

# Green Energy Technology I, II, or II (CTE course)

## Hearing Safety in the Workplace

Subject Area: CTE Energy and Utilities sector      Grade Levels: 10-12

### Lesson Overview

#### Materials Included in this Lesson

- Powerpoint
- Student Notes Sheet to accompany PPT

#### Other Materials for this Lesson

- Decibel Meter (can use iPhone/iPad download)
- Misc. Power tools (optional)
- Computer/Projector
- Ear plugs for the entire class

#### Skills the Student will Learn

Students will be able to:

- explain how the ear works in relationship to hearing
- know the industry allowable noise levels in the workplace and the relationship to exposure time
- know the short term and long term effects of damage to hearing
- measure the decibel level of the power tools in your CTE classroom
- know the different types of hearing protection available in the lab
- demonstrate the proper use of ear plugs

#### Student Deliverables

- Chart containing Equipment/Measured Decibel Level/approx. TWA
- Quiz

Length of Lesson: 1 Day in a 90 minute block

#### Activity Day One

Teacher Activity	Student Activity
Present Hearing PPT	Take Notes on PPT
	Measure decibel level of various power

	tools
	Create a chart showing max exposure time for each of the power tools
	Take a written quiz based on hearing awareness
	Take a physical quiz showing proper use of ear plugs

Powerpoint Lesson while students take notes

### Enrichment Suggestions

If you have access to a dosimeter, students can wear one for a day to record more accurately the noises and decibel levels to which they are being exposed.

### Student Resources

N/A

### NCCER Standards

**MODULE 00101-09 – BASIC SAFETY** Demonstrate the use and care of appropriate personal protective equipment (PPE).

**MODULE 00104-09 – INTRODUCTION TO POWER TOOLS** Use power tools safely.

### CTE Pathway Standards (Energy and Utilities Sector)

**STANDARD 6.2** Understand critical elements of health and safety practices related to storing, cleaning, and maintaining tools, equipment, and supplies.

### Lesson Plan Relevance To Externship

I was assigned to Laura Fisher in the Health and Safety Department at SMUD. Increasing awareness of SMUD employees of hearing hazards and how to reduce that risk is part of her job.

Rubric for the (type in the title) Project

Student Deliverables	1 Exceeds Expectations	2 Meets Expectations	3 Approaches Expectations	4 Fails to meet Expectations

# Hearing Protection in the Workplace/Classroom

## OBJECTIVES

You should be able to:

- Give reasons why we should protect our hearing.
- Explain how the ear works in relationship to frequencies.
- Know short term and long term effects of loud noises
- Know industry allowable noise levels and their relationship to exposure time.
- Know how to measure the decibel level of power tools in the classroom
- Know how to use different types of hearing PPE

## Some facts about Hearing Loss

- \_\_\_\_\_ are more likely than \_\_\_\_\_ to experience hearing loss.
- 1 in \_\_\_\_\_ Americans have hearing loss in at least one ear. This is 48 million people and far exceeds previous hearing care industry estimates of approximately 25 million.
- \_\_\_\_\_% of the US population aged 12 years and older has hearing difficulties severe enough to impact communication.
- About 26 million Americans between the ages of 20 and 69 have \_\_\_\_\_ frequency hearing loss due to exposure to loud noises at work or in leisure activities.
- About 60% of deployed military service men and women have noise induced hearing loss (NIHL), tinnitus (\_\_\_\_\_), and other hearing injuries.
- High levels of cotinine, the chemical that indicates exposure to tobacco smoke and second-hand smoke has been directly linked to higher risks of some types of hearing loss.

## How to you measure sound?

- \_\_\_\_\_ refers to the pitch of a sound and is measured in Hertz (Hz).
- The loudness of a sound is measured in \_\_\_\_\_ (dB).

## How to Measure Noise

- Decibels are measured on a **logarithmic** scale
- Every time you add **6 dB**, you \_\_\_\_\_ the sound pressure of the noise
- What frequencies can you hear now? Low: \_\_\_\_\_ High: \_\_\_\_\_

Noise	Decibel level	TWA
Quiet classroom		
Electric Drill		
Circular Saw		
Grinder		
Band Saw		
iPod on 50% volume		
iPod on 100% volume		

## OSHA (Occupational Health & Safety Administration)

- What causes hearing loss?
  - 
  - 
  - 
  -
- The decibel exposure AND the length of time you are exposed to noise determine the risk for hearing damage.
- In the workplace, at (or above) an 8 hour TWA at 85 dB =Action Level
- TWA = \_\_\_\_\_
- Hearing loss can come from long time exposures to loud noises or “Impact” or one-time exposures like a bomb exploding.

## HEARING LOSS

- Impact - One loud bang
- Cumulative - Years of a noisy environment
- Tinnitus - Ringing in the ears
- Presbycusis - Hearing loss due to aging

## Anatomy of the Ear

- Delicate hair cells vibrate to different \_\_\_\_\_
- Hair cells detect the vibration, and send a signal to the brain
- Loud sounds destroy the hair cells, and they stop functioning \_\_\_\_\_!

Draw Normal Hair Cells:

Draw Damaged Hair Cells:

## Hearing Impairment

- Hearing loss typically occurs at the \_\_\_\_\_ frequencies making it more difficult to hear consonant sounds (*i.e.* c, k, d, p, b, s, st, ch...)
- **NRR** - \_\_\_\_\_
  - Foam Plugs - 22-32 NRR
  - Ear Muffs - 22-28 NRR
- Hearing protection is designed to reduce the noise by the NRR factor. The actual result is less due to :
  - Leaks in the seal
  - Vibration
  - Improper insertion

### **How to Properly insert Ear Plugs**

1. Roll one end of ear plug until kind of pointy
2. Using your arm from the opposite side (over your head) grab the top of your ear pulling slightly upward.
3. Insert pointy end of ear plug into your ear and hold in place until foam expands completely blocking ear canal.

### **Rule of Thumb**

- **If you have to raise your voice when talking to someone an arm's distance away, you probably have a noise hazard.**