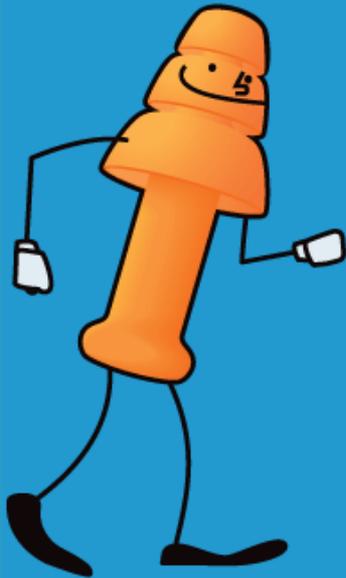
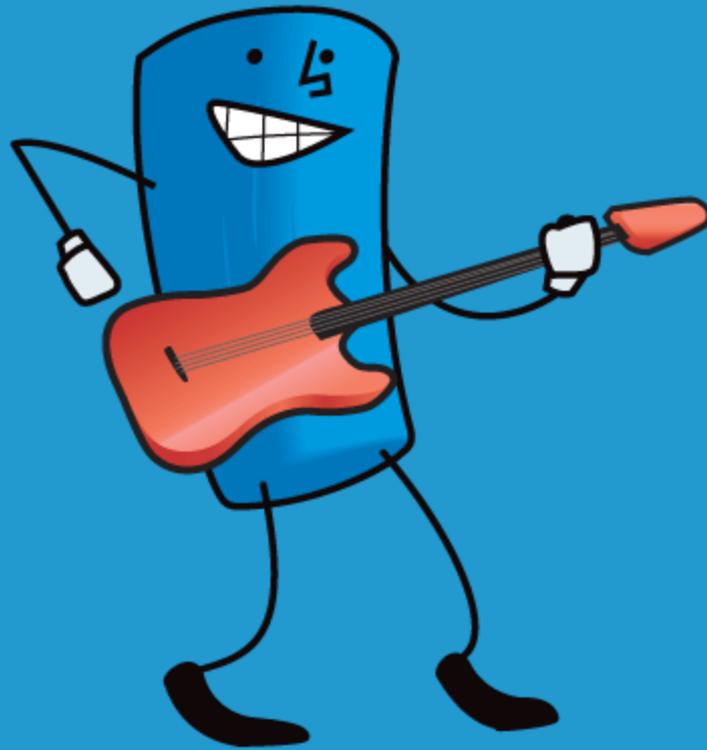


# HEARING CONSERVATION

Presented by the Bacou-Dalloz Hearing Safety Group

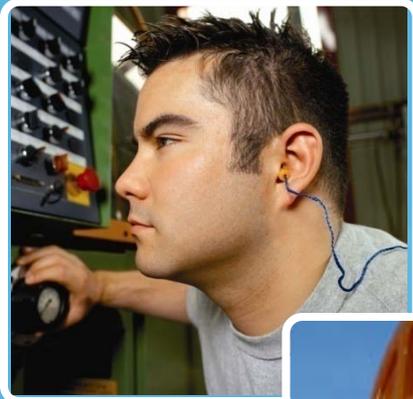


# NOISE AND ACOUSTICS



# NOISE AND ACOUSTICS

on the job .....



and off the job.



# NOISE AND ACOUSTICS

## Noise-Induced Hearing Loss

- Causes no pain
- Causes no visible trauma
- Leaves no visible scars
- Is unnoticeable in its earliest stages
- Accumulates with each over-exposure
- Takes years to diagnose

**Is permanent and 100% preventable**

# NOISE AND ACOUSTICS

## HOUSEHOLD NOISE

## OCCUPATIONAL NOISE

170 dB			140 dB
120 dB			112 dB
94 dB			100 dB
74 dB			85 dB
58 dB			60 dB

160 dB

Immediate Physical Damage

115 dB

Unprotected Noise Exposure  
of Any Duration Not Permitted  
Above This Level

90 dB

Hearing Protection Required by OSHA

85 dB

Ear Damage Possible

50 dB

Comfortable

## NOISE AND ACOUSTICS

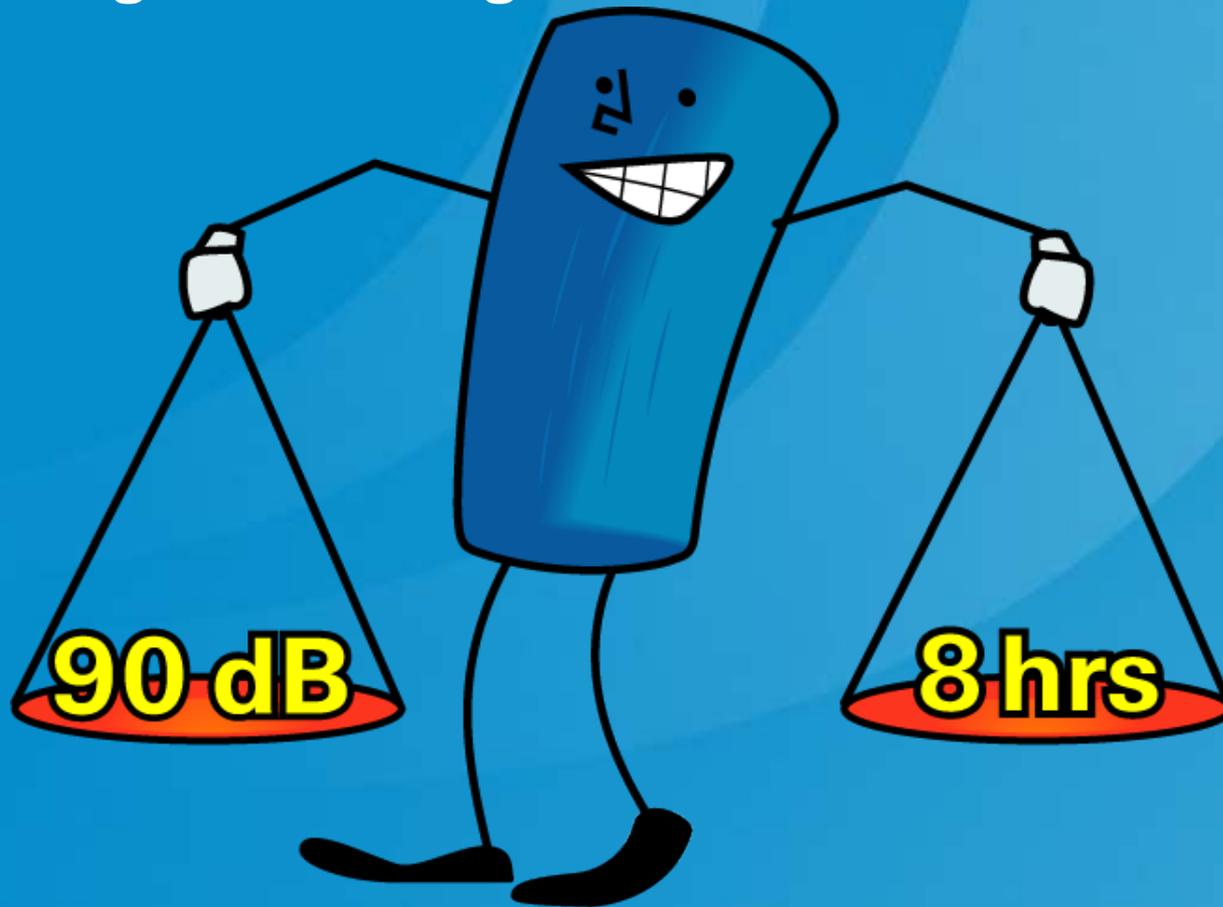
*How do I know if the noise levels are hazardous?*

If you must shout to be understood over the background noise when standing about one arm-length away from somebody,

that background noise is hazardous.

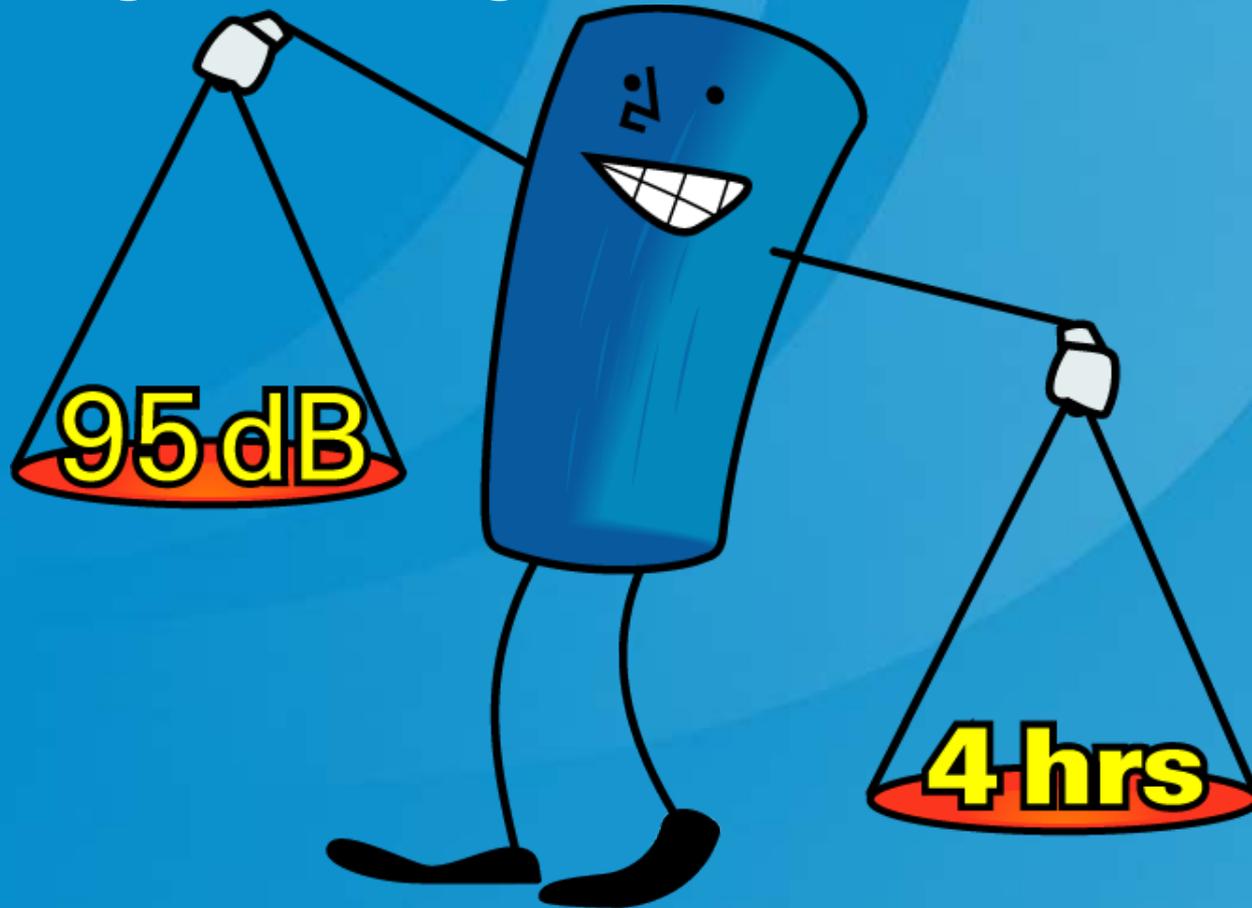
# NOISE AND ACOUSTICS

## Time-Weighted Average



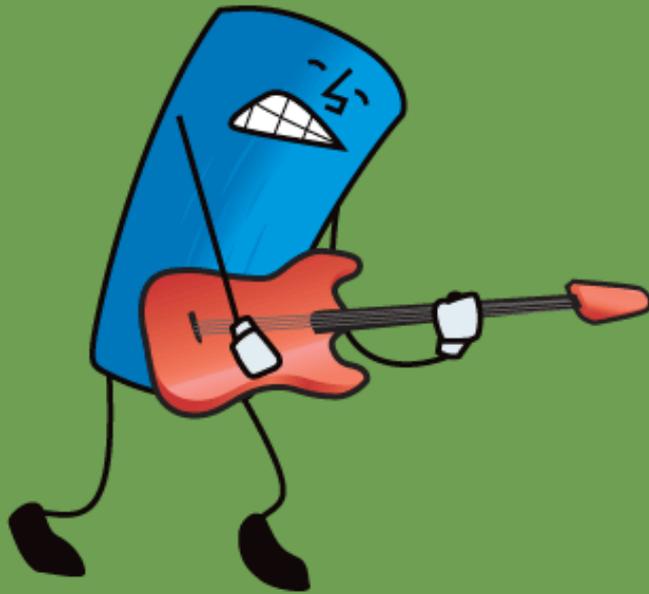
Permissible Exposure Limits

# OSHA STANDARD Time-Weighted Average



Permissible Exposure Limits

# HOW WE HEAR



## HOW WE HEAR

- **Sound waves cause the eardrum to vibrate**
- **Bones in middle ear transmit vibrations to cochlea**
- **Receptors (hair cells) in cochlea convert vibrations to electrical energy**
- **Brain interprets these electrical impulses as sound**



## HOW WE HEAR

- Nerve cells in the cochlea are tuned to specific frequencies
- Base of the cochlea is sensitive to high frequency sounds
- Tip of the cochlea is sensitive to low frequency sounds



# HOW WE HEAR

## 17-year old girl

- Low noise exposure
- Normal cochlea
- Receptors intact



## 76-year old man

- Low noise exposure
- Fewer receptors but still intact



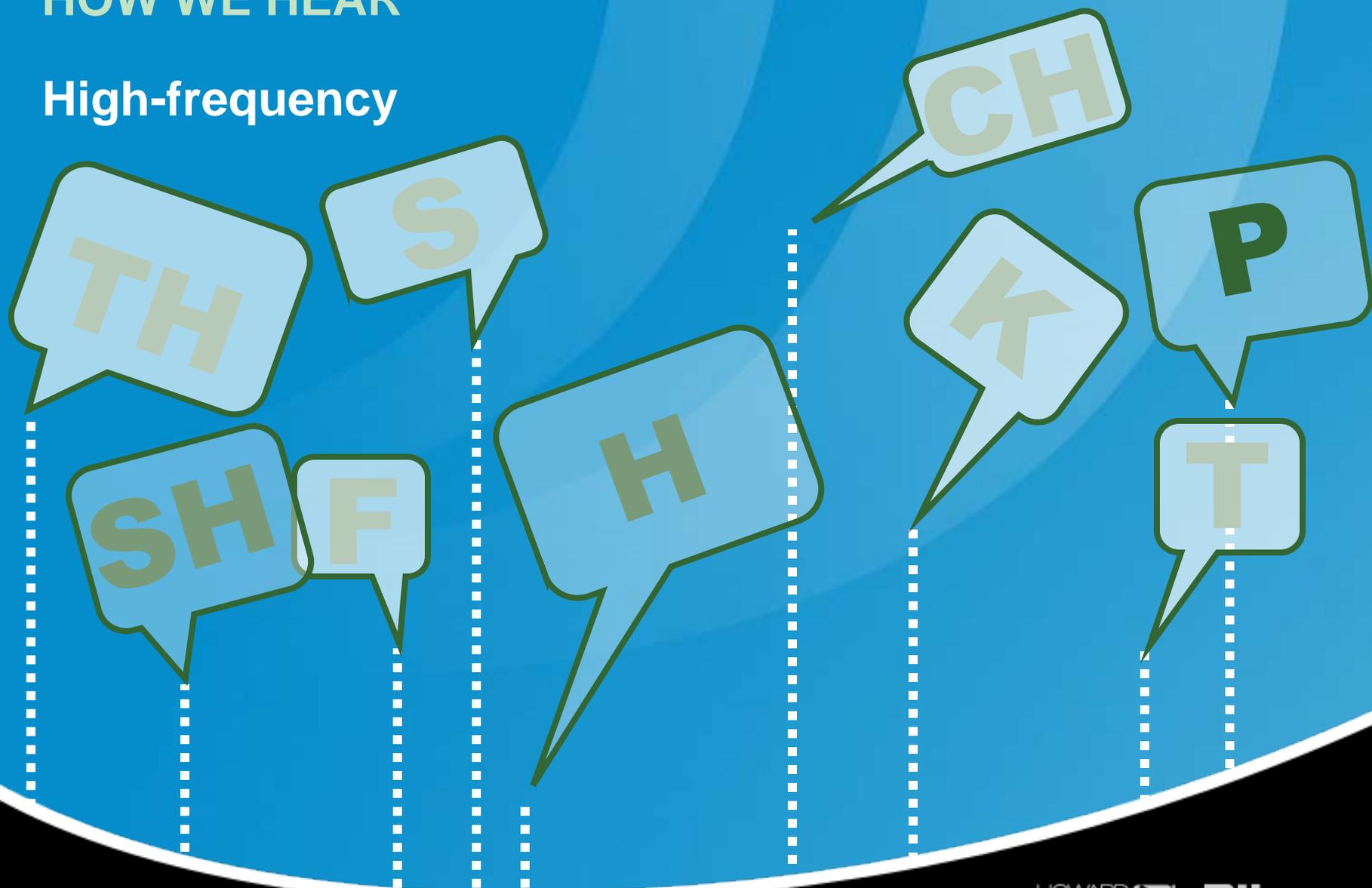
## 59-year old man

- High noise exposure
- Damaged cochlea
- Receptors destroyed



# HOW WE HEAR

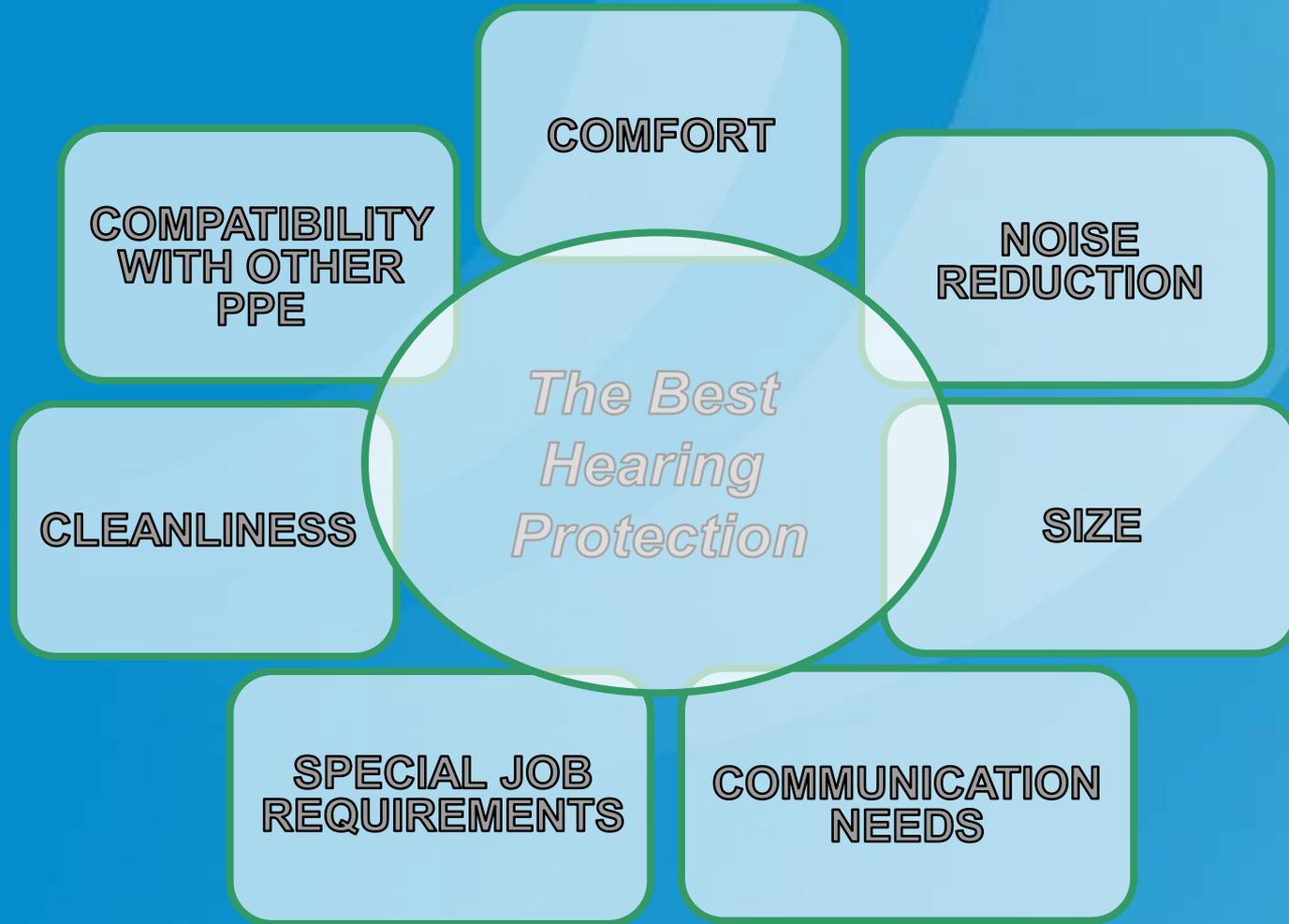
High-frequency



# HPD SELECTION



# HPD SELECTION



# HPD SELECTION

## Common Objections to Wearing HPDs

“I already lost some of my hearing, so why should I wear them?”

“Can I hurt my eardrums if I insert a plug to deeply.”

“I can’t hear my co-workers if I wear them.”

“I don’t need them, I am used to the noise.”

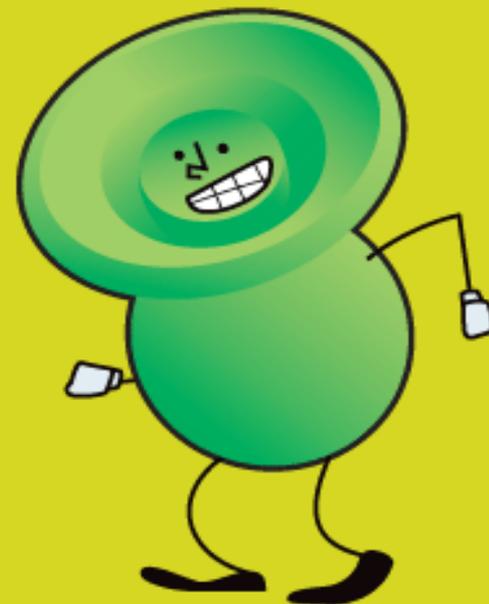
“My machine sounds different.”

“Hearing protectors are uncomfortable.”

“Won’t I get an ear infection?”

“I can always get a hearing aid.”

# FITTING TIPS



## FITTING TIPS

### Find the Right Size



Maximum protection is only accomplished when an earplug acoustically seals in the ear canal.

No earplug fits all ear canals, so manufacturers have responded with a variety of sizes.

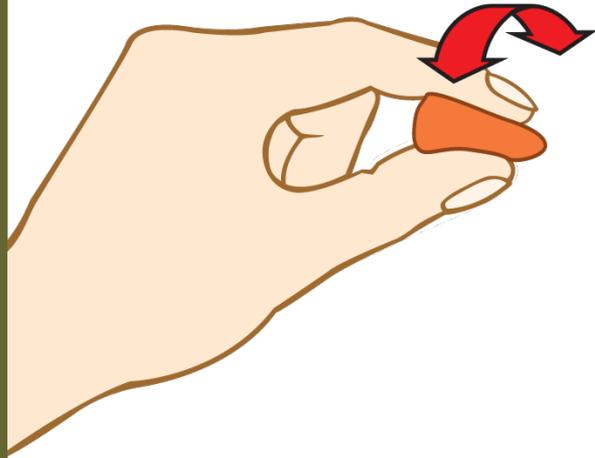
It is important to find your right size to obtain an acoustic seal

# FITTING TIPS

## ROLL-DOWN FOAM

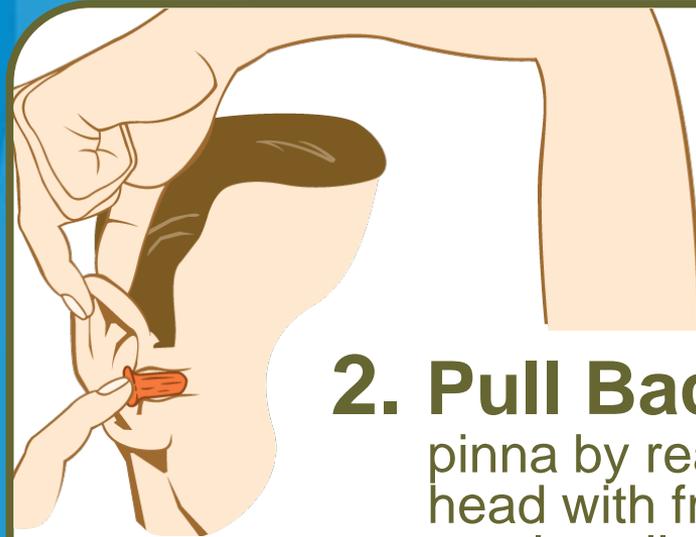
### 1. Roll

entire earplug into a crease-free cylinder



### 2. Pull Back

pinna by reaching over head with free hand, gently pull top of ear up and out



### 3. Insert

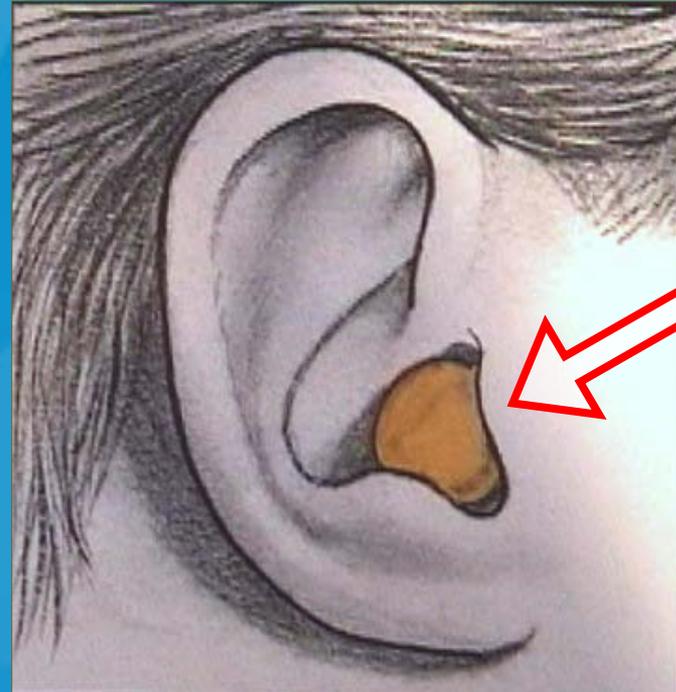
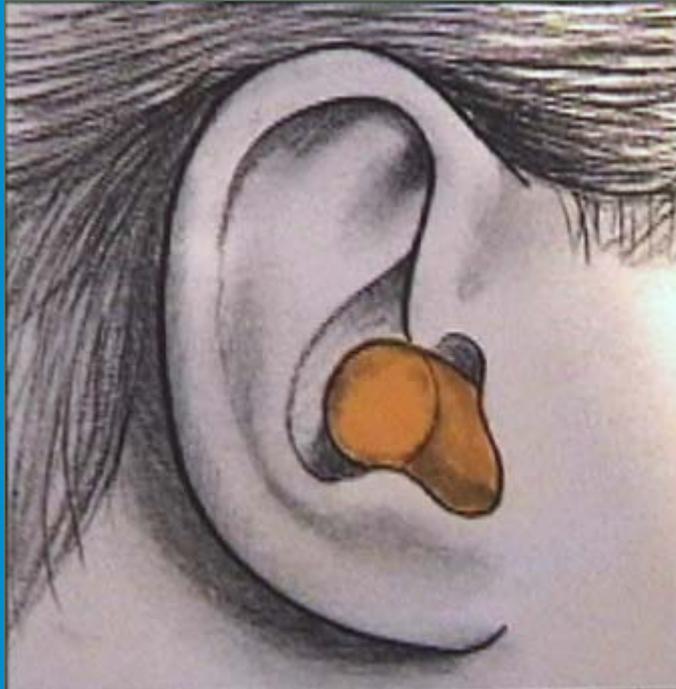
earplug well into ear canal and hold until it fully expands





## FITTING TIPS

### Visual Check for Foam Earplugs



If properly fitted, the end of the earplugs should not extend beyond the tragus (flap of the ear canal).



# NO-ROLL FOAM EARPLUGS

## 1. Reach

over head with free hand, pull ear up and back and insert earplug well inside ear canal.



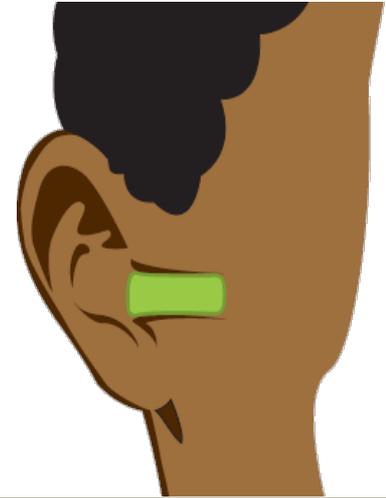
## 2. Earplugs

should be inserted as shown in these drawings. Stop pushing earplug when finger touches the ear.



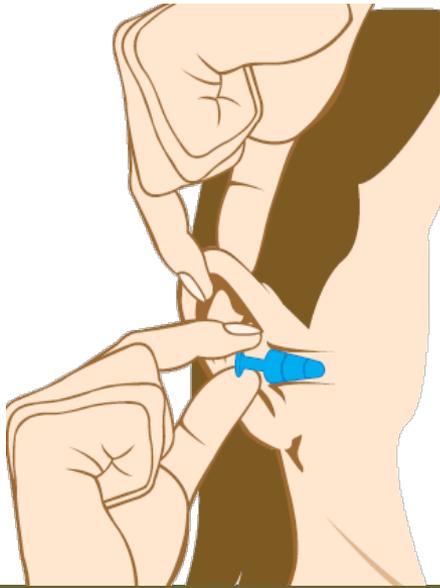
## 3. If properly

fitted, the end of the earplugs should not be visible to someone looking at you from the front.

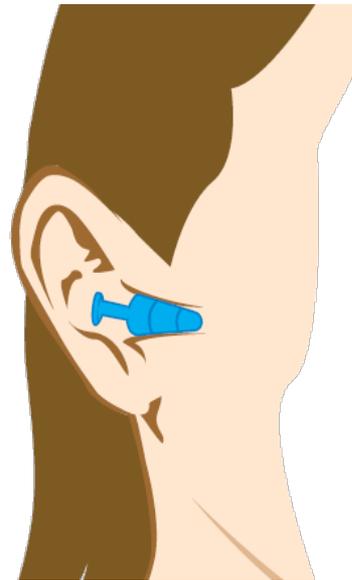


# MULTIPLE-USE EARPLUGS

1. While holding the stem, reach hand overhead and gently pull top of ear up and back.



2. Insert earplug so all flanges are well inside the ear canal.



3. If properly fitted, only the stem of the earplugs should be visible to someone looking at you from the front.

## EARPLUGS (ALL)

**1. Visual Check -** The earplug should sit well inside the ear canal and not stick out.



**2. Acoustical Check -** Cup hands over ears and release. Earplugs should block enough noise so that covering your ears with hands should not result in a significant noise difference.



# EARMUFF INSTRUCTIONS

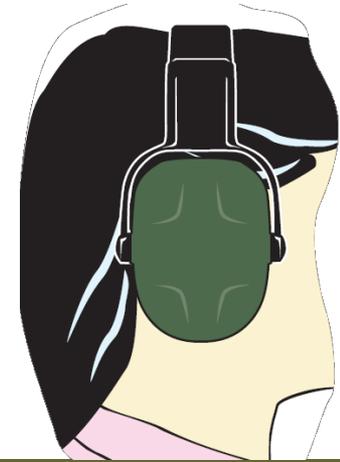
1. Place earcups over each outer ear



2. Adjust the headband by sliding the headband up or down at the attachment buttons



3. The ear cushions should seal firmly against the head



## EARMUFF INSTRUCTIONS – DON'TS

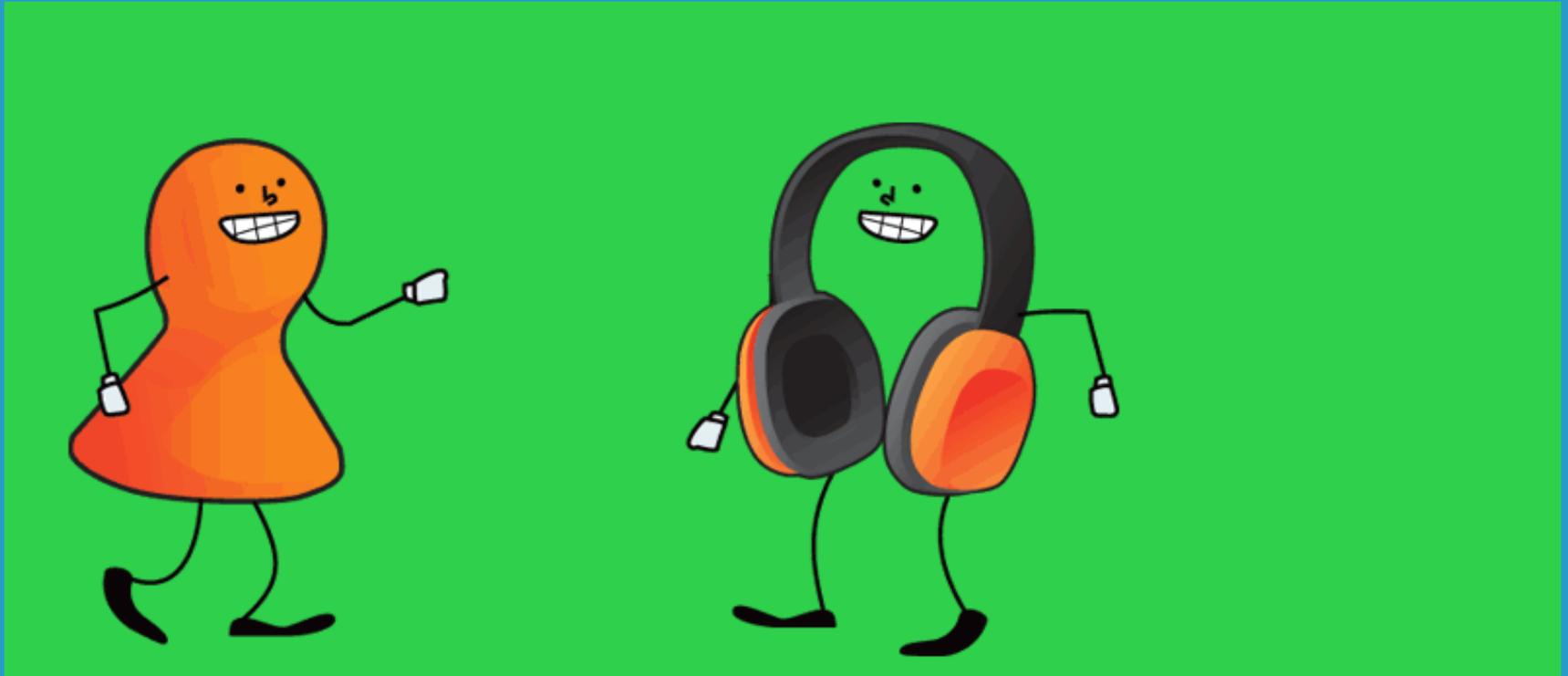
For best results, remove all hair from underneath earcup.



Ensure that the earcup creates a seal and covers the ear completely.



# PRODUCTS



# PRODUCTS

## Types of Hearing Protectors

### Earplugs

- Single-Use
- Multiple-Use
- Detectable

### Banded Protectors

- Banded Earplugs
- Canal Caps

### Earmuffs

- Standard (Headband)
- Cap-Mounted
- Electronic
- Special Application



## PROS AND CONS OF HPDs – EARPLUGS



### PRO

- Comfortable for extended use
- Disposable earplugs available
- Cooler in hot/humid environments

### CON

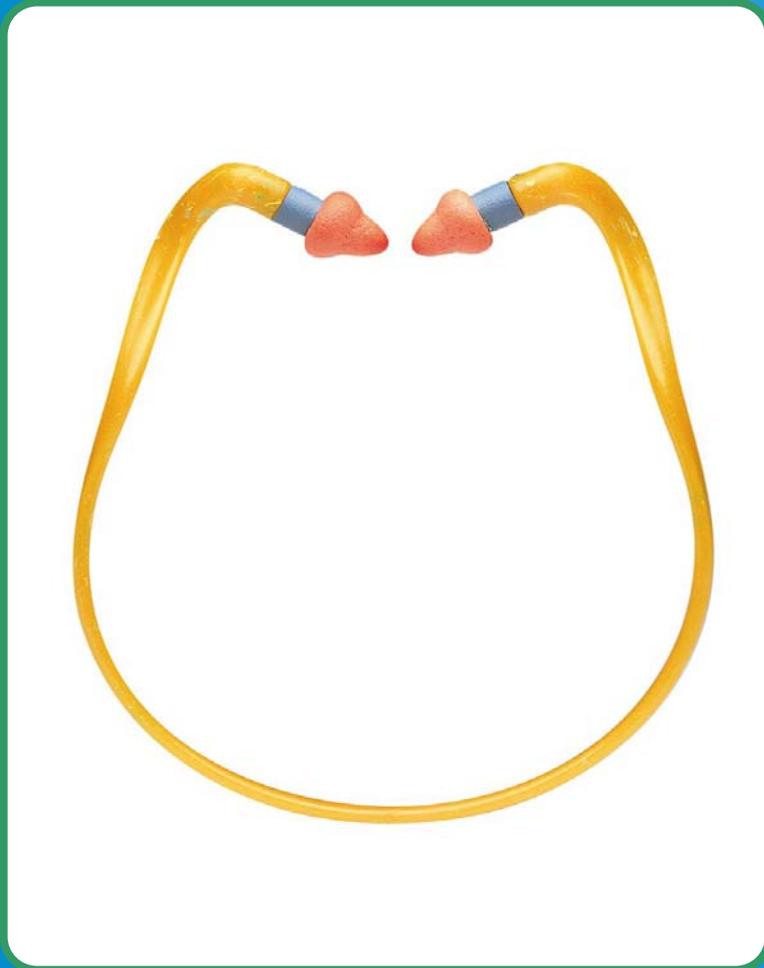
- Attenuation highly dependent upon good fit
- Hygiene issues in dirty environments

## CARE & MAINTENANCE OF HPDs – EARPLUGS



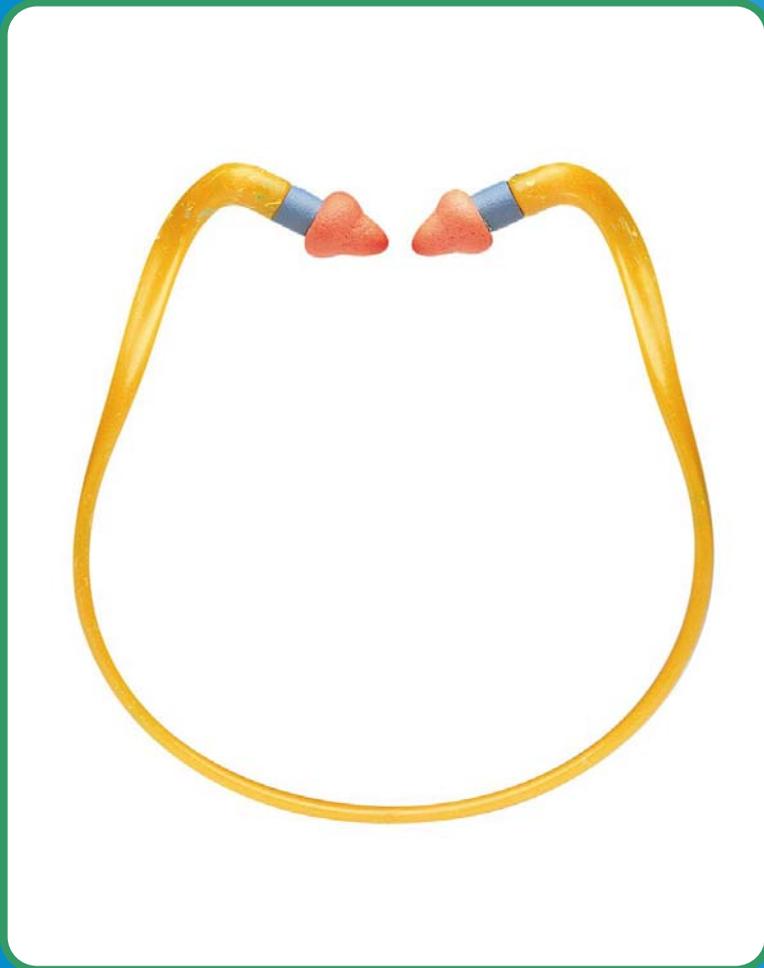
- Dispose of single-use earplugs daily
- Clean multiple-use earplugs with mild soap and water, dry thoroughly
- Inspect multiple-use earplugs for dirt, cracks or hardness, replace if damaged

## PROS AND CONS OF HPDs – BANDED EARPLUGS



- Clean and replace pods regularly

# CARE & MAINTENANCE OF HPDs – BANDED EARPLUGS



## PRO

- Very convenient for intermittent noise
- Readily available around neck when not in use

## CON

- Lower attenuation than most earplugs
- Some noise transmission through band

# PROS AND CONS OF HPDs – EARMUFFS



## PRO

- Easy to get proper fit
- Good for intermittent noise
- Radio & electronic options

## CON

- Can feel hot/heavy with extended wear
- Compatibility with other PPE?

## CARE & MAINTENANCE OF HPDs – EARMUFFS



- Clean ear cushions and headband regularly with mild soap and water
- Replace ear cushions and foam inserts every 6 months with normal wear, more often with heavy use or under humid/extreme conditions

# Hearing Loss Due To Noise Exposure Is ...

Painless  
Permanent  
Progressive

... and very **PREVENTABLE!**

# THE END

