Section 3: Curriculum and PowerPoint Slides
Overall Training Objectives

By the end of this training, participants will be able to:

1. Discuss what it is like to experience simulated hearing loss.

2. Explain the effects of hearing loss, warning signs of hearing loss and tinnitus.

3. Discuss hazardous noise, causes of hearing loss, noise-induced hearing loss, how we hear, types of noise and common hearing loss devices.

4. Describe how sound is measured, Cal/OSHA noise limits in construction, and devices used to measure noise.

5. Identify sources of noise at a construction site.

6. Discuss ways to control construction noise.

7. Review the types of hearing protection devices used in construction and demonstrate how to use an earplug correctly.
# At a Glance

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<thead>
<tr>
<th>Activity</th>
<th>Time</th>
<th>Materials &amp; Resources</th>
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<tbody>
<tr>
<td>1) Introduction</td>
<td>5 minutes</td>
<td>▪ Slides #1 - 13&lt;br&gt;▪ LCD, course USB flash drive, computer (for entire training)&lt;br&gt;▪ Flipchart, paper, flipchart pens (for entire training)&lt;br&gt;▪ Handout: <em>Noise</em></td>
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<tr>
<td>2) What’s It Like To Lose Your Hearing?</td>
<td>20 minutes</td>
<td>▪ Slides #14 - 22&lt;br&gt;▪ Handout(s)&lt;br&gt;1) <em>Say What</em> worksheet&lt;br&gt;2) (Optional) <em>What Does Noise-Induced Hearing Loss Sound Like?</em></td>
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<td>3) Hazardous Noise and Hearing Loss</td>
<td>10-25 minutes</td>
<td>▪ Slides #23 - 29&lt;br&gt;▪ (Optional) video clip from “The Hearing Video” located on the instructor’s USB flash drive.&lt;br&gt;▪ (Optional) paint brush demonstration (made in advance)&lt;br&gt;▪ Handouts: 1) <em>How You Hear</em>&lt;br&gt;2) <em>Hear Today…Hear Tomorrow</em></td>
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(Optional Activity) Read a statement that demonstrates how you would hear with severe hearing loss.

(Optional Activities) Show The Hearing Video and/or do the Paint Brush demonstration.
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<tr>
<td><strong>4) Measuring Noise</strong></td>
<td>10-25 min</td>
<td>- Slides #30 - 37</td>
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<td>- Sound level meter (SLM)</td>
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<td>- (Optional equipment) SLM, piece of noisy equipment, and sound enclosure (made in advance)</td>
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<td>- Handouts:</td>
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<td>1) Construction Noise</td>
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<td>2) Common Noise Levels In Construction</td>
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<td>(Optional Activity) Measure sound with and without a sound barrier.</td>
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<td><strong>5) Soundscape Activity</strong></td>
<td>40 min</td>
<td>- Slides #38 - 40</td>
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<td></td>
<td>- Sets of 4 flipchart markers for each small group (black, red, blue, and green).</td>
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<td>- Flipchart paper</td>
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<td>- Handouts:</td>
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<td></td>
<td>1) Protecting Yourself From Noise In Construction (OSHA pocket guide), or optional</td>
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<td></td>
<td>2) (Optional) SBCTC-LOHP Noise Safety Walkaround Checklist, and</td>
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<td>3) (Optional) SBCTC-LOHP Noise Training Guide</td>
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<td>(Optional Activities) Conduct a Walkaround Inspection and Toolbox Training on noise at the job site.</td>
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<td><strong>6) Ways to Control Construction Noise</strong></td>
<td>40 min</td>
<td>- Slides #41 – 43</td>
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<td>- Handouts:</td>
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<td>1) Buy Quiet, Hearing Loss Is Preventable</td>
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<td>2) Controlling Noise on Construction Sites</td>
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<td>3) (Optional) Laminated discussion cards</td>
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| 7) Hearing Protection Devices (HPDs) | 20 minutes | - Slides #44 - 55
- Different types of hearing protection devices:
  - Foam (formable) plugs (for each participant)
  - Reusable earplugs
  - Custom molded plugs
  - Banded or semi-aural
  - Earmuffs
- Handout: *Don’t Let Noise Steal Your Hearing*
| 8) Wrap Up                       | 5 minutes | - Slide #56
- Handout: *Workshop evaluation*  |

**Total time: Approximately 2 1/2 – 3 hours**
Preparing to Teach This Training

Before you present this training have the following materials and equipment available:

• The course USB flash drive (with PPT slides and all course materials)
• Computer and LCD projector for the PowerPoint presentation
• Extension cord for equipment
• Speakers for the Say What hearing loss simulation (if you don't have a good sound system for your LCD projector)
• Course curriculum
• One set of flipchart markers (black, red, blue, and green) for each small group (4-5 participants per group).
• Extra sheets of flipchart paper and masking tape
• Five different types of hearing protection devices to demonstrate:
  o Foam (formable) plugs, have a pair of roll up ear plugs for each participant.
  o Reusable earplugs
  o Custom molded plugs
  o Banded or semi-aural
  o Earmuffs
• Sound level meter. (There are two sound level meter applications listed in the Resource Guide, one for iPhones and one for Android phones.)
• Copies of the Say What worksheet or (Optional activity) What Does Noise-Induced Hearing Loss Sound Like?
• Workshop sign in sheet
• Copies of the handouts for all participants
• Copies of the workshop evaluation for all participants
• (Optional) Video clip from “The Hearing Video” (5:47 minutes), located on USB flash drive
• (Optional) Piece of noisy equipment (e.g. electric drill) and a homemade sound barrier (simple enclosure to put around drill made of plywood.)
• (Optional) Two paint brushes (3” or 4” flat brushes work best). On one brush cut off the top ¾ length of the bristles, leaving just a short stub of the brush.
• (Optional) Conduct a Walkaround Inspection and Toolbox Training on noise at the job site.
• (Optional) Discussion Card Activity
Instructor’s Notes

1) Introduction (5 minutes)

Key points in this session:
- Acknowledgements
- Funding sources
- Photo credits and duplication
- Course objectives
- Why the SBCTC focused on noise and hearing loss prevention

Handout: Noise (CPWR Hazard Alert)

(Slide #1 is the title page)

Show slide #2, Training Topics

Tell the class that there are eight topics in this training. (Identify ahead of time which topic(s) you are going to teach. Tell the class.)

Show slide #3, Introduction

This is the first topic of the training.

Show slide #4, Funded by OSHA

Explain that federal OSHA provided funding for the training.

Show slide #5, Acknowledgements

Acknowledge the organizations that shared their material in the development of this training.

Show Slide #6, Photo Credit and Duplication

Explain that no one can charge a fee for any of the material used in this training.

Show slide #7, State Building and Construction Trades Council of California (SBCTC), AFL-CIO

Describe the SBCTC who sponsored this program.

Show slide #8, Training Objectives.
Does anyone here have hearing loss or know someone who does? (Wait for a response. Then show the next slide.)

Show slide #9, Why Care About Hearing Loss?

Before the Industrial Revolution very few people were exposed to high levels of noise in the workplace. In the 19th century steam was the major source of energy for machinery used in the Industrial Revolution. Workers who made the steam boilers (Boilermakers) developed serious hearing loss in such large numbers that the condition became known as “Boilermakers Disease.”

In the 1905 photo on this slide the Boilermakers Local 248 (from DuBois, Pennsylvania) “feared no noise.” They prided themselves on their ability to work around loud noise. Little did they know that their job would result in significant hearing loss. The SBCTC chose this topic for training because over 100 years later, noise-induced hearing loss continues to be a serious problem for construction workers.

Show slide #10, How Big Is the Problem?

The data shown here makes a strong case for raising awareness and taking action to control noise and protect workers. The good news is that occupational hearing loss is preventable!

Show slide #11, Building Trades Workers and Hearing Loss

In 2001 the National Institute for Occupational Safety and Health (NIOSH) did a study with the United Brotherhood of Carpenters to check for hearing loss. They found that the average 25-year old carpenter had the same hearing loss as a 50 year-old man with no occupational noise exposure. Some of the equipment used by carpenters is similar to the equipment used by other trades (e.g. drill.) These early studies tell us that noise on the job is a serious problem for construction workers.

Show slide #12, Why Is Noise Accepted?

Construction workers have come to accept too much noise as part of the job. People think they can’t do anything about it. With pre-planning and coordination noise sources can be identified and limited so workers aren’t over-exposed.

Show slide #13, What’s It Like to Lose Your Hearing

This is the next topic of the training.
### 2) What’s It Like To Lose Your Hearing? (20 minutes)

Key points in this session:
- Hearing loss simulation exercise
- Effects of hearing loss
- Warning signs of hearing loss and tinnitus
- (Optional activity): Handout, *What Does Noise-Induced Hearing Loss Sound Like?*

**Handouts:** 1) *Say What* worksheet, and 2) (Optional) *What Does Noise-Induced Hearing Loss Sound Like?*

This next activity is a hearing loss simulation exercise; in this exercise participants experience what it is like to lose your hearing. The class will hear a list of ten words, repeated three times throughout the exercise. The first reading simulates what it would be like to hear the words with severe hearing loss. The second reading simulates what it would be like to hear the words with moderate hearing loss. The third reading is what it is to hear the words with normal hearing.

The aim of this exercise is to give participants the experience of hearing loss. The ten words were picked by an audiologist; they represent the sounds you will have difficulty distinguishing if you suffer hearing loss. The purpose of this training is to help workers prevent noise exposure at work so you don’t end up with severe hearing loss when you retire.

#### Optional Activity, What Does Noise-Induced Hearing Loss Sound Like?

For training rooms where a computer connection or sound system is not available, trainers can still simulate the effects of noise-induced hearing loss by simply reading with a page of written text, where the high-frequency sounds are gradually deleted. Copy and distribute the handout for everyone. Then read it out loud. The sample sentences demonstrate how you would hear the sentences with hearing loss.

Show slides #14 - #18, *Say What* activity
Hand out the *Say What* worksheet (handout #1) and make sure everyone has a pen or pencil. The audio portion of this exercise is embedded in the PowerPoint.

Go to slide #15; wait for the audio portion to begin. When it is completed proceed to slide #16, then slide #17 and finally to slide #18. These instructions will be stated by a narrator during the exercise.

► **How well do the words in your columns A, B, and C match with the correct answer? Compare them to the words on this slide (slide #18).**

Experts tell us that in the first stages of hearing loss, the high frequencies are usually lost first. (High-pitch noise is like a steam release [pssshhhhhh] while low-pitch noise is like a rumbling sound [brrrrmmm]. You may have difficulty hearing or understanding high-pitched voices of women and children. High-frequency hearing loss distorts sound, which makes speech difficult to understand even if it can be heard. People with hearing loss often have difficulty differentiating words that sound alike, especially words that contain S, F, SH, CH, H, TH, T, K or soft C sounds. These consonants are in a much higher frequency range than vowels and other consonants. The 10 words on our list contained most of these letters and letter combinations. Note: The “Say What?” exercise is used with the permission of the American Academy of Audiology.

► **How do you think hearing loss would affect your work and personal life if you couldn’t hear what people were saying?**

Show slide #19, *Effects of Hearing Loss*

In addition to the points on the slide, excessive noise can also cause nervousness, sleeplessness, and fatigue. These are called “non-auditory” effects.

Loud noise can also interfere with communication and contribute to workplace accidents and injuries by making it difficult to hear warning signals on the job.

Show slide #20, *Warning Signs*

RAISE YOUR HAND IF YOU HAVE ANY OF THE HEARING PROBLEMS ON THIS SLIDE AS I READ THROUGH THE LIST. (Read the first statement on the slide. Wait for a response. Then proceed to the next statement, etc.)
These are all symptoms of hearing loss. Hearing loss occurs gradually over time so you won’t notice small changes or loss in hearing immediately. Nothing can be done to fix your hearing once it is permanently damaged. The good news is that it is preventable.

► Does anyone experience constant ringing in their ears? (This is often an early sign of hearing loss.) If so, how does it affect you?

Show slide #21, Tinnitus

Symptoms of tinnitus can sound like constant ringing in the ears, a hissing, buzzing, roaring, chirping, or whistling sound. It is a sign that something is wrong in the auditory system, which includes the ear, the auditory nerve that connects the inner ear to the brain, and the parts of the brain that process sound.

Additional Information, Tinnitus (pronounced either ti-NIGHT-us or TIN-i-tus. Both pronunciations are correct.)

- It can be caused by NIHL, and some health conditions including ear and sinus infections, brain tumors, certain medications and drugs.

- The American Tinnitus Association (ATA) estimates over 50 million Americans experience tinnitus. Of these, 12 million have tinnitus severe enough to seek medical attention and approximately 2 million people are so debilitated they cannot function at a normal level on a day-to-day basis.

Show slide #22, hazardous Noise and Hearing Loss

This is the next topic of the training.
3) Hazardous Noise and Hearing Loss (10-25 minutes)

Key points in this session:
- Hazardous noise
- Causes of hearing loss
- Noise-induced hearing loss (NIHL)
- How we hear
- Types of noise in construction
- Common hearing loss devices
- (Optional) video clip from “The Hearing Video” located on the instructor’s USB flash drive.
- (Optional) paint brush demonstration (made in advance)

Handouts: 1) How You Hear, and 2) Hear Today…Hear Tomorrow (Cochlea illustration)

► What is hazardous noise?
Noise is unwanted sound. Noise that is loud enough to harm your hearing is called hazardous noise, and it can cause temporary or permanent hearing loss.

► What are some common causes of hearing loss? (Wait for a response. Then show the next slide.)

Show slide #23, Causes of Hearing Loss

The most common cause of hearing loss is exposure to hazardous noise that is loud enough to damage your hearing (called Noise-Induced Hearing Loss. We will cover this in greater detail.) It can also be caused from ear-damaging chemicals, drugs and medications (called ototoxic, see additional information) aging (approximately one in three people between the ages of 65 and 74 has hearing loss), heredity (from your parents), head injury, and trauma/infection. An injury or infection in the ear can cause temporary or permanent hearing loss. Examples of this are a ruptured eardrum or swimmer’s ear (an infection in the outer ear canal brought on by water that remains in your ear after swimming, creating a moist environment for bacteria to grow.)
Additional Information, Ototoxic (pronounced o-tow-tox-ic) Chemicals

According to NIOSH, many chemicals commonly found in industry, construction and agriculture can cause hearing loss, either alone or in combination with noise exposure. These are called ototoxic (pronounced o-tow-tox-ic) chemicals. The way it affects a person’s hearing is different to noise-induced hearing loss, but the consequences for the person are the same.

Ototoxic chemicals that can contribute to hearing loss include: organic solvents like toluene, styrene, xylene, nhexane, and ethyl benzene; asphyxiants like carbon monoxide; metals like lead and mercury; and pesticides like organophosphates.

Ototoxic drugs that can contribute to hearing loss include nicotine, alcohol, some antibiotics, diuretics and analgesics.

Additional Information, Conductive and Sensorineural Hearing Loss

Hearing loss can be categorized by which part of the ear is damaged. There are three basic types of hearing loss: conductive hearing loss, sensorineural hearing loss, and mixed hearing loss.

Conductive hearing loss occurs because of a mechanical problem in the outer or middle ear. Selected causes of conductive hearing loss include:
• Fluid in the middle ear from colds, ear infections, allergies
• Punctured eardrum
• Benign tumors
• Impacted earwax
• Presence of a foreign object in the ear
Causes of conductive hearing loss can often be treated and corrected.
Noise-induced hearing loss (NIHL) continues to be one of the most common work-related illnesses in the U.S. NIHL is caused by a one-time exposure to loud sound (over 85dBA) like an explosion or by repeated exposure to loud sounds over an extended period of time, like the noise created on a construction site. The louder the sound, the shorter the amount of time it takes for NIHL to happen. The damage done by noise depends mainly on how loud it is and how long you are exposed to it.

Noise-induced hearing loss can be temporary or permanent. Temporary hearing loss results from short-term exposures to noise, with normal hearing returning after period of rest. Generally, continued exposure to high noise levels over a period of time gradually causes permanent damage. It is the most common form of occupational hearing loss.

To understand how hearing loss occurs, we will discuss how you hear.
Show slide #25, *How You Hear*

Here is what happens when you hear. The ear is made up of three basic parts:

1) The outer ear
2) The middle ear
3) The inner ear

Sound travels down the **outer ear** canal, hits the eardrum and makes it vibrate (move back and forth). The vibrations pass through the middle ear which creates motion in the inner ear that is filled with fluid. The movement of fluid in the **inner ear** (the cochlea) bends thousands of delicate tiny hair-like nerve cells. The movement of these hair cells sends signals to the brain (through the auditory nerve). The brain interprets these signals as sound.

Typically the high sounds (or frequencies) are affected first because the hair-like nerve cells for those sounds are located at the entry of the cochlea where every sound wave passes by. As we discussed earlier, this can affect hearing women and young children because they have higher voices.

Show slide #26, *The Cochlea*

This slide shows three different cochleas:

- The first one is from a 17-year old girl who had low noise exposure and a cochlea with all the tiny hair-like nerve cells unbroken (no damage).
- The second one is from a 76-year old man who had low noise exposure. He has fewer nerve cells than the 17 year old girl but most of them are complete and are not broken (some damage).
- The third one is from a 59-year old man who was exposed to a lot of noise. You can see that the cochlea is damaged and that many of the hair-like nerve cells have been destroyed. Once these

**Video Option**

You can also show a short video on how you hear instead of discussing the next two slides. We recommend a video clip from “*The Hearing Video*” (5:47 minutes) that is on your USB Flash Drive. It shows how you hear (in your inner ear), how your hearing is damaged, and hearing protection devices. It also shows how to fit ear plugs correctly.
hair cells are destroyed they do not grow back. This person has permanent hearing loss.

Optional Paint Brush Activity

Get two identical paint brushes before the training (3” or 4” flat brushes work best). On one of the brushes, cut off the bristles so that only a short stub of the brush remains. The uncut brush represents a healthy ear with no damage to the hair-like nerve cells. They are all intact and move freely with sound. Illustrate this by moving your hand side-to-side across the brush. The bristles bend but recover when the motion stops. Now show the brush with the bristles cut down to illustrate what happens to the nerve endings in your ear (cochlea) if they become damaged. They are not there to receive the sound vibrations. They don’t grow back, producing permanent hearing loss.

► How do you know if it’s too loud at work? (Wait for a response. Then show the next slide.)

Show slide #27, How Do You Know If It’s Too Loud?

These are some simple “rules of thumb” that you may be in a hazardous noisy situation that could cause damage to your hearing.

Show slide #28, Types of Noise

Most noise exposures are not constant over time. There are 3 different types of noise and all of these occur in construction work:

Continuous – This type of noise is relatively steady over long periods of time. It is more often found in manufacturing industries. Ask for examples in construction.

Intermittent – This type of noise has large differences in noise levels throughout the day, along with periods of relative quiet. Intermittent noise may be less hazardous than continuous because your ears have a chance to rest during the quiet periods. Ask for examples in construction.

Impact/Impulse – This is a short duration of fairly high level noise. High-level impact noise may be more hazardous to hearing than other types of noise, especially if it is combined with continuous noise. Ask for examples in construction.
Hearing Devices

Nothing can be done to restore your hearing to normal hearing once it is permanently damaged. There are three basic types of hearing devices.

In simple basic terms, a **hearing aid** is an amplifier that makes sounds louder so you can hear them better. A person consults with a hearing specialist (audiologist) to get a hearing test to determine what kind of hearing loss they have. That information is used to select the right kind of hearing aid.

**Assistive Listening Systems (ALSs)** are sometimes called **Assistive Listening Devices (ALDs)**. Essentially they are amplifiers that bring sound directly into the ear. They can be used with or without hearing aids or cochlear implants. Examples include TV listening devices, conference microphones, and telephone amplifiers. They have been referred to as “binoculars for the ears.”

According to the FDA (who regulates medical devices) a **cochlear (koe-klee-er) implant** is an implanted electronic hearing device, designed to produce useful hearing sensations to a person with severe to profound nerve deafness by electrically stimulating nerves inside the inner ear. These implants usually consist of 2 main components:

1) The externally worn microphone, sound processor and transmitter system, and
2) The implanted receiver and electrode system, which contains the electronic circuits that receive signals from the external system and send electrical currents to the inner ear.

Currently made devices have a magnet that holds the external system in place next to the implanted internal system (as seen in the slide). An implant does not restore the person's hearing back to normal but it does allow him or her to perceive sounds.

Hearing devices cannot restore your hearing nor can they prevent the progression of hearing loss. That is why we are focusing on the prevention of hearing loss.

Show slide #29, *Measuring Noise*

This is the next topic of the training.
4) Measuring Noise (10-25 minutes)

Key points in this session:
- How sound is measured
- Cal/OSHA noise limits
- Noise measurement devices
- Construction noise levels
- Equipment needed: Sound level meter (SLM)
  - (Optional) SLM, piece of noisy equipment, and sound enclosure (made in advance)

Handouts: 1) Construction Noise (CPWR Hazard Alert), and 2) Common Noise Levels In Construction

While there are some simple signs that may alert you to hazardous noise (Slide 27), the only way to accurately know noise levels is to monitor noise while it’s happening.

► How is sound measured at the workplace?

Additional Information, How Sound is Measured

Sound is measured in three ways:
1) **Frequency** is measured as the number of sound vibrations in one second. A healthy ear can hear sounds of very low frequency, 20 Hertz (or 20 cycles per second), to a very high frequency of 20,000 Hertz.

2) **Intensity** is measured in units of sound pressure levels called decibels (named after Alexander Graham Bell) using A-weighted sound levels (dBA). The A-weighted sound levels closely match the perception of loudness by the human ear. The decibel scale is a logarithmic scale, not a linear scale. It is similar to the Richter earthquake rating scale: a small increase in dBA numbers represents enormous changes. Sound energy that is twice the level of 83 dBA is not 166 dBA, it is 86 dBA.

3) **Duration**, or how long the exposure lasts, is measured in hours and minutes, referred to as the Time Weighted Average (TWA). In a time-weighted average (TWA), greater noise levels require shorter exposure times, and lower noise levels allow longer exposure times.
Decibels (dB) are used to measure loudness. Decibels are measured on a logarithmic scale which means that a small change in the number of decibels results in a huge change in the amount of noise and the potential damage to a person’s hearing.

An increase of 3 dB means the sound intensity has doubled. For example, the sound doubles between 83 and 86 dB.

► **What is the Cal/OSHA Noise Limit in Construction?** (Wait for the class to respond. Then show the next slide.)

Cal/OSHA is the state agency in charge of making sure employers create safe workplaces. Cal/OSHA has set a limit for how noisy a work environment can be.

The chart in the slide shows the limits set by Cal/OSHA on the amount of noise workers can be exposed to on the job. This is Cal/OSHA’s PEL (Permissible Exposure Limit) for noise. PELs are the legal limits (averaged over an 8-hour workday) for exposure to a workplace hazard unless you use special protection or controls.

Cal/OSHA’s PEL for noise in construction is 90 dBA. Cal OSHA states: “If you are exposed to an average of 90 decibels for 8 hours, Cal/OSHA says that ‘feasible’ administrative and engineering controls must be used. If these fail to reduce sound levels to the PEL, workers must wear HPDs and be trained on how to properly use them.”

NIOSH (National Institute for Occupational Safety and Health) recommends a more protective PEL of 85 dBA, because exposure to 85 dBA could damage your hearing. **We recommend that you protect your hearing at 85 dBA and higher.**

**Additional Information: Hearing Conservation Program**

Cal/OSHA requires employers in general industry to have an effective hearing conservation program whenever noise levels exceed 85dBA for 8 hour time weighted average (TWA).

An effective hearing conservation program includes noise monitoring, worker hearing testing each year, training and recordkeeping. Construction is exempt from these aspects of the hearing conservation program (GISO section 5097 – GISO 5100). Employers must still have an effective IIPP program in California.
Next we are going to look at how sound is measured. It is one way to assess how much noise you are being exposed to at the workplace. Workers don’t have to be experts to measure noise they are exposed to at the workplace.

► **What kind if equipment is used to measure sound?**

Show slide #32, *Noise Measurement Devices*

Pass around a sound level meter for the class to see. (*See the following optional activities using a sound level meter.*)

There are two commonly used methods to monitor noise levels at the workplace: personal (worker) sampling using a noise dosimeter and area sampling using a sound level meter.

- A **noise dosimeter** is worn by the worker to measure the amount of noise the worker is exposed to during the work shift or sampling period. The dosimeter stays on the worker for a certain sampling period – several hours, or even the entire workday – and continuously monitors the noise. At the end of the sampling period, a read-out shows the average noise level. A person has to be trained to use a dosimeter correctly.

- A **sound level meter** (SLM) is the basic instrument for measuring noise levels. Any worker can use a SLM. Some common uses for sound level meters include:
  - Spot-check noise levels
  - Determine an employee’s noise levels whenever a noise dosimeter is unavailable or is inappropriate
  - Aid in determining the feasibility of engineering controls for individual noise sources

- There are also free **applications (apps) for cell phones** you can download for sound level meters. Recent studies show that these apps are fairly accurate. There are two apps listed in the Resource Guide, one for iPhones and one for Android phones.

- The newest method to measure exposure is to directly measure the individual’s protected exposure with “**in-ear dosimetry.**” Integrated into earplugs or earmuffs, an in-ear dosimetry device measures and records the actual amount of noise the worker is exposed to, with and without hearing protection, over their entire work shift. A person has to be trained to use this type of device.
(Optional Activities: Using a Sound Level Meter)

Move Away From the Source of Noise

Make sure you have the following equipment for this activity in advance: a sound level meter and a piece of noisy equipment (like a hammer or electric drill).

The instructor hammers or does another noisy operation for a few seconds while one student measures the sound level with the noise level meter. A second student records the dBA on the flipchart. The noise monitor walks 10 feet away and takes another measurement. Repeat the procedure. Point out and discuss the reduction in noise due to moving away from the source.

Tell the class:

For this next activity I will need two volunteers. One to record the flipchart and one to measure noise with a sound level meter. We are going to measure and record the noise at the source. Then the noise monitor will walk 10 feet away and measure the noise again. We will see how much the noise is reduced each time we move away from the source. (Every time the distance is doubled the noise level should fall by 6 dBA, under ideal conditions).

Block the Source of Noise With a Barrier

You will need to make a barrier in advance. Select a piece of loud equipment. Set up a noise barrier. For example, you can build a small box out of plywood to put over an electric drill.

The instructor uses a noisy tool (or does a noisy operation) for a few seconds while a student measures the noise. Then the instructor puts a barrier over the tool or noisy operation. The student takes another measurement.

Tell the class:

In this next activity we are going to take noise measurements with and without a barrier. (Avoid doing this near reflective walls because the noise can bounce back and alter the demonstration.)

► What did you learn from this demonstration?

Show slide #33, Noise Sources At Work
This slide shows the three main sources of noise on the job. Knowing what noise to anticipate, and when, will help you plan accordingly. You should consider all three noise sources when you plan how you are going to protect yourself from the noise.

Show slides #34, Noise From Hand Tools and slide #35, Noise From Construction Equipment

► What hand tools and construction equipment do you use on your job?

Referring to the two slides discuss the noise levels people could possibly be exposed to.

► What recreational activities could put you at risk for NIHL? (Wait for a response. Then show the next slide.)

Show slide #36, Noise Off The Job

It is important to protect your hearing both on and off the job. Hearing protection should be used when using power tools or noisy equipment.

However it is important to remember what damages hearing: both noise levels and how long you are exposed. Non-occupational noise levels are not usually as long as occupational exposures.

Work exposure accounts for the majority of total noise exposures. Therefore, although it is difficult to distinguish between job-related hearing loss and off-the-job loss, the employer is still responsible for providing protection and, if need be, compensation under Workers’ Compensation.

Show slide #37, Soundscape Activity

This is the next topic of the training.
5) Soundscape Activity (40 minutes)

Key points in this session:
- Work in small groups
- Create a noise map (Soundscape), report back to the class
- Materials needed for session:
  - Sets of 4 flipchart markers for each small group (black, red, blue, and green)
  - Flipchart paper
  - Masking tape
- (Optional) Noise walkaround inspection and toolbox training

Handouts: 1) Protecting Yourself From Noise In Construction (OSHA pocket guide), 2) (Optional) SBCTC-LOHP Noise Safety Walkaround Checklist and 3) (Optional) SBCTC-LOHP Noise Training Guide

Explain to the class:
In this activity you are going to identify the sources of noise at a construction job site. You are going to create a Soundscape of the noise.

Creating a Soundscape involves drawing a simple map or floor plan of the construction site you are assigned. Then show where the sources of noise are at that construction site.

Each small group will be assigned one phase of a construction site to analyze from the following list:

1) Site clearing, excavation and earthwork site preparation.
2) Building the concrete foundation and concrete walls.
3) Erecting the structure (walls, floors, ceiling, etc.)
4) Completing the finishing work (sheet metal, cabinetry, electrical, etc.)

Each group will have a set of markers and flipchart paper. Use the **black** marker to draw the assigned site/floor plan on the flipchart.
paper. The plan should show the work area, major machinery, equipment, and vehicles used in that operation.

Show slide #38, Sample Soundscape

This is a slide of a sample Soundscape of an office. This is a sound map created by an OSHA inspector using a sound level meter to record the dBA in various locations. You don't have to estimate the decibel rating on your Soundscape. Just mark the sources of noise you might find in your assigned construction site in another color. Make sure to include noise produced by other trades (and equipment) who might be working in the same area.

Show slide #39, Soundscape Activity (Part 1)

- Divide the class into small groups of 3-5 participants. Assign each small group a different phase of construction to map.

Tell the group:

You will have about 15 minutes to create your Soundscape. Each group should select someone to present their Soundscape to the class later. Be prepared to describe the sources of noise identified in your construction phase to the rest of the class. Ask each group to identify the main sources of noise in the construction phase they were assigned.

- Give each group a blank sheet of flipchart paper and a set of markers.

- While people are creating their Soundscapes, walk around among the various groups and answer any questions they may have. Be sure the groups choose two or three main sources of noise, and tell them to be ready to explain why they chose those particular noise sources. Give each group a “two minute warning” when time is almost up.

- Bring the class back together and have the small groups present their Soundscape. Have one group volunteer to go first, briefly explaining the construction phase they illustrated and the two or three main sources of noise they identified. They should hold up their Soundscape or tape it to the wall as they explain it. Then continue until all of the groups have presented.

Show slide #40, Ways To Control Noise
This is the next topic of the training.

**Optional Activities: Conducting a Walkaround Inspection and Tailgate Noise Training**

(All companies must have a written Injury and Illness Prevention Program (IIPP) that meets all Cal/OSHA requirements. The IIPP must include identification of noise hazards on the site, regular inspections, accident investigation, and correction of hazardous conditions. [1509])

**Preparation**

Conduct a walkaround inspection of the job site first, using the **Safety Walkaround Noise Checklist** (located in Tab 4 of your binder). It will help you identify the noisy jobs on site. It summarizes Cal/OSHA regulations related to noise, as well as some good safety practices. You will use the information recorded on your Checklist to prepare for your Tailgate meeting.

There is also a **Training Guide on Noise** (located in Tab 4 of your binder) with a lesson plan. You should take time before the Tailgate meeting to become familiar with the Training Guide. Read it over and fill in the blanks. You’ll need information from the Noise Checklist you completed earlier, as well as from your own knowledge of the job. Adding these details to the Training Guide helps ensure that the safety meeting deals with actual conditions on the job site.

**Hold The Tailgate Meeting**

Throughout the Training Guide you will find instructions directed to you as the trainer (they appear in italics.) Ask the numbered discussion questions in in sequence. After you ask each question, allow time for the crew to answer. After the crew members have given their answers, discuss them, and then use the information in the Training Guide to add any points you think are important.

Remember to document any hazards they crew reports to you during the meeting. Make a plan for correcting the hazards that are under your control. If the hazards are outside your control, report them immediately to your supervisor so they can be corrected.

**Equipment needed:** samples of hearing protection devices (earplugs and/or earmuffs) used on the job site to show the crew during the meeting.
6) Ways to Control Construction Noise (40 minutes)

Key points in this session:
- How to eliminate or control noise hazards
- Small groups show how to control noise on their Soundscapes
- Materials needed for session:
  - Sets of 4 flipchart markers for each small group (black, red, blue, and green)
  - Flipchart paper
  - Masking tape
- (Optional) Discussion card activity

Handouts: 
1) Buy Quiet- Hearing Loss Is Preventable, and
2) Controlling Noise on Construction Sites, and
3) (Optional) Laminated Cards

On a flipchart page, draw two columns. Head the left column Construction Noise and the right column Possible Solutions. (see chart below for example)

Under Construction Noise, write “Compressor.” (Or choose a tool or piece of equipment that commonly creates noise for your trade, phase of construction, or current jobsite.)

What are all the ways you can think of to solve the problem of a noisy compressor?

As participants suggest answers, write them in the Possible Solutions column next to the hazard.

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<th>Construction Noise</th>
<th>Possible Solutions</th>
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<tbody>
<tr>
<td>Compressor</td>
<td>• Buy generator designed to emit low noise</td>
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<td>• Enclose compressor with damping cladding</td>
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<td>• Move compressor away from workers.</td>
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<td>• Workers wear HPDs</td>
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Explain to the class:

As we’ve seen, there are a number of ways to protect workers from noise. But not all solutions are equally effective. We can think
in terms of a pyramid or “hierarchy” of possible solutions, with the most effective kind of solutions at the top.

Show slide #41, How To Control Noise at Work

- Draw a large pyramid on a flipchart page (dry erase board, chalkboard or whatever you have available). Divide the pyramid into three sections as shown below. Write “Remove the Hazard” in the top section.

Explain possible ways to “remove the hazard”:

The best way to protect workers is to remove the hazard from the workplace altogether or at least keep the hazard away from workers.

▶ What Are Some Examples of Removing the Hazard to Control Construction Noise?

Write what the class says on the flipchart.

Possible answers include:

- Substitute quieter process or equipment (e.g. Buy Quiet, see Additional Information box below)
- Eliminate or minimize noise at the source
- Isolate/enclose the process or operator
- Increase distance from the source of noise
These are called Engineering Controls. They are considered most effective because they get rid of the hazard at the source, they don’t rely on people to follow procedures, and they don’t allow for shortcuts.

An easy way to remember controls for hazardous noise is, “Reduce It—Move It—Block It.”

Write “Policies and Procedures” in the middle section of the pyramid.

► What are possible ways to use “policies and procedures” to control noise?

Write what people say on the flipchart.
Possible answers:

- Do a Job Safety Hazard Analysis (JSHA) in the planning stage. Identify the noisy tasks and ways to control them before work begins
- Create a noise perimeter zone to limit exposure to noisy processes or equipment
- Schedule noisy tasks off hours in advance
- Ask the employer to monitor noise levels of different tasks, use that information to inform how the work is done
- Training

These are called **Administrative Controls**. They are second in the pyramid because they don't remove the hazard, they limit or prevent people's exposure to the hazard through policies or procedures.

Write “Personal Protective Equipment” in the bottom section of the pyramid.

![Pyramid Diagram]

Tell the class about **Personal Protective Equipment**: Personal protective equipment, or PPE, is worn on the body and protects you from exposure to a hazard. It includes gloves, goggles, respirators, earplugs, hard hats, coveralls, safety shoes, etc. Workers wear PPE when other methods of controlling
hazards aren’t possible or don’t give enough protection. PPE is the least effective. Try to remove the hazard or change work policies or procedures first.

► Why are hearing protection devices (HPDs) less effective than the other methods?
Possible answers include:

- It doesn’t get rid of the hazard itself.

- Workers may not want to wear them because they are uncomfortable and may make it hard to communicate.

- HPDs have to fit properly to work, and in some cases must be cleaned and inspected to work properly.

- Workers must be trained on how to use HPDs properly.

- One size, style, model doesn’t fit all workers

- Have the class look back at the list of controls for the hazard “noisy compressor” and have them categorize each control.

- Summarize key points about the different control methods.

Explain to the class

Sometimes you may need a combination of methods to control a hazard. Even when engineering controls are used, you usually need training programs and other workplace policies and procedures. There may also be situations where PPE is essential even though it’s the least effective method. For example, you will have to wear hearing protection devices in construction if the noise cannot be eliminated or controlled at the source.

Show slide #42, Soundscape Activity (Part 2)

- Tell the class:

  You will have about 10 minutes to figure out ways to control the sources of noise identified in your Soundscape. Focus on the main sources of noise you identified earlier. Try to find engineering solutions to remove the hazard. Each group will present their ideas back to the class.
Ask each group to explain the controls they chose to address the main sources of noise identified in their Soundscape.

- Refer participants to the Factsheet, *Controlling Noise on Construction Sites*, in their binder. Tell them that this factsheet provides background information on ways to eliminate or reduce construction noise.

Show slide #43, *Hearing Protection Devices (HPDs)*

This is the next topic of the training.

**Optional Activity: Discussion Card Activity**

You will find a set of 81/2 by 11 inch laminated plastic cards in the pocket of your binder. Each one illustrates a different topic related to controlling construction noise and other noise topics. They can be used in Tailgate Training (or any other training) as discussion triggers or talking points.

The cards are designed for the instructor to show the crew. A photo or questions appear on the front of the card. The answers and prompts for the instructor are written on the back of the card.

Review the cards in advance and select the ones that are appropriate for your audience.
7) Hearing Protection Devices (HPDs) (20 minutes)

Key points in this session:

- Demonstrate five types of hearing protection devices
- Demonstrate how to use an earplug correctly.
- Materials needed for this session:
  - Foam (formable) plugs (for each participant)
  - Reusable earplugs
  - Custom molded plugs
  - Banded or semi-aural
  - Earmuffs

Handout: Don’t Let Noise Steal Your Hearing

Have different types of hearing protection devices available to show as you discuss them. Have a pair of disposable ear plugs available for each student.

Show slide #44, Types of Hearing Protection Devices (HPDs)

► What kind of hearing protection do you use?

Show an example of each type of HPD as you discuss it. Ask people to explain the pros and cons of using each device.

► What is the main consideration for you when selecting a HPD?

(Wait for a response. Then show the next slide.)

Show slide #45, Selecting Hearing Protection

There are basically seven factors to consider when selecting hearing protection. Convenience and comfort are typically the most important considerations, although the other factors can either rule out or require a certain type.

In a NIOSH study, workers cited communication as an important reason for not using HPDs. The HPD (headset with microphone) in this slide allows the wearer to communicate with another worker.
Show Slide #46, *Noise Reduction Rating (NRR)*

Hearing protection devices are tested in a laboratory to determine how much noise they block from reaching your ears. This is called the NRR (*Noise Reduction Rating*) and should be listed on the HPD package.

Since lab conditions are not the same as workplace conditions, the actual noise reduction is at least 7 dBA less than the printed NRR. Many experts say actual protection is only half the NRR rating on the package.

Show slide #47, *Advantages and Disadvantages*

This slide summarizes the advantages and disadvantages of each type of HPDs. Foam plugs and ear muffs provide the highest level of protection when used and maintained properly.

► Do you have additional advantages or disadvantages you would like to add?

Show slide #48, *Ear Muffs and Safety Glasses*

► What is the problem in this photo? How would you address it?

If workers have to wear earmuffs over safety glasses, choose thin frames. Thinner frames cause the least problem getting a seal against the ear to reduce the noise.

Show slides #49 & #50, *Care and Maintenance*

These slides show the basic care that is needed for HPDs. Your employer should train you on ways to properly care for this equipment.

Remember that formable foam ear plugs should be replaced after each use.

Show slide #51, *How Much Protection Do These Earplugs Provide?*

► How much protection do you think each of these earplugs provides the worker (on the slide)?

The amount of protection will be shown on the slide when the instructor advances the slide. It will show 0 dB for ear #1, 0 dB for ear #2, and 33 dB for ear #3.

► Why is ear #2 not protected?
Explain that the second earplug is not fitted properly and it is also worn around the edges so it doesn't give a good fit. That is why we are going to discuss how to fit an ear plug correctly.

► **Who has been trained to fit an ear plug properly?** (Ask for a show of hands. Then ask who trained them to use an ear plug.)

**Show slide #52, Fitting An Earplug**

Pass out a set of ear plugs to each trainee. Tell the class to do the following (instructor also demonstrates how to fit an ear plug):

- Roll foam plug tightly. Make sure there are no creases.
- Pull the ear back gently at the top to straighten the ear canal.
- Insert the plug.
- Release your ear while holding the plug in for 10 seconds. It will expand to the shape of your ear canal.
- When plug has expanded, tug on it gently to see if it is secure.

► **What should a worker do to check for hearing loss?** (Wait for a response. Then show the next slide)

**Show slide #53, Hearing Test**

Professional hearing tests are called audiometric tests. You should get one every year to monitor your hearing and see if you are being protected well enough from noise. The test takes about 10 -15 minutes and is done by a professional healthcare worker. Hearing tests will identify small changes in your hearing that you will not be able to notice.

Construction employers are **not** required to provide hearing tests in California. So it is a good idea to monitor your own hearing.

► **What should an employer do to address noise before a project begins?** (Wait for a response. Then show the next slide.)

**Show slide #54, What Employers Should Do Before Work Begins**

► **Is there anything else you would add to this list?**

Refer students to our Noise Walkaround Safety checklist and Training Guide on Noise. They are located in the tab 4 of the binder, under factsheets.
Remember, workers have the right to see and copy the results of any noise monitoring that the employer does in their work area. Workers also have the right to see the results of their own hearing tests.

Show slide #55, **Wrap Up**

This is the final topic of the training.
8) Wrap Up (5 minutes)

Key points in this session:
- Conclude workshop
- Participants evaluate workshop

Handout: Workshop Evaluation

Show slide #56, Hear Today…Hear Tomorrow

This concludes our presentation on noise and hearing loss in construction. Remember, workers have the right to workers’ compensation if their hearing loss was caused by work and is severe enough. Workers’ compensation includes: disability payments, payment for hearing aids, and coverage of ongoing medical care needed for hearing damage.

The goal of this training is to prevent hearing loss before it happens. Only employers and employees working together can ensure that hearing is protected.

► Will you please complete the workshop evaluation?

Distribute the workshop evaluation to participants and thank them for attending the workshop.
Construction Noise & Hearing Loss Prevention

State Building & Construction Trades Council of California, AFL-CIO
Funded by Federal OSHA, 2015
Training Topics

1) Introduction
2) What’s It Like To Lose Your Hearing?
3) Hazardous Noise and Hearing Loss
4) Measuring Noise
5) Soundscape Activity
6) Ways to Control Noise
7) Hearing Protection Devices
8) Wrap Up
1. Introduction
Funded by OSHA

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Acknowledgements

- American Academy of Audiology (AAA)
- American Speech-Language-Hearing Association (ASHA)
- Build It Smart
- Cal/OSHA
- Center for Construction Research & Training (CPWR)
- Federal OSHA
- Howard Leight, Honeywell Safety Products
- Laborers’ Health and Safety Fund of North America (LHSFNA)
- The National Institute on Deafness and Other Communication Disorders (NIDCD), NIH
- WISHA (Washington Industrial Safety and Health Act)
- Worksafe (Canada)
- The Commission on Health and Safety and Workers’ Compensation, California, Department of Industrial Relations, Worker Occupational Safety and Health (WOSH) Specialist Training Program
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- This program to be used for instructional, educational purposes only
- Fees may not be charged for any of this material
State Building and Construction Trades Council of California (SBCTC), AFL-CIO

• Umbrella organization for 160 unions
• Represents 350,000 skilled construction workers in California
• Developed and presented seven OSHA funded health & safety programs since 2000
Training Objectives

1. Discuss what it is like to experience simulated hearing loss.
2. Explain the effects of hearing loss, warning signs of hearing loss and tinnitus.
3. Discuss hazardous noise, causes of hearing loss, noise-induced hearing loss, how we hear, types of noise and common hearing loss devices.
4. Describe how sound is measured, Cal/OSHA noise limits in construction, and devices used to measure noise.
5. Identify sources of noise at a construction site.
6. Discuss ways to control construction noise.
7. Review the types of hearing protection devices used in construction and demonstrate how to use an earplug correctly.
Why Care About Hearing Loss?

Photo courtesy of The International Brotherhood of Boilermakers

Construction Noise & Hearing Loss Prevention

STATE BLDG & CONST TRADES COUNCIL OF CA
safety.sbctc.org
How Big Is The Problem?

- 30 million workers in the U.S. are exposed to hazardous noise at work
- 50% of construction workers suffer hearing loss
- $242 million is spent annually on workers’ compensation for hearing loss disability

Source: OSHA & NIOSH
Building Trades Workers and Hearing Loss

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

Chart courtesy of NIOSH

Construction Noise & Hearing Loss Prevention

STATE BLDG & CONST TRADES COUNCIL OF CA
safety.sbctc.org
Why Is Noise Accepted?

• Can’t do anything about it
• Poor planning
• Lack of coordination

Photo courtesy of OSHA
2. What’s It Like To Lose Your Hearing?
The “Say What” exercise is used with the permission of the American Academy of Audiology. www.audiology.org

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Effects of Hearing Loss

• Difficulty communicating with loved ones
• Loneliness and depression
• Low self-confidence
• Increased stress, blood pressure, hypertension and cardio vascular disease
Warning Signs

Do You Have Any of the Following Problems:

- 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

- Constant ringing in ears (or hissing, buzzing, roaring, chirping, or whistling sound)
- 50 million people in the U.S. have tinnitus
3. Hazardous Noise and Hearing Loss
Causes of Hearing Loss

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

Photo, courtesy of 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

Photo courtesy of NIOSH
How You Hear

Slide courtesy of Howard Leight, Honeywell

Construction Noise & Hearing Loss Prevention

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The Cochlea

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

Missing hair-like nerve cells

Slide courtesy of Howard Leight, Honeywell

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How Do You Know 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 talk
• Move to a quieter area to talk

After work you:

• Hear ringing or humming in your ears
• Experience temporary hearing loss
Types of Noise

Continuous
- same noise level over long periods of time

Intermittent
- periods of quiet, interrupted by noise
- most noise exposures are intermittent

Impact or impulsive
- nail gun

Construction has a combination of all noise types

Slide courtesy of Build It Smart

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Hearing Aids

Illustration courtesy of NICDC, NIH
Assistive Listening Devices & Cochlear Implants

- Assistive Listening Devices
- Cochlear Implants

Photos courtesy of Wikipedia
4. Measuring Noise
How Sound IsMeasured

- Sound is measured in units called **decibels** (dBA)

- An increase of 3 dBA means the sound intensity has **doubled**

- Hearing loss can occur when 8-hour average noise exposure **exceeds 85** decibels (NIOSH)

- Threshold of pain: 140
- Jet take-off (200'): 130
- Jackhammer: 120
- Bulldozer: 110
- Freeway noise: 100
- City traffic: 90
- Normal conversation (3' rule): 80
- Soft whisper (5') 70
- 60
- 50
- 40
- 30
- 20
- 10
- 0 Threshold of hearing

Illustration courtesy of WISHA
# Cal/OSHA Noise Limits In Construction

<table>
<thead>
<tr>
<th>Duration per day in hours</th>
<th>NIOSH (recommended)</th>
<th>Cal/OSHA (Construction Standard)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>85</td>
<td>90</td>
</tr>
<tr>
<td>4</td>
<td>88</td>
<td>95</td>
</tr>
<tr>
<td>2</td>
<td>91</td>
<td>100</td>
</tr>
<tr>
<td>1</td>
<td>94</td>
<td>105</td>
</tr>
<tr>
<td>½</td>
<td>97</td>
<td>110</td>
</tr>
<tr>
<td>¼</td>
<td>100</td>
<td>115</td>
</tr>
</tbody>
</table>
Noise Measurement Devices

PERSONAL DOSIMETER
Photo courtesy of Wikipedia

SOUND LEVEL METER
Photo courtesy of Howard Leight, Honeywell

IN-EAR DOSIMETER
Photo courtesy of Howard Leight, Honeywell
Noise Sources At Work

- Noise you create
- Noise your trade creates
- Noise from other trades
Noise From Hand Tools

- Air Gun 108-112
- Chipper 103-113
- Jackhammer 102-111
- Paint Sprayer 95-105
- Concrete Saw 98-102
- Skil Saw 88-102
- Air Compressor 90-98
- Portable Drill 88-96
- Belt Sander 90-95
- Hammer 85-95

90 dB
- Green: Low Level
- Red: High Level

Slide courtesy of Build It Smart

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Noise From Construction Equipment

- Bulldozer 90-103
- Back Hoe 85-102
- Crane 82-102
- Man Lift 84-101
- Gas Compactor 90-95
- Portable Welder 84-96
- Ringing Telephone 75-85
- Conversation 55-65

90 dB

Yellow: Low Level
Red: High Level

Slide courtesy of Build It Smart

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5. Soundscape Activity
Sample Soundscape

Illustration courtesy of OSHA

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Soundscape Activity (Part 1)

- Break into small groups
- Each group is assigned a different construction phase to analyze for noise
- Each group gets set of flipchart pens and flipchart paper
- Take 15 minutes to draw your Soundscape
- Report back to the large group
6. Ways To Control Construction Noise

Hardhats United to Save Hearing
How To Control Noise

- Engineering Controls
- Administrative Controls
- Personal Protective Equipment (PPE)

Photo courtesy of NIOSH
Soundscape Activity (Part 2)

• Break into small groups
• Take 10 minutes to discuss how you would control the main sources of noise identified on your Soundscape
• Report back to the large group
7. Hearing Protection Devices (HPDs)
Types of Hearing Protection Devices

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

Slide courtesy of Build It Smart
Selecting Hearing Protection

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

Slide courtesy of Build It Smart

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Noise Reduction Rating (NRR)

- NRR is measured in decibels
- The **NRR** is found on the earmuff or earplug package
- Higher the number, greater the protection
### Advantages & Disadvantages

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

Photo courtesy of Howard Leight, Honeywell

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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

Photos courtesy of Howard Leight, Honeywell
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

Photos courtesy of Howard Leight, Honeywell

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How Much Protection?

0 dBA
EAR #1

0 dBA
EAR #2

33 dBA
EAR #3

Slide courtesy of Howard Leight, Honeywell

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Fitting An Ear Plug

1. Roll entire earplug into a crease-free cylinder

2. Pull Back ear 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

Slide courtesy of Howard Leight, Honeywell
Hearing Test

- First test is a “baseline” test
- Test once a year
- Future tests are compared to baseline

Photo courtesy of Wikipedia

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What Employers Should Do To Plan Ahead

• Do a walk-around inspection – identify noisy equipment and jobs
• Monitor noise levels
• Develop a plan for noisy tasks
• Schedule noisy work off hours
• Buy or rent quieter equipment
• Provide different types of HPDs - one size or style may not fit all workers
• Provide training on each type of HPDs provided
8. Wrap Up
Hear Today…Hear Tomorrow

You only have one set of ears.

Protect them.

State Building & Construction Trades Council of California, AFL-CIO
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