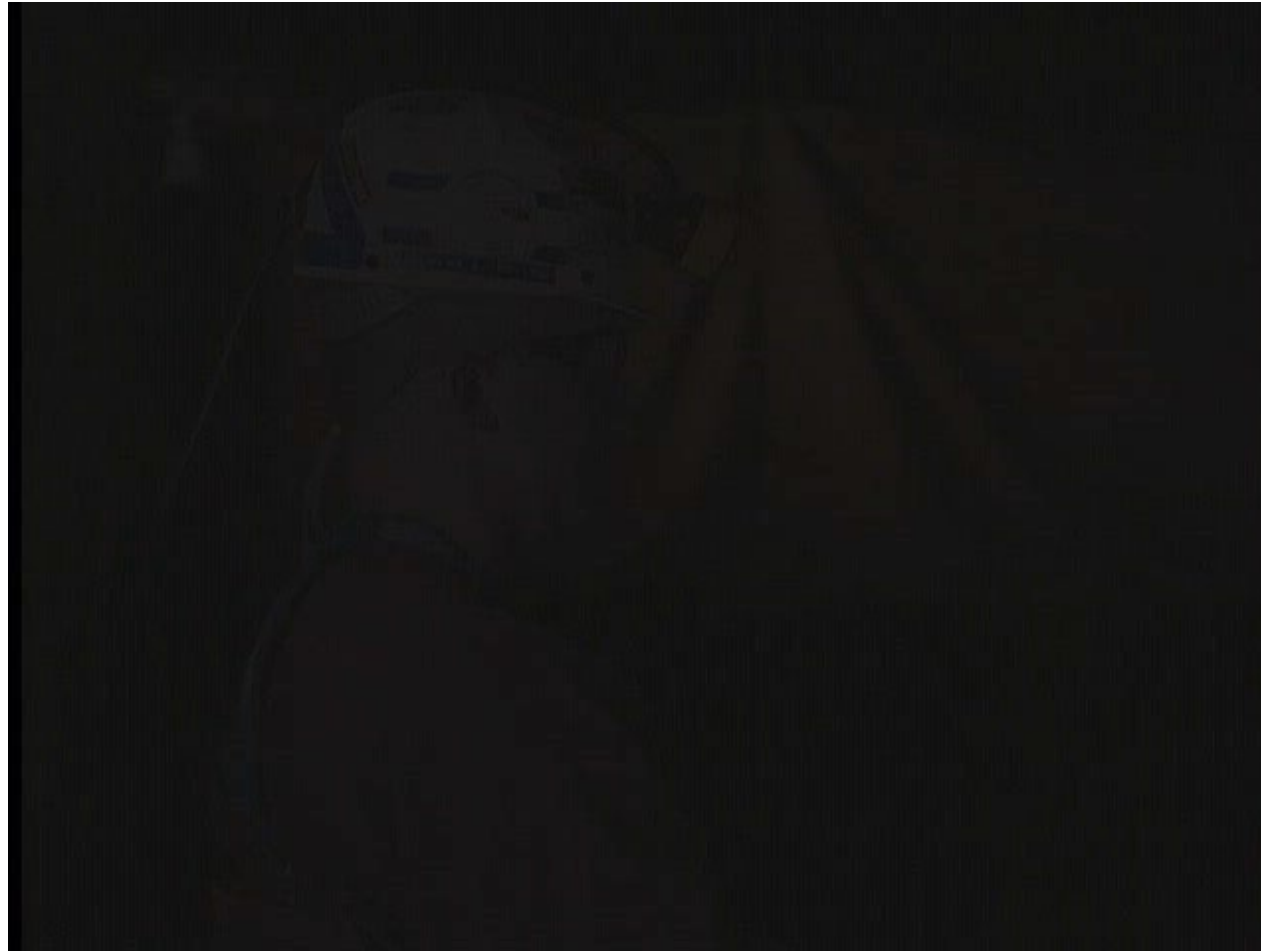
# Hearing Protection Won't Work if it Doesn't Fit



Source: State Building & Construction Trades Council of California, AFL-CIO: Construction Noise & Hearing Loss Prevention training program, Funded by Federal OSHA, 2015 (courtesy of Howard Leight, Honeywell )



# Roll – Pull – Hold

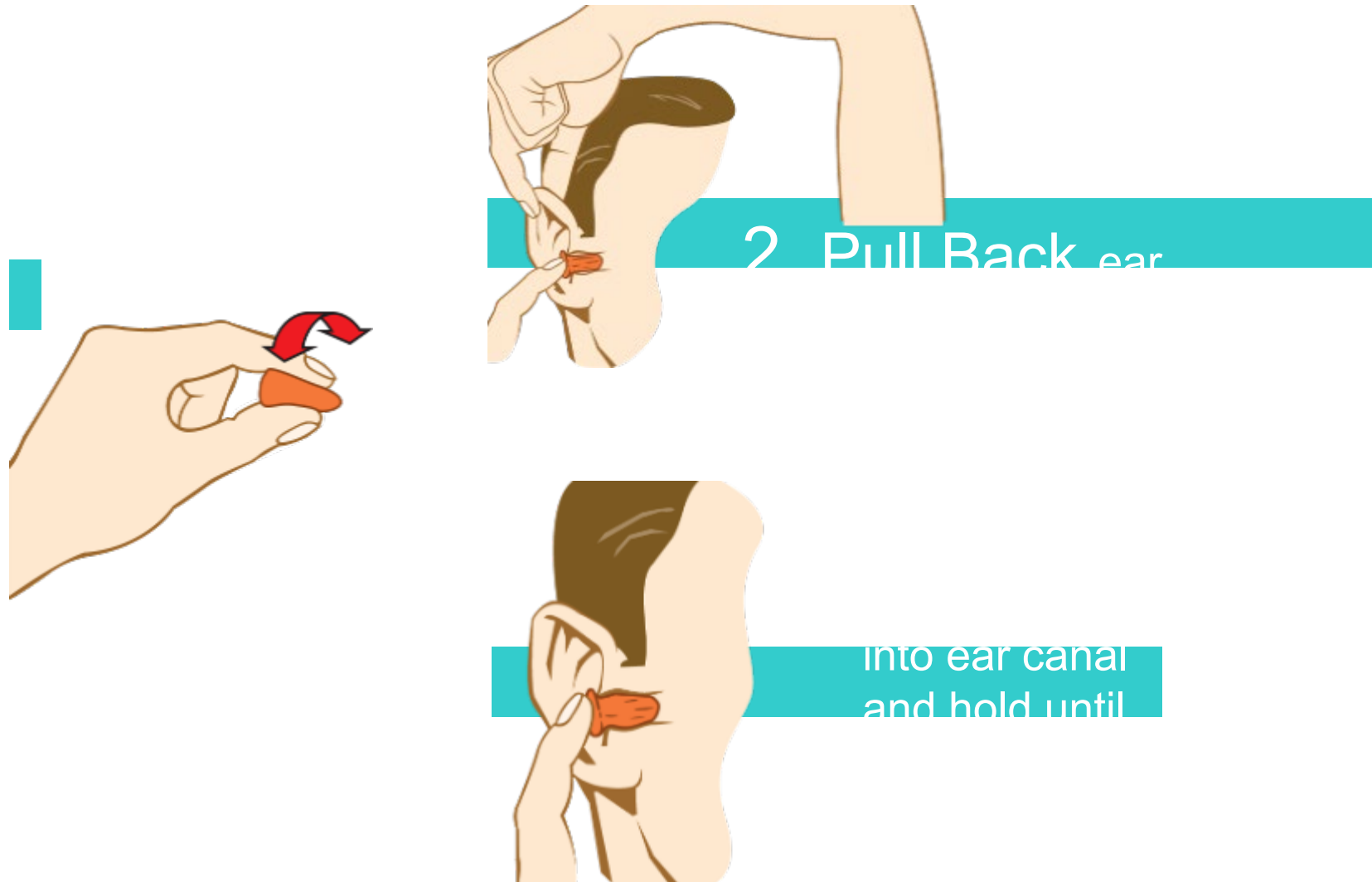


Source: Pittsburgh, PA: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, Publication No. 2007-147c, 2003 Mar.



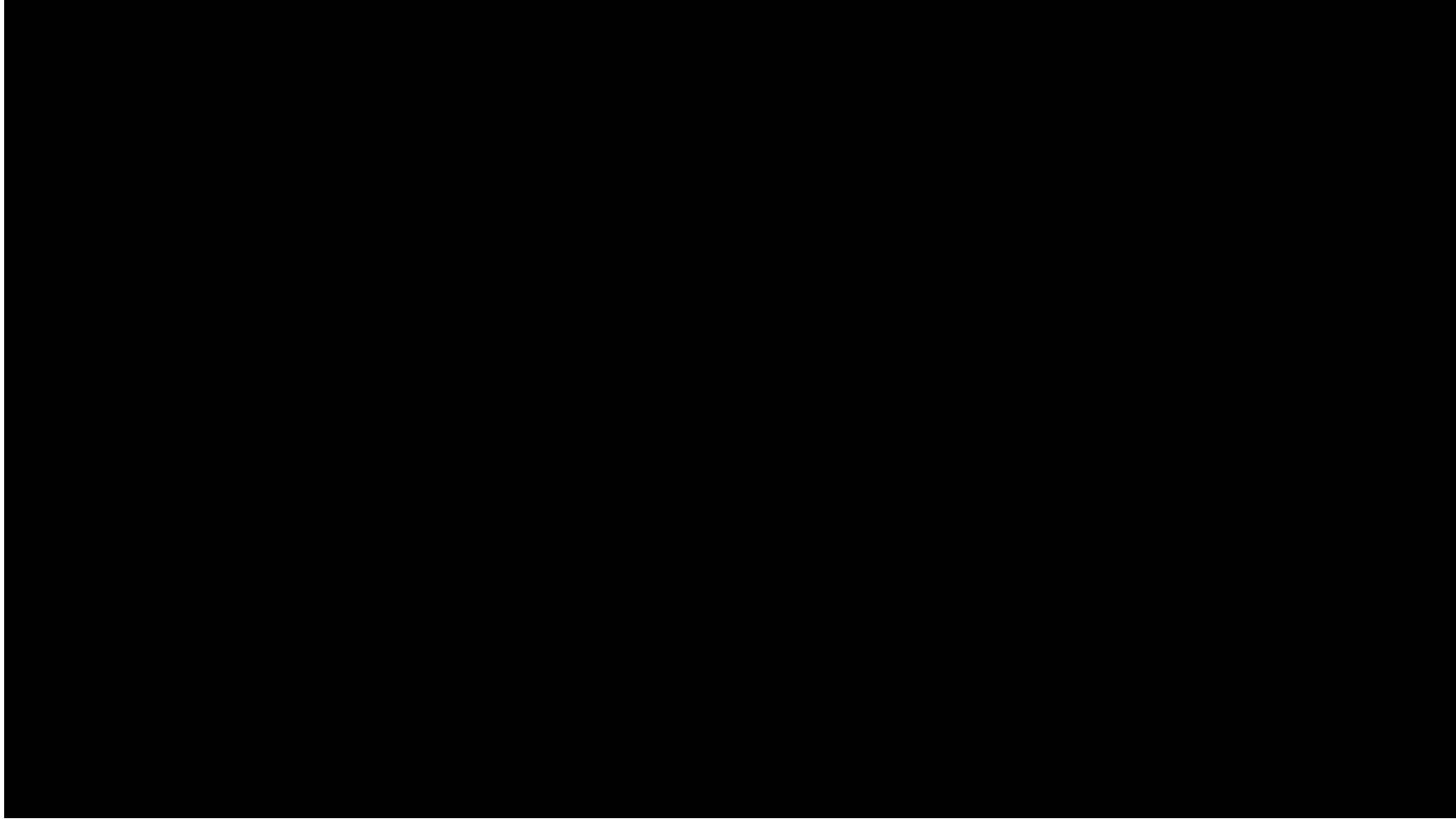


# Fitting An Ear Plug





# What's It Like To Lose Your Hearing?



Video (HUSH Stories Youtube) used with permission from State Building & Construction Trades Council of California



# What we covered

- ☐ The Risk for Hearing Loss
- ☐ How to Identify Noise Sources
- ☐ Measuring Noise
- ☐ Ways to Control Noise
- ☐ Hearing Protection Devices
- ☐ Real Life Lessons

# IN-CLASS & HANDS-ON REFRESHER EXERCISES MODULE

**Section A -- NOISE TRAINING EXERCISES FOR  
USE IN OSHA 10- AND 30-HOUR MODULES (SUCH  
AS TRAINING ON PPE, USE OF POWER TOOLS,  
etc.):**

- **Exercise A-1 – The Impact of Hearing Loss**
- **Exercise A-2 – Are You Talking To Me?**
- **Exercise A-3 – What Does Hearing Loss Sound Like?**
- **Exercise A-4 – How to Properly Use Ear Plugs**
- **Exercise A-5 – How Loud is TOO Loud?**
- **Exercise A-6 – How Would You Describe Your Hearing?**

# IN-CLASS & HANDS-ON REFRESHER EXERCISES

## Section B -- NOISE TRAINING EXERCISES FOR USE IN IN-CLASS FOR SKILLS TRAINING PROGRAMS:

- **Exercise B-1** – Cumulative Presentation: Noise & Hearing Loss – The risk & prevention
- **Exercise B-2** – Stand-Alone Slides: Noise & Hearing Loss – The risk & prevention
  - **B-2 (A)** – Noise – What are the risks?
  - **B-2 (B)** – The Cost of Hearing Loss
  - **B-2 (C)** – How Loud is TOO Loud?
  - **B-2 (D)** – Preventing Hearing Loss

# IN-CLASS & HANDS-ON REFRESHER EXERCISES

## **Section B -- NOISE TRAINING EXERCISES FOR USE IN THE HANDS-ON PORTION OF SKILLS TRAINING PROGRAMS:**

- **Exercise C-1** – Identifying Noise Levels of Equipment (Group Activity)
- **Exercise C-2** – Measuring Noise Levels Throughout the Day (Individual Activity)
- **Exercise C-3** – Choosing the Right Hearing Protection

# HANDOUTS

## HANDOUT - ARE YOU TALKING TO ME?

	Exercises				
	1	2	3	4	5
Word 1					
Word 2					
Word 3					
Word 4					
Word 5					
Word 6					
Word 7					
Word 8					
Word 9					
Word 10					

### CHOOSING THE RIGHT HEARING PROTECTION

Repeated exposure to high noise levels can lead to permanent hearing loss. Because construction jobsites so often expose workers to these high levels of noise, you are at a much higher risk of developing hearing loss than workers in other industries. In fact, one study suggests the risk is as much as 2.5 times higher among construction trade workers. It is important to use proper hearing protection whenever you are around loud equipment or noise-producing tasks. Below are the different types of protection and tips for using them from [NIOSH](https://www.cdc.gov/niosh/topics/noise/noise_choose.html).

#### EXPANDABLE FOAM PLUGS

These plugs are made of a formable material designed to expand and conform to the shape of each person's ear canal. Roll the expandable plugs into a thin, crease-free cylinder. Whether you roll plugs with thumb and fingers or across your palm doesn't matter. What's critical is the final result—a smooth tube thin enough so that about half the length will fit easily into your ear canal. Some individuals, especially women with small ear canals, have difficulty rolling typical plugs small enough to make them fit. A few manufacturers now offer a small size expandable plug.

#### PRE-MOLDED, REUSABLE PLUGS

Pre-molded plugs are made from silicone, plastic or rubber and are manufactured as either "one-size-fits-most" or are available in several sizes. Many pre-molded plugs are available in sizes for small, medium or large ear canals.

A critical tip about pre-molded plugs is that a person may need a different size plug for each ear. The plugs should seal the ear canal without being uncomfortable. This takes trial and error of the various sizes. Directions for fitting each model of pre-molded plug may differ slightly depending on how many flanges they have and how the tip is shaped. Insert this type of plug by reaching over your head with one hand to pull up on your ear. Then use your other hand to insert the plug with a gentle rocking motion until you have sealed the ear canal.

Advantages of pre-molded plugs are that they are relatively inexpensive, reusable, washable, easy to carry, and come in a variety of sizes. Nearly everyone can find a plug that will be comfortable and effective. In dirty or dusty environments, you don't need to handle or roll the tips.

#### CANAL CAPS

Canal caps often resemble earplugs on a flexible plastic or metal band. The earplug tip of a canal cap may be a formable or pre-molded material. Some have headbands that can be worn over the head, behind the neck or under the chin. Newer models have jointed bands increasing the ability to properly seal the earplug.

The main advantage canal caps offer is convenience. When it's quiet, employees can leave the band hanging around their necks. They can quickly insert the plug tips when hazardous noise starts again. Some people find the pressure from the bands uncomfortable. Not all canal caps have tips that

### WHEN TO USE HEARING PROTECTION

Hearing protection should be used anytime the noise level reaches above 85 decibels. To give you an idea of what that means, normal conversation is about 60 decibels, a ringing telephone is about 80, and a lawn mower is 90 decibels. That means any equipment that is loud enough that you can't talk over it normally is probably too loud!

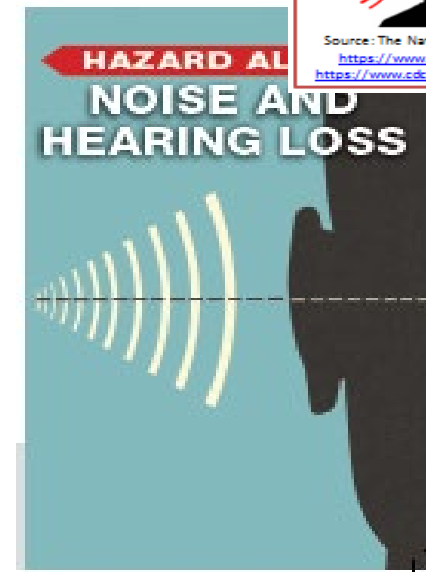
#### Decibel Levels for Common Tools:

Pneumatic Precision Drill	119
Hammer Drill	114
Chain Saw	110
Spray Painter	105
Hand Drill	98

Not sure how loud it is? Download the NIOSH Sound Level Meter App in your iPhone app store!



Source: The National Institute for Occupational Safety & Health, <https://www.cdc.gov/niosh/topics/noise/choose.html> and <https://www.cdc.gov/niosh/topics/noise/noise-meter.html#p0.html>





# Acknowledgments

State Building and Construction Trades  
Council of California

Dr. Robert M. Ghent and Brad K. Witt of  
Honeywell Safety Products, San Diego, CA.





**QUESTIONS?**