

Department of the Navy



OCCUPATIONAL AUDIOLOGY

HEARING CONSERVATION

TRAINING COURSE

STUDENT MANUAL

2013 Edition

ACKNOWLEDGEMENTS

The 2013 versions of the Occupational Hearing Conservation Technician Training Manual and instructional PowerPoint materials have been a collaborative effort by LT Chris Duhon and Connie Barker, Ph.D. We thank LCDR Michelle Kee for her attention to details and excellent feedback during the editing process. In addition, this project would have been significantly more difficult without the earlier versions as a foundation. In 1998-1999, then LT Kelly Paul developed the original student manual and then LTJG Joel Bealer created the PowerPoint slides. CDR Paul and CDR Bealer updated the materials in 2005, with the last revision by CDR Paul in 2006.

COURSE GENERAL OBJECTIVES

At the completion of this course, each student should successfully fulfill each of the general objectives below. Each chapter has specific learning objectives.

1. Establish and/or maintain an effective unit level Hearing Conservation Program based on a thorough understanding of the rationale and mission of the DoD Hearing Conservation Program (HCP).
2. Maintain a basic knowledge of noise, noise management and how to access industrial hygiene information related to hearing.
3. Articulate a general understanding of hearing loss, ear diseases and the potential impact of hearing loss to the individual and society.
4. Operate microprocessor audiometer and data management software for patient testing and referrals, hearing data recordkeeping and routine equipment calibration.
5. Interpret hearing test results accurately, make appropriate disposition decisions and explain results and follow-up procedures to patients.
6. Perform otoscopic examinations and tympanometry, and accurately interpret findings in order to make appropriate medical referrals.
7. Maintain knowledge of approved hearing protection devices and purchase protocols; fit personnel with appropriate hearing protection and educate them in the most effective use of HPDs.
8. Identify and accurately use all forms and documents relevant to the Audiology HCP; maintain knowledge of DoD and service branch regulations and protocols.
9. Maintain and properly display current certification and professional behaviors

RECOMMENDED DAILY CLASS SCHEDULE

* Followed by 15 min Break

Day 1

0730-0800	Introductions & Expectations/Welcome & Administrative Remarks
0800-0830	Overview of Hearing Conservation Program (HCP)
0830-0915 *	Physics of Sound
0930-1015	Noise Measurement & Control
1015-1100 *	Anatomy & Physiology of the Ear
1115-1200	Ear Disorders & Hearing Loss
1200-1300	Lunch
1300-1330 *	Audiometer and Test Environment
1345-1430 *	Audiometric Testing – Protocols and Techniques
1445-1530	Otoscopic Examination and Tympanometry Basics (with Practice)
1530-1600	Questions and Administrative Remarks

Day 2

0730-0815 *	Review of Day 1 / Video
0830-0915 *	Audiometric Testing – Results, Follow-up and Referral
0930-1015	Audiogram Exercise
1015-1100 *	Hearing Protection
1115-1145	HC Education and Motivation
1145-1300	Lunch
1300-1345 *	Recordkeeping and Program Evaluation
1400-1445 *	Regulations and Compensation
1500-1530	OHC Technician – Role and Responsibilities
1530-1600	Administrative Remarks / Review Study Guides for Test

Day 3

0730-0800	Review of Day 2
0800-0930 *	Written Exam
0930-1000	Audiometric Equipment Set-up by students
1000-1200	DOEHRS-HC Workshop
1200-1300	Lunch
1300-1530	DOEHRS-HC Workshop
1530-1600	Administrative Remarks / Review DOEHRS-HC

Day 4

0730-0800	Review / Administrative Remarks
0800-1200	DOEHRS-HC Workshop
1200-1300	Lunch
1300-1530	DOEHRS-HC Workshop
1530-1600	Review DOEHRS-HC / Practical Exam

Day 5

0730-0800	Review / Administrative Remarks
0800-1200	DOEHRS-HC / Practical Exam
1200-1300	Lunch
1300	Presentation of Certificates / Adjourn

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OVERVIEW OF THE HEARING CONSERVATION PROGRAM

Learning Objectives

1. Describe the potential effects of noise
2. List the purposes of the Hearing Conservation Program (HCP)
3. Describe the five elements of the HCP
4. Identify the team members of the HCP and their general duties

Hearing Has Direct Impact (AUDIO CLIP)

- Mission readiness
- Completing the mission and all duty assignments (Survivability and Lethality of Warfighter)
- Safety of government personnel and protection of government property

Noise Induced Hearing Loss Is #1 Occupational Health Hazard

- Noise-induced hearing loss (NIHL) is the **number one (#1) occupational health hazard** in the military according to Veterans Administration disability claims (2010).
- **Financial impact** of NIHL, tinnitus and related costs of hearing loss is **greater than \$1.8 billion** (2010 VA Benefits Report).
- **NIHL negatively affects** mission readiness, fitness for duty, retention and advancement opportunities and the quality of life.
- **Non-occupational noise** also causes hearing loss. It is often difficult to differentiate between the effects of occupational and non-occupational noise exposure on hearing.
- Noise-induced hearing loss is often underrated because usually there are **no visible signs of injury**.

What could \$1.8 + Billion Buy?

450+ M1A1 Abram Tanks @ \$4M each



19+ Years of Employment for every

18+ Joint Strike Fighters @ \$100M each



electd US Congressmen and Senator (535)

Re: 2011

Auditory Effects of Hazardous Noise Exposure

• **Auditory Effects**

- Typically causes a **gradual, progressive high frequency (noise-induced) hearing loss** but can result in **immediate hearing loss from impulse-type noise**, such as acoustic trauma from weapon fire, explosions or IED's.
- Progressive **loss of communication ability** and difficulty understanding conversation, especially in background noise. Parts of sentences, conversations, commands and/or warning signals are not heard or are distorted. On the job this can result in **safety accidents** and, socially, this can result in **embarrassment, frustration and withdrawal** from others.
- Hearing loss affects how **quickly/accurately** you are able to **localize/detect sounds**.
- Hearing aids may help, but will **never restore normal hearing ability**. There is also cultural resistance to hearing aids, as it is associated with aging and/or vanity concerns.
- Good **hearing is priceless** – probably the most important sensory system because “hearing connects people with people – vision connects people with things” (**Helen Keller**).
- Constant **tinnitus**, a ringing sensation in the ear or head, is a common side effect of hearing loss. It can be mild to severe, and possibly disruptive to daily life.

• **Non-Auditory Effects of Hearing Loss and Tinnitus**

- Can **affect job performance**, decrease productivity and increase accidents
- Leads to **isolation and withdrawal** from social situations due to repeated embarrassment from misunderstanding conversations; can cause distance or lack of emotional intimacy in relationships with loved ones due to increased effort involved in communicating.
- Can lead to **stress-related diseases** (high blood pressure), sleep disturbance (sleep is critical for weight management), disruption of attention or concentration, fatigue, tension and hostility after prolonged exposure.

(Hearing Loss Demonstration - Audio File)

Four Characteristics of Noise Induced Hearing Loss (NIHL) – “Four P’s”

- **Painless**
- **Progressive**
- **Permanent** – there is no cure!
- However, NIHL is **PREVENTABLE**

Purposes / Goals of the Hearing Conservation Program

- To **prevent** occupationally related **noise-induced hearing loss**
- To maintain **mission and combat readiness**.
- To maintain **fitness for duty**.
- To retain **job or work specialty**
- To control and reduce **disability and compensation costs** for hearing loss.
- To promote healthy hearing and **quality of life**.

Five Major Elements of the Hearing Conservation Program

1. Noise Hazard **Identification**
2. **Engineering** Controls
3. Audiometric **Monitoring**
4. Hearing Protective Devices (**HPDs**)
5. Hearing Conservation **Education**

HCP Element #1: Noise Hazard Identification

- Identification of potential hazardous work **environments and equipment** (noise sources). An **Industrial Hygienist** is primarily responsible for identification.
 - Levels of noise are **measured** within defined areas and for individual personnel
 - **Definition of hazardous noise levels:**
 - **≥ 85 dBA SPL steady state/continuous noise**
 - **≥ 140 dB SPL impulse/impact noise**
- Determine **individuals** or **work space areas** exposed to hazardous noise using a **dosimeter or sound level meter**.
- **Provide recommendations** to the command's Safety Officer on who should be included in the Hearing Conservation Program based on noise hazardous measurements. The **Safety Officer is responsible** for establishing and maintaining a roster of personnel on the HCP and providing the cognizant medical facility the total number of personnel enrolled in the HCP **semi-annually**.
- **Hazardous areas and equipment are labeled**, e.g. "Hazardous Noise Area (or Equipment): Hearing Protection Devices Required."

HCP Element #2: Engineering Controls

- Purpose of engineering controls is to **reduce or eliminate the noise level** at its source.
- Engineering controls are the **PRIMARY methods** for reducing or controlling noise.
- Possible **methods** for reducing or controlling noise:
 - Place baffles or sound absorbing material on ceiling, walls or floor
 - Preventive maintenance on equipment (oil/lubrication).
 - Purchase new, quieter equipment
 - Isolate noisy equipment from the worker or isolate the worker from the noise
- If engineering **controls prove unfeasible or cost prohibitive** in reducing noise below hazardous levels, then personnel are required to use **hearing protection devices (HPDs)**.
- An Industrial Hygienist or Audiologist should be involved in **new machinery / equipment purchases** to ensure that equipment has the lowest decibel levels that are technologically and economically possible while still compatible with performance and environmental requirements.
- There are **exceptions** to strict engineering control regulations, such as tactical vehicles and high performance ships, aircraft and weaponry.

HCP Element #3: Audiometric Monitoring

- All military and civilians who are routinely exposed to hazardous noise and are enrolled in the HCP must have an **annual hearing test** (DD 2216).
- The annual audiogram (DD 2216) is compared to the **reference audiogram** (DD 2215) to look for changes in hearing or **Significant Threshold Shift (STS)**.
- The **Occupational Hearing Conservation (OHC) Technician** is primarily responsible for routine monitoring of hearing. He or she determines possible STS, need for follow up testing, and referrals for full audiology assessment or medical consultation.
- The **Occupational Audiologist** is responsible for complete occupational hearing assessment to determine if the STS is a **Permanent Threshold Shift (PTS)** or if further medical referrals are needed. Occupational Audiologists also determine **Fitness for Duty** re: hearing.
- **Statistics** on amount of STSs found among the noise-exposed populations help determine the **effectiveness of a hearing conservation program** within a unit, command, and military branch. Occupational Audiologists analyze and interpret this data and generate reports using software available to them in the DOEHRs-Data Repository.

HCP Element #4: Hearing Protective Devices (HPD's)

- Personnel enrolled in the HCP must use **single HPD protection** if hazardous noise levels are ≥ 85 dBA SPL (continuous noise).
- Personnel enrolled in the HCP must use **double HPD protection** (i.e. earplugs plus noise muffs) if **hazardous noise levels are > 96 dBA SPL or ≥ 140 dB Peak SPL**. ****HIGHLY recommend DOUBLE HPD use for all impact/impulse situations (firearms/explosives)**.
- Must be provided by each command **free** of charge to noise-exposed personnel.
- **Several types** available through national stock number (NSN).
- Employees should have **freedom to choose** the type they prefer to wear from among approved devices unless contraindicated.
- If HPDs do not reduce exposure below 85dBA, **administrative controls** should be used in addition to the devices, i.e. reduce exposure time, relocate personnel.

HCP Element #5: Hearing Conservation Education:

- All **shipboard** personnel are mandated to receive **initial training** prior to work assignment in hazardous noise areas. **Ashore**, all personnel enrolled in the HCP and their supervisors are mandated to receive initial training prior to working in hazardous work spaces.
- **Annual training** is required for all personnel enrolled in the HCP.
- Initial and annual training is the **responsibility** of each command's safety or medical representative; however, it should be **augmented and reinforced** by the OHC technician during annual testing. Training provided by audiometric technicians should be documented on the DD Form 2216.
- **Importance** of hearing conservation and prevention of noise-induced hearing loss is sometimes **difficult to convey** to personnel because signs of permanent hearing loss are not typically evident immediately after exposure to noise. It is usually a **gradual, progressive loss** with no physical pain
- **Required elements of training** include:
 - HCP elements and rationale (Only required for **initial** training)
 - The effects of noise on hearing
 - Purpose, styles, proper use and maintenance of various HPDs
 - Command responsibilities
 - Individual employee's responsibilities protecting their own hearing
 - Impact hearing loss has on career, safety and mission
 - Off-duty hearing health practices
 - Purpose of hearing tests and procedures (Only required for **annual** training)

Occupational Hearing Conservation Team

The OHC Team involves personnel at **all levels of command**.

The following explanation is presented in the **sequence or process of implementing a HCP**.

- **Commanding Officer**
 - Responsible for **overall compliance** with instructions within **their command's HCP** per the President's orders (Title 29 CFR Section 1910.95).
 - Supported by Safety, Industrial Hygiene, Medical Officers, Audiology Support, Supervisors and Employees working in hazardous noise areas or equipment.
 - Provides a **role model** for healthy and compliant hearing conservation behaviors.

- **Safety Officer**
 - **Manages** Commanding Officer's program related to HCP.
 - **Reports or communicates potential noise hazards to Industrial Hygienist**
 - **Monitors** noise exposed personnel at work sites for **correct use of HPDs**
 - **Assist** supervisors and commanding officers in **HCP training**
 - Maintains **current rosters** of noise exposed personnel and semi-annually provides the cognizant medical facility the number of personnel enrolled in the HCP – uses data software programs, e.g. SAMS, E-SAMS, MRRS.
 - Ensures all HCP personnel receive **required hearing tests**
 - **Maintains adequate supply** of HPDs at command for noise exposed personnel

- **Industrial Hygienist**
 - Conducts **noise surveys** and makes recommendations for each command
 - Performs Noise Hazard Evaluation **Surveys** on all suspected **noise hazardous areas and equipment** at least once and within 30 days of any changes in operation or equipment
 - Maintains a current **inventory of all noise hazardous areas and operations** and types of control measures used
 - Provides **noise survey and dosimetry results** with recommendations and corrective actions to Commanding Officers and Safety Officers/Supervisors.
 - Forwards dosimetry and noise sampling results collected on individuals for inclusion into their **medical records**

- **Noise-Exposed Personnel**
 - **Wears approved, properly fitted hearing protection** when exposed to hazardous noise levels (both on and off the job)
 - Keeps hearing protection in possession **at all times** while on the job
 - Reports for **annual hearing tests and annual training** on hearing conservation
 - **Reports** any hearing **problems** or difficulties associated with HPDs to supervisors
 - **Maintains hearing protectors** in a sanitary and serviceable condition; **requests a new set** when current set becomes unserviceable or lost

- **OHC Audiology Technician**
 - Most important team member – **The “Face” of HCP**
 - Responsible for majority (approx 97%) of audiometric monitoring for HCP personnel.
 - Administers **air conduction hearing tests** to noise exposed personnel. May also administer hearing tests for personnel not in the HCP, i.e. PHAs, pre-hire evaluations, separations from military service.
 - Determines **follow-up** and appropriate **referral** needs.
 - **Counsels** and **motivates** personnel to practice good HC behaviors.
 - **Fits/refits HPDs** when appropriate (when patient has STS).
 - Provides hearing **documentation** in individual medical records.
 - Provides and saves **accurate data** to OHC software (DOEHRS-HC and DOEHRS-DR).
 - Performs daily **equipment** calibrations, maintenance & troubleshooting tasks.

- **Audiologists**
 - Serves as the installation and/or regional **Hearing Conservation Program Manager (HCPM)**. Note that the HCPM includes Occupational Health Physicians/Nurses in many areas
 - **Supervises monitoring audiometry** at hearing conservation test sites
 - Performs complete, **diagnostic audiometric evaluations** on personnel in the HCP who have sustained an STS after the 1st and/or 2nd follow up hearing screenings.
 - **Refers** personnel requiring specialty evaluations to ENT or appropriate clinic
 - Conducts Hearing Conservation **Technician Certification Courses**
 - Provides **guidance on hearing conservation issues** and perform assist visits with Medical Officers, Preventive Medicine staff, and certified technicians
 - Provides **guidance and training assistance** upon request to Commands and Commanding Officers on Hearing Conservation Program requirements
 - Uses hearing conservation **data and statistics to evaluate program** participation, quality assurance and program effectiveness

- **Medical Officers/Physicians**
 - Includes Primary Care Providers, Ear Nose Throat Specialists (Otolaryngology), Independent Duty Corpsmen, Occupational Health Nurses
 - **Evaluates and treats** outer and middle ear pathologies
 - **Refers** patients for audiology medical evaluations
 - Note: **Occupational Health Physicians and Nurses** may assist with numerous aspects of the HCP in some commands: program management, administer hearing testing and surveillance particularly with civilian employees in the HCP, fit HPDs, provide HC education and training

- **Safety Officers and/or Supervisors - COMPLETING THE PROCESS**
 - Takes **feedback from medical** and inputs data into SAMS/E-SAMS/MRRS in order to manage their respective CO's HCP.
 - Ensures **personnel are compliant** with HPD use.
 - Reports confirmed **PTS/OSHA hearing losses** to OSHA and/or Navy Safety Center.

- **All Team Members Are Essential**
 - To carry out OSHA/DOD instructions for the CO's HCP
 - To maintain mission readiness and safety
 - To ensure quality of life

OHC Technicians play a critical role in the HCP

- You **see** personnel **first**
- You **fit** HPDs to individual employees
- You **educate and motivate** personnel during their annual testing
- You **answer** their questions
- Again, you are the “**Face**” of the Hearing Conservation Program

Summary

- **Goal** of Hearing Conservation: To prevent occupationally related Hearing Loss & ensure auditory Fitness For Duty
- Discussion **topics** included:
 - **Effects** of noise on our hearing
 - **Purposes** of the Hearing Conservation Program (HCP)
 - Five **Elements** of the HCP in the Navy
 - HCP **team** members
 - Importance of the **OHC Technician**

**The HCP team strives to protect
one of our most precious abilities.....
hearing and understanding of sound and speech**

**The OHC Technician is a critical part of the HCP Team
because you see the majority of patients.**

You are the “FACE” of the HCP!

STUDY GUIDE (OVERVIEW of the HEARING CONSERVATION PROGRAM)

1. What is a good method for determining the effectiveness of your hearing conservation program?
 - a. Ensure that you have strictly adhered to the guidelines in the current instructions
 - b. Provide effective annual hearing conservation training
 - c. Ensure that everyone working in noise hazardous areas wears double hearing protection
 - d. Evaluate statistics on the amount of STS found during annual testing

2. What is the purpose of the Hearing Conservation Program?
 - a. To reduce hearing loss compensation costs
 - b. To promote healthy hearing for quality of life reasons
 - c. To maintain good hearing in order to maximize operational readiness
 - d. To prevent noise-related hearing loss
 - e. All of the above

3. Which of the following professionals are parts of the hearing conservation team?
 - a. Occupational health nurses
 - b. Medical officers
 - c. Safety officers
 - d. Audiologists
 - e. Industrial hygienists
 - f. Hearing conservation technicians
 - g. All of the above

4. T or F Single hearing protection is required in hazardous noise levels above 80 dBA

5. What level of hazardous noise is double hearing protection required?
 - a. Greater than 96dBp
 - b. Greater than 96dBA
 - c. Greater than 85dBp
 - d. Greater than 85dBA

6. What outcome does noise exposure have on individuals?
 - a. Noise-induced hearing loss
 - b. Isolation and withdrawal from social situations
 - c. Progressive loss of communication ability
 - d. Tinnitus
 - e. Stress-related diseases
 - f. All of the above

7. T or F Non-occupational noise does not result in hearing loss.

8. Noise-induced hearing loss is
 - a. a known and acceptable result of exposure to hazardous noise
 - b. a common side effect of tinnitus
 - c. often underrated because there are no visible signs of injury
 - d. the most prevalent occupational health hazard in the military
 - e. C and D

9. What might be considered an obstacle to an effective Hearing Conservation Program?
 - a. Hearing conservation personnel fail to obtain annual hearing screening
 - b. Industrial Hygienist fails to notify command of noise exposure risks
 - c. Command purchases noise hazardous equipment without consulting Industrial Hygienist
 - d. Poor communication and cooperation between all HCP Team Members
 - e. All of the above

10. List the Four P's of hearing loss.
 - a. _____
 - b. _____
 - c. _____
 - d. _____

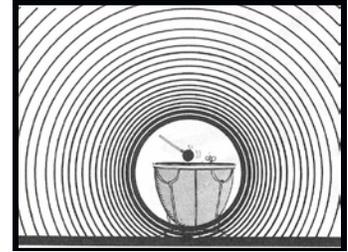
11. List the five elements of a successful hearing conservation program
 - a. _____
 - b. _____
 - c. _____
 - d. _____
 - e. _____

12. What team member is the most crucial part in the hearing conservation program?
 - a. The Command's CO since s/he's ultimately responsible for his/her program
 - b. The genius engineer who develops ways to dampen and quiet machinery
 - c. The good looking occupational audiologist who teaches these classes
 - d. The OHC technician because they see the patients first, monitor their hearing status, teach them how to properly wear their HPD and educate and motivate them on the importance of protecting their hearing

PHYSICS OF SOUND

LEARNING OBJECTIVES

1. Explain the parameters of sound and how they are measured
2. Apply the parameters of sound to the sensitivity of the human ear
3. Apply the parameters of speech and sound to an audiogram
4. State the intensity levels related to hazardous noise



Definitions of Sound

- In terms of **physics**: A rapid variation in atmospheric pressure caused by some disturbance or agitation of air molecules or any elastic medium. This is the scientific **physical definition** of sound. Therefore, sound occurs whenever the air molecules (or water, metal, wood, etc) are pushed or disturbed into pressure waves regardless of whether any human is around to hear the pressure wave.
- In terms of **human hearing**: A sensation resulting from stimulation of the auditory mechanism by air waves or other vibrations transmitted through the air or other medium. This is the **psychological definition** of sound. Therefore, sound is heard only when air pressure waves enter the ear and mechanically move the eardrum and other parts of the ear which then stimulates auditory nerves which carry the “sound” to the brain’s auditory centers.

Definition of Noise

- Any **unwanted sound** – any sound that is perceived as irritating or interferes with an activity, i.e. talking, listening, sleeping, working, etc.
- Interpreting sound as noise varies from person to person
- Hazardous sound or noise is defined as intensity levels 85dBA or greater.

Required Elements of Sound

- Three (3) major elements to generate physical sound and four (4) major elements to communicate sound with meaning
- ONE: A **source of energy**,
- TWO: A **source of vibration**, such as the lungs
- THREE: A **path or medium** to carry the wave motion of the vibration, such as air
- FOUR: A **receiver**, such as the human ear and a brain to interpret meaning of the sound.

EXAMPLES OF SOUNDS	ENERGY SOURCE	VIBRATION SOURCE	PATH OR MEDIUM
Radio	Electricity	Speaker Cone	Air
Submarine	Fuel	Propeller	Water
Speech	Lungs & Muscles	Vocal Cords	Air

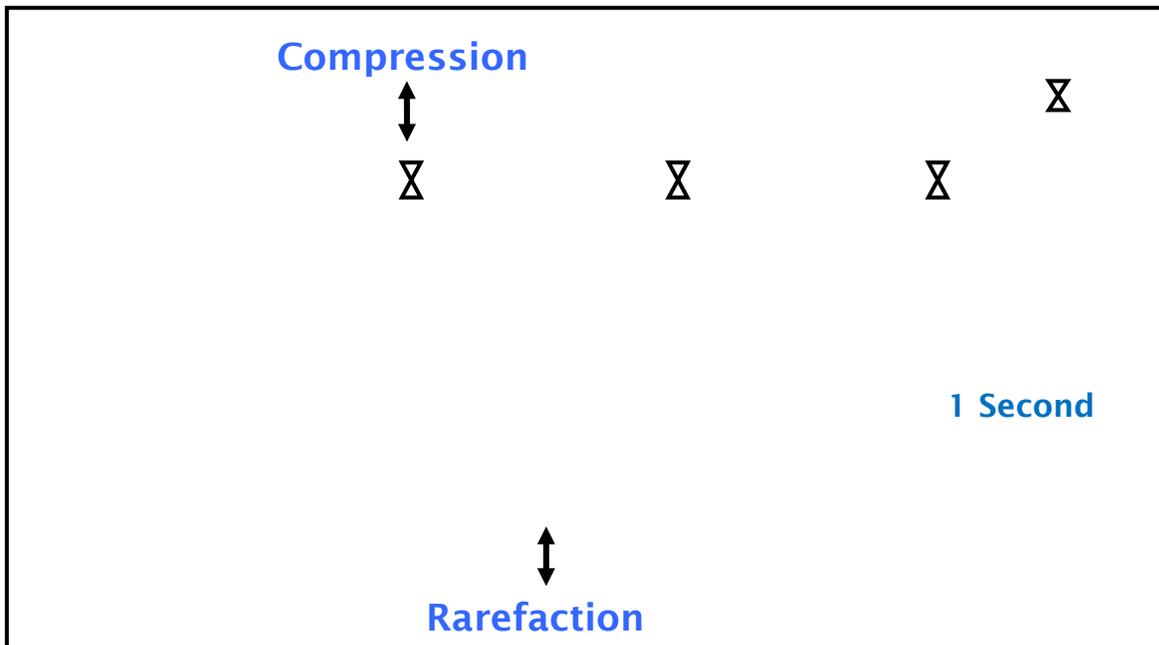
Creation and Transmission of Sound

- Vibration of a sound source causes **alternating pressure changes** in air molecules surrounding the source.
 - **Compression** – occurs when the molecules of the medium are forced together causing an area of high pressure; the medium becomes compressed
 - **Rarefaction** – molecules of the medium separate from each other causing an area of low pressure; the medium is rarefied
- A series of compressions and rarefactions make up a sound wave by producing a series of alternating areas of high and low pressure

(Audiovisual animation of sound wave)

- The speed at which sound waves travel depends on the medium; **the denser the medium, the faster sound travels**. Note that sound waves move out in all directions from a vibrating object.
 - Air = 1,100 feet per second
 - Water = 4,500 feet per second
 - Steel = 15,000 feet per second
- **Sine Wave** – graphic representation of the **simplest sound wave** or pure tone (doesn't happen in real physical world because physical objects/vibrating sources have mass and resonance characteristics). Look at graph below.
 - Horizontal axis – represents time in seconds
 - Vertical axis – represents molecular movement
 - Compression – represented by upward movement indicating a rise in pressure
 - Rarefaction – represented by downward movement indicating a drop in pressure
 - Cycle = 1 complete compression + 1 complete rarefaction

EXAMPLE of a SINE WAVE



Characteristics or Parameters of Sound Waves

- Sound has **four (4) major paired characteristics** or parameters. Every sound wave has these characteristics/parameters and is described or labeled with these terms. The first three parameters are measured in specific units of measurement.
- **Frequency** is perceived as **pitch**.
 - Measured in **Hertz**, abbreviated as **Hz**.
 - Number of complete **cycles** that occur over a given length within one (1) second.
- **Intensity** is perceived as **loudness**
 - Measured in **decibels**, abbreviated as **dB** (little d, big B).
 - How far the air molecules move or are **displaced** within the movement cycle.
 - **Amplitude** is the associated term
- **Duration** is perceived as **time**.
 - Typically measured in **milliseconds and seconds**.
 - When describing duration of exposure to hazardous noise, duration is measured in minutes and hours.
- **Spectrum** is perceived as the **quality** of the sound.
 - Spectrum is all the **other three parameters** – frequency, intensity and duration – **combined**. Also, referred to as complexity or complex waves.
 - All sources of vibration produce multiple sound waves simultaneously due to their mass and density. For example, the characteristic sounds made by a violin are different from the big double bass.
 - Complex waves are perceived as the **quality** of the sound and is how we **identify** what or who is making the sound.

Sound Characteristic of Frequency

- Physical **rate** of sound vibration or number of **compressions and rarefactions** (cycles) that occur in one second (**cycles per second**)
- Psychologically perceived as **pitch**
- **Measured in Hertz (Hz)**, named in honor of the German physicist Heinrich Hertz (1857-1894)
- Examples: A sound that is perceived as a high pitched sound will have sound waves that have a high rate of vibration or cycles of compressions and rarefactions. That means the sound will be described as having a high frequency, such as 4000 Hz (cycles per second).
- The **smaller the number of cycles** or Hz (i.e. 500 Hz), the longer the **wavelength** of the sound wave because fewer cycles need to occur within one second. In contrast, sound waves with higher frequency or Hz (i.e. 8000Hz) will have shorter wavelengths because many more cycles have to occur within one second of time.
- One way to measure frequencies is in **octaves**. Originally based on the musical note scale, an octave is when a **frequency is doubled**. For example, standard octaves used are 250Hz, 500Hz, 1000Hz, 2000Hz, 4000Hz and 8000Hz
- At birth, the **human ear** can detect frequencies in the range of **20-20,000 Hz**. Most healthy adults hear about 100 to 12,000 Hz. Hazardous noise typically impairs high frequency hearing sensitivity.
- The **frequencies** that we are **most sensitive** to are those that are most critical for **understanding speech sounds** – **500 to 4000 Hz**.

Sound Characteristic of Intensity

- Physical **power or sound pressure level (SPL)** of a sound wave.
- Psychologically perceived as **loudness**

- In audiology, intensity is expressed in **sound pressure level (SPL)** which is a function of distance that the vibrating object is **displaced (amplitude)**, which depends on energy applied to that object. In turn, the object displaces the air molecules surrounding it.
- When measuring acoustic energy, the sound being measured is compared to a known reference level of intensity. Therefore, the measurement represents a ratio of two energy levels.
- **Measured in decibels (dB)**
 - The capital B in dB is in honor of Alexander Graham Bell.
 - A decibel is 1/10 of a bel which is based on SPL measured in microPascals (mPa)
 - Decibels are **logarithmic units** using base 10. This means 20 dB is not plus 10 more than 10 dB but is multiplied 10 times more than 10 dB. Using a logarithmic scale compresses the very large range of pressure our ears can hear into a small range of workable numbers for convenience.
- Average **intensity range** of human hearing is **0 to 140 dB HL** (dynamic range of hearing)
 - These intensities 0-140 dB represents a sound pressure range of **1 to 10,000,000 units** (a ratio of 10 million to 1 sound pressure units!)
 - Sound pressure or energy is present at **0 dB HL** and below. However, 0 dB HL is the **softest sound detectable by normal young adults** (on average).
- **Examples** of sound levels
 - An **average speaking voice is 60 dB**.
 - **Steady state sound** is defined as **hazardous** when it is ≥ 85 **dB SPL**. A practical way to determine if sound is within this hazardous level is the “**Three Foot Rule**.” If you are three (3) feet away from a listener and need to shout to be heard, you are in a noise-hazardous environment
 - **140 dB** is considered the **threshold of pain**. We can hear sounds more intense than 140dB, but tonal quality is lost.
 - **170-180 dB** causes **tissue damage** in the body. 180 dB + can cause **death**.

Sound Pressure Level SPL

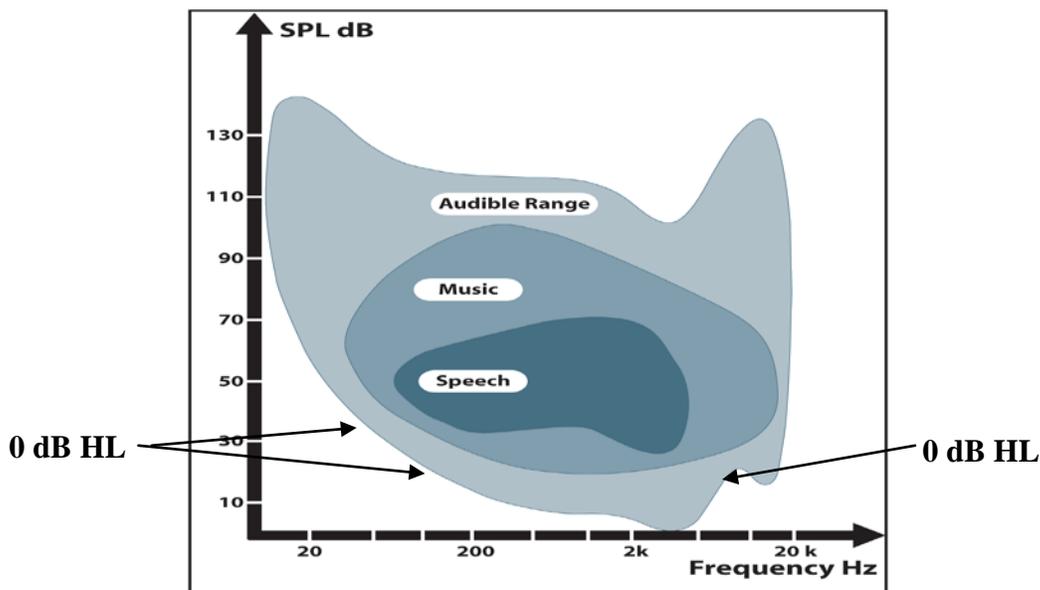
	<i>Sound Pressure Level (decibels dB SPL)</i>		<i>Sound Pressure (micro pascals mPa)</i>
	160	JET ENGINE	2,000,000,000
PAIN	140	GUN BLAST	200,000,000
	120	CHAIN SAW	20,000,000
	100	HAMMER DRILL	2,000,000
	80	VACUUM CLEANER	200,000
	60	CONVERSATION	20,000
	40	QUIET ROOM	2,000
	20	WHISPER	200
	0-7 @ 1kHz	HEARING THRESHOLD	20

Intensity of Sample Sounds

Hearing Level (HL) Scale

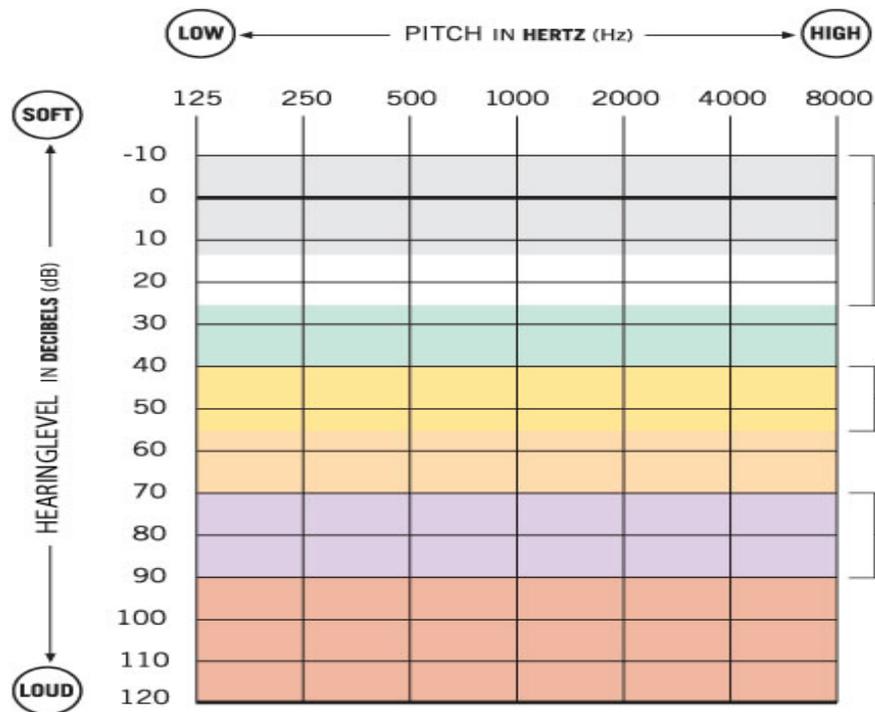
- Scientists found that humans could not hear all physical sounds measured in sound pressure levels (SPL).
- The human ear is **most sensitive to 1,000 - 4,000 Hz** and least sensitive to the frequencies below 1000 Hz. In other words, some frequencies must have more physical energy or amplitude or sound pressure to be barely heard.
- A scale was developed to more closely represent human hearing, called the **Hearing Level scale, or HL**. So 0dB HL (human hearing) does not equal 0dB SPL (physical sound energy).
- The HL scale was developed from results of testing a large group of young, normal hearing people. Their averaged results allowed a new scale using **zero as the softest volume** that could be detected at each frequency. Therefore **HL is not the same as SPL**. Zero has been normalized for the purpose of audiometric testing and interpretation.

HUMAN HEARING LEVEL – SENSITIVITY or AUDIBILITY RANGE



Audiogram

- An audiogram is a **graph** that is used to plot a person's hearing levels.
- An audiogram is based on the **Hearing Level (HL) decibel scale** because we are testing humans.
- The graph was flipped so that **0dB HL is at the top** of the graph.
- Hearing is typically **tested in octaves** from 250 Hz to 8000Hz.
- When testing a person, one frequency is presented at a time, varying the intensity until the softest intensity level that the person responds to at that frequency is determined.
- **Symbols** are marked on the audiogram to record each of those final hearing levels for each ear, i.e. O for right ear and X for left ear when listening through headphones.
- Note the order of notations on the graph: **Frequencies are low to high in a left to right** direction. **Intensities (dBHL) are soft to loud in a top to bottom** direction.
- The most important **frequencies for understanding human speech sounds** are between **500Hz and 4000Hz**.



Graphic Audiogram

Scales or Types of Decibel Measurements – Summary

- The scale reference (SPL or HL) must be known in order for the “# dB” to have meaning.
- Hearing Level -- dB HL
 - Referenced to normal hearing
 - Used when measuring hearing
 - Normal hearing range = -10dB HL through 25 dB HL
 - When different frequencies at 0dBHL are measured in SPL, the SPL value varies because the human ear varies in sensitivity to sound pressure across frequencies.
- Sound Pressure Level – dB SPL
 - Referenced to 20 microPascals (least amount of pressure needed to move a diaphragm the same size of an eardrum)
 - Used when measuring noise levels
 - Putting an “A” behind the “dB” (dBA SPL) indicates a sound pressure level scale that filters out some of the low frequencies, more closely representing the **response of the human ear.**
 - Putting a “P” behind the “dB” (dBP SPL) indicates a sound pressure level scale that measures **very fast, loud sounds** such as weapon fire. The ‘P’ stands for **peak**--the loudest peak of the noise level.

Interaction of Intensity and Distance

- The relationship between sound intensity and distance is described by the **Inverse Square Law**. This principle is used to define **noise hazard radius** of a sound source.
- The Inverse Square Law states that when the **distance from a sound source is doubled**, the **intensity level decreases by 6 dB**.
- Intensity is **NOT cut in half** by doubling the distance –intensity is reduced **only by 6 dB**.
- Inverse square law is **only true in far free field** – not inside where sound could reflect off surfaces.
- **Example:** A generator noise level is measured at 93 dBA. At ten (10) meters, the generator's noise level is measured at 88dBA. At twenty (20) meters, the generator's noise level is measured at 82dBA. Each additional doubling of distance will decrease the decibel level by another 6dB.

More Than One Sound Source

- Decibel (dB) levels are **not additive**. The dB scale is a multiple/logarithmic measurement scale.
- dB levels of different noise sources are not added together to determine the total hearing hazard.
- A **combination** of two different noise sources of **equal intensity** increases the measured intensity by **(three) 3 dB**.
 - **Example:** Noise source of 93 dBA + another noise source of 93 dBA = combined intensity of 96 dBA (only 3dB increase overall)
- The **combined** intensity output varies when two different noise sources have **unequal intensity** outputs. A chart is used to determine the number of dB that is added to the greater decibel measurement. The **greater the dB difference** between the noise sources, the **smaller the increase** of combined intensity, until there is zero (0) impact at a 10dB or greater difference.
 - **Example:** Noise source #1 is measured at 93 dBA and Noise source #2 is measured at 95 dBA. The combined intensity will be an additional 2dB added to the higher 95dBA for a total of 97dBA. When the output difference between the two sound sources is 10dB or greater, the combined intensity will equal the higher measurement, e.g., 90dBA + 103dBA = 103 dBA combined intensity reading.
 - **However**, the **perception** of the combined noise will seem to be **twice as loud** as either of the noise sources heard alone.

Duration of Sound

- Duration is the **physical measurement** of the continuous presence of a sound stimulus.
- **Time** is the psychological interpretation of the auditory sensation.
- Measurements can be thousandths of a second (milliseconds), minutes or hours in duration.
- Occupational noise exposure is identified as **continuous (steady-state)**; measured in brief seconds to hours, or **impulse (impact)** type of noise, measured in milliseconds to a few seconds.
- Each type of noise is further described according to its **duration or amount of time** an individual worker is **exposed** to it.
- **Degree of damage to hearing depends on the intensity of the noise and the duration of exposure**. Generally, the louder the noise and the longer the exposure, the more damage will occur. The majority of noise-induced hearing loss is from long-term exposure to continuous noise.

Spectrum

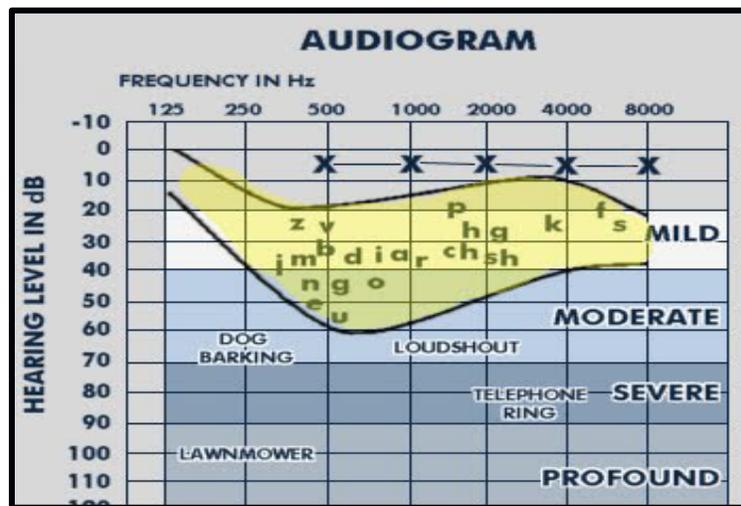
- **Spectrum** or complexity is the **physical measurement** of all the frequencies at their respective intensities over the duration of a sound or during a specified span of time.
- The psychological **perception** or interpretation of spectrum is the **quality or tone** of the sound.

- Simplest form of sound is the **pure tone** consisting of a single frequency with no harmonics or overtones (i.e., a tuning fork).
- **Natural sounds** in the world are **complex**, a mix of many frequencies and intensities, such as the human voice.
- Spectrum or quality is the **identifying “name”** of a sound or individual voice.

Physics Of Speech

- Human speech is made of **very complex sounds** that rapidly occur in **patterns** that are meaningful to specific populations. However, regardless of language, speech sounds follow similar acoustic rules.
- **Frequencies** that we are **most sensitive** to are those that are most critical for understanding speech sounds – **500 to 4000 Hz**.
- Speech sounds typically occur within the **intensity range** of **30dBHL to 65 dB HL**
- The bulk of **vowels** are lower in frequency and have higher intensity, carry minimal information and are easily heard. Vowels provide the **power of speech**.
- The bulk of **consonants** are higher in frequency, vary in intensity, and carry the majority of speech information. Consonants provide the **understanding or intelligibility of speech**.
- Many **consonants** are in the **frequency regions** that are **typically damaged** by excessive or intense hazardous noises.
- The audiogram below shows the major frequencies used to identify English speech sounds. Notice the **vowels are in the lower frequencies** and the **softer consonants are in the high frequencies** (not all speech sounds are shown).

**AUDIOGRAM: SPEECH SOUNDS, ENVIROMENTAL SOUNDS
(X indicates normal hearing sensitivity with degrees of hearing loss shaded)**



- The human ear changes or transduces the **complex sounds into frequency, intensity and duration components** that are transmitted as nerve impulses to the brain. Analysis and reorganization occurs all along the anatomic pathway to result in meaning **within milliseconds of time**.

Sensitivity of the Human Ear - Review

- **Frequency Range: 20 - 20,000 Hz**
 - Healthy adults typically hear 100 - 12,000 Hz
- **Intensity Range: 0 - 140 dB HL**
 - The dynamic range of hearing
 - Approximate range, as younger people can hear in negative numbers, and sounds above 140 dB HL are very painful
 - Sounds above 140dB HL are audible but lose tonal quality
 - **Normal** hearing range is defined as **-10 to 25 dB HL**
- **Speech Frequencies: 500 - 4000 Hz**
 - Sounds at higher and lower frequencies add quality to speech, but little intelligibility
 - **Consonant** sounds - soft, low energy, higher frequency sounds, convey **80% of meaning** or intelligibility of speech
 - **Vowel** sounds - loud, high energy, low frequency sounds, carry **80% of the energy or power** of speech
 - **Noise-induced hearing loss** occurs primarily in the **higher frequencies**, therefore the ability to hear **consonant sounds are lost** first. Common complaint with this type of loss is that the **person can “hear” speech, but cannot “understand” it** due to the loss of meaning.
 - Environments with competing noise add to the hearing-impaired listener’s difficulty in understanding speech, such as: vehicle noise, television and radio, restaurants, reverberant rooms, social groups
- Human hearing is usually described in the form of a graph called an **audiogram**.
- The **lowest sound intensity** that can be heard for each frequency is known as the **threshold** of hearing.

STUDY GUIDE (PHYSICS OF SOUND)

1. What are the four parameters of sound?
 - a. frequency, intensity, duration, spectrum
 - b. pitch, hertz, db, loudness
 - c. time, quality, spectrum, noise
 - d. impulses, impact, steady state, continuous
2. What are the requirements for sound to be generated?
 - a. medium, source, receiver, sound pressure
 - b. decibels, pitch, time, duration
 - c. noise, vibration, compression, rarefaction
 - d. vibration source, energy source, medium, receiver
 - e. vibration source, energy source, medium
3. Match the following physical measurements of sound with their psychological interpretation:

a. frequency	time
b. intensity	quality
c. duration	pitch
d. spectrum	loudness
4. What is the range of frequencies that the human ear can hear?
 - a. 1000-4000 Hz
 - b. 500-6000 Hz
 - c. 20-20,000 Hz
 - d. 0-140 dBA
5. What criteria below are considered hazardous noise?
 - a. ≥ 85 dBA
 - b. 1000-4000 Hz
 - c. 0-140 dBP
 - d. >140 dBP
 - e. A and D
6. What frequencies is the human ear most sensitive to?
 - a. 0-140 dB
 - b. 20-20,000 Hz
 - c. 8000-12,000 Hz
 - d. 500-4000 Hz
7. T or F Frequency = number of compression and rarefaction cycles per second and is measured in Hz.

8. T or F Doubling the distance from the noise decreases its intensity at the ear by 10dB
9. The simplest form of sound consisting of a single frequency with no harmonics or overtones is called:
- auditory stimulus
 - auditory sensation
 - spectrum
 - pure tone
10. What is the average intensity range of human hearing at each frequency?
- 500-6000 Hz
 - 1000-4000 Hz
 - 0-140 dB HL
 - ≥ 85 dBA and 140 dBP
11. T or F The denser the medium, the slower the sound travels
12. What is the definition of sound as it relates to human hearing?
- The sensation resulting from stimulation of the auditory mechanism by air waves or vibrations transmitted through the air or other medium
 - Any unwanted noise
 - Molecules pressing together causing an area of high pressure
 - Double the distance from the sound source decreases the intensity by 6 dB
13. What two factors will determine whether noise is hazardous to hearing?
- frequency and intensity
 - duration and spectrum
 - impulse and impact
 - intensity and time/duration
14. T or F Intensity relates to loudness and is measured in dB.
15. The human ear is least sensitive to
- frequencies below 1000 Hz
 - 1000-4000 Hz
 - 500-6000 Hz
 - 20-20,000 Hz

16. In which medium does sound travel the fastest?

- a. air
- b. water
- c. steel
- d. all of the above

17. T or F Most sounds in the world are pure tones consisting of one frequency.

18. Match the following:

- | | |
|-----------------------|---|
| a. compression | 1. an explosive sound |
| b. noise | 2. molecules separate from each other causing an area of low pressure |
| c. impact noise | 3. graphic representation of the simplest sound |
| d. rarefaction | 4. molecules are forced together causing an area of high pressure |
| e. impulse noise | 5. double the distance from a sound source reduces intensity by 6db |
| f. sine wave | 6. any unwanted sound, varies from person to person |
| g. inverse square law | 7. noise that occurs from two or more objects hitting together |

19. What is the threshold of pain?

- a. 96 dB SPL
- b. 85 dBA SPL
- c. 0002 dynes per square cm SPL
- d. 140 dB HL

20. T or F Decibels are logarithmic units and compress a very large range of pressure that the ears can hear into a small range of numbers for convenience.

21. T or F Zero dB represents the absence of sound energy.

22. Zero dB HL on the audiometer at each frequency is

- a. the same as 0db sound pressure level
- b. the softest sound that normal hearing young adults can hear at each frequency
- c. an indication that the person being tested cannot hear at all the frequencies tested
- d. a technical problem with the audiometer

23. What principle is used to define the noise hazard radius?

- a. law of gravity
- b. time-weighted average
- c. inverse square law
- d. weighting networks

24. Why is it silent in space? _____

NOISE MEASUREMENT and CONTROL

Learning Objectives

1. Define hazardous noise re: military service regulations
2. State the purposes of noise surveys
3. Identify noise measurement equipment
4. Explain the major methods of measuring noise

Hazardous Noise Levels

- **Amount of time** a person can be exposed to hazardous noise levels without hearing protection before damage occurs in the ear(s) **varies** with the decibel level.

Exchange Rate = 3 dB

NOISE LEVEL –dBA SPL	EXPOSURE TIME	SOURCE EXAMPLES
85	8 hours	Blender on High
88	4 hours	
91	2 hours	Heavy city traffic
94	1 hour	
97	30 minutes	
100	15 minutes	Punch press
103	7.5 minutes	
106	≈ 3 min 45 secs	Steel plate falling
109	≈ 1 min 45 secs	
112	≈ 1 min	Hard rock music
115	≈ 30 secs	Jet passing overhead
118	≈ 15 secs	
121	≈ 7.5 secs	Jack hammer
124	≈ 3 sec	
130	≈ 0.25 sec	Shotgun
150-170	≈ 0.0019 sec	Jet Plane taking off

- **Exchange rate** relates to change in intensity levels and corresponding changes in exposure time before hearing damage can occur. An exchange rate of 3dB is defined as **for every 3 dB of increase in intensity, the permitted exposure time decreases by one half (1/2)**. (OSHA uses a 5dB exchange rate).
- DODINST 6055.12 highly recommends 3dB exchange rate be used and mandates workers to use hearing protection in noise levels 85dBA or greater.
- **Other factors** that can increase an **individual's susceptibility** to Noise Induced Hearing Loss (NIHL) is fatigue, stress, heavy metals, chemical solvents, asphyxiates and drugs.

Purpose of Noise Hazard Evaluations or Noise Surveys

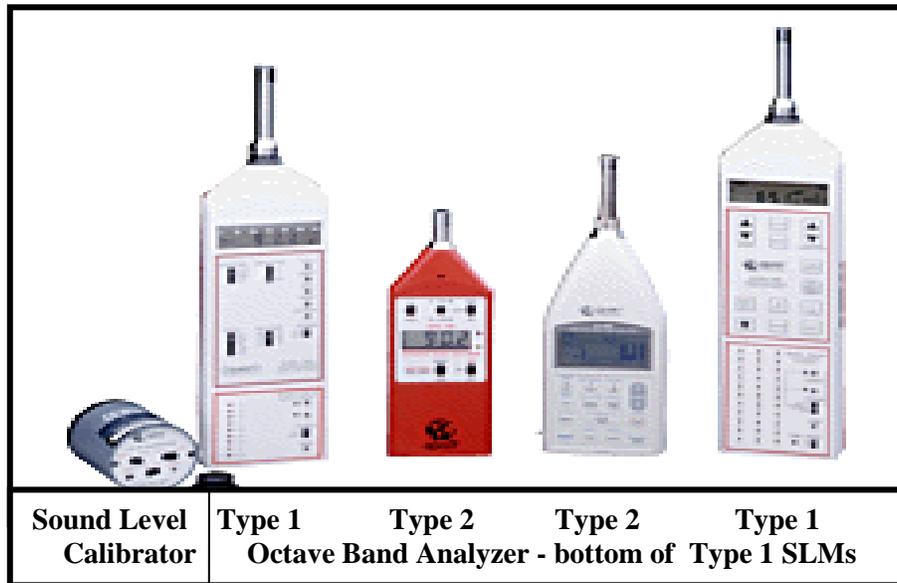
- **Events that lead to a noise hazard evaluation** may include the following:
 - new or modified **equipment**
 - new or modified **process or procedure**
 - employees complain of **excessive noise and difficulties** in communicating effectively
 - employees complain of **muffled hearing and tinnitus** after work
 - changes in **work requirements** in hazardous noise
- Major **purpose or outcomes** of noise hazard evaluations/noise surveys. Details will follow later in this unit.
 - **Identify sources** of hazardous noise re: equipment, areas, operations
 - Determine if **engineering controls** can reduce or eliminate noise hazards
 - Identify and **label** noise hazards
 - Recommend **enrollment** of personnel exposed to hazardous noise in the **HCP**
- **Baseline** surveys are conducted **at least once** on all noise hazard areas/operations, and again within **30 days** of a change in equipment or operations.

Responsibility for Noise Surveys

- **Industrial Hygienists (IH)** have primary responsibility for conducting noise surveys and analyzing the measurement data and recommendations.
- **Audiologists'** professional training allows them to conduct noise surveys, although it is **not a typical** responsibility in the military.
- **OHC Technicians** may be trained to **assist** IH in conducting portions of a noise survey but must be under IH supervision. NOTE: The OHC Technician is not directly responsible for noise evaluation and control.

Noise Measurement Equipment

- **Sound Level Meters (SLM)** are used to **screen** environmental areas or spaces for noise hazards by taking a **sample of noise** in a general area or specific area surrounding equipment. If the screening detects noise levels ≥ 85 dBA, a **dosimeter with octave band analysis** is then used to determine the individual worker's **noise dose**.
 - **Type 1 – precision sound level meter**
 - More expensive – “thousands”
 - Allowable variation in **accuracy** is no more than +/- 1 dB
 - May be used for hearing conservation purposes
 - Device used for annual hearing booth certification
 - Device used for annual electroacoustic “audiometer” calibration
 - Requires calibration pre and post measurement of noise
 - **Type 2 – general purpose sound level meter**
 - Less expensive – “hundreds”
 - Allowable variation in **accuracy** is no more than +/- 2 dB
 - May be used for hearing conservation purposes
 - Requires calibration pre and post measurement of noise



- **Impulse or impact noise** measurements
 - Require a meter with the ability to respond to very rapid rise in sound level pressure and peak hold capability,
 - Usually only found in **Type 1** sound level meters.
- **Weighting networks** in Sound Level Meters – used to reduce or increase the intensity of sound in certain frequencies depending on the purpose of the measurement.
 - **A Scale:** selectively reduces the intensity of low frequency sounds *which results in a response curve that is similar to the sensitivity of the human ear.*
 - **C Scale:** Very little selective reduction in the intensity of sounds (only the extreme low frequencies) which results in an almost flat response curve. This scale is used by researchers and Hearing Protection Device (HPD) manufacturers to estimate the effectiveness of ear protectors.
 - If a sound measurement is higher on the C scale than the A scale, then the noise has a significant low frequency component
- **Octave Band Analyzer**
 - Available either as a separate sound level meter or as a filtering attachment for Type 1 sound level meter.
 - Measures the sound pressure levels in specific frequency ranges which provides data guidance for engineering solutions for noise control.
 - Used to certify audiometric test booths, also.
- **Microphones** attached to the sound level meter have different characteristics that must be understood to make an accurate measurement.
 - **Measurement angle** – Some microphones must be pointed directly at the noise source, while others must be at an angle to the source.
 - **Diameter** – The higher the sound pressure level to be measured, the smaller the diameter of the microphone used. To measure very low SPL's in an audiometric test booth, a 1 inch diameter is best, but to measure very high SPL's, such as weapons fire, a ½ or ¼ inch microphone is required.

- **Sound level calibrators** generate known sound pressure levels in order to perform a **field calibration check** of SLMs.
 - Most calibrators generate a **single frequency** (i.e. 1000 Hz with one or two intensity levels).
 - **Multi-frequency**/multi-sensitivity calibrators are available to check octave band analyzers.
- **Dosimeters** are used to measure **personal (individual) noise exposure**. Dosimetry is the only **reliable** method for determining the noise dose of individual employees over a specific time period.
 - Measures **Time-Weighted Averages (TWA's)** which is the average exposure projected over an 8-hour time period.
 - Dosimeter is **worn** by a worker on his or her clothing or in a carrying pocket. The **microphone** must be within a certain distance of the person's ear.
 - Various **sampling methods** are used but should represent the **typical workday exposure** to noise for that individual. Data stored in the dosimeter is analyzed by computer software.
 - Specific **facts** about dosimetry and TWAs:
 - Personal dosimetry is the **only reliable** method of obtaining a TWA
 - Obtain from DOD **civilian** employees routinely working in hazardous noise areas
 - Obtain from **military** personnel working in industrial-type hazardous noise operations
 - Obtain at least **once and then within 30 days** of any change in operations affecting noise levels
 - Obtain using the **A weighted scale**, as required by OSHA
 - Document TWA's in worker's **health record**
 - If dosimetry is not available, **Similar Exposure Groups (SEG)** may be used to estimate exposure levels for an individual worker or unit. This exposure profile is based on statistical analysis of 6-10 dosimetry TWA measurements.
 - Factors affecting dosimetry **validity**
 - **Microphone** placement & stability
 - Employee **tampering** with dosimeter
 - Work environment measured is **typical** of the employees regular exposures

NOTE: Dosimeter is a general term related to devices that gather data about exposure to a variety of hazards, i.e. noise, radiation, chemical, etc.

Steps in Completing a Hazardous Noise Evaluation or Noise Survey

- **Step 1: Identify noise hazardous equipment, operations, and locations** for the purpose of protecting exposed personnel.
 - Hazardous noise is defined as
 - **≥ 85 decibels A-weighted (dBA) steady state noise (SPL)**
 - **≥ 140 decibels Peak (dBp) impulse/impact noise (SPL)**
 - Identify **primary noise sources** by any or all of the following **procedures**:
 - Screening: continuous, intermittent, impulse (Type 2 SLM)
 - Mapping: describe noise levels within area (Type 2 SLM)
 - Time Studies: by location and operations (Type 2 or dosimeter)
 - Dosimetry: workers' TWA exposures (dosimeter)
 - Octave Band Analysis: specific frequencies (Type I SLM using OBA)
 - Identify **synergistic exposures** where noise exposure is more damaging in the presence of other toxic elements or harmful circumstances.
 - **noise plus toxins** like heavy metals, organic solvents, asphyxiants
 - combination of noise with any of these substances can be the **catalyst** for more hearing loss

- **Step 2: To determine if noise hazards can be eliminated or reduced through Engineering Controls**
 - Engineering controls should be the **primary means** of protecting personnel from hazardous noise.
 - All **practical approaches** to engineering noise out of the work place or reducing noise levels to below hazard criteria should be explored.
 - Damping, isolation, and maintenance of equipment
 - Change procedure or process of operation
 - Construct barriers or enclosures to separate equipment from workers
 - Install sound absorption materials in work area
 - Personal Noise Controls (HPDs) should be the last line of defense (more info later)
 - An **engineering control feasibility study** is mandated when workers are exposed to > 100 dBA for more than 4 hours.
 - Engineering controls will be applied to military unique workplaces within the **constraints** of maintaining combat readiness.
 - **New equipment** being considered for purchase should have the lowest sound emission levels that are technologically and economically possible.

- **Step 3: Label noise-hazardous areas and equipment**
 - Signs and labels inform workers when it is **necessary to wear HPD's**.
 - Signs are placed on **individual pieces of equipment** as reminders that operation presents a noise hazard.
 - Signs are to be placed on **door of shop/space** only if the entire area is noise hazardous.
 - **Exception:** labels are not to be placed on exteriors of combat equipment and tactical vehicles.



- **Step 4: To recommend enrollment of personnel in the Hearing Conservation Program**
 - Noise level data is a vital element of the HCP, and helps determine who to enroll in the HCP. **Enrollment is based on ≥ 85 dBA TWA, not short-term exposure.**
 - **Absence of noise level data** does not preclude enrolling personnel in the HCP. (If a suspected noise hazard exists that has not yet been measured, personnel in the work area should be enrolled in the HCP until noise level data demonstrates there is no risk.)
 - When **noise data is unavailable**, HCP enrollment may be based on similar exposure groups (SEG's).
 - **Use of HPDs** is required for all personnel while working in hazardous noise environments, whether or not they are in the HCP.
 - If workers' TWA exposures cannot be reduced below 85 dBA with the use of HPDs, then **administrative controls** should be used to limit exposure times, either by rotating, removing or substituting workers in areas of hazardous noise.

Personal Noise Controls (HPDs)

- Personal HPD use is the **least effective for overall noise control** because it is dependent on human compliant behavior and proper use.
- However, this is the type of noise control that you as an **OHC Technician will be responsible** for on a daily basis. **Educating and fitting** employees enrolled in the HCP with HPDs (particularly earplugs) are crucial to a successful Hearing Conservation Program.

Hearing Protection Requirements

The Action Level requiring use of hearing protection devices (HPDs) according to DoDI 6055.12, OPNAVINST 5100.19/23 & BUMEDNOTE 6260 includes the following:

- > 84 dBA SPL of continuous or steady state sound/noise (said another way ≥ 85 dBA)
- ≥ 140 dBP SPL impulse or impact sound/noise
- > 96 dBA SPL continuous sound requires use of double HPDs (earplugs & earmuffs) **

- **Single hearing protection** must be used in continuous noise levels greater than (>) or equal to 85 dBA (e.g. ≥ 85 dBA).
- **Double hearing protection** must be used in continuous noise levels greater than (>) 96 dBA and for impact/impulse noises greater than or equal to 140 dBP (e.g. ≥ 140 dBP). Wearing two sets of HPDs do not “double” the attenuation or protection but increase the attenuation value/benefit by 5-6 dB.
****Weapons Fire/Explosives far exceed 100 dBA TWA in the typical military evolution, therefore, Industrial Hygienists typically recommend DOUBLE HPD for these scenarios.**

Summary

- **Intensity and duration** are the **two main factors** that determine whether noise is hazardous to hearing (How loud was it? How long was the exposure?). Exposure to unprotected continuous/steady-state hazardous noise over several years will likely cause a gradual hearing loss. Exposure to unprotected hazardous impulse/impact noise is likely to cause more immediate hearing loss.
- **The amount of hearing loss created by a given noise exposure varies from individual to individual.** Under the same noise conditions, a group of people may receive varying degrees of hearing loss, as some people are more susceptible to hearing loss than others.
- The Hearing Conservation Program begins with **noise measurement** and identification of noise hazards.
- The **preferred method** for noise control is engineering controls, which is then followed by consistent and correct use of hearing protection devices by the noise exposed personnel. If either of the above two do not reduce the noise level below 85dBA for the individual employee, then administrative controls should be used to limit the time exposed to the noises.

HOW TO OPERATE A SOUND LEVEL METER FOR ACCURATE MEASUREMENTS

1. Control Switches

- Power switch
- Battery check switch
- Weighting Network selector
- Fast / Slow meter response selector
- dB range selector
- Display is either digital or analog (dial) meter
- Attenuator switch (usually only on Type 1 SLM's) allows measurement of sound pressure levels 10-20 dB above the selected dB range.

2. SLM Operating Instructions for measuring continuous or intermittent noise

- Verify that the SLM and calibrator have a current electro-acoustic calibration (performed within the last 12 months) documented on a label on the instrument.
- Field check SLM calibration – before each day's use and document it on the measurement form
- Set weighting switch to dBA
- Set meter response to slow
- Starting with the highest dB range, adjust meter dB range selector until response is seen on display
- Hold the SLM at ear level, close to the worker's most exposed ear
- Read dB level on display meter
- Record results on appropriate form
- Field check SLM calibration after each day's use and document it on the measurement form.

3. Factors Affecting Validity of Sound Level Readings

- Weak battery
- Body baffle effect – microphone held too close to your body may cause absorption or reflection of sound
- Shielding effect – occurs when measurer's body or other object is located between the sound source and the microphone
- Wind noise – wind velocities above 5 mph may affect measurements; a microphone windscreen helps reduce wind noise
- Humidity / moisture on microphone or inside meter
- Microphone size – larger microphone (one inch) is best for measuring a broad frequency ranges
- Operator errors

4. Care of the Sound Level Meter

- Must be electro-acoustically calibrated annually
- Calibration must be checked both before and after measurements are taken
- Kept in a dry, safe place

STUDY GUIDE (NOISE MEASUREMENT & CONTROL)

1. Hazardous noise level criteria for steady state and impulse noise are:
 - a.
 - b.

2. Who has primary responsibility for performing noise hazard evaluations?
 - a. ENT physicians
 - b. certified audiometric technicians
 - c. industrial hygienists
 - d. environmental health officers

3. Which types of sound level meters are acceptable for use in hearing conservation noise hazard measurement?
 - a. Type 0 and Type 1
 - b. Type 1 and Type 2
 - c. Type 2 and Type 3
 - d. Type 0 and Type 3

4. T or F Sound level meters are the only type of instruments used for measuring noise hazards.

5. What should be the primary means of protecting personnel from hazardous noise?
 - a. engineering controls
 - b. hearing protection
 - c. administrative controls
 - d. hearing conservation training

6. On a sound level meter, which weighting network most closely corresponds to the way the human ear responds to sound?
 - a. A scale
 - b. B scale
 - c. C scale
 - d. D scale

7. T or F Doubling the distance from the noise decreases its intensity at the ear by 10dB.

8. T or F A noise level survey is required in order to place personnel in the HCP.

9. Which of the following instruments measures Time Weighted Averages?
- Type 1 Sound Level Meter
 - Type 2 Sound Level Meter
 - C scale
 - Dosimeter
10. What is the purpose of a noise hazard evaluation?
- to determine if noise hazards can be eliminated through engineering controls
 - to determine if noise levels are hazardous to hearing
 - to determine if personnel need to be enrolled in the hcp
 - to identify and label noise-hazardous equipment
 - all of the above
11. T or F The calibration of the equipment is checked before and after each noise measurement.
12. T or F Impulse noise can be measured with any basic sound level meter.
13. Time-Weighted Averages should be measured:
- on DOD civilians routinely working in noise
 - on military personnel working in industrial noise areas
 - within 30 days of a change in operations affecting noise levels
 - all of the above
14. What matters most when determining how damaging a hazardous sound sources is?
- frequency (HZ)
 - intensity (dB)
 - spectrum
 - time
 - b and d
15. An octave band analyzer is used
- to measure the sound pressure levels in specific frequency ranges
 - to give guidance on engineering solutions for noise control
 - as a filtering attachment for type 1 or type 2 sound level meters
 - to certify audiometric booths
 - all of the above
16. T or F Weighting networks are used to reduce or increase the intensity of certain frequencies depending on the purpose of the measurement.
17. T or F The higher the SPL measured, the larger the diameter of the microphone used.

18. T or F The total noise hazard level is calculated by adding the dB level of each noise source together.

19. While taking noise measurements, the sound level meter should be held

- a. three feet from the worker
- b. at the noisiest part of the machine or noise source
- c. close to your body
- d. close to the worker's most exposed ear

20. What is the purpose of engineering controls?

- a. to test hearing protection in a laboratory setting to ensure adequate attenuation
- b. to eliminate or reduce the noise level at its source
- c. to determine if hearing aids can be used in the work environment
- d. to eliminate or reduce noise-induced tinnitus

21. T or F Industrial Hygienists and/or Audiologists should be involved in new equipment purchases to ensure that the quietest equipment available is purchased, while still meeting operational needs.

22. T or F A hazardous noise sign should be placed on the door of a shop or workspace if any piece of equipment within the shop produces hazardous noise whenever it is operated.

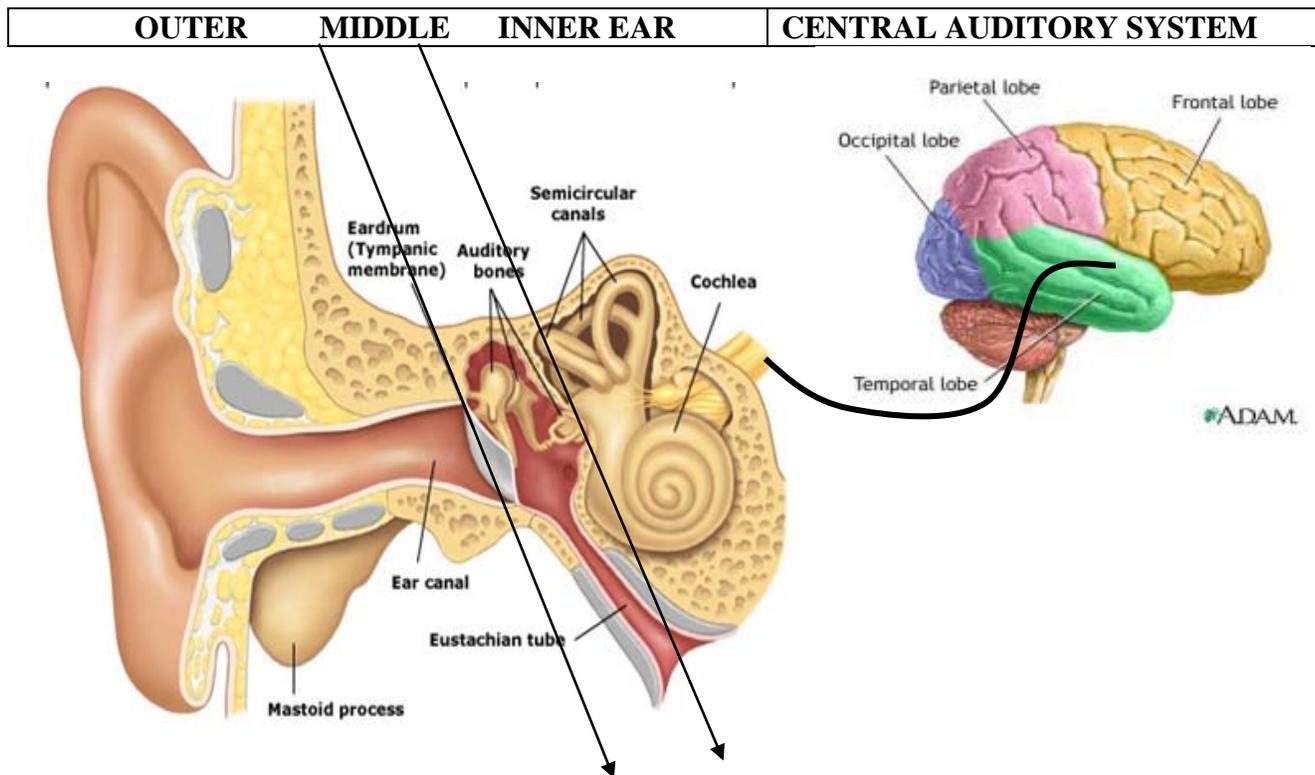
ANATOMY and PHYSIOLOGY OF THE EAR

LEARNING OBJECTIVES

1. Identify the basic anatomical and functional divisions of the ear
2. Describe the basic anatomical and functional structures of each division
3. Summarize how sound travels through the ear and is transmitted to the brain

The Human Ear has Four Divisions

- **Outer ear:** the part that you can see and touch; it functions as a sound collector
- **Middle ear:** right behind the eardrum; it is air-filled and is the mechanical part that transmits sound waves into inner ear
- **Inner ear:** fluid filled organ with sensory cells that begin the neural response to sound
- **Central auditory nervous system:** nerve fibers that carry sound signals through the brainstem to the auditory centers of the brain.



Division #1: The Outer Ear

- **Pinna or Auricle**
 - Visible part of the ear; it is made of cartilage
 - Major function is to collect sound or acoustical energy and to focus sound into the ear canal
 - It also acts as an amplifier for higher frequencies. Higher frequencies resonate among the pinna's ridges and creases, boosting or amplifying by approximately 5-6 dB.

- Helps us to localize sound or allows us to know from which direction a sound is coming. Sound arrives at each pinna at slightly different times (except if the sound is generated directly in front or behind). The brain computes the time difference which tells us the direction of the sound source. This ability is called localization.
 - Localization is a strong developmental skill. It provides the ability to know when danger or safety may be an issue.
 - A person who has a significant unilateral hearing loss will be at a tactical/safety disadvantage from localizing the enemy, weapons fire, heavy machinery, etc... and will endanger themselves, others and government property.
- **External Auditory Canal**
 - Approximately 1 to 1 1/2 inches in length
 - Has a **curved** shape. You must pull the pinna up and back to straighten the canal during an otoscopic exam to view the canal and tympanic membrane
 - Outer 1/3 of the canal is surrounded by **cartilage**, inner 2/3 is surrounded by **mastoid bone**; skin is thin in inner 2/3 segment so there is a **high risk of abrasions** when using cotton swabs or any hard object in the canal.
 - Outer 1/3 of canal is lined with **glands**, which produce **cerumen** or ear wax
 - It is normal to have some cerumen in the ear. Color and amount of production can vary with age, gender and race.
 - Cerumen naturally pushes itself out of the ear canal
 - Primary purpose of cerumen is **lubrication and protection** against injury, infection or insects/foreign bodies.
 - **Cotton swabs** should never be used to clean the ear canals because they can push the cerumen further into the canals and stimulate the glands to produce more cerumen potentially causing impaction. Accidents can also occur resulting in the swab perforating the eardrum and severely damaging the ear structures.
- **Mastoid Process**
 - **Bony ridge** behind the pinna
 - **Hardest** bone in the body, protects the cochlea and vestibular system
 - Provides support to the external ear and **posterior wall** of the middle ear cavity
 - Contains **air cavities** which can be a reservoir for infection (mastoiditis)

Division #2: The Middle Ear is an air-filled space lined by mucous membrane with three (3) major structures.

- **Tympanic Membrane** (eardrum)
 - Thin, delicate, **translucent membrane** that forms the **boundary** between the outer and middle ear
 - Pearly **gray** in color
 - Vibrates in response to acoustical sound waves. It is very sensitive to a **wide range** of intensities: movement of hydrogen molecule to 160dBHL (instant perforation)
 - Main **function** is to change **acoustical energy to mechanical energy**

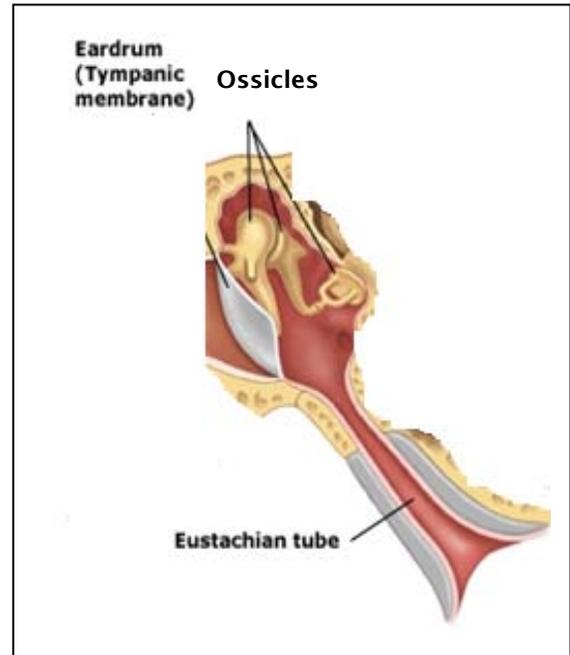


Video otoscopic view of the tympanic membrane

- **Ossicles** or Ossicular Chain connects the eardrum to the inner ear.
 - Three small **bones** from eardrum to inner ear are called the **malleus (hammer), incus (anvil), stapes (stirrup)**.
 - They are the three **smallest** bones in the body and the only bones which are adult size at birth. Each bone is smaller than a grain of rice.
 - Ossicular chain acts as a **system of levers** that carry and **amplify sound** vibrations as mechanical energy to the inner ear. It transfers the vibrations from the tympanic membrane (eardrum) through the middle ear cavity to the fluid of the inner ear.
 - **Malleus** is attached to the center of the eardrum.
 - **Incus** is the middle bone
 - **Stapes** is connected to the oval window, the entryway into the inner ear. The stapes is the smallest bone in the body. Note that it is constructed with an arch, the strongest architectural structure.
 - Footplate of the stapes connects with the **oval window** of the **cochlea**, and sound energy is conducted into the inner ear.
 - As the stapes pivots in and out of the oval window, vibrations or movements in the **cochlea's fluid** begin. The mechanical energy is then converted to **hydraulic energy**.
 - The ossicles have **two (2) major purposes: transfer mechanical sound energy** and amplify or maintain the intensity that would be lost due to the **impedance mismatch** between air and fluid sound vibrations. The ossicles are sized, shaped and connected so that sound vibrations from a large area (tympanic membrane) are focused into a small area (stapes footplate and oval window), thus maintaining or amplifying the sound energy. Therefore, the 25-30dB of energy that otherwise would be lost due to the density difference (impedance) between air and fluid are overcome (translated as 50-60dBHL on an audiogram).
 - Additional Note: There is a small muscle that attaches its tendon to the stapes. When we hear a very intense sound (greater than 70 dB HL), the **stapedial muscle** will contract. This **stiffens the ossicular chain**, reducing the sound vibrations entering the inner ear for a brief period of time (about a minute or so). Referred to as the **stapedial or acoustic reflex**, perhaps it was our first HPD!

- **Eustachian Tube – “The Equalizer”**

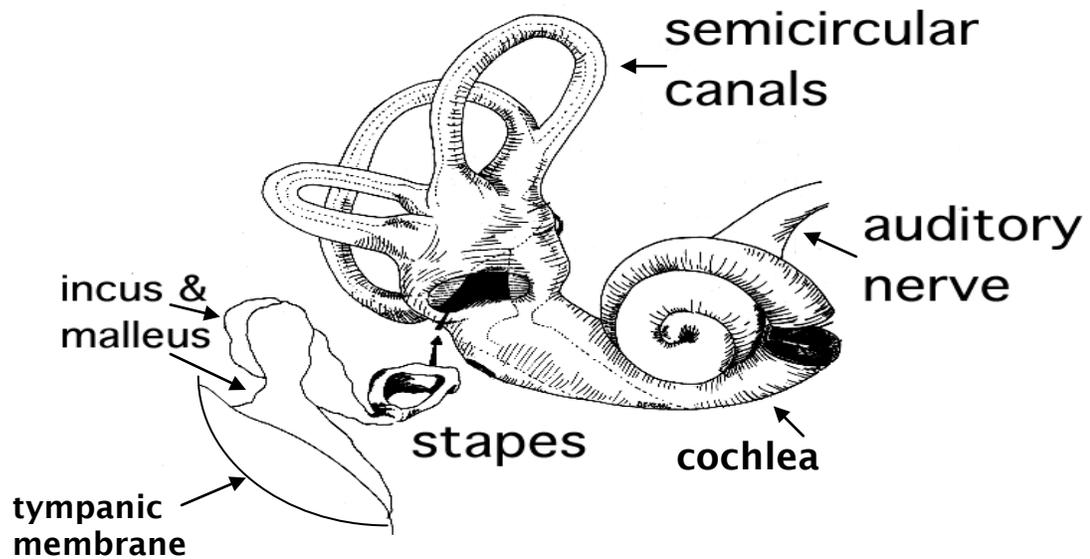
- Lined with mucous membrane. **Connects** the middle ear cavity with the **nasopharynx** (back of the nose and upper throat).
- The opening in the nasopharynx is **normally closed** but opens briefly when we do certain things, such as swallow, yawn, change altitudes – go over mountains, dive into deep water, or perform the Valsalva maneuver. This action allows **air into the middle ear** so that there is equal air pressure on both sides of the eardrum.
- Major purpose is to **equalize pressure** in the middle ear - allows air to enter the middle ear cavity to equalize pressure in the middle ear with atmospheric pressure. Equal pressure is necessary for the middle ear system to vibrate efficiently and to maintain a healthy middle ear cavity.



- May allow a pathway for infection. In **children** the Eustachian Tube is more horizontal, and becomes more vertical with age, reducing the chances for **middle ear infections**.

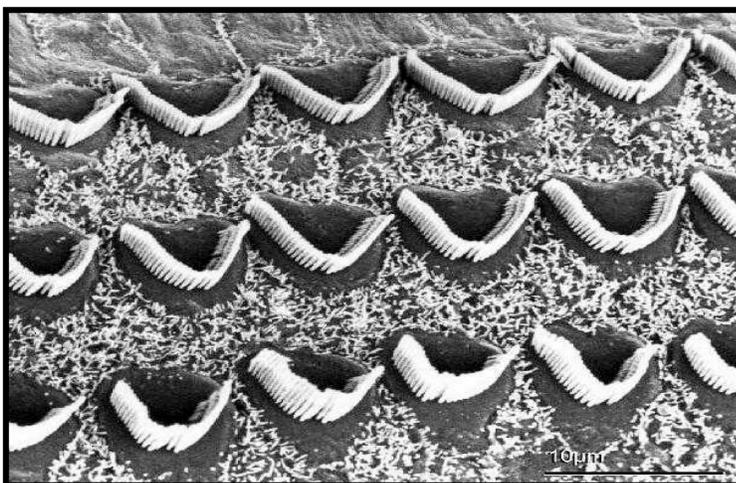
Division #3: The Inner Ear is a fluid filled labyrinth that contains organs for hearing and balance.

- Inner Ear is located inside the **temporal bone**, the hardest bone in the body, and is located on each side of the skull. It protects these very sensitive, small pea sized organs.
- **Cochlea** is the hearing organ. It is **snail-shaped** with 2 ½ turns containing a series of **fluid-filled** (perilymph & endolymph) tunnels or chambers
 - The cochlea’s **primary function** is to convert the mechanical energy of the middle ear to **hydraulic (fluid)** which then converts the fluid movements into **neural impulses or electrical energy**. This process involves an intricate **breakdown** of complex sounds into individual frequencies, intensities and timing characteristics.
 - Within the innermost tube or chamber that runs the length of the cochlea is the **Organ of Corti** (the actual sense organ of hearing). It contains sensory “**hair cells**” with nerve endings which eventually transmit sound information to the auditory nerve.
- Two membranes or “windows” provide **openings into the cochlea**
 - **Oval Window** – located at the footplate of the stapes; movement of the stapes’ footplate in and out of the oval window/membrane sets fluid into motion in the cochlea, creates a traveling wave
 - **Round Window** – functions as a pressure relief port for the fluid set in motion by the stapes and is located inferior to the oval window in a small niche

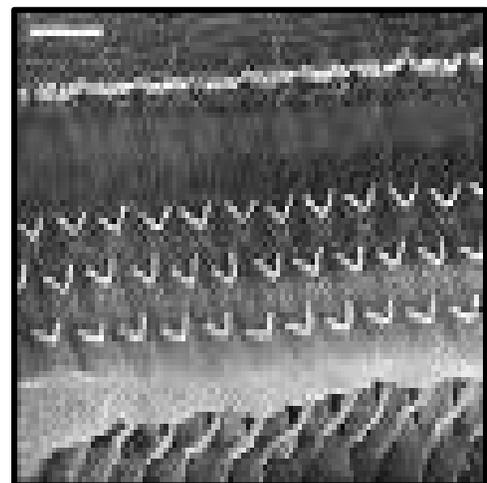


Schematic drawing of the inner ear system – parts are not drawn to scale

- **Hair cells** (stereocilia) are the sensory cells with protruding “hairs” or cilia that are moved with cochlear fluid movements.
 - Hair cells are frequency-specific. Those that respond to **high frequency/pitched tones** are located **at the base** of the cochlea near the oval window; those that respond to **low frequency/pitched tones** are located **at the apex** or top of the turns.
 - Movement of the fluid causes deflection or **bending of the “hairs”** which generate an **electrical reaction** in the cell body and then to the nerve endings.
 - The sound energy has now become **electrical energy** to be transmitted to the brain via auditory nerves.
 - While exact functions of outer and inner hair cells are still being researched, we know that **outer hair cells generally transmit intensity** information, amplifying low level intensities in particular.
 - **Inner hair cells** are generally responsible for transmitting amplified **frequencies** to nerve fibers.



Electron microscopic view of the cochlear outer hair cells.



Inner hair cells are at top of picture.

- **Vestibular System** is the non-hearing part of the inner ear.
 - Consists of three (3) **semicircular canals** (one in each spatial plane) and two (2) sensory areas –otolith system--which house the mechanisms that play a major role in regulating our **balance** system and knowing where our body is in space.
 - Monitors the **position** of the head and **speed** of movement in space
 - **Shares fluid system** with the cochlea, therefore, certain problems in the cochlea may affect the vestibular system and vice-versa

Division #4: Central Auditory System involves all **auditory nerves** that leave the inner ear and travel through the **brainstem** to auditory centers in **brain**

- **Auditory Nerve** is also called the eighth (8th) cranial nerve or cochlear nerve. It transmits an electrical signal (energy) from the cochlea through the brain stem to the brain/cortex
 - It is made of **multiple nerve fibers** (30-35,000) that twist together in a specific pattern. The nerves on the inside of the bundle as it travels through the internal auditory canal carry mainly low frequency information and the nerves twisting around the outside mainly transmits high frequency information.
 - **Other nerves** that travel alongside the auditory nerve in the internal auditory canal are the vestibular system nerves and the facial (7th cranial) nerve. That is why a tumor growing in the internal auditory canal can affect balance, hearing and/or facial movement on that side of the head.
- **Brainstem Auditory Pathways**
 - The Auditory Nerve from each cochlea exits the internal auditory canal and travels up the brainstem with continual **processing** at different nerve centers along the way.
 - There are two tracks in the brainstem, one starting from each ear. As the nerve fibers reach a nerve center or “processing station,” some nerve fibers from each ear branch off and travel to the **other side**. This back and forth happens several times as the auditory signal travels through the brainstem auditory “processing” centers.
 - Two **major reasons** for this comparison and integration of sound from both ears/sides are related to **binaural hearing and localization to sound** (direction) and **understanding speech in noisy backgrounds**.
- **Auditory Cortex** (Wernicke’s area) is located in the **temporal lobes** of the brain.
 - The auditory center in the brain is where sounds are **perceived, analyzed** and **given meaning**.
 - Sounds are interpreted based on **experience and association** with past and present stimuli in the environment. Auditory information (neural impulses) is processed with **language and cognitive areas** to comprehend language and communication meaning.

How Sound Travels Through the Ear: (Review)

1. **Acoustic energy**, in the form of sound waves, is channeled into the **ear canal** by the **pinna**. Sound waves hit the **tympanic membrane** and cause it to vibrate, like a drum, changing it into **mechanical energy**.
2. The **malleus**, which is attached to the tympanic membrane, starts the **ossicles** into motion.
3. The **stapes** moves in and out of the **oval window** of the **cochlea** creating a fluid motion or **hydraulic energy**.
4. The fluid movement causes membranes in the **Organ of Corti** to shear against the **hair cells**.
5. This creates an **electrical signal**, which is sent up the **Auditory Nerve** to the brain.
6. The **brain** interprets it as sound, speech, language and other useful information.

How Sound Travels Through the Ear...

1. Pinna
2. Ear Canal
3. Eardrum
4. Ossicles
5. Cochlea
6. Organ of Corti
7. Hair Cells
8. Auditory Nerve
9. Brainstem
10. Brain

ENERGY

Outer ear
Acoustic

↓

Middle ear
Mechanical

↓

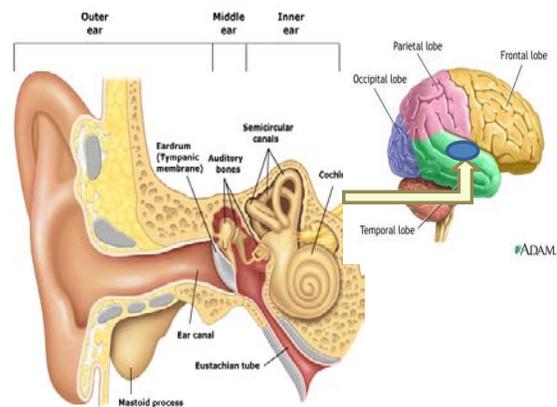
Inner ear
Hydraulic-
Electrical

↓

Central ear
Electrical

↓

“Meaning”
Comprehension



20

STUDY GUIDE (ANATOMY & PHYSIOLOGY)

1. Name the four divisions of the hearing mechanism.
 - a.
 - b.
 - c.
 - d.
2. Name the three bones in the middle ear that make up the ossicular chain..
 - a.
 - b.
 - c.
3. What is the smallest bone in the body? _____
4. The _____ collects sound and focuses it into the ear canal, amplifying the sound by 5-6 dB.
5. T or F The external auditory canal leads from the pinna to the tympanic membrane in a straight line allowing you to easily view the canal and TM.
6. The _____ vibrates in response to sound changing acoustical energy to mechanical energy.
7. The cochlea and Vestibular System together are known as the _____.
8. Match the following:

Organ of Corti	Located at footplate of stapes, where fluid is set into motion
Oval Window	Frequency specific, low freq are at apex, high freq at base
Round Window	End organ of hearing, contains hair cells
Hair Cells	Pressure relief port for fluid set in motion by stapes
9. In the cochlea, an electrical signal is created that is carried by the _____ through the brainstem to the brain.
10. The Eustachian Tube
 - a. is normally open but closes when we yawn and swallow
 - b. is located in the inner ear
 - c. equalizes pressure in the middle ear cavity
 - d. carries sound from the tympanic membrane to the cochlea
11. Within the vestibular system, the _____ regulate our balance system.

12. When the _____ contracts, it reduces the movement of the stapes at the oval window, protecting the cochlea from loud sounds. This reaction is called the _____.
13. The cochlea
- is a snail shaped organ with a series of fluid-filled tunnels
 - is located in the inner ear
 - converts mechanical energy to electrical energy
 - houses the organ of Corti
 - all of the above
14. Cerumen
- serves to lubricate and protect the ear
 - naturally pushes itself out of the ear canal
 - is normal to have in the ear canal, as long as it is non-occluding
 - should be cleaned from the ear canal with cotton swabs on a regular basis
 - a, b, and c
 - all of the above
15. The vestibular system
- functions as a pressure relief port for the fluid moving within the cochlea
 - is the end organ of hearing
 - consists of 3 semi-circular canals which regulate balance
 - shares fluid with the cochlea
 - together with the cochlea are known as the inner ear
 - c, d and e
16. The central auditory nervous system
- includes the 8th cranial nerve and the auditory cortex
 - changes acoustical energy into mechanical energy
 - includes membrane covered openings in the cochlea
 - is the end organ of hearing
 - all of the above
17. Hair cells
- are located within the organ of Corti in the cochlea
 - are frequency-specific
 - move in response to the movement of cochlear fluid
 - shear against membranes in the organ of Corti creating an electrical signal
 - all of the above
18. The mastoid process
- is a thin membrane that separates the outer and middle ear
 - is a bony ridge behind the pinna
 - is a system of levers that carry sound
 - connects the stapes to the middle ear cavity wall
 - all of the above

EAR DISORDERS and HEARING LOSS

Learning Objectives

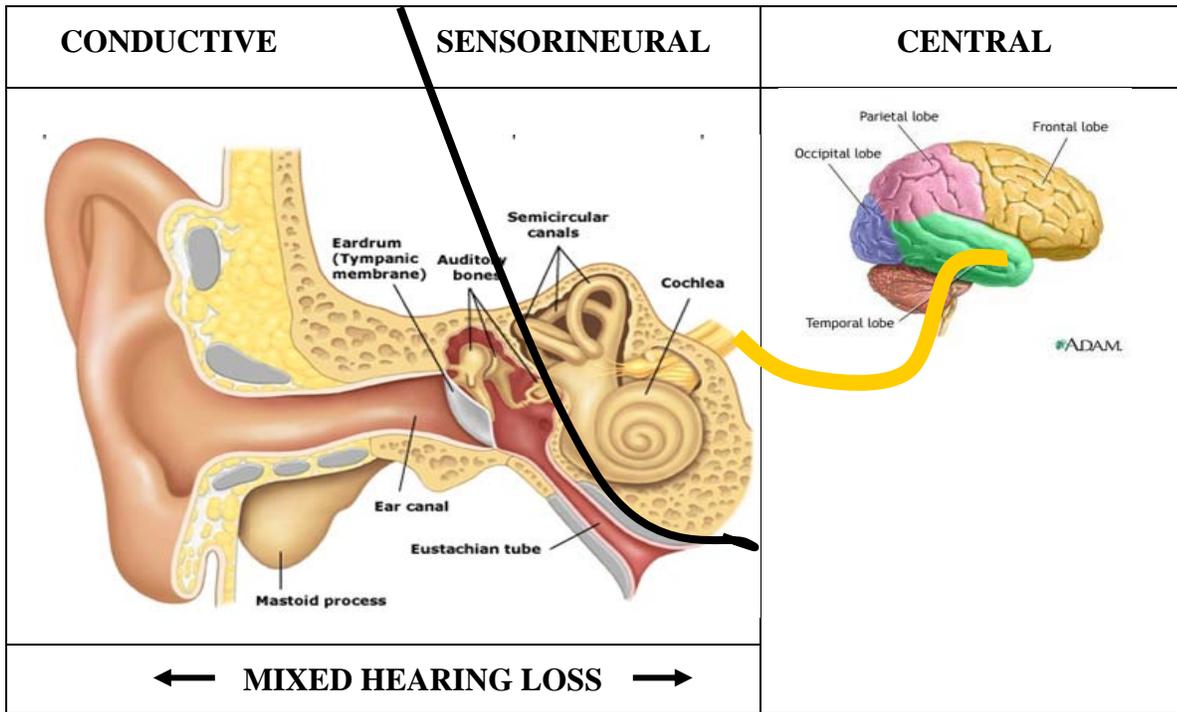
1. Define the five types of hearing loss
2. Describe medical and communication symptoms that are characteristic of each type of hearing loss
3. List common causes of and basic treatment for each type of hearing loss
4. Explain how impact and continuous noise exposure affect ear structures and functions

OHC Technician Responsibility

- OHC Technician needs **general knowledge** in order to perform the following tasks.
 - Understand **common types** of hearing loss & ear disorders
 - Be able to recognize **normal and abnormal** symptoms and hearing test results
 - Make **appropriate referrals** to medical officers & audiologists
- OHC Technician should **NOT** use this general knowledge to do any of the following:
 - **Diagnose type** of hearing loss
 - **Diagnose specific ear disease**
 - Recommend **treatments**, except in the area of hearing protection devices.

Five Types Of Hearing Loss

- The types of hearing loss are named according to the type of **dysfunction** and relates to **location** of the problem in the ear.
- **Conductive** hearing loss refers to any problem in the **outer and/or middle** ear.
- **Sensorineural** hearing loss refers to any problem in the **inner** ear.
- **Mixed hearing loss** refers to problems that result from **both a conductive and sensorineural** hearing loss simultaneously. Therefore, there is a problem in the **outer OR middle ear AND in the inner ear**.
- **Central hearing loss** refers to any problem in the **central auditory system** (nerves and brain).
- **Non-organic or Functional hearing loss** refers to someone who does not have a physical hearing problem but is displaying one.



NON-ORGANIC OR FUNCTIONAL HEARING LOSS

Conductive Hearing Loss

- Name relates to **impaired function** of channeling or **conducting sound** from the outer and middle ear into the normal functioning inner ear.
- Cause is **blockage or malfunction** in the **outer and/or middle ear(s)** preventing complete conduction of sound waves into cochlea
- Can typically “see” conductive problem or disease through **otoscopy** and manipulation of eardrum movements.
- **Symptoms**
 - Typically **temporary** condition with acute onset although there are some progressive diseases
 - Patient **talks softly** or reports “I sound like I’m talking in a barrel”.
 - We normally hear ourselves via bone/skull vibration and airborne sound waves. When the airborne sound is muffled or blocked, our voice sounds extra loud and hollow. The result is a natural reduction of voice volume or softer speaking voice.
 - This phenomena is called the **Occlusion Effect**
 - Patient reports **understanding speech normally when people talk loudly**. The increased intensity of speech gets through the conductive blockage to the normal inner ear.
 - Patient reports **no problems understanding speech in noisy situations**.
 - Background noise is muffled by the conductive problem plus speakers naturally raise their voice volume in noise to be heard
 - This phenomena is called the **Lombard Effect**

- **Congestion** from recent head cold (URI), allergies, or altitude change. This indicates that the **Eustachian tube** is malfunctioning and outer/middle ear **pressure is not equal**.
- Patient reports hearing **low pitched sounds (tinnitus)** in affected ear(s) such as crackling or bubbling sounds caused by fluid behind eardrum
- **Audiogram** results indicate hearing loss in the **low frequencies** or relatively flat/equal across all frequencies. Note that conductive loss hearing test levels can never be more than 60-65 dB HL because sound intensity will be great enough to be heard via bone conduction (skull vibrating) which stimulates the normal inner ear.
- **Otoscopy** and **tympanometry** will have **abnormal results**. These two tests are explained in later chapters.
 - Otoscopy – viewing the ear canal and eardrum through an otoscope
 - Tympanometry -- test for middle ear function using varying pressure against the eardrum

IMPORTANT SKILL: In order to recognize possible conductive problems, the OHC Technician must become skilled in **identifying** the range and characteristics of a **normal** outer ear, ear canal, and tympanic membrane (eardrum). Technicians are NOT responsible for diagnosing specific problems but are responsible for being familiar with “normal” appearance in order to refer for questionable or possible outer ear conditions.

Conductive Hearing Loss: Outer Ear Diseases and Disorders

- **Occluded or impacted ear canal**
 - **Cerumen** (earwax) can totally occlude the ear canal due to over production or something that impedes the natural progression out of the canal, i.e. excessive hair, narrow canal, sharp bend in canal or daily use of Q-tips, earplugs or earmolds.
 - **Symptoms** may include a plugged up feeling, muffled hearing, and low pitched tinnitus. **Hearing loss** may be mild ($\leq 35\text{dBHL}$) and **tympanogram** will be flat (Type B). **Refer to medical officer** or trained corpsman for ear lavage to remove excessive cerumen. While over the counter wax removal products can help soften the wax in preparation for medical removal, self removal or candling methods are NOT recommended.
- **External Otitis** or infection of the outer ear is caused by a bacterial or viral infection involving the pinna, ear canal and/or mastoid area. Often called “swimmer’s ear” because an organism is picked up from water. External otitis can also be caused by an abrasion in the ear canal getting infected. **Symptoms** can include extreme pain, redness and swelling, general fever or heat around ear and debris in ear canal (pus, dead cells, fluid, cerumen). **Hearing loss** may be mild ($\leq 35\text{dBHL}$). Refer for **immediate medical treatment**. External otitis can become **chronic** (long standing) and can become very difficult to treat or cure.
- **Skin diseases** of the ear can include **dermatitis** and **basal cell carcinoma** on any part of the outer ear and surrounding areas.
- **Exotosis** is bony **growths** that protrude up under the skin of the ear canal. This condition is most often seen in people that are often in **cold water** (divers, swimmers, surfers). Unless the growths close off the ear canal, there is not a serious health concern. However, **caution** must be used when fitting earplugs or making earmolds on these individuals.
- **Foreign objects** such as cotton or **insects** can occlude the ear canal or contribute to a full impaction when combined with cerumen, etc. Hearing loss will not occur without full occlusion of the ear canal. **Medical referral** is needed for removal of object.
- **Fungus** in the ear canal can be extremely difficult to cure and/or manage. The **warm moist environment** of the ear canal, particularly combined with subtropical and tropical climates, is a positive setup for fungal colonies to flourish. **Symptoms** are itching and drainage with a foul odor. Often the patient is unaware of the fungal growth. Typically there is no **hearing loss**

unless the canal becomes occluded or damage to the eardrum occurs. **Refer** to a medical officer who may treat with topical medications.

- **Congenital atresia** is when there is no opening into the ear. The bony external ear canal did not develop properly during fetal development.

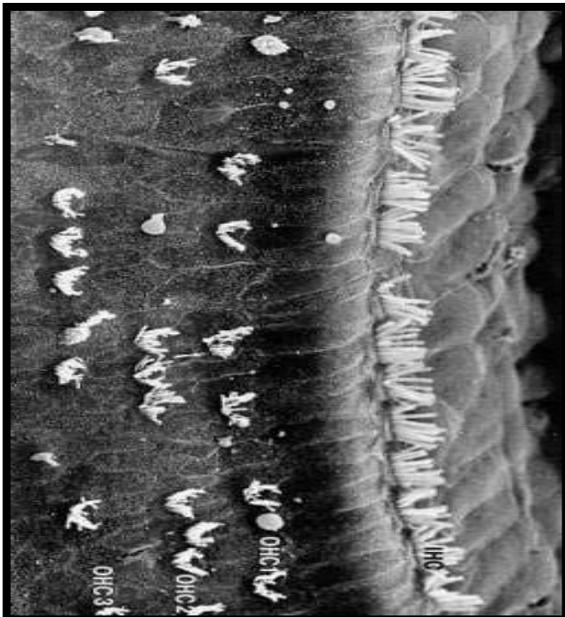
Conductive Hearing Loss: Middle Ear Diseases and Disorders

- **Tympanic membrane (TM) or eardrum perforation** is a hole in the TM from external or internal forces. Most TM perforations are **temporary** but can become permanent often with serious complications.
 - The size and location of the hole will vary with the **cause**: ear infection (otitis media), surgical perforation for Pressure Equalization (PE) tubes, foreign object inserted or flies into ear canal, sudden sound pressure wave from weapon fire or explosion, head trauma, or a cupped hand slap to the ear, severe change of altitude while flying or diving.
 - **Symptoms** connected with a one time event may include acute pain at time of injury which quickly subsides, slight bleeding, drainage of any middle ear fluid, relief of pain and pressure, and no to mild hearing loss. A chronic perforation will have recurrent infection, drainage with a foul odor and color, and mild hearing loss.
 - Amount of **hearing loss** will be none to mild ($\leq 35\text{dBHL}$) depending on the size of the perforation. The **tympanogram** will be abnormal (Type B) with a large volume reading.
 - **Refer** to a medical officer for possible treatment. While small perforations heal naturally, large perforations need surgical repair. However any hole of any size can lead to further disease (cholesteatoma) which can have **very serious complications**. **Swim plug protection** may be recommended while swimming or bathing to keep water out of middle ear space
- The **ossicles can become dysfunctional** by becoming detached or disarticulated from each other, becoming stiff or fixated, or eroding. **Causes** include disease, trauma by severe sound pressure wave (IED's) or physical object inserted through eardrum, and birth related events or development.
 - **Symptoms** include report of one of the above causes, acute pain and blood from eardrum perforation, low pitched tinnitus, very slow progression of hearing loss
 - **Hearing loss** will range from mild to severe (0 to 65dBHL). **Tympanograms** will be abnormal extremes, indicating severe stiffness (fixation) or severe flexibility (disarticulation) of eardrum movement.
 - **Refer** to medical officer and audiologist. Diagnostic evaluations are needed.
- **Eustachian tube dysfunction** prevents normal aeration of the middle ear space and equalization of pressure on each side of the eardrum. **Causes** may include inflammation from upper respiratory infections, nasal allergies, or spasm from severe change in environmental pressure (air or water).
 - **Symptoms** include report of nasal congestion, clogged feeling in ears, sounds are muffled, recent plane trip or diving activity, or pain in ears.
 - **Amount of hearing loss** will be none to slight in low frequencies. **Tympanogram** will be abnormal with negative pressure peak (Type C).
 - **Refer** to medical officer or encourage patient to return in 2-3 weeks for a repeat tympanogram. The problem often resolves itself but is also the precursor to an ear infection (otitis media).

- **Middle Ear Effusion or Serous Otitis Media** occurs when clear **un-infected fluid** fills the middle ear space due to **Eustachian tube dysfunction**.
 - **Symptoms** may include congestion or ears feeling clogged, muffled sounds, hearing bubbling or crackling or water sloshing in ear(s), lack of response to soft sounds/speech, mild pain, recent cold or plane ride or diving activity. Note that there may not be any physical symptoms except for not responding to soft sounds, particularly in young children.
 - **Hearing loss** may be mild to moderate ($\leq 60\text{dBHL}$). Tympanogram will indicate abnormal negative pressure or be flat (Type C or B).
 - **Refer** to a medical officer who may treat with decongestants or a myringotomy (lancing TM to drain fluid).
- **Otitis media** is **infection or inflammation of middle ear space** and is the number one reason for pediatrician visits.
 - This disease has a **cycle of events** from onset to resolution: Eustachian tube dysfunction (negative pressure/vacuum in middle ear) >> middle ear effusion (serous) >> otitis media/infection >> infection resolved (serous otitis) >> Eustachian tube opening (drainage and normal middle ear pressure restored). It typically has an acute onset of 24 hours to several days. Resolution may take several days to three weeks.
 - **Symptoms** during the otitis media phase are acute pain, fever, full feeling in ear, muffled hearing, low pitched tinnitus, recent upper respiratory infection/cold, nasal allergies, or recent plane flight or diving event. Patient may report sudden relief from these symptoms and drainage if middle ear fluid bursts through eardrum. This does NOT mean the infection is resolved.
 - **Hearing loss** is mild to moderate ($\leq 60\text{dB HL}$). Tympanograms will be flat (Type B).
 - **Refer** to a medical officer who may treat with antibiotics, decongestants and/or pain and fever relievers. A **myringotomy** or lancing of the eardrum may be performed to drain fluid and control potential perforation.
 - **Recurrent otitis media** can be treated with pressure equalization tubes (PE tubes) placed in the lower TM to allow for constant aeration of the middle ear space. Removal of the adenoids has also proved very beneficial for preventing recurrent OM episodes. **Chronic otitis media** can result in very serious complications including cholesteatoma, mastoiditis, meningitis, brain abscess and permanent sensorineural hearing loss.
- **Other** middle ear diseases are **cholesteatoma** and **otosclerosis**. **Cholesteatoma** is a **cystic mass** that usually develops from progressive retraction of the TM which draws in squamous epithelium/dead skin cells and debris. It grows silently, is very erosive and, if untreated, can invade the mastoid and cranial vault and can become life threatening. Typically, it is connected with history of eardrum perforation or chronic otitis media. Surgery is required. **Otosclerosis** is a disease that stiffens and fuses the middle ear ossicles -- particularly the stapes footplate-- causing a slowly progressive maximum conductive hearing loss. Treatment is typically replacement of the stapes with prosthesis through surgery and/or hearing aid amplification. Otosclerosis can occur also inside the cochlea.
- **Summary:** Conductive hearing losses are due to problems that occur in the **outer and middle ear** which are usually **temporary** and/or **treatable** with **medications, surgery and good ear hygiene and care**. For those few people who have uncorrectable conductive hearing losses, hearing aids are of significant benefit as **sound amplification** is what is needed to get to the normal inner ear. **Conductive hearing losses create a loudness problem;** if sound is made loud enough to overcome the blockage, understanding and clarity will be normal.

Sensorineural Hearing Loss

- Name relates to **inner ear hair cells** sensing sound, responding and stimulating nerves to fire or transmit sound information to the auditory nerve. Cause is **damage or malfunction of cochlear structures & nerve fibers**. Results in **both a loudness deficit and distorted** hearing which is typically **permanent** and **untreatable** (drugs or surgery). Cannot typically “see” sensorineural hearing loss except in an individual’s behaviors and difficulties hearing.
- **General Symptoms**
 - Patient uses inappropriately loud voice. Has reduced hearing by both air and bone conduction and does not hear him/herself or others well without speaking loudly.
 - Amount of **hearing loss** will be mild (30dBHL) to profound (90+ dBHL), generally centralized in the 3000-4000Hz frequency ranges. The **tympanogram** will be normal (Type A) with a normal ear canal volume reading.
 - **Speech sounds are distorted** even at loud levels. Reduced ability to hear high frequency, low energy speech sounds such as s, sh, ch, th, f, v, and k.
 - **Difficulty understanding conversation in background noise** (i.e. restaurants, vehicle noise, reverberant rooms, tv/radio, and social groups).
 - **Tinnitus** is a ringing, buzzing, roaring, humming sound(s) in the ear. Although tinnitus is a symptom of inner ear disease, the most common cause is inner ear hair cell damage associated with noise-induced hearing loss. Tinnitus is noticed mostly in quiet settings, and especially after noise-exposure.
 - Report of **balance difficulties** (spinning sensation) and/or history of **serious illness, head trauma, ototoxic medications/conditions**
 - History of **hazardous noise exposure** in work or recreational environments.



Missing and damaged hair cell cilia and nerve fibers

Sensorineural Hearing Loss: Inner Ear Diseases and Disorders

- **Ototoxic drugs** – aspirin, commonly used antibiotics like tetracycline, ampicillin, quinine, -- mycin drugs, salicylates, cisplatinum, etc. Toxicity depends on dosage and synergistic effects with other medications.
- **Ototoxin exposure** – Airborne or dermal exposure to certain industrial agents such as chemicals and solvents may affect the auditory and/or vestibular system. Some examples include: Toluene, Xylene, Styrene, Trichloroethylene, Carbon monoxide, Carbon disulfide, N-hexane, mercury, Hydrogen cyanide, heavy metals, fuels and solvent mixtures. Research indicates that the combined exposure to noise and ototoxins in the work place may synergistically increase the damaging potential of noise on hearing loss
- **Head trauma** may fracture the temporal bone. The cochlea fluid may leak, structures may be damaged and the Organ of Corti destroyed.
- **Presbycusis** is hearing loss due to effects of aging in the auditory system.
- **Auto-Immune Inner Ear Disease (AIED)** is hearing loss due to some part of our own bodies **attacking itself** (originating within the inner ear or from outside the inner ear via the circulatory system). It is characterized by **asymmetric, bilateral SNHL** that often progresses over weeks or months and is sometimes accompanied by vestibular symptoms.
- **Unknown** or Idiopathic causes of hearing loss are usually sudden, unilateral, and sensorineural; commonly associated with ear fullness. Permanent hearing loss is more likely when treatment is delayed.
- **Bacterial or viral diseases** such as measles, mumps, meningitis, and scarlet fever can cause mild to profound hearing loss
- **Meniere's Disease** is a chronic disease of the inner ear characterized by recurrent episodes of vertigo, fluctuating/progressive sensorineural hearing loss and low pitched tinnitus. It is a malfunction of amount and interaction of cochlear fluids which causes fluctuations in the fluid pressure inside the cochlear and vestibular structures.
- **Genetic or birth** related reasons that cause sensorineural hearing loss may include maternal illnesses and toxic substances, birth trauma and genetic syndromes.



#1 Occupational Health Hazard in the Military

prolonged exposure	≥ 85 dB HL
sudden impulse/impact	≥ 140 dB Peak HL

- **Noise exposure** – prolonged exposure to continuous or impulse hazardous noise levels cause hearing loss by physical destruction of the hair cells in the cochlea.
 - The **irreversible damage to the hair cells** of the Organ of Corti can be sudden (**acoustic trauma**) from a single exposure to intense impulse sound (explosion or gunshot) or, more often, a gradual loss from chronic long-term exposure to loud steady state noise.
 - May cause a noise-induced, permanent threshold shift (**PTS**). This is a significant change/decrease in hearing that does not resolve after a period of quiet rest.

- The amount of hearing loss created by a given noise exposure **varies from person to person**. Under the same noise conditions, people can receive varying degrees of hearing loss because some people are more susceptible to hearing loss than others. Terminating exposure to hazardous noise levels by removal or protection is the only solution to preventing or reducing the progression of noise-induced loss
- **Characteristics** of a noise-induced hearing loss (NIHL) include tinnitus, a “noise notch” audiogram and difficulty understanding speech. **Tinnitus** is typically a high pitched hum or constant ring. Tinnitus is a dependable warning sign of over exposure to loud noise. Classic noise-induced hearing loss shows a “**noise notch**” or **drop in hearing within the frequency range 3000-6000Hz**. As the loss progresses, the notch becomes deeper and wider and the tinnitus will likely become more pronounced. The patient will report **difficulty understanding conversation, especially in background noise**. This is due to 80% of speech energy located in the lower frequencies with 80% of the information – (your ability to understand) - coming from higher frequencies.
- **Treatment** – Sensori-neural hearing losses are due to problems that occur in the inner ear and are **almost always permanent and untreatable**. A few diseases can be treated with medication and surgery, i.e. Meniere’s disease and acoustic tumors. However, the major treatment is amplification. Hearing aids will benefit most people with sensorineural hearing loss, but many may still have difficulty understanding speech in all circumstances due to the permanent damage to the hair cells and nerve fibers in the cochlea.

Mixed Hearing Loss

- **Combination** of a **conductive** (outer or middle ear) disorder and a **sensorineural** (inner ear - cochlear or retro-cochlear) disorder.
- **Most common kind** of mixed hearing loss is when a person with a long standing permanent sensorineural hearing loss becomes ill with an outer/middle ear disorder or cerumen impaction. Once the conductive disorder is treated, the temporary mixed hearing loss becomes a sensorineural hearing loss only. Therefore, most mixed hearing loss conditions are temporary.
- **Congenital** hearing disorders (abnormal fetal development) and physical trauma to the ear can result in permanent mixed hearing loss. Some chronic conductive disorders will cause a sensorineural hearing loss over time.
- Treatment may be available for the conductive portion of the hearing loss, but the sensorineural hearing loss will remain. The sensorineural portion may possibly be assisted with hearing aid amplification.

Central Hearing Loss

- Problem occurs within the auditory nerve, the auditory nerve fibers traveling through the brainstem and/or the auditory centers of the brain. There is **no peripheral organ involvement** (outer/middle/inner ear).
- Assessment and identification may be **difficult** because many other health, language and behavior problems have the **same symptoms**, particularly in children.
- Often normal hearing for tones, however, possible **symptoms** may include asymmetrical hearing loss, difficulty understanding speech in all conditions or good speech understanding in quiet but significantly greater difficulty in noisy environments, constant tinnitus, learning difficulties, or easily distracted by other sounds
- **Hearing loss is variable**: none to profound loss, tones heard normally but speech understanding is poor, unilateral or bilateral loss, particularly asymmetrical hearing loss.

- Treatment is **surgery**, if possible, for tumors on the auditory nerve (**acoustic neuroma**) or elsewhere in auditory nervous system. **Educational therapy**, use of **adaptive techniques** and use of **assistive listening devices** (ALDs) or hearing assistance technology (HAT) are treatments for integration and processing problems.
- **The Key** point for OHC Technicians is to refer anyone with these symptoms/behaviors to the audiologist or medical officer.

Non-Organic or Functional Hearing Loss

- **No medical or physical reason** for hearing loss. The **two major types** are voluntarily presenting a hearing loss and converting a psychological trauma into a hearing loss (rare).
- **Malingering** – conscious exaggeration of hearing impairment. May occur for monetary or other personal gain or to escape assignments or responsibilities.
 - **Symptoms (red flags)** of malingering may include any or all of these observations.
 - **Patient history** includes recent enlistment, service separation or retirement, pending discipline or deployment, or change in work assignment.
 - **Exaggerated behaviors** such as talking very loudly or with an inconsistent volume level, cupping hand behind ear, leaning forward and staring intensely at speaker
 - Exaggerated attention to testing process. Pushes on earphone during testing as if concentrating hard to hear. Asks lots of questions about how to respond.
 - Responds to soft speech and automatic statements (e.g. “step over here”) when speaker is facing away from patient.
 - **Inconsistency** during current test and/or when comparing between today’s test and prior tests
 - Equal hearing loss at all frequencies or no response at all in one or both ears..
 - **Discrepancy** between pure tone test results and ability to hear normal conversational speech (normal voice level is around 60dB HL).
 - **“Treatment”** is to **give the patient an “out”** or reason to respond better
 - Give instructions again
 - Check for proper connection of headphones and cords
 - Acknowledge that it is difficult to hear the soft tones due to group testing situation, hot and stuffy booth, fatigue, tinnitus
 - OHC Technician **should NOT confront** the person about “lying” but can say “These results just don’t make sense with how the ear works and how we are communicating. Just relax and let’s try it again.”
 - **Refer** to occupational audiologist for full audiology evaluation.
- **Conversion disorder** is an **unconscious development** of a non-organic hearing loss to deal with **psychological trauma or stress**. Patients demonstrate neurological symptoms, such as numbness, blindness, paralysis, seizures, or HEARING LOSS, but without physical evidence of a neurological cause. It is thought that these problems arise in response to difficulties in the patient's life, and the patient “converts” their anxieties into physical symptoms. It is considered a psychiatric disorder.
 - The patient believes the impairment is real and is a **protective or compensatory behavior**. This condition is very **rare**.
 - **Symptoms** are a history of trauma, a flat affect or emotionless face/attitude, and no indication/report that the patient is trying to avoid work or obtain monetary compensation.
 - **Refer** to a medical officer or audiologist.

Summary

- There are five types of hearing loss. They are listed below with typical characteristics.
 - **Conductive Hearing Loss** = Low Frequency = Outer or Middle Ear = Temporary
 - **Sensorineural Hearing Loss** = High Frequency = Inner Ear = Permanent
 - **Mixed Hearing Loss** = High and Low Frequency = Outer or Middle and Inner Ear = Conductive portion of HL is treatable, Sensorineural portion is permanent
 - **Central Hearing Loss** = Normal Hearing Thresholds = Auditory Processing Problem along the pathway from the Auditory (8th) Nerve up the Brainstem to the Auditory Cortex=Surgery (Auditory Nerve) or Educational/Behavioral techniques.
 - **Non-Organic Hearing Loss** = Flat Loss Across All Frequencies or No Response at All Frequencies = Not a True HL, Exaggerated Hearing/ Possible Malingerer
- The OHC Technician is responsible for general knowledge of these disorders in order to recognize normal from abnormal and to make appropriate referrals to medical officers and audiologists.

STUDY GUIDE (EAR DISORDERS & HEARING LOSS)

1. Name three symptoms of a conductive hearing loss.
 - a.
 - b.
 - c.

2. Name four possible causes of a conductive hearing loss.
 - a.
 - b.
 - c.
 - d.

3. Pathology of the inner ear or auditory nerve will result in what type of hearing loss?
 - a. conductive
 - b. sensorineural
 - c. mixed
 - d. central

4. Name four symptoms of a sensorineural hearing loss
 - a.
 - b.
 - c.
 - d.

5. Noise exposure can cause irreversible damage to the _____ in the Organ of Corti.

6. Injury to the ear resulting from a single exposure to intense sound is called
 - a. presbycusis
 - b. acoustic neuroma
 - c. cholesteatoma
 - d. acoustic trauma

7. The conscious exaggeration of hearing impairment for personal gain is called
 - a. tinnitus
 - b. noise-induced hearing loss
 - c. malingering
 - d. otosclerosis

8. Name three symptoms of malingering.
 - a.
 - b.
 - c.

9. A conductive hearing loss is a result of pathology in the _____ ear, causing a _____ frequency hearing loss, and is usually _____.
- outer/middle, low, temporary
 - inner, low, temporary
 - outer/middle, high, permanent
 - inner, high, permanent
10. A sensorineural hearing loss is a result of pathology in the _____ ear, causing a _____ frequency hearing loss, and is usually _____.
- outer/middle, low, temporary
 - inner, low, temporary
 - outer/middle, high, permanent
 - inner, high, permanent
11. A combination of conductive and sensorineural pathology results in a _____ hearing loss.
- permanent
 - non-organic
 - mixed
 - central
12. People with a _____ frequency _____ hearing loss complain of difficulty understanding conversation, especially in background noise.
- low, conductive
 - high, sensorineural
 - high, conductive
 - low, sensorineural
13. Someone with a classic noise-induced hearing loss will typically have the worst threshold at
- 1000 Hz
 - 500 Hz
 - 8000 Hz
 - 4000 Hz
14. A characteristic of noise-induced hearing loss includes
- tinnitus
 - high frequency hearing loss around 3000-6000 hz
 - difficulty understanding conversation, especially in background noise
 - all of the above
15. The sequence of events that typically leads to otitis media is _____ and _____.
16. Airborne or dermal (skin) exposure to _____ may affect the auditory and/or vestibular system and act synergistically with noise to compound hearing loss.
- acoustic neuroma
 - humid weather
 - industrial ototoxins
 - presbycusis
 - Meniere's disease

17. A central hearing loss is caused by
- middle ear pathology
 - an auditory processing disorder in the CNS
 - loss of balance in the vestibular system
 - conscious exaggeration of hearing loss
 - a combination of pathologies in the middle and inner ears
18. Match the causes and symptoms/findings with the type of hearing loss.

C = Conductive S = Sensorineural

- _____ Trouble hearing "sh", "f", "th"
- _____ Speaks loud
- _____ Perforated tympanic membrane
- _____ Ototoxic drugs
- _____ Normal low frequency thresholds
- _____ Presbycusis
- _____ Acoustic trauma
- _____ Speaks softly
- _____ Meniere's disease
- _____ Swimmer's ear
- _____ Correctable hearing loss
- _____ Cholesteatoma
- _____ Tinnitus
- _____ Atresia
- _____ Otosclerosis

19. Match the ear disease / disorder with the part of the ear it affects.

O = Outer M = Middle I = Inner

- _____ Perforated tympanic membrane
- _____ Ototoxic drugs
- _____ Presbycusis
- _____ Acoustic trauma
- _____ Cholesteatoma
- _____ Atresia
- _____ Otosclerosis
- _____ Swimmer's ear
- _____ Meniere's disease
- _____ Otitis media

OTOSCOPIC EXAMINATION and TYMPANOMETRY BASICS

LEARNING OBJECTIVES

1. Explain the purpose of otoscopic examination and tympanometry
2. Describe the basic characteristics of a normal and an abnormal tympanogram
3. Describe normal and abnormal physical findings
4. State conditions requiring medical referral
5. Perform otoscopy and tympanometry using proper technique

OTOSCOPIC EXAMINATION or OTOSCOPY

- **Definition:** The examination of the ear canal and tympanic membrane (eardrum) through the use of an otoscope. An otoscope is a hand-held tool with a speculum and light source to see into the ear canal
- **Purpose:** The otoscopic exam is to ensure that the ear canals are free of any obvious problems prior to fitting hearing protection, performing tympanometry and administering hearing tests
- OHC technician typically performs otoscopy after a hearing test screening when a positive STS is discovered.

Scope of Practice Related to Otoscopy – What does Otoscopy Assess?

- **Skilled Physician or Medical Officer** can identify or rule out disorders of the outer ear and middle ear disorders that involve the eardrum.
- **OHC technician** should be able to identify a normal appearing outer ear and eardrum and rule out obvious abnormalities or potential disease problems.
- **Caution:** Viewing the eardrum through the otoscope reveals information about the middle ear; however, the main purpose of otoscopy is to view the outer ear canals.

Equipment – Otoscope

- An **otoscope** is a hand-held tool with a speculum and light source.
- Two major **types** of otoscopes:
 - Portable hand-held scopes that use batteries
 - Scopes that are attached to the wall and use electricity
 - Older models use a light bulb for illumination; newer models can use fiber optics (more expensive) which typically results in a clearer image and more magnification
- **Batteries** must be at full power to provide brightest light and illumination
- Become familiar with light (rheostat) and magnification **controls** for most effective viewing
- Otoscopes can also be digital so that **pictures** can be taken of the patient's ear canal and eardrums.
- **Disposable specula** (plural for speculum) come in at least two sizes; a narrow opening for smaller ear canals and a medium/large opening for the majority of the adult population.

Otoscopic Examination Method

- **Preparation**
 - Observe proper **hygiene**: wash hands or use gloves, note any bodily fluid or secretions from patient's ears
 - Select a **speculum** of most appropriate **size** and lock it into place on otoscope. It is best to use the largest speculum possible in order to view a large area at once.
 - Always **change/discard the speculum** after each patient and after each ear of any patient with draining ear(s).
- **KEY** is placing the **otoscope in the ear canal first**, then placing your eye to the otoscope second. Never reverse this order of steps - hazardous to patient safety and comfort if you place your eye to the otoscope and then move otoscope to insert in ear canal.
- **STEP 1**: Grip otoscope firmly & comfortably.
 - some people hold the body of otoscope down in the palm of their hands
 - other people hold the otoscope by the neck so the body is sticking up
 - may depend on your handedness (right or left handed) and which ear you are viewing
- **STEP 2**: Grasp upper edge of the ear (helix)
 - for adults – best to grip at 1100 position (right ear) and 0200 position (left ear)
 - for children – best to grip at 0900 position (right ear) and 0300 position (left ear)
- **STEP 3**: Pull pinna gently upward & back to straighten ear canal
- **STEP 4**: Insert lighted otoscope past the first canal bend using the naked eye
- **STEP 5**: Rest 1-2 fingers of your otoscope hand against patient's head or face This braces and stabilizes the otoscope in case of sudden movement
- **STEP 6**: NOW bring your eye up to the otoscope eyepiece to view the ear canal & eardrum WITHOUT moving otoscope
 - There is a natural tendency to move the otoscope inward or deeper as you move your eye toward it which can cause discomfort to the patient. Prevent this by bracing your otoscope hand
- **STEP 7**: Examine ear canal & tympanic membrane
 - Be careful. Move the otoscope around very slowly to obtain the best composite view of canal & eardrum
 - Take your time. Don't be satisfied with a partial viewing -- you might miss something significant
 - If you take your time & use proper procedures, you will NOT hurt the patient
- **STEP 8**: Dispose of the speculum. Turn off otoscope light or replace on wall mount.
- Your **goal** as an OHC Technician is to determine if the condition of the ear canal and eardrum appear to be “**Within Normal Limits**” or “**Abnormal.**” Never hesitate to ask a fellow technician, if available, to look if you are uncertain of what you are viewing.
- **DO NOT diagnose or label a problem** or pathology. It is alright to describe what you see.
- **Normal findings**
 - Eardrum (TM) is a translucent, pearly gray or pale white color
 - Cone of light spreads from the center to outward edge of the TM
 - Lower end of the malleus is protruding at the center of the TM
 - Ear canal is less than 25% occluded with cerumen
 - Intact eardrum

Examples of Acceptable and Not Acceptable Comments to Patient

OK TO STATE OBSERVATIONS	NOT ACCEPTABLE
“Your ear canal appears very swollen.”	“Oh #@%), what is THAT?!”
“There is too much wax to see anything. You need to go to sick call for an ear lavage.”	“Wow, it’s all gooey and nasty!”
“Your eardrum looks very red.”	“Looks like you have otitis media.”
“There is some blood & yellowish wetness in your ear.”	“You need to see your PCM for some ear drops ASAP”!
“I need to refer you to your PCM/MO.”	Yes, I see a hole in your eardrum. You’re going to need surgery.

- **Findings that Warrant Referral to Physician**
 - Ear pain or discomfort
 - Ear canal blockage (impacted cerumen, foreign body)
 - Bulging TM
 - TM perforation
 - Visible drainage
 - When in doubt or uncertain of possible pathology

When To Perform An Otoscopic Examination

- **Ideally**, otoscopy should be done before any testing to rule out impacted cerumen
- Typical practice is to perform otoscopy if the **patient has a positive STS** on the first test (before follow-up tests) or in the following situations.
- **Always BEFORE . . .**
 - Testing when there are ENT or medical complaints related to congestion, ear pain, ear drainage
 - Conducting tympanometry
 - Fitting earplug fitting
- **Always AFTER . . .**
 - A positive STS is discovered.
 - A low frequency or flat hearing loss is detected.

TYMPANOMETRY

- **Definition:** Tympanometry is a measurement technique that can be used to assess the function of the middle ear and screen for the presence of middle ear pathology.
 - By sealing the ear canal and sending in a low frequency tone while varying air pressure against the eardrum, we can measure the **stiffness or flexibility** of the eardrum.
 - Combined with otoscopy, it is an **objective, fast, and highly accurate** way to rule out outer and middle ear pathology
- **Purposes** for tympanometric screening in a Hearing Conservation Program:
 - To identify patients who require **medical referral** for middle ear pathology
 - Separating probable noise-induced **etiologies** (sensorineural) from those due to other causes (conductive).
 - Tracking the **progress of middle ear pathologies** that are under medical treatment
 - **Objective results** (not controlled by patient) can be used as counseling or **motivation tool** to encourage patients to respond to lowest intensity levels during the hearing test.

When to Use Tympanometry

- If a **positive STS** is present after follow up testing, perform tympanometry to be sure referral should not be to a Medical Officer rather than to an Occupational Audiologist for evaluation.
- If **patient complains** that there is a feeling of fullness or pressure in his or her ear regardless of test results.
- **CAUTION:** Never use tympanometry if there is a history of middle ear (bone) surgery

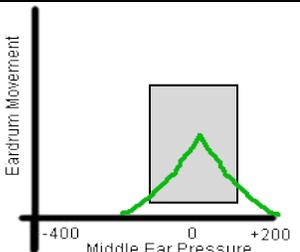
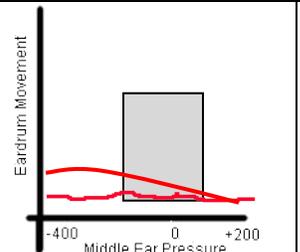
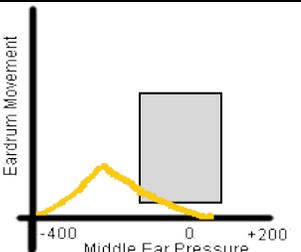
How Does Tympanometry Work

- **ALWAYS perform otoscopy first** to check the ear canal for obstructions before inserting a probe tip.
- A soft tipped probe is held tightly against the ear canal opening or inserted inside the ear so that an **air seal** is obtained. The test will not work or continue if an air pressure seal is not obtained or maintained.
- A **pure tone** is sent into the ear canal through the probe tip (typically 226Hz).
- An air pump varies **air pressure** against the eardrum.
- The tympanometer measures **how much of the pure tone gets through** the eardrum and/or how much of the pure tone energy is reflected back into the ear canal.
- Results indicate the **flexibility or the stiffness** of the eardrum and middle ear system (bones, Eustachian tube function, middle ear space).
- Results are displayed **in graphic form called a tympanogram** and in **numerical** form.

Types of Tympanograms

- There are **three (3) major types** of tympanograms: Type A, Type B, Type C
- They **vary according to shape and peak placement** in relation to the vertical and horizontal axes. The **vertical axis** indicates eardrum movement in cm^3 and the **horizontal axis** indicates middle ear pressure in daPa. Typically, there is a shaded box or area on the graph indicating normal range.
- OHC Technician must be able to **recognize the pattern** or configuration to determine if the patient's middle ear system is functioning normally or if a middle ear pathology is present.

Major Types of Tympanograms

Measurement/Axis	TYPE A	TYPE B	TYPE C
Pressure (horizontal)	-150 to +50	> -150 or NP*	> -150
Flexibility (vertical)	0.2 to 1.8	< 0.2	0.2 to 1.8
Ear canal volume	< 2.5	< 2.5 or > 3.0**	< 2.5
Description	Well defined peak within normal range	Flat or no defined peak	Skewed to left with defined peak
Tympanogram Example			
Basic interpretation or Most Common Problem(s)	No problem Normal function of middle ear & Eustachian tube	-- TM not moving -- Otitis Media -- Perforated TM -- Blockage	-- Eardrum moving but retracted -- Eustachian Tube dysfunction

* NP = no pressure peak measured

**Type B Alternative interpretation: Everything equal except that ear canal volume > 3.0 would indicate a perforated TM or patent pressure equalization tube (PE tube).

Interpretation for Referral Decisions

- **Type A** indicates a normal outer and middle ear. Therefore....
 - Patient does NOT have conductive hearing disorder so no medical referral needed
 - Patient with STS has sensorineural hearing loss or inner ear disorder (if true thresholds) so needs referral to Occupational Audiologist for evaluation.
- **Type B** usually indicates eardrum with poor mobility or an outer ear blockage. Therefore....
 - Patient probably has a conductive hearing disorder so medical referral needed
 - Patient with STS probably has a conductive hearing loss and may have a mixed hearing loss. The conductive disorder will increase (worsen) low frequency thresholds.
 - Patient w/ flat line and very large ear canal volume (> 3.0) probably has a perforated eardrum (bad thing) or an open/functional, surgically placed, PE-tube (good thing).
 - Patient w/ flat line and very small ear canal volume (< 0.2) has a blocked ear canal.
 - Patient w/ flat line and normal ear canal volume (< 2.5) likely has a middle ear disorder.

- **Type C** indicates a closed or dysfunctional Eustachian tube, resulting in significant negative pressure in the middle ear space and a retracted eardrum
 - Patient typically will NOT have fluid in the middle ear space so medical referral is not indicated unless persistent condition/problem.

Disposition of Patients with Abnormal Tympanograms

- **General Rule** is make a medical referral for any abnormal tympanogram
- Final criteria is determined by the **local SOP** and available **resources**
- If possible, continue to track the patient until middle ear pathology is resolved.
- During treatment for fluid behind the eardrum (otitis media), tympanograms may **progress from one type to another**. A full cycle of onset to resolution is Type C to Type B to Type C to Type A over a period of 10-14 days.
- Patient with a **Type C** should be tested again in 10-14 days. If still abnormal tympanogram, make a medical referral.
- **Follow-up hearing testing** should not resume until the patient has been cleared by an Audiologist or physician.
- **Refer to a Medical Officer** when these conditions present **regardless** of results from otoscopic examination, tympanometry or hearing testing
 - Pain or discomfort is reported
 - Drainage is visible
 - Perforation is visible
 - Tympanic membrane is bulging
 - Ear canal is blocked by cerumen or foreign body
 - Complaint of **sudden severe hearing loss** with tinnitus and/or dizziness >> **Immediate referral!!!** Time is critical in order to preserve hearing in many cases.
 - When in doubt

OHC Technician Responsibilities and Limitations related to otoscopy and tympanometry

- Technicians should not draw diagnostic conclusions or interpret test results without supervision.
- Always perform otoscopy first before tympanometry or HPD fitting
- Interpret tympanograms as “Normal” or “Abnormal” only
- Consider all information before referral: patient history, otoscopy, tympanograms, audiograms

Discussion of Ear Disorders Associated with Tympanogram Types

See PowerPoint slides for pictures

Referral Practice Scenarios

- **Patient Scenario #1**
 - History includes recent head cold with congestion the day of testing.
 - Patient has a positive STS on test. Greatest threshold shifts are at 500 Hz & 1000 Hz
 - Otoscopy reveals a slightly red TM/eardrum.
 - Tympanometry indicates a slowly rising line from right to left but no visible peak
 - DO YOU REFER? Why?

- **Patient Scenario #2**
 - Patient complains that sounds are muffled and he/she noticed gradual increase in hearing difficulty.
 - Decrease in hearing across most frequencies in both ears.
 - Otoscopy reveals cerumen in canal -- unsure if fully occluded but can't see eardrum.
 - Tympanometry indicates a flat line with 0.1 cm³ ear canal volume.
 - DO YOU REFER? Why?

- **Patient Scenario #3**
 - Patient complains of a plugged up feeling since a recent airplane flight.
 - Positive STS, including decrease in hearing in lower frequencies.
 - Otoscopy reveals normal appearing eardrum in terms of color & landmarks (cone of light). However, middle ear ossicles are very visible, appearing like they are sticking out
 - Tympanometry indicates a drawing severely skewed to the left with a peak in the high negative pressure range
 - DO YOU REFER? Why?

- **Patient Scenario #4**
 - Patient complains of trouble hearing in background noise & ringing sound in both ears.
 - Positive STS found in high frequencies.
 - Otoscopy reveals a normal appearing ear canal and eardrum.
 - Tympanometry indicates a symmetrical "hill" with defined peak within normal "box"
 - DO YOU REFER? Why?

(Answers following Study Guide questions)

STUDY GUIDE (OTOSCOPIC EXAMINATION & TYMPANOMETRY)

1. A normal tympanogram
 - a. is categorized as type a
 - b. peak pressure is between +50 and -150 mm
 - c. requires referral to a medical officer
 - d. a and b
 - e. all of the above

2. T or F The purpose of an otoscopic examination is to ensure that the middle ear system is functioning normally.

3. Upon otoscopic examination, you see a pressure equalization tube (PE tube) in the patient's right ear. A flat (Type B) tympanogram was measured along with a very small ear canal volume. His hearing test results are as follows in his right ear.

500Hz	1000Hz	2000Hz	3000Hz	4000Hz	6000Hz
40	35	20	10	10	10

What abnormality most likely describes this patient's condition?

 - a. fluid in the middle ear space
 - b. occluded ear canal
 - c. noise induced hearing loss
 - d. ossicular disarticulation
 - e. non-patent (blocked) PE-tube

4. A Type C tympanogram suggests
 - a. Eustachian tube dysfunction
 - b. otitis media
 - c. tympanic membrane perforation
 - d. malingerer

5. What abnormality in the middle ear may cause a flat (Type B) tympanogram?
 - a. ear canal is occluded with cerumen
 - b. severe Eustachian tube dysfunction
 - c. fluid in the middle ear space
 - d. perforated tympanic membrane
 - e. all of the above

6. T or F Tympanometry is a measurement of auditory nerve function and is used to screen for retrocochlear lesions.

7. T or F A tympanogram is a graphic picture of middle ear function.

8. T or F Technicians should provide diagnostic interpretations of tympanogram results to the medical officer so that the patient may receive timely treatment.

9. What purpose does tympanometry serve in the Hearing Conservation Program?
- identifies medically referable cases
 - separates noise-induced pathologies from possible middle ear pathologies
 - tracks the progress of middle ear pathologies during medical treatment
 - all of the above
10. T or F Medical referral is generally indicated for all abnormal tympanogram findings.
11. What are the three basic types of tympanograms?
- A, B and C
 - A, S and D
 - C, D and S
 - X, Y and Z
12. T or F An otoscopic examination will quickly rule out problems in the outer ear.
13. T or F A tympanometer is a tool used to measure middle ear function.
14. Match the following tympanograms with probable etiologies:
- | | |
|-------------------------------------|---------------------------------|
| a. Type A | 1. Negative middle ear pressure |
| b. Type B (normal ear canal volume) | 2. TM perforation |
| c. Type B (large ear canal volume) | 3. Normal middle ear function |
| d. Type C | 4. Middle ear effusion |
15. T or F If an STS is present during testing and an abnormal tympanogram is identified, you should conclude that the STS is the result of noise exposure.
16. Fluid behind the eardrum typically produces what type of tympanogram?
- Type A
 - Type B
 - Type C
 - Type D
17. T or F Prior to referring a patient to the medical officer, it is best to have all of the following information: patient history, audiogram, tympanogram & otoscopic findings.
18. If a patient with an STS has been diagnosed with middle ear pathology by a physician, you should perform the 1st follow up test
- after 5 days
 - after 10-14 days
 - after 14 hours away from noise
 - after the patient has been cleared by an audiologist or physician

Answers to Patient Scenarios in Text

Scenario #1

Type B tympanogram with information provided. It may be a Type C with a severely retracted TM. All four (4) data points – history/complaint, low frequency hearing loss; otoscopy; tympanometry – are consistent with otitis media. General Rule – **YES**, refer to medical officer. Consider local SOP & medical care circumstances. May request return in 10-14 days for repeat tympanogram.

Scenario #2

Type B tympanogram All four (4) data points – history/complaint of gradual onset, flat even hearing loss; otoscopy- can't visualize eardrum; flat tympanogram with very small ear canal volume – are consistent with impacted cerumen. Therefore, **YES**, refer to medical officer or trained IDC/RN/Corpsman for ear lavage. Another possibility is related to equipment troubleshooting. Take off probe tip & look at end (the openings) of probe. If any of the tiny openings are clogged with wax, carefully dig out wax with stretched open paper clip.

Scenario #3

Type C tympanogram. All four (4) data points – patient history, slight hearing loss, otoscopy showing a retracted eardrum, tympanometry indicating negative middle ear pressure – are consistent with Eustachian Tube dysfunction. Recommend that **patient wait** for 2-3 weeks to see if ear “opens” up and retest. If when patient returns and tympanometry indicates a Type A or normal middle ear function and, hearing returns to normal (no STS, no decrease in low frequencies), then no further action is required. If tympanometry continues to indicate a Type B or Type C pattern, and hearing test indicates a positive STS and/or a decrease in low frequencies, then **YES**, refer to medical officer. If any discomfort/pain/fever occurs, **YES**, immediately seek medical attention because the Eustachian Tube dysfunction has developed into otitis media).

Scenario #4

Type A tympanogram. All four (4) data points – difficulty hearing/understanding in noisy surroundings; hearing loss in higher frequencies, normal otoscopy & tympanometry – is consistent with a sensorineural hearing disorder (abnormal inner ear but normal outer & middle ears). **YES**, Refer to Occupational Audiologist for audiology evaluation to determine if STS is valid.

AUDIOMETER and TEST ENVIRONMENT

Learning Objectives

1. Describe the critical components of the audiology test environment
2. Identify the equipment required for audiology testing
3. Explain required audiometer calibration and equipment checks
4. List infection control procedures
5. Troubleshoot temporary and permanent equipment problems

Foundation of Accurate and Valid Hearing Tests

- Test **environment** must be free of ambient noise that may affect the patient's ability to hear.
- Test **equipment** must be working properly and consistently in order to have valid and reliable results.

Equipment Used for Audiometric Testing

- Sound-treated test **booth** to provide a proper listening environment.
- **Audiometer** (manual or microprocessor) to present each test frequency at various intensity levels.
- **Computer** and **data management software** to interface with the audiometer.
- **Headphones/earphones** that deliver the test tones (stimuli) to the patient's ears.
- Hand switch/**response switch** for the patient to indicate he or she hears test tones.
- **Artificial ear** is used to simulate a normal hearing listener to determine if the audiometer and headphones are delivering calibrated test signals (expected intensity values) every day – formally referred to as an electroacoustic ear but commonly referred to as “**Bio-Joe**”.

Audiometric Sound Booths

- Sound treated booths are **enclosures** built with materials which **muffle or reduce the intensity of sounds** occurring outside of the booth to a listener inside the booth. These booths are **NOT sound proof** but sound treated.
- **Excessive environmental noise** within the test room or outside the room/building/mobile unit can interfere with test results. Excessive background or ambient noise in the test environment may interfere with the patient's hearing test results in the **500 to 1000Hz** range. When this occurs, the patient will have **elevated thresholds** at these **lower frequencies**.
- Sound proof or anechoic chambers are highly treated to create a near perfect silent environment. These booths are used in research not for routine testing of patients.
- **Audiometric booth certification is required annually**, and therefore, it must be current within one (1) year of any hearing test date. Noise levels inside the booth must be below established maximum levels at each frequency IAW ANSI S3.1.
 - Booth certification is typically performed by an **Industrial Hygienist (IH)**, Audiologist or trained technician.
 - Booths must be **re-certified** if the environmental conditions change, i.e. ongoing construction, on-ships in port vs. on-ships underway.
 - The **certification document** must be placed in plain view, typically on the outside wall of the booth.

- **Causes of excessive noise** in the test environment are typically by one of four (4) things.
 - Deterioration of **door seals** due to age or environmental conditions (excessive hot dry air or humidity). Result is the seal is not tight, allowing noise to enter the booth around the door.
 - Leaks around the **jack panels**. Jack panels are the areas where the inside equipment is connected to the outside equipment via a panel opening in the booth wall.
 - **Ventilation system** of the booth is too noisy. The motor that is cycling the air is too noisy or the movement of the cycling air is too noisy (too much pressure).
 - Excess **external noise** created by activity inside & outside the booth.
 - Other **patients** making sounds in multiple person booths
 - **Technician** or technicians talking, answering telephones, etc. in the test room area.
 - Activity outside test room in the **hallway** (conversation, clinic public announcements, equipment movement, remodeling, ship operations) or **outside building** (construction, band practice, bad weather)
- **Solutions for excessive noise** in the test environment
 - **Repair or replace** door seals, jack panel, ventilation motor and/or fan
 - To reduce **patient related noise** inside the booth, request that all jackets be removed (particularly the “swishy” material) and personal electronic devices be turned off or left outside the booth. Technician should note whether someone is coughing, sniffing, or moving around excessively inside booth .
 - **Control** noise generated by OHC Technician(s) or other **test room sounds**
 - Reduce talking --post “no talking” signs if necessary
 - Reduce telephone ring volume
 - Close audiology room doors securely while testing
 - Monitor noise levels of radios, fans, printers
 - If exterior noise cannot be controlled, **change test schedule** either temporarily (a few hours or few days) or permanently (months or more) due to construction or change in use of the surrounding building & outside areas.
 - **Relocate booth** if ambient noise standards cannot be met.

Audiometer

- An electronic instrument that **measures hearing sensitivity** through the use of calibrated **pure-tone signals** of a known frequency (pitch) and intensity (loudness). Most DoD hearing conservation audiograms are administered using **microprocessor audiometers** (computer – driven). Audiologists typically use a **manual audiometer** with capability of multiple types of tests using multiple types of sound stimuli and presentation modes.
- **Microprocessor audiometer** has the following features.
 - Audiometer is connected to a computer and testing is **managed by the software**.
 - Tests **individuals or groups** up to eight (8) patients, depending on configuration.
 - Random stimulus presentation; **patient response triggers the stimulus**; utilizes the bracketed stimulus presentation test method (10 dB decrease after response-5dB increase with no response).
 - Test **technique is the same** regardless of the examiner, increasing reliability (repeatability) of test.

*Benson Medical Inc
CCA-200 mini audiometer*



- Performs an **automatic audiogram review**. Requires data to be entered into all fields, and does not allow entry of information that is not appropriate.
- **Automatically calculates** Significant Threshold Shifts (STS) and OSHA recordable hearing losses. Also, determines asymmetry between ears and records reports of tinnitus and annual hearing conservation training.
- Computerized **printout of all audiogram forms** (DD 2215, 2216 or Non-Hearing Conservation test). Test results are saved in the local computer.
- Also has the capability to test in a **manual mode**. Switching from microprocessor testing to a manual test mode may be necessary in difficult-to-test cases and for patients with inconsistent responses.
- Tests the left ear first when testing both ears. Will test the ear/s with an STS upon first/second follow-up exams.
- Although an automated test, results still **require technician review** for accuracy, validity, appropriate STS calculation, and disposition/referral.
- Requires proper **maintenance of software, and data management**, i.e. software upgrades, monthly updates of look-up tables, back-up of audiometric data on/in a separate storage source (local shared drive or RW/CD).
- **Used exclusively in all DOD Occupational Hearing Conservation Programs** with the exception of many Reserve sites
- **DOEHRS-HC** (Defense Occupational & Environmental Readiness System -Hearing Conservation) is a **DOD-wide** computer based audiometric testing and data management system. The DOEHRS-HC software also includes SF600 and SF513 referral forms that can be utilized to refer patients to other providers.
- Audiometric **data** can be **transferred/exported** to a central database. In DoD HCPs, data is exported to the DOEHRS Data Repository (DR) - DAILY or **at least each day patients are tested**.
 - Global accessibility to employees' hearing records
 - Allows ability to monitor HCP effectiveness
 - Statistics on STS and program compliance are available
 - Offers a variety of canned reports for evaluating local data
- **Manual Audiometers** have the following features.
 - Tests **one person** at a time.
 - Examiner has **full control** of presenting frequency and intensity stimuli, and determines whether to accept patient response and when hearing threshold is reached.
 - Examiner should vary the silent interval between presentations so a predictable rhythm or pattern is not established for the patient to predict.
 - Tone length and silent interval between tones **varies from examiner to examiner**.
 - Unless linked to a computer that generates an audiogram printout, the **audiogram** is **handwritten** and subject to human error in transferring data to forms.
 - Requires **manual STS calculations** and manual recording.
 - Test results must be entered into the **microprocessor database** as soon as possible.
 - Requires **maintenance & annual calibration**. Typically, a listening check only is done before each day's use.
 - **Audiologists** use manual audiometers for **diagnostic audiology testing** which involves many types of hearing tests. They typically record audiometric results on a **graph** on the diagnostic audiogram. OHC technicians should be familiar with symbols used on a diagnostic audiogram because they may be required to **transcribe** results onto a newly established DD2215 baseline audiogram in a microprocessor database.

- **X = left ear, O = right ear**
- If pen colors are used, **Blue/Black = left ear, Red = right ear**
- Common way to remember is **Red, Right, Round**

DoD Uses Three Coordinated Systems

- DoD Hearing Conservation Programs use three (3) systems in a coordinated & interfacing manner to test and monitor hearing. These three systems **test hearing, collect, retrieve, analyze and store data**.
- The **CCA-200** Microprocessor **Audiometer** performs the hearing test and retrieves the data from **DOEHRS-Hearing Conservation (HC)** via the local computer database. This software is embedded within the DOEHRS-HC software.
- **DOEHRS-HC** collects employee demographic and hearing data on 1 to 8 employees during one test session
- **DOEHRS-Data Repository (DR)** stores all DOEHRS-HC demographic & hearing data uploaded world-wide into a central database. Also, DOEHRS-DR is used to **analyze** data to generate reports, and to evaluate & manage Hearing Conservation Programs
- These three (3) **systems work together**:
 - DOEHRS-HC downloads previous demographic and test data from DOEHRS-DR
 - DOEHRS –HC transfers 2215 reference data to CCA-200 audiometer
 - CCA-200 software compares reference data to current test thresholds to determine significant threshold shifts (STS)
 - DOEHRS-HC retrieves test data from CCA-200 audiometer
 - DOEHRS- HC uploads to DOEHRS-DR to store updated employee data so it is available to other test sites/personnel
 - DOEHRS – DR provides HCP Managers useful data to provide to local commands concerning their HCP effectiveness.
- Note: The Defense Health Services Systems manages DOEHRS which has software versions for the Military Health System, i.e. Industrial Hygiene (DOEHRS-IH), Environmental Health (DOEHRS-EH), Hearing Conservation (DOEHRS-HC), etc. The acronym means Defense Occupational and Environmental Health Readiness System.

Other System Components

- The **hand switch** is used by the patient to confirm that s/he heard the series of beeps or signal.
- Electroacoustic **calibrator or artificial ear** is used to **verify calibration** status of the audiometer. It is commonly called “**Bio-Joe**”.
 - Artificial ear is plugged into the hand switch jack for **Biological Calibration Check**
 - Typically, the Bio-Joe is mounted on a wall bracket at every listening station with the mini audiometer tucked behind it.
 - A **human listener** with known hearing thresholds can be used as an alternative to using an artificial ear if absolutely necessary; however, a backup Bio-Joe is recommended.
- **Headphones or earphones** are a delicate part of the audiometric test system
 - Headphones and audiometers must be **calibrated together as a unit**; exchanging headphones changes audiometer calibration.
 - Headphones are utilized by multiple patients each day so ensure they remain functional and receive appropriate cleaning.
- Other equipment and supplies used in the audiometric test environment
 - **Tympanometer** and probe ear tips used in tympanometry testing
 - **Otoscope** and speculae
 - Ear gauges for earplug fitting

Audiometer Care and Calibration and Required Equipment Checks

- Electroacoustic Calibration is done **annually** or after **relocation** and/or **repair** of audiometer.
- Functional Listening Check is done **daily** before use.
- Biologic Calibration Check is done **daily** before use.

Audiometer Electroacoustic Calibration

- **Purpose** of electroacoustic calibration is to **verify** that the audiometer is generating known **outputs** at all frequencies and intensities. In other words, if the audiometer says it is presenting 1000 Hz at 40 dBHL to the listener, the output is truly 1000 Hz at 40 dBHL
- Required **annually**. DOEHRS-HC software will show a warning message 90 days prior to the electroacoustic calibration due date. DOEHRS-HC software will stop functioning if electroacoustic calibration is not completed by the due date
- Completed by the **Navy and Marine Corps Public Health Center (NMCPHC)** Calibration Lab. Standards are IAW ANSI S3.6.
 - Results are recorded on standard NMCPHC form
 - Type I sound level meter is used
- A **specific audiometer** is **always calibrated** with a **specific pair of headphones** (i.e. a set, a total sound system). If one of these two (2) pieces of equipment need repair or replacement during the calibration year, electroacoustic calibration must be completed on the new pairing of audiometer & headphones.
- Each audiometer has a **calibration sticker** indicating the serial number & date of calibration.
- **Immediately after** the electroacoustic calibration is completed by NMCPHC and the audiometer(s) is re-installed, an **initial Biologic Calibration** must be performed for each audiometer. These initial dB levels will be recorded as the baseline (DD2217) that will be compared to each additional daily calibration (Days 2-365); all documented on DD2217.
- **Calibration records** must be maintained in DOEHRS-HC software and in printed form. Audiograms may be considered invalid if evidence of calibration is not available during inspections or legal proceedings.

Functional Listening Check – See Instructor’s Demonstration Below

- **Purpose** of the Functional Listening Check is to **detect any hardware problems** and ensure the audiometric equipment is working properly. It is a **hands-on**, thorough check of the audiometric test system at each listening/test station. This is the **only way** to detect problems with the headset, wiring, hand switch, jacks and plugs.
- Performed **daily** by the OHC Technician on each audiometer prior to use.
- **Visually check** audiometer components for proper function.
 - **Earphone headband** should have enough tension so that earphones touch each other when not in use. Replace headband when tension is insufficient.
 - **Earphone cushions** should not be dry or cracked. Replace with new earphone cushions. Just the cushion! Replacing the whole earphone will invalidate electroacoustic calibration!
 - Check the **earphone diaphragm** (opening) for obstruction, dirt/debris or punctures.
 - Check **cords and connections** for breaks or looseness.
- **Listen through headphones** for the following:
 - Appropriate **frequency/pitch changes** – a functional check of the DOEHRS-HC system will cycle through frequencies from 500-6000 Hz in the left earphone.
 - Appropriate **intensity/loudness changes** – a functional check of the DOEHRS-HC system will cycle from 60 dB down to 0 dB in the right earphone.
 - **Tone quality** at each frequency – listen for even pitch changes, even intensity changes, and a non-wavering tone.

- **Crosstalk** between earphones – ensure the tone is only present in the test earphone, and there is no sound in the non-test earphone.
- Check integrity of **cords/connections** and ensure there are no breaks. Lightly slide fingers down the extent of the cords and/or shake cords and listen for static, cracking sounds or interference.
- **Set up headphones for daily biological calibration check** by putting headphones on Bio-Joe and unplugging response cord. A light on the Bio-Joe indicates it is engaged and ready to respond to the audiometer/software.

Biological Calibration Check – See Instructor’s Demonstration Below

- Purpose is to **verify that daily output** (dB) from audiometer has not changed significantly from dB values obtained on the Day 1 calibration immediately performed after annual electroacoustic calibration. This daily calibration check establishes a **legal record** of accurate audiometer functioning.
- **Performed daily** on each audiometer prior to use. DOEHRs-HC will not interact with the audiometer if this Biological Calibration check is not completed.
- Instructions require that an artificial ear – **“Bio-Joe”** -- be used to perform daily biologic calibration. Artificial ears typically have a **flat response curve** across frequencies between **60-80dBHL**.
- May utilize human listeners if necessary. **Human listeners** must have documented normal hearing thresholds. Access to two listeners is necessary, in the event one listener fails the calibration test.
- Recorded on **DD2217** electronically or manually if human listener is used. There must be a DD2217 established for each listener on **each audiometer**. Monthly printed **records** must be maintained for **five (5) years** at the test site.
- **Successful biological calibration check** occurs when thresholds do not differ from the baseline. DD2217 (Day 1) by more than **+/- 5 dB at 500-4000 Hz and +/- 10 dB at 6000 Hz**.
 - If audiometer fails the biologic calibration, **check** all cords, jack/plug connections and status of headphones. **Repeat** the biologic calibration.
 - If audiometer then fails the biologic calibration, use a **second listener (recommend 2nd Bio-Joe calibrated as “Backup Listener” as Humans Listeners tend to relocate)**.
 - If audiometer fails calibration with second listener, **discontinue use** and send audiometer and headphone pair in for **repair/calibration** immediately.
- **Troubleshooting** when biologic calibration check fails
 - Improper **earphone placement** on artificial ears (most common reason for failure)
 - Poor **connections** at jack panel – use alcohol swab to clean jack connections
 - Replace worn out or flattened **earphones**
 - Audiometer annual electroacoustic **calibration has expired** – check sticker with date
 - **Malfunction** of **artificial ear** – requires repair or replacement
 - **Malfunction** of **audiometer** – requires repair or replacement
- **“Audiometer Calibration and Repair Contact Information”** can be found in the Appendix.

Audiometer Care & End of Day Procedures

- **Clean earphone cushions** daily with non-alcohol wipes. Ensure that moisture does not enter the diaphragm of the earphones.
- **Hang headphones** on hook, NOT placed on Bio-Joe, to maintain proper headband tension.

- **Replace** earphone cushions, cords, headbands and handswitches as needed. **NOTE:** These components do not affect audiometer calibration. **CAUTION:** When replacing the cords in a multi-station booth, recommend replacing one set of cords at a time so as not to interchange right and left, thereby negating the calibration.
- **Back up audiometric data** on a drive or storage source separate from DOEHRS-HC files.
- **Export audiometric data** to DOEHRS-DR daily or weekly (if no internet connection).
- Properly **shut down the audiometric system** (PC software; not necessarily the computer). Removing your CAC card prior to system shutdown may cause data corruption and hardware issues that render the audiometer inoperative.

Infection Control

- **Critical audiometric equipment** must be cleaned and sterilized after each use. This type of equipment includes objects that touch blood, mucous, ear drainage, cerumen, or other body fluids. Critical audiometric equipment include items such as:
 - Probe ear tips used in tympanometry testing
 - Non-disposable otoscope speculae
 - Ear gauges
- **Non-Critical Audiometric Equipment** must be cleaned and disinfected after each patient or at least daily using disposable germicidal pre-moistened cloths, or any hospital grade disinfectant/detergent that is tuberculocidal and registered by the EPA. Take note of required “contact time” of solution used. Non-critical Audiometric Equipment includes items such as:
 - Headphones/earcups
 - Headbands
 - Hand switch/response buttons and cords
 - Environmental surfaces in patient care areas (desks, chair armrests, stools)

DOEHRS-HC Audiometric Checks

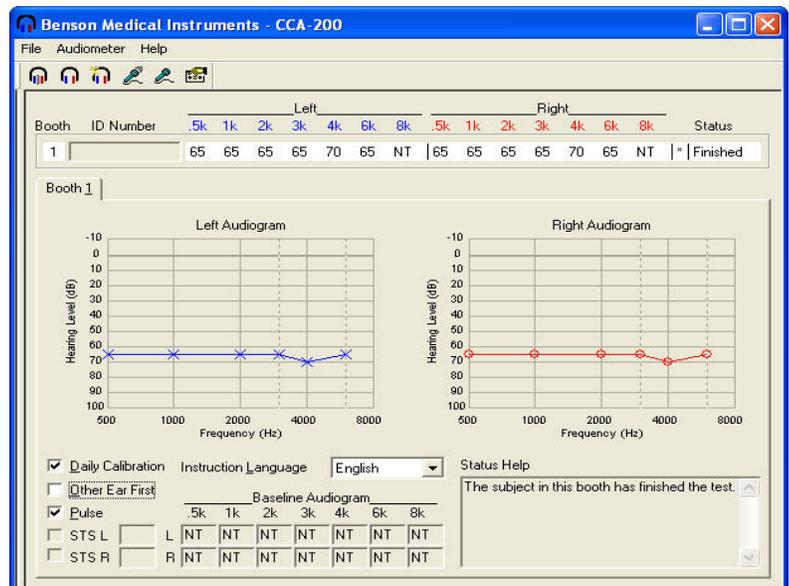
Functional Listening Check

1. Check the headphones, wires, and connections for physical damage.
2. Open the DOEHRs-HC (the CCA-200 software is embedded within DOEHRs).
3. On the Audiometer menu, click **Functional Check**.
4. Go in the booth, place headphones on and press the response button to begin the functional check. Do this for each test station.
5. Listen for the pitch, loudness, and quality of the tones. Check for static by moving hands along the cords to inspect for damage or loose connections while listening to the tones. Check for cross talk when the tone returns to the left ear.
6. When finished, click **Close**. The functional check is complete.

Daily Calibration Check

1. Check the Place the audiometer headphones on the listener or Artificial Ear. The left (blue) headphone goes on the left transducer “ear” and the right (red) headphone goes on the right transducer “ear”.
2. When using an artificial ear, unplug the hand switch from the “Response” jack on the Artificial Ear. A steady red light on the ME 500/BAS 200 indicates that all of the equipment is connected properly.
3. Check the **Daily Calibration** check box, or click Audiometer > Daily Calibration > Set.
4. Start the test by clicking the **Start Test** icon; click Audiometer > Start Test.
5. The audiometer will now perform the calibration test. The Artificial Ear should automatically respond to the various frequencies. The test should take about a minute to complete once each ear has been tested.
6. The calibration results from the CCA-200 software will automatically be **retrieved** in the DOEHRs-HC software upon test completion. **“Choose a Listener”** dialog box will automatically pop-up requesting listener (**Bio-Joe Model & Serial Number**). **Type** the correct information into the blank screen (1st Daily Calibration) or **Choose** the correct audiometer from the list. **CAUTION:** On 1st Daily Calibration performed, the automatic boxes do not pop-up in sequential order so make certain to input correct Bio-Joe serial number with correct audiometer.
7. The daily calibration is complete.

**Completed Daily
Calibration Window**



STUDY GUIDE (AUDIOMETER & TEST ENVIRONMENT)

1. What is the purpose of performing the Functional Listening Check?
 - a. to detect hardware problems and ensure the audiometer is working properly
 - b. to ensure the audiometric test booth is certified
 - c. to ensure that all documents are prepared for an inspection
 - d. to ensure that you have a well instructed, cooperative patient

2. The daily biologic calibration check passes when it meets the following criteria:
 - a. matches the baseline biologic calibration exactly, it cannot vary at all
 - b. does not differ from the baseline by more than 15 dB
 - c. does not differ from the baseline by more than 5 dB at 500-4000 Hz or 10 dB at 6000 Hz
 - d. does not differ from the baseline by more than an average of 10 dB at 2000, 3000 and 4000 Hz

3. What might be the reason for the biologic calibration check to fail?
 - a. malfunction of the audiometer or artificial ear (Bio-Joe)
 - b. connection of response chord to audiometer during calibration check
 - c. improper earphone placement on the artificial ear
 - d. excessive environmental noise inside or outside the sound booth
 - e. all of the above

4. The following are characteristics of audiometers. Write MAN beside the manual audiometer characteristics and MIC beside microprocessor characteristics.

_____ Test is the same regardless of examiner	_____ Computerized printout
_____ Tests individuals or groups	_____ Tests one person at a time
_____ Examiner controls the stimulus	_____ No computerized printout
_____ Tone length and silent interval varies from examiner to examiner	_____ Patient response triggers the stimulus

5. How do you determine when the audiometer is due for an electro-acoustic calibration?
 - a. medical repair will call two weeks prior to the expiration date to schedule calibration
 - b. the label on the audiometer will identify when calibration is due
 - c. all calibrations are contracted out and the company will contact you to schedule the calibration
 - d. the audiometer must be electro-acoustically calibrated every day prior to using the equipment

6. T or F Using a backup artificial ear (Bio-Joe) for daily calibration is preferable to using a human listener due to the “human backups” rotating out so frequently.

7. If the first listener fails the biologic calibration check but the second listener passes, the most likely conclusion is that
 - a. the audiometer and matching headphones must be sent for electroacoustic calibration
 - b. there is a problem with the second listener
 - c. there is a problem with the first listener
 - d. the electroacoustic ear (Bio-Joe) has a hearing loss
8. If both the first and second listeners fail the biologic calibration check, the following action must be taken.
 - a. the audiometer and matching headphones must to be sent for electroacoustic calibration
 - b. the first and second listeners need to be examined
 - c. switch the headphones with a properly functioning pair
 - d. the electroacoustic ear (Bio-Joe) needs repair
9. T or F Hand switches may not be interchanged or replaced with new ones unless the equipment has been calibrated with those hand switches
10. T or F A microprocessor audiometer has the capability to perform both automatic and manual modes of audiometry.
11. Biologic calibration procedures are as follows:
 - a. if the audiometer fails calibration, use a second listener
 - b. immediately following the electroacoustic calibration, obtain baseline thresholds on a primary and alternate (backup) listener for each audiometer
 - c. establish a baseline on a DD Form 2217 for each listener
 - d. all of the above
12. Required daily equipment tests include
 - a. booth certification
 - b. functional listening check
 - c. biologic calibration check
 - d. electroacoustic calibration
 - e. b & c
13. T or F Data should be backed up to an external hard/shared drive daily and exported to DOEHRS-DR at least weekly (preferred daily).
14. How often is the audiometer to be electroacoustically calibrated?
 - a. daily
 - b. monthly
 - c. quarterly
 - d. annually
15. T or F Switching from automated microprocessor to a manual mode of testing may be necessary with some difficult-to-test patients.

16. What equipment is used for audiometric testing?
- audiometric test booth
 - audiometer
 - headphones
 - response switch
 - artificial ear
 - all of the above
17. Booth certification is typically performed by
- service-specific facilities (nehc/merc/army medical maintenance)
 - an occupational health nurse
 - medical repair staff
 - industrial hygienist
 - safety officer
18. Audiometer calibration is typically performed by
- service-specific facilities (nmcphc/merc/army medical maintenance)
 - an occupational health nurse
 - medical repair staff
 - industrial hygienist
 - safety officer
19. A potential cause of excess noise inside the test booth is
- ventilation noise
 - leaks around the jack panel
 - deterioration of door seals
 - excessive ambient room noise
 - all of the above
20. T or F Audiometers and headphones must be calibrated together as a unit.
21. What type of care and maintenance is required for the headphones?
- clean earphone cushions daily w/ non-alcoholic germicide wipes
 - maintain headband tension by hanging headphones on a hook when not utilized
 - replace earphone cushions, cords and hand switches as needed
 - change the batteries in the audiometer at least weekly
 - a, b & c
22. T or F Absolute silence is required in the booth during all hearing tests.
23. T or F During annual audiometric testing, the examiner should maintain the same time interval between tone presentations.
24. The Functional Listening Check is an equipment test to check for
- crosstalk
 - static
 - stable, non-wavering tones
 - appropriate frequency and intensity changes
 - all of the above

25. The following must be cleaned daily (or preferably between each patient) with non-alcohol wipes or solution:

- a. earcups
- b. headband
- c. hand switches
- d. environmental surfaces and patient care areas
- e. all of the above

26. What is DOEHRS-HC?

- a. an educational program to teach workers about hazardous noise.
- b. an occupational health program to track on-the-job injuries and compensation.
- c. a DoD-wide computer-based audiometric testing and data management system.
- d. an environmental health program managed by TriCare.

27. The DOEHRS Data Repository

- a. is a central database where audiometric data is exported
- b. allows measurement of HCP effectiveness
- c. contains statistics on STS and program compliance
- d. offers a variety of canned reports for evaluating local data
- e. all of the above

28. T or F Without appropriate calibration records, audiograms may be considered invalid during legal or regulatory proceedings.

29. Audiometric data must be transferred/exported to the DOEHRS Data Repository at least:

- a. daily
- b. weekly
- c. monthly
- d. annually
- e. biannually

30. On what form is the daily biologic calibration check recorded (either manually or electronically)

- a. DD 2214
- b. DD 2215
- c. Non-Hearing Conservation Test Form
- d. DD 2216
- e. DD 2217

AUDIOMETRIC TESTING: PROTOCOLS AND TECHNIQUES

Learning Objectives

1. Name types of audiograms and purposes
2. List patient characteristics that need consideration before testing
3. Explain the method used to establish hearing thresholds
4. Name factors affecting test validity and reliability
5. Role play pre-test activities with “patient”

Purpose of Audiometric Testing

- **First primary reason** for performing audiometric testing is to **measure hearing thresholds** of individual employees.
- **Second primary purpose** is to determine if there has been any **change** in those hearing thresholds for the individual compared to his/her baseline threshold levels.
- The **other purposes** of audiometric testing follow from these two (2) primary reasons.
 - Hearing conservation **education** & proper fitting of Hearing Protection Devices (**HPDs**) and their use can be provided during explanation/counseling of test results
 - Routine testing can identify employees that **need referral** to audiologists & medical officers for hearing related problems.
 - Audiometric testing is the first step in evaluating for **Fitness for Duty**
 - Analysis of large groups of employees’ hearing thresholds can provide data to monitor the **effectiveness of the Hearing Conservation Program**.
 - **Mission** of Occupational Audiology & the HCP – prevention of hearing injuries and conservation of hearing health.

Hearing Measurement by OHC Technician

- OHC Technician measures hearing by testing with **pure tones** delivered to the listener by air conduction (earphones).
- An employee’s sensitivity to **specific frequencies** (pitches) are measured. These specific frequencies are 500 Hz, 1000 Hz, 2000 Hz, 3000 Hz, 4000Hz and 6000 Hz.
- **Goal** of this hearing test is to determine the **individual’s threshold** of hearing at each of these frequencies.
- **Definition of threshold** is the “softest intensity of sound that can be detected at least 50% of the time”
- OHC Technician is responsible for the **accuracy of employee data collected and recording it** on appropriate forms and software databases.

Types of Audiograms

- DoD uses **three (3) types of audiograms** to record routine hearing tests: DD Form 2215, DD Form 2216, and the Non-HCP form. Each form is used for different reasons or purposes.
- **DD Form 2215** is the **Reference** or Baseline audiogram required of **all military personnel** when they begin service and those DOD **civilians enrolled in the HCP**.
 - Future hearing tests will be compared to these **reference thresholds** in order to measure and monitor any changes in hearing.
 - The original DD Form 2215 Reference Audiogram should be completed before beginning work in hazardous noise.
 - When a **Significant Threshold Shift (STS)** has been confirmed by an audiologist upon diagnostic evaluation, a **new DD Form 2215** Audiogram reference is established with the new or current baseline thresholds. The previous DD 2215 Audiogram is maintained in the Medical Record (strike through with date) but should not be used for comparison with future hearing tests.
- **DD Form 2216 Hearing Conservation** audiogram is used to record hearing test results of active duty military and civilians who are **enrolled in the HCP**. This is the primary reason for completing a DD 2216. The form is used to record results of (annual, follow-up tests 1 and 2, pre/post deployment, termination and other tests).
 - In order to generate a DD 2216, the patient must have a **valid DD2215 Reference** audiogram completed in order for thresholds to be compared.
 - There is **no requirement** for an employee to be **noise-free** for 14 hours before completing an initial DD 2216 HC test.
 - **Annual Audiogram:** All military personnel or civilians enrolled in the HCP receive an annual audiogram. Note: As of 2012, **all active duty Marine Corps** personnel are enrolled in the HCP and should receive annual hearing tests (DD 2216) regardless of specific work duty.
 - **Follow-up Audiogram:** Follow-up hearing tests #1 and #2 are recorded also on the same DD 2216 audiogram as the annual test. Follow-up tests require the patient to be **noise free for 14 hours** prior to testing. Follow-up tests must be completed **within 30 days** of the annual test.
 - **Pre/Post-deployment Audiograms:** Administered before and after deployment and evaluates the amount of hearing loss (if any) acquired during deployment. Army and Air Force personnel are required to be tested both pre and post deployment. Normally, Navy personnel are not required to obtain a hearing test pre/post-deployment since our peacetime/wartime deployments are the same; however, it may be requested for some Sailors going IA in support of Marines &/or Army Units.
 - **Termination Audiogram:** All military personnel must have a termination audiogram prior to leaving active duty. All service members enrolled in the HCP should have a termination audiogram completed when no longer working in a noise hazardous environment and are removed from the HCP. Civilian workers enrolled in the HCP should have a termination audiogram completed when HCP enrollment is terminated or prior to leaving civil service.
 - **Other:** Administered to individuals that are not being seen for one of the reasons above; however, are required to have a DD 2216 for a specific purpose.
- **Non-Hearing Conservation Test** form is used to record test results for personnel **not enrolled in the HCP**.
 - Test results are **not compared to DD 2215 Reference** audiogram results officially. However, an OHC Technician may use judgment whether to visually compare during counseling the patient and if circumstances allow for this courtesy.

- **Reasons** for using a Non-HCP test form may include the following: physical health assessment (PHA), flight physicals for administration pilots and physicians, dive physicals, occupational health physicals, forklift and other driving equipment physicals, officer commissioning physicals, pre-hire civilian job applicants, most non-activated military reserve personnel, sick call physician requests, etc. Check your local SOP.
- **Diagnostic Audiology Evaluation** test form is used by **audiologists**. Only an audiologist can confirm **validity of a positive Significant Threshold Shift (STS)** and re-establish a patient's DD 2215 Reference (unless SOP states otherwise). The Diagnostic Audiology Evaluation test form has an audiogram in **graphic form** where the audiologists manually record patient responses to pure tones with symbols. Other types of hearing test results are also recorded on the form.
 - OHC technician may be required to **transfer** audiologist's audiogram **results** into DOEHRS-HC software
 - **Left ear** responses are indicated by a **blue "X"** and right ear responses are indicated by a **red "O"** on the graph.

Critical Steps in Hearing Testing

1. Getting the patient **ready** for testing
2. **Administering** the hearing test
3. **Recording** test results

STEP #1: Getting the Patient Ready

- These procedures should be followed regardless of test booth size. However, reasonable modifications can be used for single person test situations
- Obtain all **demographic data** required by DOEHRS-HC. Have patient fill out form.
- Ask questions to **clarify or confirm** demographic data
 - Purpose of test (are you routinely exposed to hazardous noises (HCP) or are you here for a PHA or other test?)
 - UIC (unit identification code) = command assignment
 - Hearing difficulties (significant head cold or sinus issues today)
 - Ear problems
 - Have you been exposed to hazardous noises in the last 14 hrs (on or off duty) – *only for baseline/reference or follow-up tests.*
 - Use of hearing protection & type of HPD typically used
 - Bothersome constant ringing or buzzing in the ears
- Give employee choice of **seating position** if possible. Large groups typically require seat assignment for efficiency.
- Writing test **station number (#)** on demographic form is highly recommended.
- **Special considerations** that may affect the test for the individual or other patients in the booth.
 - **Glasses, hats, and large earrings** can interfere with proper placement of earphones.
 - **Gum chewing** interferes with hearing soft sounds – request employee to remove/discard gum or anything else in mouth.
 - **Jackets and coats** should be removed because the test booth becomes too warm, particularly in group testing, and some jacket materials make noise with body movements.
 - **Hearing aids** must be removed and turned off to prevent squealing or whistling, preventing interference to others. It is recommended that patient keeps the hearing aids rather than leave them outside booth to prevent any possibility of loss or damage.

- **Personal electronic devices** -- cell phones, pagers, etc – should be turned off or on vibrate to not disturb anyone. It is highly recommended that electronic devices be left outside the booth because employee can be distracted with vibration, etc.
- **Testing instructions** should be brief, clear, and clearly demonstrate the desired response.
 - Clear understanding of instructions is critical for **accurate results** and **efficient use of test time** (avoids re-testing frequencies with unacceptable responses).
 - It is highly recommended that the **technician verbally instruct patients**, regardless of whether the CCA-200 audiometer is set to present **recorded instructions**. Some patients with hearing loss or non-native speakers of English may have difficulties with the recorded instructions. Questions can also be addressed.
 - Instructions must include **four (4) critical elements** --
 - What will they hear
 - What are they supposed to do
 - Red earphone on right ear (blue earphone on left ear)
 - Encouragement, i.e. listen for faintest sound, approximate length of test
 - An example of instructions is the following: **“I’m looking for the softest sounds that you can hear. Even if you barely hear them, I want you to respond. Each time you hear a SERIES of beeps, immediately push and release the button only ONCE. Put the red earphone on the right ear. The test should take about 10 minutes.”**
 - OHC technician should observe or check **correct earphone placement** before closing the booth door for testing. Earphone diaphragm should be over ear canal; headband should be on top of head and adjusted to fit snugly or close to head; each patient should have the response switch/button in hand.
 - If a **manual audiometer** is used, the patient should be instructed to raise their hand in response to the tones.

“You are going to hear a series of beeping tones. Each time you hear the tones and as soon as you hear them, raise your hand and quickly lower it. No matter how faint the tones, raise and lower your hand when you hear them.”



STEP #2: Administering Hearing Test – Test Protocol

- After completing all patient preparation procedures, click on the **“START”** on the audiometer screen for all test stations being used.
- In DOEHS-HC, enter each **patient’s identification number** and update all **demographic data**. The goal is 100% accuracy in data entry.
- **Transfer (“T”** box next to patient station number) patient data to CCA-200 audiometer. The identification number will appear on line recording thresholds. Also, any 2215 Reference threshold data will appear on graphic audiogram screen when a particular listening/test station is viewed.
- When testing is complete, **retrieve (“R”** box next to patient station number) patient threshold data to DOEHS-HC. Test thresholds will appear on that station’s line.
- Click **“STOP” icon** on CCA-200 audiometer to end presentations of tones.
- Note: Audiometer has a **“Keep Busy”** feature so that listeners continue to hear tones until everyone in the group is finished and can be stopped at the same time.
- **Print (“P”** box) all audiograms and any referral forms.
- Highly recommend that you **do not clear test results** until AFTER patient(s) leaves in case test data needs editing, visual audiogram graph is used in counseling, etc.

Special Testing Situations

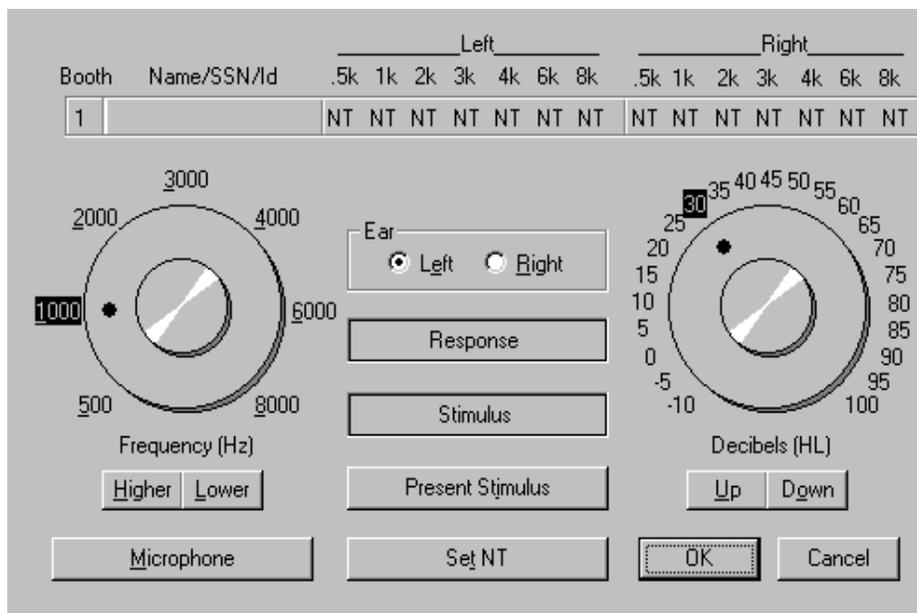
- Perform **otoscopy** on all patients prior to testing, if possible, but mandatory for all patients with reported congestion, head colds, ENT complaints/concerns or before Follow Up #1.
- If feasible, test the **better ear first** if there is a significant difference between the two. This will allow the patient to adjust to the test stimulus prior to testing the poorer ear and facilitate the most accurate results. In the audiometer software, under Audiometer tab >> Test Presentation, click “Other Ear First” in lower left corner. Remember to click it back for later patients.
- **Crossover:** Patients with **unilateral losses or significant asymmetrical losses** may exhibit crossover or lateralization. This occurs when testing the poorer ear. It occurs when sound energy reaches a certain loudness level that it crosses through the skull from the poorer ear to the better ear or the sound leaks around the headphones. When the better ear hears the sound, the patient responds; therefore the patient is not responding to sound in the test ear.
 - Occurs when there is a difference in hearing between the ears at the same frequency of **40 dB or greater**.
 - These patients **need to be tested by an Audiologist** since the use of masking may be required to eliminate crossover.
- **Excessive Tinnitus:** If possible, test patients with significant hearing loss **alone or manually** as they take longer to test and have a more difficult time with tinnitus.
- Occasionally a patient will present with **collapsing ear canals**, where the pressure of the earphones cause the ear canals to close off, creating what **appears to be a low frequency or flat hearing loss**. Ideally, these patients should be tested by an Audiologist. Never allow patients to press on the earphones during the test, as the pressure on the external ear may close off the ear canal, and therefore affect the test results.
- **Inconsistent behavior:** The most appropriate action the technician can take with a patient who is responding inconsistently or appears to be malingering is to re-instruct and re-test. Refer to the audiologist if the patient persists in not cooperating.
- **Severe to Profound hearing loss:** Be aware that **high intensity test signals** required by an employee with a this degree of hearing loss may be heard by others in a group testing situation.
- **Claustrophobia:** Provide the following options:
 - Sit in first seat position near booth door facing window
 - Test alone in first seat position facing the window.
 - Test alone with door open or not completely closed. Of course, the technician must maintain silent environment and may need to note test conditions in Remarks section audiogram.
 - Note: sometimes showing employee how easily the door opens can reduce anxiety – let them open & close door.

Manual Audiometry - Test Technique

- The CCA-200 mini audiometer has a manual audiometer feature that allows the **technician to control the stimulus** and its presentation. Using the manual audiometer may be necessary for patients who are having difficulty with the listening task.
- A technique called the **Bracketed Method** is used where the tone intensity is decreased 10 dB for every response and increased 5 dB for every no response or “**Down 10 dB, Up 5 dB**”. Threshold is determined when the patient responds to the lowest intensity presented 2 out of 3 times on an ascending (increasing intensity) run. The software will change the dB level and determine the final threshold level. Below is an explanation of the Bracketed Method.

- Start at 0 dB. Present the tone as you increase volume until the patient responds.
- Present the tone again at that level for initial response confirmation.
- **Decrease intensity 10 dB** and present the tone. Continue decreasing intensity in 10 dB steps until the patient stops responding.
- **Increase intensity 5 dB** and present the tone again. Continue increasing intensity in 5 dB steps until patient responds.
- Continue the technique of going down 10 dB and up 5 dB **until the patient responds at the same dB level 50% of the time**, usually 2 out of 3 times during the ascending movement of the test. (The microprocessor audiometer electronically administers tones using the Bracketed Test Method, and records patient thresholds.
- Tone presentation should last for **approximately 1-3 seconds or 3 pulses**. Vary the interval between tones so as not to create a rhythmic, predictable presentation pattern.
- Caution: It is easy to give patient visual cues when presenting the tones.
- **The microprocessor audiometer tests frequencies in the following sequence:** 1000, 500, 1000, 2000, 3000, 4000, 6000 (validates threshold at 1kHz). The 1000 Hz tone is the first frequency tested because it is an easily detectable pitch for humans to hear.
 - The **threshold is validated at 1000 Hz** in order to verify the accuracy and reliability of the test. It usually takes some practice to listen to very soft sounds.
 - The threshold obtained during the validation check at 1000 Hz should be within +/- 5 dB of the first threshold obtained at 1000 Hz; within this 5dB range, **the better threshold is recorded. If the threshold is outside the 5 dB range, results are considered unreliable and the test should start over from the beginning.**

Manual audiometer screen



Factors Affecting Test Validity

- Test **environment conditions** that may affect results
 - Excessive ambient/background noise
 - Poor ventilation making the booth noisy and too warm
 - Poor lighting
 - Equipment and booth out of calibration or not operating correctly
- **Procedures** that may **negatively affect** results
 - Poor instructions to the patient
 - Improper earphone placement
 - Auditory and/or visual cues from the examiner or test equipment
 - OHC Technician skills and attention to following protocols and observing factors that may affect test validity
- **Physical and psychological factors** related to the patient that may impact test results
 - Poor health or fatigue
 - Tinnitus
 - Significant hearing loss
 - Collapsing ear canals
 - Poor understanding of test instructions or test process
 - Poor motivation
 - Poor attention span
 - Limited hearing test experience
- To obtain the **most accurate** hearing test results:
 - Conduct tests in a currently certified test environment
 - Use a properly calibrated audiometer
 - Ensure the examiner is a well-trained, certified Hearing Conservation Technician
 - Have a well-instructed, alert and cooperative patient

STEP #3: Recording Results

- Record patient test results on the **correct form**.
 - **DD 2215** reference audiogram for civilians in the HCP and all active duty military
 - **DD 2216** monitoring audiogram – annual HCP, deployment, separation/retirement
 - **Non-Hearing Conservation Test**
- **Accuracy and validity** of all data is critical
 - Hearing tests/forms are **medical-legal documents**
 - All information printed on these documents and entered in the database **must contain accurate and valid information** and be defensible in court, should the need arise. The OHC Technician **name and certification number** is on this form, stating responsibility for the test and data accuracy.
 - Data not only impacts the patient/employee but entire commands in terms of **regulation compliance and HCP effectiveness**.

STUDY GUIDE (AUDIOMETRIC PROTOCOLS & TECHNIQUES)

1. T or F Patients who wear hearing aids should adjust the volume to the level they usually keep it during the hearing test.
2. The primary purpose of audiometric testing is to
 - a. determine changes in worker's hearing thresholds compared to their baseline audiograms
 - b. monitor the effectiveness of the hearing conservation program
 - c. determine if a referral is needed based on symptoms and test results
 - d. to assist command in providing annual hearing conservation training to employees
3. T or F Specific goal when testing patients is to identify the "softest intensity of sounds that can be detected 100% of the time".
4. The following method is used when performing manual hearing tests
 - a. threshold technique method
 - b. microprocessor testing
 - c. bracketed method
 - d. biological test sequence
5. To assist tinnitus patients in distinguishing the test tone from their tinnitus, you should:
 - a. use a continuous tone
 - b. use a pulsed tone
 - c. crack the door open while testing
 - d. test them with a group to distract them from their tinnitus
6. The following employees should be tested on a 2215 audiogram form:
 - a. all DOD employees prior to employment
 - b. all military employees prior to employment and civilians in an HCP
 - c. all employees in an HCP with a confirmed STS
 - d. all employees exposed to noise with no record of 2215 in medical record or DR
 - e. b, c & d
7. Claustrophobic patients
 - a. need no special attention and should be tested along with everyone else
 - b. should be tested alone and allowed to take breaks when needed
 - c. in a very quiet room, can be tested with the door cracked open, if absolutely necessary
 - d. b and c
8. T or F Patients with severe hearing losses and/or tinnitus should be tested alone on a manual audiometer, if possible.

9. What steps are needed to prepare the patient prior to administering the annual hearing test?
 - a. Obtain all demographic data needed for DOEHRS-HC data entry
 - b. Determine if patient has current head cold or congestion (ENT) problems
 - c. Inquire if person is routinely exposed to hazardous noises at current command (HCP)
 - d. Perform otoscopy and tympanometry.
 - e. A, B and C

10. The following employees should be tested on a 2216 audiogram form.
 - a. all Marines annually
 - b. all DoD personnel enrolled in an HCP
 - c. active Duty put on HCP on first ship command, now working in quiet shore command
 - d. employees routinely exposed to hazardous work conditions at current command
 - e. a, b, and d

11. The following employees should be tested on a Non-HCP Test form
 - a. employees not routinely exposed to hazardous work conditions at current command
 - b. occupational health and flight physical personnel without noise hazardous duties
 - c. personnel tested for commissioning, MEPS or pre-hire physical purposes
 - d. hospital employees in general
 - e. all of the above

12. When testing patients, use the following protocol EXCEPT
 - a. require patients to remove glasses, chewing gum, hats, jackets, and turn off cell phones
 - b. instruct patients to push the response button only when they hear the tone very clearly
 - c. in a group test setting, inform patients to be still and quiet so as not to interfere with others taking the test
 - d. inform patients that the test will last approximately 10 minutes
 - e. all of the above

13. Who is required to have a DD 2215 in their medical record?
 - a. all DOD employees
 - b. all military personnel
 - c. all DOD civilians
 - d. all civilians in the hearing conservation program
 - e. a and b
 - f. b and d

14. Which of the following procedures may impact test results?
 - a. poor instructions
 - b. rhythmic tone presentation
 - c. auditory or visual cues from the examiner
 - d. improper earphone placement
 - e. all of the above

15. Which of the following patient factors may affect test results?
- poor health
 - poor attention
 - test instructions
 - collapsing ear canals
 - a, b and d
16. Which of the following test environment conditions may have an impact on test results?
- tinnitus
 - technicians talking outside booth
 - poor ventilation
 - in a group testing situation, one of the patients has a severe hearing loss
 - b, c and d
 - all of the above
17. T or F If the patient is having difficulty hearing the tones, it is helpful for them to press gently on the headphones and the tones will become clearer.
18. Which of the following will help eliminate patient testing errors and speed up test time?
- using an abbreviated test procedure
 - providing clear and complete test instructions
 - administering tympanometry screenings on all patients prior to testing to rule out middle ear problems
 - have the patients raise and lower their hand when they hear the tones, rather than using a response switch
19. T or F Accurate DOEHRs data entry is vital for administrative decisions related to HCP effectiveness, targeted intervention and mission readiness.
20. What is the most appropriate action to take when a patient is responding inconsistently or appears to be malingering?
- re-instruct the patient
 - confront the patient
 - refer the patient to the legal office
 - contact the patient's supervisor
 - move the patient to a different seat in the booth, or test him/her in a different clinic
21. What is a termination audiogram?
- an audiogram performed by an audiologist after the patient has sustained an STS
 - the last audiogram a civilian receives prior to being removed from the hearing conservation program
 - an audiogram performed by a technician after the active duty patient leaves the military
 - all of the above
22. Where should the first DD Form 2215 be obtained on active duty military patients?
- at the military entrance processing station (MEPS)
 - at NEHC
 - at the beginning of basic training
 - at the first duty station

23. How often are personnel in the Hearing Conservation Program required to have a hearing test?
- at least annually
 - semi-annually
 - quarterly
 - monthly
24. For what purpose is the DD Form 2216 used?
- 90-day audiogram
 - annual audiogram
 - pre & post deployment audiogram
 - termination audiogram
 - follow-up testing
 - all of the above
25. Prior to performing an annual hearing test on a DD Form 2216, what document must be present in the patient's medical record?
- a five-year physical exam
 - an SF 513 referral form
 - an SF 600 documenting and ear, nose and throat exam from the medical officer, clearing the patient for a hearing test
 - a DD Form 2215
 - all of the above
26. T or F There should only be one 2215 audiogram in every patient's medical record-- the one they received at basic training or upon employment into a noise-hazardous environment. If more than one reference audiogram is found, you should remove all but the most recent one.
27. Hearing threshold levels are recorded or plotted on
- an audiometer
 - a cardiogram
 - a tympanometer
 - an audiogram
 - an audiograph

AUDIOMETRIC TESTING: RESULTS, FOLLOW-UP & REFERRAL

Learning Objectives

1. Define the degrees of hearing loss
2. Differentiate between STS, TTS, and PTS
3. Interpret hearing test data to determine if follow-up testing, a new baseline and/or a referral is required
4. List criteria for referring a patient to an audiologist and to a medical officer
5. Role play the presentation of test results and referral information

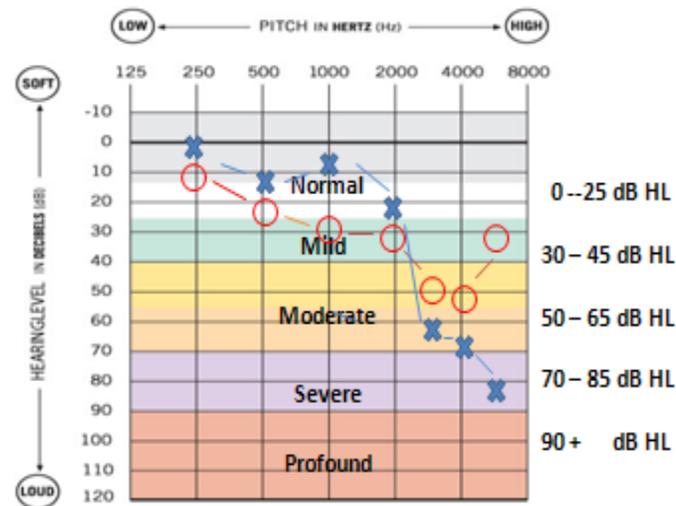
Purposes of Audiometric Testing - Review

- To identify significant changes in hearing of those enrolled in an HCP over time
- To provide opportunities for HC education and re-instruction for proper HPD fitting
- To identify and refer patients when needed to audiologists and physicians
- To assist in gathering accurate data to determine large scale HCP effectiveness

What Are We Testing and How Do We Test? – Review

- **Otoscopy** assesses the outer ear; observations of general ear canal and eardrum conditions through an otoscope.
- **Tympanometry** assesses the function of the outer and middle ear system, but specifically helps identify middle ear disorders; a tympanometer is used and produces a tympanogram.
- **Audiometry** assesses the whole system (sounds travel from earphone through outer-middle-inner-central divisions of the ear) but specifically tests the patient's inner ear and its sensitivity to pure tones. **Pure tone thresholds** are measured using an audiometer.
- OHC Technicians must integrate all data, along with patient reported symptoms, to accurately interpret results, counsel the patient and make appropriate referrals.

Degrees of Hearing Loss



Degrees of Hearing Loss - Graphic Audiogram – Review

Describes amount of hearing loss by degrees or categories of hearing loss. Remember that a person’s hearing must be described for each ear (unless thresholds are very similar) and may include more than one degree or category of hearing loss across frequencies.

- **Normal** hearing range across frequencies (Hz)/itches is between -10 to 25 dB HL
 - **Mild** hearing loss range is between 30 to 45 dB HL
 - **Moderate** hearing loss range is between 50 dB HL to 65 dB HL
 - **Severe** hearing loss range is between 70 dB HL to 85 dB HL
 - **Profound** hearing loss is 90 dB HL and greater
- Audiograms are used by audiologists to plot results of an audiology evaluation: red “O” for right ear (RE), blue/black “X” for left ear (LE). An OHC Technician may be requested to **transcribe** a handwritten audiogram into the DOEHRS-HC database.
- If a patient has a hearing loss, he or she typically does not have a straight “line” or equal hearing loss across frequencies.
- Most common hearing loss is a sloping or falling (increasing dB) pattern with **greater loss in the high frequencies**. Noise induced hearing loss will often have greatest loss between 3000 – 6000Hz, referred to as a “**noise notch**”.
- Hearing thresholds are recorded by DOEHRS-HC using a left to right numerical table form.
- One way to interpret the above audiogram: the left ear has normal hearing through 2000 Hz sharply decreasing to a moderate and severe hearing loss in the high frequencies; the right ear has normal hearing in the low frequencies, a mild hearing loss beginning at 1000 Hz and decreases to a moderate hearing loss at 3000 and 4000 Hz, indicating a clear “noise notch”.

DOD Audiogram Forms

- OHC Technician must determine **the correct form** to use based on the purpose/reason for the test (HCP or Non-HCP). See Audiometric Testing: Protocols and Techniques chapter to review the criteria to determine the correct audiogram form for each patient test.
- **DD Form 2215 (Reference Audiogram)** includes patient data, OHC Technician and audiometer data, patient hearing test results (one horizontal line of numbers), and a Remarks section to help communicate information between OHC technicians &/or providers.
- **DD Form 2216 (Hearing Conservation Form)** or “Annual Audiogram” form compares 2216 test results with 2215/baseline results and determines if a significant change in hearing has occurred; and if so, has space available for two additional tests, if necessary.
- **Non-Hearing Conservation Test Form** is used for all tests performed on DoD employees NOT enrolled and/or NOT relating to a Hearing Conservation Program.
- **NOTE:** All Army and Marine Corps personnel are enrolled in the HCP; therefore, they would be tested using a DD Form 2216 in almost all situations.

Primary Interpretation of Annual Audiogram

- Determine whether a **Significant Threshold Shift (STS)** is indicated in either ear.
- **Definition** of STS: An average shift of greater than or equal to 10 dB (positive or negative) at 2000, 3000 and 4000 Hz in either ear.
- **“Steps in Reading a DD Form 2216 Audiogram”** **SEE PAGE 167 IN APPENDIX**
 - Top horizontal line indicates left and right **ears**
 - Next (second) line of boxes indicates the **frequencies** (Hz) tested for each ear.
 - Next (third) line of boxes indicates the **dB threshold levels** obtained during the **current hearing test**.
 - Next (fourth) line of boxes *should* indicate the **dB threshold levels** obtained for the **most recent DD Form 2215 Reference**. **Confirm validity** with medical record.
 - Next (fifth or last) line of boxes *should* indicate the **differences** between the current test and current reference dB threshold levels.
 - An **STS** or Significant Threshold Shift in either ear is when the differences at 2000Hz, 3000Hz, and 4000Hz add up to 30 or greater **OR** an average of 10 or greater.
 - An STS is coded for each ear as **1 for NO and 2 for YES** in the white box left of the 5th pink line. A plus (+) sign or negative (-) sign after the number 2 means a positive STS or negative STS respectively. In other words, a “1” means “Pass”, a “2+” means “Positive STS” or “significant decrease in hearing” and a “2-“means a “Negative STS” (patient responded to softer or better levels than reference).

Other Threshold Shift Terminology

- A **Temporary Threshold Shift or “TTS”** is the term used when a positive STS resolves after 14 hours of auditory rest following the first 2216 annual test. The significant shift in threshold may be due to a number of circumstances, i.e. exposure to noise preceding the test. Follow-Up testing is required with at least 14 hours auditory rest prior to testing to determine if the shift is temporary or permanent.
- A **Permanent Threshold Shift or “PTS”** is the term used when a positive **STS has not resolved after 14 hours of auditory rest and is verified** by an audiologist, usually after a full audiology evaluation. The audiologist or local SOP will authorize a new baseline (2215) to be established.
- An **“Early Warning”** is a threshold shift of ≥ 15 dBHL at 1000, 2000, 3000 **or** 4000Hz in either ear

- Indicated when a patient passes the annual test (average threshold differences at 2000, 3000, and 4000 Hz do NOT meet STS criteria).
- In the “Remarks” section on the 2216 Audiogram, it will state that results indicate an early warning of possible hearing loss.
- Patient should sign/initial line in the “Remarks” section, indicating understanding that an STS or Early Warning has been found by the hearing test.

Form 2216 Annual Audiogram Outcomes

- After interpreting the audiogram, there are **five basic outcomes**.
- A patient will **NOT have an STS**. It is a “Pass”.
- A patient will NOT have an STS but will have an **Early Warning** for a specific frequency or frequencies in either ear.
- A patient will have a **positive STS** in one or both ears with thresholds outside of normal hearing limits.
- A patient will have a **positive STS** in one or both ears **BUT** all thresholds are within **normal limits**. This outcome is based on local command SOP.
- A patient will have a **negative STS** in one or both ears. Today’s thresholds are better than the current reference.

Procedures for No STS on 2216 Annual Audiogram – “1” in the STS box

- **Explain results** to patient. DO NOT tell them “You passed!” without explaining the audiogram.
 - Use everyday vocabulary terms.
 - Orient them to the audiogram: identify left and right ear lines, low to high pitches or frequencies, lines for today’s test results and most current reference/baseline thresholds.
 - Numbers represent the softest volume that patient responded to each tone or pitch
 - The lower the number, the better the hearing or thresholds.
 - Thresholds 25 dB or less are considered normal adult hearing; any number above 25dB is considered a hearing loss.
 - When today’s hearing levels were compared to reference levels, there were no significant changes or shifts for the critical pitches or frequencies.
- **Complement** patient on maintaining good hearing and counsel patient about hearing protection. Emphasize recreational activities can also affect hearing abilities.
- Properly place 2216 in **medical record** above previous 2216s and behind 2215 reference audiogram(s).
- Give patient medical record and any completed forms required by local safety officer/command.
- **Retest** patient in twelve (12) months/one year.
- Multi-person booths: consider **group counseling** using “How to Read an Audiogram” chart. Be sure to ask for permission to do so from patients (HIPAA regulations).

Procedures for No STS on 2216 Annual Audiogram BUT with Early Warning

- **Explain test results** to patient. DO NOT say “You passed except you had a little difficulty for one or two tones.” See counseling tips in previous section (no STS).
- Counsel and encourage patients to **wear HPD consistently** and as deeply as possible in their ear canals; both on/off duty around hazardous noise. Make an effort to re-instruct patient in proper insertion and use of earplugs.
- **Patient signs** DD Form 2216 audiogram in the “Remarks” section, acknowledging counseling about early warning and use of hearing protection.
- Give patient **medical record** and any completed forms required by local safety officer/command.
- **Retest** patient in 12 months or one year.

Procedures for Positive STS on 2216 Annual Audiogram – “2+” in the STS box

- **Explain test results** to patient. DO NOT say “You failed. You will need to come back a second time.” See counseling tips in “No STS” section.
- Explain to patient it is necessary to **return for Follow-Up** testing to verify the hearing test results.
 - Follow up test must be completed **within 30 days** or the software will force today’s test to be repeated.
 - Patient must be **14 hours free of hazardous noise** before the Follow-Up test. It is best to come in first thing in the morning before working or after a quiet weekend. ** DoD is more stringent than OSHA and does not allow HPDs to be worn in place of being 14 hours noise free.
- **Patient signs DD Form 2216** audiogram indicating acknowledgement of STS and understanding that Follow-Up testing is required within 30 days and with 14 hours of auditory rest prior to test.
 - Possible encouragers to motivate them to return: “you might be tired today,” “you might have been distracted by others in the booth,” “you are familiar with the test setup now.”
 - For those possibly worried about employment/career impact: “regulations require that you return for Follow-Up testing”, “these results go back to your supervisor and will affect your unit’s compliance if you don’t return”, “let’s just recheck after auditory rest.”
- Under ideal situations, OHC Technician should perform **otoscopy** and possibly **tympanometry** before the patient leaves.
 - It **rules out** impacted cerumen and/or possible middle ear problems as the cause of the STS.
 - Completing these procedures **NOW** before Follow-Up testing allows the patient to seek medical attention and **prevent an unneeded referral** to occur.
 - If otoscopy and/or tympanometry reveals a possible outer/middle ear problem, **refer** the patient to a **medical officer**: active duty patients to sick call, and civilian patients to their primary care physician.
 - If otoscopy and/or tympanometry reveals **NO** problems (normal appearance & function), then instruct patient to **return for Follow-Up** testing within 30 days after 14 hours of auditory rest.

Procedures for Follow-Up Testing due to Positive STS on 2216 Annual Audiogram – “2”

- When patient returns for **Follow-Up Test #1** within 30 days, the patient should be given a complete hearing test. Try to seat patient in a **listening station different** from the annual test. If patient was referred for medical reasons after annual test, ensure that the problem has been resolved (patient report, otoscopy, tympanometry).
 - If test results indicate **no STS**, explain test results to patient, i.e. previous test results may have been a Temporary Threshold Shift (TTS) or other test related variable(s).
 - Encourage patient to **use HPDs appropriately** and consistently. Take time to **reinstruct him/her on the correct technique needed for a proper HPD fit**. Emphasize that repeated TTS will result in a permanent threshold shift (PTS) or hearing loss.
 - Give patient medical record and any completed forms required by local safety officer/command and retest patient in twelve months/one year.
 - **If test results indicates an STS**, save Follow-Up Test #1 results into DOEHRS-HC, and **immediately begin Follow-Up Test #2**, without taking patient out of booth.
- If **Follow-Up Test #2** results indicate **no STS**, explain results to patient in the same manner suggested for Follow-Up Test #1. Counsel and re-instruct about HPD use and complete necessary recordkeeping.
- If results for Follow-Up Test #2 indicate a **positive STS**, then a **referral** for a full audiology evaluation with an Occupational Audiologist (preferably) is required.
 - **Explain the test results** to the patient: The STS has appeared in three hearing tests and protocol requires that a referral be sent to the Occupational Audiologist for a full audiology evaluation and/or baseline re-establishment.
 - **Caution** must be used when answering the patient’s questions to avoid providing information beyond the scope of the OHC technician’s role. For example, patients may ask for a diagnosis or cause of hearing loss, impact on Fitness for Duty or employment, or possible treatments, etc. An example: “The audiologist or provider will have to answer those questions because they will integrate other information with the audiogram results.”
 - **Refer** to an Occupational Audiologist for full **diagnostic evaluation** to verify hearing thresholds and determine if the STS is a PTS.
 - OHC Technician follows **referral protocol** according to the **local SOP** and/or available resources.
- DOEHRS – HC will generate a **Referral form** that can be placed with the final 2216 audiogram in the patient’s medical record.

Procedures for Positive STS on 2216 Annual Audiogram – Within Normal Hearing Limits

- Relates to one of two situations where OHC Technician can re-establish a 2215 Reference Audiogram without specific validation from an audiologist. This protocol must be verified by your written local SOP.
- If results on the 2216 Annual Audiogram indicate an **STS**, proceed with Follow-Up procedures within 30 days. Remind patient to have 14 hours auditory rest before the test.
 - If Follow-Up #1 and #2 indicate a positive **STS AND all thresholds are within normal limits, AND** outer/middle ear disorders are ruled out with otoscopy & tympanometry, then a **new 2215 Reference Audiogram** can be re-established.
 - **Type** into the **Remarks** section why a new 2215 Reference Audiogram was established. For example, “Reference revised per local SOP; patient’s thresholds WNL.”
 - **Line out** previous 2215 Reference Audiogram.
 - If Follow-Up Tests indicate **NO STS**, then complete **counseling** and **educate** on proper/consistent HPD use in order to prevent future hearing loss.

Procedures for Negative STS on 2216 Annual Audiogram – “2–”

- A Negative STS result is the second of two situations that an OHC Technician can re-establish a 2215 Reference Audiogram without consulting an Audiologist. This protocol must be verified by **written local SOP**.
- Results of the initial annual test meet the criteria for an STS; however, the thresholds are significantly **“better”** than the current 2215 Reference Audiogram.
 - DOEHRS-HC will indicate a **Negative STS or “2–”** in STS box.
 - DOEHRS-HC will acknowledge the negative STS and request **permission to retest** or complete a Follow-Up #1 immediately. Click YES.
- If Follow-Up #1 indicates **no negative STS** (it was resolved), then follow normal annual hearing test counseling procedures.
- If Follow-Up #1 test results **confirm the negative STS**, respond to DOEHRS-HC prompts to revise 2215 Reference Audiogram. Verify that current 2215 Reference is being used.
- Type in **“Remarks” section** reason for re-establishing the 2215 Reference Audiogram, i.e., “Today’s test results indicate a negative STS; a new 2215 Reference was re-established per local SOP.” Line out previous 2215 Reference Audiogram and provide the date the reference was re-established.
- **Explain test results** to patient, reinforcing good hearing protection behaviors and return to annual hearing test status.

Procedures for Non-Hearing Conservation Test

- A Non-Hearing Conservation (NHC) hearing test is a test for individuals that are **not enrolled** in the HCP. They need a hearing test to complete a **routine physical** for a specific purpose, i.e. general health, commissioning, corpsman school, pre-hire requirement, forklift driving, etc.
- There is **no comparison** of current test results with the reference or previous audiograms. However, good counseling and customer service requires explanation of results and answering questions from the patient.
- If a hearing loss is indicated, it does not require referral to the Occupational Audiologist (patient not enrolled in the HCP). However, encourage patient to request an audiology evaluation from their medical provider. Check with local SOP for referral procedures.

Data Management

- **DOEHRS –HC**
 - Export hearing tests to the Defense Occupational Environmental and Health Readiness System - Data Repository (DOEHRS-DR) - preferably daily or weekly at a minimum.
 - Input manual audiogram results for audiologist or when testing in special situations.
 - Maintain backup file on external media or share folder.
- **Audiograms**
 - Printed audiograms must be placed in patient’s medical record.
 - File DD 2216 audiogram(s) behind reference DD 2215 audiogram(s) with most recent audiogram(s) on top.
 - Void former 2215 audiograms -- slash and stamp with current date.
 - Never remove audiograms from records.
- Follow local SOP for **tracking patient referrals**. Input, document and code patient encounters in AHLTA or CHCS. Documenting patient workload guides Navy leadership when determining if more/less OHC positions are needed.

General Protocol for Referrals

Unless otherwise written in the local SOP, a physician or **audiologist must review** all reference audiograms (DD 2215) that meet referral criteria and all hearing conservation audiograms (DD2216) having an STS after the second follow-up.

Reasons to Refer to an Occupational Audiologist

- Check **local SOP** for specific referral protocol.
- Always check medical record for **previous audiology evaluation(s)**. Evaluation results and recommendations (example: “patient must be tested by audiologist”) may not have been transcribed into DOEHRS-HC. If there is a past evaluation, check the disposition or recommendations to see how they may relate to current referral decisions.
- **2215 Reference** audiogram indicates **abnormal hearing** for the newly enlisted recruit.
- **2216 Follow-Up #2** test indicates an **STS** (significant threshold shift).
- **2216 Follow-Up #2** test indicates an **asymmetrical hearing loss** -- difference between ears is 20 dB or greater at two (2) consecutive frequencies. Example: Thresholds in right ear at 1000 & 2000 Hz (consecutive) are 10 and 10 dBHL; threshold in left ear at 1000 & 2000Hz are 30dB and 30dBHL.
- Patient complains of **significant difficulty** with tinnitus and/or difficulties understanding speech in background noise.
- Patient **responds inconsistently** during testing, regardless of repeated instruction and Follow- Up procedures.
- Patient has **collapsing ear canals**. Indications: flat hearing loss with normal otoscopy and tympanometry results. Test by pressing in front of ear where earphone would rest and view if canal collapses quicker than normal canals. If so, patient needs to be tested by insert earphones by an audiologist.
- **Fitness for Duty** issues – patient has had three (3) re-established 2215 Reference audiograms or the 270 Rule exists (discussed end of this chapter).

Reasons to Refer to a Medical Officer or Physician

- Patient complains or OHC Technician observes **symptoms** which includes the following:
 - Ear pain
 - Drainage from the ear canal
 - Severe or persistent tinnitus of recent or sudden occurrence
 - Vertigo or severe dizziness – may or may not be accompanied by nausea
 - Sudden hearing loss
 - Visible abnormality through otoscopy or tympanometry
- **NOTE: Vertigo and/or sudden hearing loss should be evaluated ASAP by a physician. Time can be a critical factor between temporary and permanent hearing loss (usually <24 hours).**

Audiologist Responsibilities Upon Referral

- The Audiologist is responsible for specific patient assessment and care activities after the OHC Technician makes a referral.
- **Evaluates** the patient’s medical record, **reviews** his/her noise history and **provides** all necessary follow-up tests to determine the nature of the hearing loss. Additionally, the audiologist will provide advice, counseling and **education** to help prevent future hearing loss.

- Provides patient and his/her command **written notification** of verified positive STS which now has become a PTS.
- Make appropriate Fitness for Duty recommendation to patient's command.

Fitness For Duty Evaluation Criteria Across Military Service Branches

Example Audiogram at beginning of chapter entitled “Degrees of Hearing Loss”

- **NAVY and MARINE CORPS**

The Navy has a “270/3 STS Rule” which is defined as follows.

- When the **sum of thresholds at 3000, 4000 and 6000 Hz** in both ears **meet or exceed 270 dB** – as described in OPNAV 5100.19 and 5100.23 series

OR

- When the **reference audiogram has been re-established three (3) times**

THEN

- The OHC Technician **must refer** to an Occupational Audiologist or Occupational Medicine Officer for a **Fitness for Duty (FFD) evaluation.**
- The **purpose** of the Fitness for Duty 270 and Three STS Rule is to trigger a multi-disciplinary evaluation for individuals showing a marked susceptibility to noise-induced hearing loss.
- **ARMY and AIR FORCE** use a Profiling system to determine FFD to patients according to their hearing thresholds at all frequencies tested
 - The four (4) hearing profiles indicate the patient's Fitness for Duty.
 - H1 – Fully Fit for duty
 - H2 – Fit for duty with limitations
 - H3 –Trigger to evaluate for FFD
 - H4 – Hearing levels preclude safe or effective job performance with or without hearing aids. Requires a medical board evaluation.

IMPORTANT: Any employee, who has significant hearing impairment that **interferes with communication, placing themselves, their co-workers and/or government property at risk of injury/damage**, should be referred for a Fitness for Duty evaluation.

Practice Interpreting Sample Audiograms and Counseling Results

See Appendix pages 147-160

STUDY GUIDE (AUDIOMETRIC TESTING, FOLLOW-UP & REFERRAL)

1. What is a hearing threshold?
 - a. 0 dB
 - b. 85 dB
 - c. the softest volume that can be detected at least 50% of the time.
 - d. -10 to 25 dB

2. What type of audiogram might be found in a patient's medical record?
 - a. DD Form 2215 Reference Audiogram
 - b. DD Form 2216 Hearing Conservation Data
 - c. clinical audiology diagnostic audiogram
 - d. all of the above

3. What is considered to be the range of normal hearing?
 - a. -10 to 25 dB
 - b. 30 to 45 dB
 - c. 50 to 65 dB
 - d. 70 to 85 dB
 - e. 90 and above

4. Which statement may a certified technician make to a patient?
 - a. "You have a bilateral moderate high frequency sensorineural hearing loss."
 - b. "Your hearing has decreased since your last annual test and requires follow-up testing."
 - c. "You are a good hearing aid candidate and are being referred to the audiologist for a hearing aid evaluation."
 - d. "You have a unilateral hearing loss which may indicate a tumor on your hearing nerve. and requires that an MRI be performed."

5. What is the protocol for patients having asymmetrical or unilateral hearing loss not previously identified?
 - a. refer to ENT to rule out any pathology
 - b. re-establish DD2215 reference audiogram
 - c. perform manual audiometry
 - d. refer to audiologist for diagnostic evaluation

6. What is the definition of a STS?
 - a. a shift in hearing of 15 dB or more (positive or negative) at 1000, 2000, 3000 or 4000 Hz in either ear
 - b. an average shift of 10 dB at 1000, 2000, 3000 and 4000 Hz (positive or negative) in either ear
 - c. an average shift of 10 dB at 2000, 3000 and 4000 Hz (positive or negative) in either ear
 - d. A and C
 - e. all of the above

7. Which of the following complaints would justify referral to a Medical Officer?
 - a. sudden hearing loss
 - b. ear pain or drainage
 - c. visible abnormality on otoscopic exam
 - d. all of the above

8. What action should you take if a patient sustains a negative STS on the annual and first Follow-up test?
 - a. perform an otoscopic exam, refer to health care provider if abnormal, fit the patient with hearing protection, counsel on the importance of wearing the protection, and schedule patient for 2nd Follow-Up test
 - b. refer the patient to the audiologist
 - c. re-test within 12 months
 - d. refer the patient to the medical officer
 - e. re-establish the reference audiogram

9. A reference audiogram should not be performed if
 - a. the patient has an ENT problem.
 - b. the patient has been working in a noise hazardous environment within the last 14 hours.
 - c. the patient is a civilian who is not enrolled in the hearing conservation program.
 - d. all of the above

10. What is the purpose of the 270 Rule?
 - a. to dis-enroll personnel from the hearing conservation program who do not need audiometric monitoring
 - b. to establish threshold criteria at which noise exposed personnel should be evaluated to determine fitness for duty
 - c. establishes guidelines for how to deal with uncooperative patients
 - d. all of the above

11. What system do the Army and Air Force use to assist with Fitness for Duty issues?
 - a. A Duty Restriction System
 - b. The Whisper Test
 - c. A Profile System
 - d. The 270 Rule

12. What action should you take if the patient has no STS on the annual test?
 - a. re-establish the reference audiogram and re-test within 12 months
 - b. counsel patient on results and re-test within 12 months
 - c. perform 1st Follow Up test after 14 hours away from noise
 - d. perform otoscopic exam, fit patient with hearing protection, counsel patient on use of HPDs and schedule patient to see the audiologist

13. T or F Both Follow-Up #1 and #2 tests can usually be done on the same day.

14. T or F A Temporary Threshold Shift is a shift in hearing that resolves itself after a period of auditory rest.

15. When do you refer a patient to the Audiologist?
 - a. when the patient sustains an STS after the Follow-Up #2 test
 - b. if the patient does not meet threshold criteria on a reference audiogram or does not meet criteria for job requirements
 - c. if there is a unilateral hearing loss not previously identified or that may require masking by an audiologist
 - d. if the patient complains of tinnitus or difficulty hearing
 - e. when a patient exhibits uncooperative behavior, or when responses appear to be unreliable after re-instruction and re-testing
 - f. all of the above

16. What is the primary purpose of performing Follow-up testing when a patient has an STS?
 - a. to ensure medical-legal requirements are met
 - b. to document a progressive hearing loss
 - c. to determine whether the hearing loss is temporary or permanent (TTS versus PTS)
 - d. to inform patients of their status in the hearing conservation program

17. What action should you take when a patient has a positive STS on the annual test?
 - a. explain results of the test, re-fit patient with HPDs and counsel on their proper use.
 - b. perform otoscopic exam and tympanometry to determine if immediate medical referral needed
 - c. conduct first 14-hour noise-free Follow-up test within the next 30 days
 - d. all of the above

18. What action should you take if a patient has a positive STS on the first Follow-Up test?
 - a. re-establish the reference audiogram
 - b. refer patient to the audiologist
 - c. re-test within 12 months
 - d. perform second follow-up, if possible the same day and certainly within 30 days of the annual.

19. T or F The DD Form 2216 accommodates up to three hearing tests, and all three tests must be completed within 30 days, regardless of the outcome of each test.

20. What action should you take when a patient sustains a positive STS on the 2nd Follow-Up test?
 - a. refer patient to the audiologist, or follow his/her written guidelines for disposition.
 - b. refer patient to the medical officer or ENT physician
 - c. perform otoscopic exam, fit patient with HPDs, counsel patient on proper use of HPDs, schedule patient for follow-up
 - d. all of the above

HEARING PROTECTION

Learning Objectives

1. List the considerations used to select hearing protection devices (HPD)
2. Identify and describe the major types of HPDs
3. Compare the advantages and disadvantages of each type of HPD
4. Demonstrate proper HPD Fitting on self and others
5. Explain the effect of HPDs on speech understanding for normal and impaired hearing

Situations Requiring Hearing Protection

- Whenever the danger of noise **hazard is present**, regardless of the duration of the noise When noise hazard signs are posted; a sign indicates hazardous noise levels have been measured within the area
- Any work or recreational activity when noise levels are ≥ 85 dBA for **continuous** and ≥ 140 dBP for **impulse/impact** noise.
- **Double hearing protection** (plugs and muffs) is required when continuous noise levels exceed 96-100 dBA. Use of both types of protection must provide effective exposure to < 85 dBA or 140 dBP.
- Hearing protection should be worn by both **visitors** as well as employees inside hazardous noise areas.



Noise Reduction or Attenuation Ratings

- The **Noise Reduction Rating (NRR)** of an HPD is the advertised decibel attenuation measured in dBC. Manufacturers advertise their HPDs as reducing the intensity of sounds reaching the ear by the stated NRR. An NRR of 25dBC means that a 100dBA noise intensity level would be reduced to 87dBA at the eardrum when that HPD is used correctly.
- NRR values are **found** on the HPD container and/or in its specifications.
- However, advertised NRRs values are measured **using a dB C scale** rather than a dB A scale.
 - The dBC scale includes all frequencies at all intensity levels; therefore, this measurement includes non-hazardous low frequencies that are not included in a dB A scale.
 - Using the dBC scale **results in a higher number value** which is misleading
 - **Industrial Hygienists** measure dangerous decibel levels **using dBA scale** and make recommendations to commands using the dBA values.
 - **Field measurements** indicate attenuation levels are approximately **one half (1/2)** the advertised NRR value. Consider this fact when selecting the most effective HPD.

Noise Level dBA	100 dBA HL	Noise level measured by IH
NRR dBC	25 dBC HL	Advertised reduction on box of HPDs
NRR Attenuated Level	75 dB HL	Assumed intensity level reaching eardrum
Real Life reduction based on dBA measurement scale	12 - 13 dB	One half (1/2) of the NRR rating
Actual attenuated level	87 – 88 dBA	Actual reduction of intensity at eardrum

Selection Considerations for Hearing Protectors

- Only **approved** hearing protection is acceptable for use in the HCP
- **Type** of hearing protection should be **selected** based on the following factors.
 - **Work environment:** inside/outside, clean/dirty surroundings, humidity, continuous/intermittent noise
 - **Job requirements:** continuous/impulse noise, communication critical job or not?
 - Degree of **noise attenuation capability** versus the level of noise exposure
 - Consideration of **advantages /disadvantages** of each device in terms of ease and comfort of use, durability, effective noise reduction, and cost
 - **Communication needs:** intermittent or constant, clarity, near field or wireless
 - **Safety needs:** enough attenuation to protect hearing but not to block warning signals
 - **Personal choice and comfort:** individual size and sensitivity to HPD shapes, sizes and materials
 - **Cost effectiveness** of a particular HPD for the purpose it is used
 - Example: Handformed earplugs (“foamies”) might be inexpensive (less than 10 cents a pair) but should be used only once. Hearing protection is needed only intermittently when an employee uses a particular piece of equipment. If the worker uses 10 pairs of foamies throughout the work day, he would use 50 pairs a week or 2600 pairs a year.
 - A pair of noise muffs hanging near the equipment to use during operation is more practical and more cost effective. Noise muffs may cost more initially but in the long term will save the command money.
 - **Double protection needs.** With double hearing protection (such as earplugs and noise muffs), the **second form of hearing protection adds about 5-6 dB of protection** from noise. It does not double the protection capability. It is not recommended that double protection be used when noise levels are between 85 - 96dBA as this may prevent situational awareness.
 - HPDs can only reduce the noise level to **half** of the advertised **NRR**.
 - With an additional 5-6 dB of protection obtained by doubling HPDs, maximum **attenuation** achieved will be 20-30 dB.
 - For hazardous noise levels **exceeding 110 dBHL**, HPDs probably will NOT be able to reduce the individual’s exposure to less than 85 dBA.
- **Administrative controls** (time limitations in the noise area) are required whenever personal hearing protection cannot reduce actual exposure to 84dBA or less.
- Bottom line: **THE MOST EFFECTIVE HEARING PROTECTION IS THE TYPE THAT WILL BE WORN CONSISTENTLY AND PROPERLY**

Approved Types of Hearing Protection

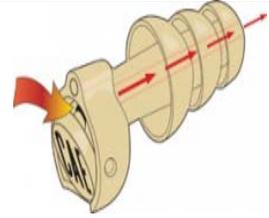
There are **4 main types of hearing protection devices** that are **approved by DOD**

- Earplugs – pre-formed and hand-formed
- Noise Muffs – all authorized (without radios)
- Ear Canal Caps
- Helmets

Pre-Formed Earplugs

- Pre-formed earplugs must be **fit** by medical department personnel. Technicians must fit both ears individually, as some people will wear different sizes and/or different types in each ear
- An **ear gauge** may be used to assist in determining the appropriate size earplug, but cannot be relied upon without fitting the actual earplugs in each ear.
- The earplug **carrying case** can be used to assist with the fitting process (using attachment).
- Patients with sharply **bending ear canals** will not do well with triple or quad flange earplugs because they do not seat well. Approximately 10 - 15% of patients should not use them for this reason.

Pre-formed Earplugs

Type	NRR*	Sizes	Fit	Example
Single Flange	25 dB	5 color coded Extra small to Extra large	Medical fit required. Tab points to back of ear	
Triple Flange	26 dB	3 color coded Small – Medium – Large	Medical fit required. Jiggle into ear canal. Stick should show slightly	
Quad Flange	25 dB	Universal fit One size fits most (except extra large)	Medical fit required. Jiggle into ear canal. Stick should show slightly	
Combat Arms	22+ dB steady noise	3 Sizes Small- Medium - Large	Medical fit required. Inserted color not visible	

*NRR = Noise Reduction Rating

- **Advantages of pre-formed earplugs**
 - **Effective** protection with proper insertion depth
 - **Durable** - can be washed and re-used several times until dry and cracked.
 - Easily **carried** on uniform or clothing in earplug carrying case
 - **Less expensive** than ear muffs and hand-formed earplugs for frequent users (in the long run)
 - Fairly **comfortable** although adaptation period may be needed.
- **Disadvantages of pre-formed earplugs**
 - Requires individual **medical fitting** of both ears
 - Frequent insertion may cause **irritation** (minimized by proper fitting)
 - Works loose with **jaw movement** (talking, chewing) which can require user to re-insert earplug often
 - Improper fit **reduces effectiveness** or attenuation benefit

Hand Formed Earplugs

- Commonly called “**foamies**”, these soft pliable earplugs should be **used only one time** for good ear hygiene. Since the earplugs must be rolled tightly for proper insertion, **clean hands** are imperative.
- Personnel must be **trained** to insert hand formed earplugs correctly. **Proper insertion** and effectiveness are too often compromised because it is assumed that the plugs are easy to use and inserting any portion of the foam plug provides adequate protection. Not necessary to be medically fit by medical personnel.

TYPE	NRR	SIZES	FIT	EXAMPLE
Sound Guard EAR Classic	29 – 33 dB	Medium	No color should show when viewed directly in front	
EAR Classic 30	29 – 33 dB	Small	No color should show when viewed directly in front	
EAR Classic 33	29 – 33 dB	Large	No color should show when viewed directly in front	

- **Advantages** of hand-formed earplugs:
 - Effective **protection** when properly inserted into ear canal
 - Most **comfortable** - generally half of employees prefer foamies as HPD
 - **Universal fit** (Sound Guard or EAR Classic) -- regular size fits 70% of population; small (EAR Classic 30) & large (EAR Classic 33) sizes available for other 30%
 - Individual medical fitting not required
 - **One time use** – hygienic IF hands are clean when inserting
 - **Least expensive** of all HPD’s for full time or very infrequent use; **however**, cost goes up if multiple earplugs are used per day
 - Good choice when hat or **helmet required** – nothing sticks out of canal to “catch” the helmet.
- **Disadvantages** of hand-formed earplugs
 - Must be **properly molded** into small smooth cylinder shape with no creases and inserted deeply into ear canal
 - Easily **soiled** and absorbs dirt and oil that can be transferred into the ear canal
 - Must be properly **inserted** – color of earplug should not be visible when viewed directly in front
 - **One-time use** – so continual supply is needed; remind employees not to re-use
 - Should use **clean hands** – Dangerous to use if working with corrosives or dangerous chemicals in work areas which require use of chemicals and gloves
 - Do not use in presence of **corrosives** – disintegrate and can cause skin damage, hearing loss or dizziness (ototoxicity). See list of ototoxic chemicals in Appendix.

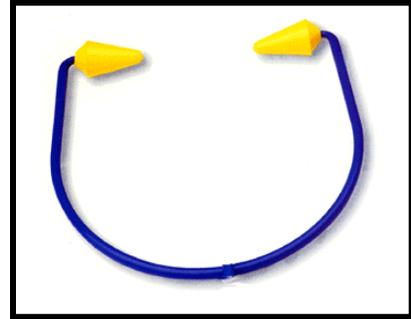
Noise Muffs or Circumaural Headset:

- Effective **protection** with a typical **NRR of 25-35dB.**
- Often used with earplugs for **double protection** (30 dB+)
- Some types may allow variety of **headband placement**: top of head, behind head, under chin. However, a good seal around the entire ear/pinna should never be compromised.
- **Initially expensive** but cost effective over time.
- **Advantages** of noise muffs
 - Effective **protection** or attenuation of noise
 - **Universal fit** -- as long as headband adjusts
 - Individual medical fit not required
 - Can be worn with earplugs for **double protection** in extreme noise situations
 - Can incorporate **communication equipment** and/or Active Noise Reduction (ANR) features
- **Disadvantages** of noise muffs
 - Most **expensive** type of HPDs
 - **Bulky and heavy**
 - Uncomfortable in **heat** and humidity due to perspiration
 - **Hair/eyeglasses/earrings** decrease fit effectiveness
 - Not easily **carried**



Ear Canal Caps:

- Typical Noise Reduction Rating (**NRR**) is **18dB** but is extremely variable due to inconsistent sealing of ear canal
- **Universal fit** for ear canals; no medical fit required
- **Headband tension** varies with individual head size which may negatively affect proper insertion of caps in ear canals.
- **Advantages** of ear canal caps
 - **Quickly** inserted without soiling
 - **Universal fit** - individual medical fit not required
 - **Lightweight** and easily carried around neck for immediate use
 - Best for **intermittent and modest noise** (95dB or less)
- **Disadvantages** of canal caps
 - More **expensive** than earplugs
 - **Uncomfortable** after extended use
 - **Limited** attenuation
 - Poor **headband tension** greatly reduces effective attenuation/protection



Helmets for integrated and specialized HPDs

- Helmets are for **specific operational uses**, which typically incorporate **communication capability**
 - Aviators, Aviation Crew
 - Flight and Well Deck Personnel (“cranials”)
 - Tank crews
 - Amphibious Assault Vehicle Crew Members



Care and Maintenance of Hearing Protection

- **Pre-formed Earplugs**
 - **Clean** after each use with warm, soapy water; rinse and dry thoroughly before re-use.
 - Avoid insertion with soiled hands.
 - Check plugs or ear tips periodically for **deterioration** (dryness, stiffness, cracks) and correct size.
 - When plugs are no longer serviceable, a **new pair** should be obtained.
- **Hand-formed earplugs**
 - These earplugs are ordinarily **disposed of after each use**.
 - Avoid rolling and inserting with soiled hands
 - Never use if contaminated with metal filings or corrosives
- **Noise Muffs**
 - Wipe down **ear-cup seals** with moist cloth (alcohol-free) after each use.
 - Replace **seals** when cracked or broken.
 - Replace **cushions** inside ear-cups when unserviceable (cracked or broken).
 - Check for **defects** (cracks or holes) in ear-cups.
 - Ensure there is adequate **headband tension**; replace headband when necessary.
 - **Modification** of noise muffs is **prohibited** (such as incorporating music).
- **Ear Canal Caps**
 - **Clean** after each use with warm, soapy water, rinse and dry thoroughly before re-use
 - Check **headband tension** to ensure a tight insertion in ear canals
 - Replace when **ear tips** become hard

Characteristics of a Good Earplug Fitting

- With both earplugs inserted, people's **voices sound muffled**
- There is a **vacuum effect** or feeling when tugging on the earplug
- The earplugs feel **comfortable** and do not irritate the ear canal skin over time
- Specific pre-formed earplugs can be **inserted** properly: tab of single flange plug is oriented toward the back of the head; largest flange possible (correlating with size of patient's ear canal) of a multi-flange plug is flush against the ear canal opening.
- Both ears are **medically fit**. Some people will wear two different sizes in each ear, and some may wear a combination of different types of earplugs
- None of the hand-formed earplug is visible ("**no color**") when looking directly at user.
- Earplug stays inserted properly in ear canal over time, regardless of talking (jaw movement)
- **Practical check** for proper insertion of earplugs or ear caps: Compare environmental sound with and without cupped hands covering ears. If both conditions sound the same, earplugs are inserted correctly.

Fitting Techniques and Proper Use Procedures

- **Pre-Formed Earplugs** Pull up and back on pinna. User should use **opposite hand** over head to pull on pinna, straightening ear canal
 - Insert earplug
 - Gently jiggle or slightly twist plug into ear canal
 - Single flange: tab is oriented toward back of the head
 - Triple or Quad flange: dependent upon size of ear canal, last flange should be flush against ear canal opening; with a small amount of stick showing
 - **Both ears** must be fitted as some people wear different sizes in each ear
 - Use a smaller or larger size if a good seal is not obtained
- **Hand-Formed Earplugs** ("foamies")
 - **Roll earplug** between thumb and index finger into slender tube to the smallest size possible. Ensure there are **no creases** in the compacted "tube".
 - Pull up and back on pinna. User should use **opposite hand** to pull pinna up and back
 - **Insert earplug deeply** into the ear canal. Very little of the plug should be extending outside of ear canal.
 - Push deeper 1-2X with either fingertip to reach maximum insertion depth
 - If insertion is difficult, try the larger or smaller size plug
 - **Practical tips** for proper insertion: when moving index finger from front to back across ear, a user should not feel any of the "foamie"; no color should be seen when user looks directly into mirror or a buddy looks at user directly in front.
- **Noise Muffs**
 - Noise muffs should **seal** around the entire ear/pinna (ear cushions should be replaced when cracked or worn).
 - With certain types of noise muffs, **headband placement** can be on top of the head, behind the head, or under the chin (sometimes referred to as Type II muffs, while straight over-the-head muffs are Type I).
- **Ear Canal Caps**
 - Canal caps should be **inserted as tightly** into the opening of the ear canal as possible to form a seal
 - **Headband placement** can be on top of the head, behind the head or under the chin
 - Users with very large or very small heads may receive **poor benefit**



PRACTICE: See “Good and Bad Fit?” pictures on slides.

Responding to Employees Who Don’t Use HPDs Consistently

- **Common excuses** for not wearing hearing protection may include the following:
 - They hurt or itch my ears!
 - My ears will become infected!
 - I can’t hear the engine sounds!
 - I need to get used to how loud my weapon is!
 - I won’t be safe if I can’t hear live fire or my equipment operating!
- Some of these excuses are **generally false**. Some of them refer to the **need to adapt** to noise attenuation. All of them reflect **short-term thinking** instead of long-term thinking that hearing loss is a permanent injury and will result in negative impact on career choices.
- Use of hearing protection is always preferable to a progressive, permanent hearing loss.



Hearing Performance when Using Hearing Protection

- Interaction of the **Lombard and Occlusion Effects** result in people speaking at a loudness level that usually overcomes the effects of surrounding noise and the HPD attenuation.
 - **Lombard Effect** – occurs when people **raise their voices** in the presence of loud background noise in order to be able to monitor their own speech and to allow others to hear them talking
 - **Occlusion Effect** – with the ears plugged, people will **speak more softly** because they will hear their own voices more easily through bone conduction
- Facts about communication and understanding **speech understanding in noise with HPDS**
 - In **low noise areas**, hearing protection may cause communication problems. Due to the absence of the Lombard Effect, voices are too faint to be heard well.

- In **high noise areas**, hearing protection can enhance speech understanding for normal hearing people, because the hearing protection helps eliminate the high frequency noise and allows more of the speech frequencies to pass through.
- **People with hearing loss** will have more difficulty understanding speech while using hearing protection because of the combined effects of HPD attenuation on top of the hearing loss effects on communication ability. These difficulties may limit their ability to work safely in some industrial areas.
- There is a **practice effect** or adaptation requirement for good hearing performance as people re-learn work environment sounds with hearing protection in place. With time and practice, sounds become recognizable again. When fitting and educating patients, stress patience with adapting to understanding environmental sounds and communicating with HPD use.
- Caution: **Don't overprotect**. Match attenuation of HPD to exposure level. Overprotection may cause a safety hazard if warning sounds are inaudible.

Specialized HPDs

- Custom earmolds or earplugs
- Musician hearing protection
- Communication earplugs and headsets

Custom Earmolds or Plugs

- Custom earmolds or earplugs are made to **fit the individual's ear**.
- Using a syringe device, a soft material (silicone) is put into the ear canal which hardens into a pliable mold of the individual's ear canals. The molds are sent to a lab to be made into permanent custom earmolds.
- Made by **audiologist** or trained personnel with supervision
- Noise Reduction Rating (**NRR**) varies but excellent due to exact fit
- **Expensive** (approx \$60-\$120/pair). Unless absolutely required for the job, commands do not usually pay for custom earmolds. To order custom device, contact regional audiologist.
- Most often used by **pilots**

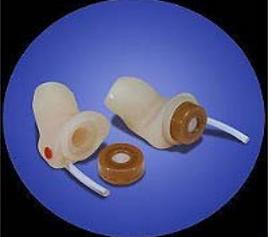
Musician Hearing Protection (Custom Molded or Pre-formed Plugs)

- These earplugs are designed for musicians and sound engineers, and incorporate filters which yield a relatively **flat attenuation across frequencies**. Therefore, sound quality is not distorted in the same way conventional hearing protectors do.
- Musicians must be **medically fit** with these devices because they are custom molded earplugs, and earmold impressions with a **deep canal portion** are needed. For a successful fit, the earplugs must be checked following delivery of plugs.
- Noise Reduction Rating (**NRR**) = 15-25 dB

Communication HPDs

- **Communication HPDs** may be **mechanical or electrical** devices that are designed with communication capability in mind.
- They offer the **ability to hear** sounds the war fighter needs to hear (approaching footsteps), **AND protects** against **impulse or continuous noises**.
- **Combat Arms Earplug** is an example of a mechanical device. A mechanical filter remains open for non-hazardous sounds, allowing for communication to occur, but will briefly close off during impulse noise situations (gunfire, IEDs).
- **NACRE Quiet Pro, Silynx C4-OPS, and the Atlantic Signal’s Dominator** are examples of electrical Communication HPDs . They work similarly to combat arms earplugs, but turn on/off much quicker in response to gunfire. They can be attached to radios for **long distance communications**.
- **Communication Headsets** are another type of **electronically driven HPD**. They are similar in function to the above electrical communication devices but are less expensive. Useful in a variety of situations on shore and on ship, particularly by **civilian** employees.
- Some communication earplugs such as the **Communication Ear Piece (CEP)** or **ACCES Earplugs** incorporate a speaker inserted at the end of the HPD. They are typically used by pilots/navigators and attached via helmets to radio system for pilot to pilot/ground crew communications.
- Research incorporating **Active Noise Reduction (ANR)** or “**noise canceling**” is currently ongoing by NAVAIR Command. ANR electronically cancels low frequency noises (<500Hz frequencies only). ANR is not effective with jet noise due to high frequency characteristics of the jet noise.
- Another advantage of electrical communication HPDs is that they can be connected to long range **radio systems** to allow for long distance communication.

Examples of Communication HPDs

Musician Earpiece	Mechanical & Combat	Electrical & Headset	Electrical & Combat
			
			

Funding for HPDs

- According to regulations, appropriate hearing protection must be issued with **no cost to personnel**. HPDs must be replaced if lost, damaged or poorly fit
- Civilian and active duty personnel enrolled in the HCP have the **right to choose, within reason**, which type of HPD they prefer to use. The HPD must be among approved selections and provide adequate attenuation for the particular job being performed.
- **Each command is responsible for purchasing** and providing a reasonable variety of HPDs.
- **Medical clinics**, i.e. Occupational Audiology or Health/Medicine, may fit the **initial device**, particularly pre-formed earplugs. However, it is always the **responsibility of the command** or unit/shop to purchase and supply the HPDs.
- Navy **AFLOAT instructions** state that the initial HPD is issued and paid for by the medical clinic. However, subsequent HPDs are issued and obtained from the worker's department.
- NOTE: When a worker **sustains a positive STS**, it is highly recommended that the medical facility have a ready supply of HPDs (pre- and hand-formed earplugs) to provide the employee while demonstrating proper fit and use.
- **Customized earmolds** are available upon request but are dependent upon command funding.

**THE BEST HEARING PROTECTION
IS THE ONE YOU USE
CONSISTENTLY AND CORRECTLY**

Practice Earplug Fitting

A



B



C



D



E



F



STUDY GUIDE (HEARING PROTECTION)

1. The four main types of approved hearing protection are:
 - a. _____
 - b. _____
 - c. _____
 - d. _____
2. Who pays for hearing protection for personnel enrolled in the HCP?
 - a. noise-exposed personnel
 - b. unit or shop where noise-exposed personnel are employed
 - c. the closest medical facility
 - d. the audiologist or hearing conservation department
3. At what decibel level is double hearing protection required? _____
4. T or F When fitting and issuing preformed earplugs, you only need to fit one ear because both ears are the same size.
5. T or F The noise reduction rating (NRR) listed on the hearing protection package closely resembles real world noise reduction.
6. T or F Personnel in the Hearing Conservation Program have the right to choose which type of hearing protection they prefer to wear from the choices available in national stock, unless there is a medical or environmental contra-indication.
7. Raising your voice in the presence of loud background noise in order to be able to monitor your speech and allow others to hear you is called _____.
8. With hearing protection in your ears (in quiet situations), you will speak more softly because you will hear your own voice more easily through bone conduction. The term for this is called _____.
9. What is the appropriate care and maintenance of pre-formed earplugs?
 - a. place in carrying case after each use until the next workday
 - b. wash daily after use with warm, soapy water and allow to dry completely before re-use
 - c. wash each day after use with antiseptic cleaner and allow to dry completely before re-use
 - d. store on a top shelf away from pets and children in a cool, dry place
10. Characteristics of a good earplug fitting include
 - a. No difference in sound when cupped hands are placed over ears and removed
 - b. Majority or all of earplug is “not” visible when looking straight into mirror
 - c. Slight tension, or a vacuum effect is felt when pulling on the stem of the earplug
 - d. User perceives his/her voice as if talking in a barrel
 - e. All of the above

11. T or F Preformed earplugs must be medically fit by trained personnel.
12. Which is the best type of hearing protection?
 - a. pre-formed earplugs
 - b. hand formed earplugs
 - c. noise muffs
 - d. the one that the patient will wear consistently both on/off duty in hazardous noises
13. T or F Civilians in the Hearing Conservation Program are required to purchase hearing protection for their own personal use in noise hazardous areas.
14. What performance factor(s) need to be considered to ensure effective hearing protection?
 - a. with time and practice work environment sounds become recognizable through HPDs.
 - b. use of hearing protection is preferable to progressive, permanent hearing loss.
 - c. re-adjustment of hearing protection throughout the day may be necessary to maintain an effective fit.
 - d. all of the above
15. Advantage(s) of using ear canal caps include
 - a. cheapest of all HPDs for infrequent or intermittent use
 - b. has the highest NRR of all HPDs
 - c. most comfortable fit of all HPDs
 - d. best for intermittent use and modest noise environments
 - e. can be worn with earplugs
16. Advantage(s) of using noise muffs include
 - a. cheapest of all HPD's for infrequent or intermittent use
 - b. has the highest NRR of all HPDs
 - c. most comfortable of all HPDs
 - d. best for intermittent use and modest noise environments
 - e. can be worn with earplugs
17. Hearing protection should be worn
 - a. whenever the danger of noise hazard is present
 - b. by visitors to noise hazardous areas
 - c. when noise levels are ≥ 85 dBA or ≥ 140 dB
 - d. when noise hazard signs indicate that hearing protection is required
 - e. all of the above
18. When double hearing protection is worn, the second form of protection offers the following amount of protection from noise:
 - a. 14 dB
 - b. 10 dB
 - c. 20 dB
 - d. 5-6 dB
 - e. the NRR level for that hearing protector
19. T or F Administrative controls refer to time limitations that are set for people working in very high noise levels to limit exposure.

20. T or F Hand formed earplugs (“foamies”) typically fit 70% of the HCP population. The EAR Classic 30 (small) and EAR Classic 33 (large) are available for the other (30%).
21. T or F Half of the HCP population that choose earplugs can comfortably wear one of the three sizes of “foamies”. Quattro earplugs would be a good recommendation for those who find “foamies” uncomfortable to wear consistently.
22. The following devices can be used during weapon-fire without compromising hearing for soft sounds
- The Combat Arms Earplug
 - Quiet Pro (Tactical Communications Device)
 - C4OPS (Tactical Communications Device)
 - Dominator (Tactical Communications Device)
 - all of the above
23. T or F Custom hearing protection is available to all noise-exposed personnel from standard stock supplies.
24. The following is true about hearing protection and hearing performance:
- people with hearing loss have more difficulty understanding speech when wearing hearing protection.
 - people with normal hearing have improved speech discrimination when wearing hearing protection in noise
 - use of hearing protection in quiet areas causes reduced speech discrimination
 - all of the above
25. T or F Earplugs or noise muffs do not usually impair the communication ability of a person with normal hearing when worn in a noise-hazardous area.

HEARING CONSERVATION EDUCATION and MOTIVATION

Learning Objectives

1. List HCP Education/Training Instructions
2. Identify who requires initial and annual training
3. Identify training content requirements and command responsibilities
4. List activities to motivate and encourage behavior change for improving compliance
5. List education and training resources

The Goal of the Hearing Conservation Program

- **To prevent occupationally related noise-induced hearing loss.**
- **Continual education** of noise-exposed personnel is necessary in order to accomplish this goal.

Regulations / Instructions that provide direction and guidance on the requirements of the Hearing Conservation Program (HCP)

- DOD Instruction 6055.12
- Navy/Marine Corps
 - OPNAV Instruction 5100.23 series (shore)
 - OPNAV Instruction 5100.19 series (ship)
 - MCO 6260 series (Marines)
 - NEHC TM 6260.51.99-2 (Medical Dept HCP Procedures)
- Army
 - DA Pam 40-501
- Air Force
 - AFOSH AFI 48-20
- Local Instruction (Base/Post Order) - SOP

Education/Training: Who Needs It and How Often?

- **Shore Based** training and education: OPNAVINST 5100.23G
 - **Supervisors and HCP enrollees** must receive **initial and refresher** hearing conservation training.
 - “Refresher training can be given by local medical personnel at the time of the annual audiogram”, however, given the length of time needed to cover all aspects of the required training, this option is less than ideal. Training can be **augmented** by the OHC Tech during annual testing; however, it is the ultimate **responsibility** of each command.
- **Shipboard** training and education: OPNAVINST 5100.19E
 - The **medical department representative** (MDR) SHALL conduct **training for all hands** during **indoctrination**. This representative may be the medical corpsman trained as a OHC Technician.
 - The MDR SHALL ensure that **annual, refresher** training for the HCP-enrolled personnel is performed.
 - In conjunction with annual training, personnel often receive additional refresher training during **annual audiogram counseling**.

Initial Training Requirements

Initial training requirements per OPNAVINST 5100.19E and OPNAVINST 5100.23G require that the following topic areas be discussed with military and civilian personnel enrolled in the HCP .

- The **elements and rationale** for HCP
- The **effects of noise** on hearing
- Proper wearing and maintenance of **HPD**
- Command program & individual **responsibilities**
- **Individuals' responsibility** in protecting their own hearing
- How hearing loss **affects career** progression, retention, job performance & mission
- **Off duty practices** which will aid in protecting their hearing
- **Communication** in high-noise environments

Annual Training Requirements

- Generally, the **only difference** between initial and annual training is that initial training requires a discussion about the “**Elements and Rationale** of the Hearing Conservation Program”.
- Per DODI 6055.12, all personnel routinely working in designated hazardous noise areas shall receive annual training on the **nine (9) training elements** below.
 - The effects of noise on hearing.
 - The purpose of hearing protection.
 - The advantages, disadvantages, and attenuation of various hearing protectors.
 - Instructions on selection, fit, use, and care of hearing protectors.
 - Mandatory requirement of assigned protective equipment, and administrative actions that may follow for failure to wear.
 - The purpose of audiometric testing.
 - An explanation of the audiometric test procedures.
 - The fact that hearing loss may lead to disqualification from current duties.
 - All personnel shall be encouraged to use hearing protectors when exposed to hazardous noise during off-duty activities.
- OPNAVINST 5100.23G states that the “refresher training can be given by **local medical personnel at the time of the annual audiogram**”, however, given the length of time needed to cover all aspects of the required training, this option is less than ideal. Training can be **augmented** by the OHC Tech during annual testing, however, it is the ultimate **responsibility** of each command.

Shipboard Training and Education:

- **Who** provides it?
 - OPNAVINST 5100.19E - the [shipboard] medical department representative (MDR) shall conduct training for all hands during indoctrination.
 - The MDR shall ensure refresher (annual) training is provided for the HCP-enrolled personnel.
- **When** does it occur?
 - Initial and annual training sessions
 - Stand Downs
 - Counseling during hearing test results -- MDR/OHC Technician

Shore Based Training and Education:

- **Who** provides it?
 - Command Safety Officer has primary responsibility for providing initial and annual HCP training on shore.
 - The OHC technician is responsible for augmenting the refresher (annual) training during the counseling of hearing test results.
- **When** does it occur?
 - During initial and annual training sessions
 - Stand Downs
 - Counseling during hearing test results.

OHC Technician Contributions to Annual Training

- Specific contributions an OHC Technician makes during annual training “moments” regardless of working on ship or on shore.
 - Praise normal hearing -- no STS – or praise no further STS
 - Encourage consistent use of HPDs
 - Re-instruct proper insertion of earplugs. Don’t hesitate to take 30 seconds to demonstrate or ask the patient to demonstrate proper procedures.
 - Encourage awareness of noise levels and HPD use during home and recreational activities
 - use common sense when listening to personal listening devices: too loud if someone within two (3) feet of you can tell if device is playing or if everything around you is only visual, e.g. no auditory signals heard over or with the music means music too loud
 - do not use I-pods underneath earmuffs when needle gunning onboard ship or in the yards
- Role Play 60-90 second counseling with motivational remarks that you could use during hearing test results counseling. An example follows.
 - “We see no change from your reference hearing levels and your hearing is still within normal limits.
 - You are doing a great job protecting your hearing.
 - Remember the tip about putting in your foamies – IF you can look directly into a mirror or have a buddy look at you directly, you should NOT be able to see any color IF the foamies are in deeply enough
 - Don’t forget to think about noise outside of work. If you are in noise & talking to someone, remember the ARM or Three Foot Rule. If either one of you have to raise your voice to be heard, the noise is at the hazardous level and could be damaging your hearing. Think about using protection or adjusting what you are doing (duration/frequency). Examples include: Gas powered lawn equipment, NASCAR races, hunting, music events/clubs, weapons firing, construction, etc... “

**YOU MUST BE THE CHANGE YOU WANT
TO SEE IN THE WORLD. GANDHI**

Employee Motivation

Key: Behavior must change in order to improve hearing protection use

- **Ashore:** The OHC Technician motivates a patient through **attitude** of taking the hearing test seriously and enthusiastically explaining test results and answering questions.
 - Demonstrating **good patient care/customer service** in verifying referral appointments and any other “promise” made to a patient or command personnel who calls for information.
 - Use **positive reinforcement** whenever personnel has maintained hearing status and consistently used hearing protection.
- **Afloat and Rural Commands:** The OHC Technician may **assist the Safety Officer** or **unit supervisors** in more direct educational and motivational activities.
 - Promote discipline and responsibility. Report non-compliance. Disciplinary action should be used as a last resort for non-compliance.
 - Reinforce use of hearing protection in the presence of co-workers.
 - Provide positive feedback to those who consistently wear HPDs.
 - Work with personnel having difficulty using hearing protection
 - Encourage management and supervisors to lead by example and wear HPDs.
 - Within reason, allow personnel to choose the type of HPD they like best.
 - Develop healthy, creative competition within or between units on use of hearing protection with leadership involvement. Leaders may decide to have a reward system for units/personnel with the best compliance, such as a “trophy of the ear” or liberty time.
 - Working with regional audiologist, recognize units or work centers having the highest test compliance rates and lowest STS rates.
 - Use videos, posters and special speakers, i.e. hearing impaired people to talk to units.
- **Motivate with Enthusiasm**



**If YOU believe in the OHC program,
your efforts in educating others will prove successful**

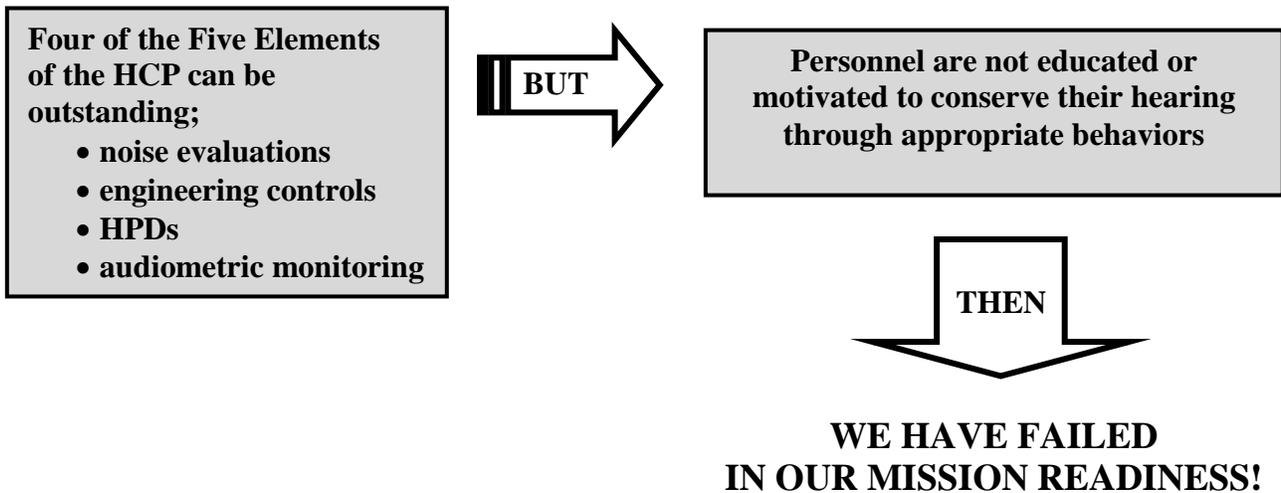
Documentation

- **Annual** hearing conservation training must be documented in the individual’s **medical record** when training is provided in conjunction with the annual audiogram. When printing DD 2216 audiogram, DOEHS requires “clicking” on whether annual training was provided. Local command may require other printed and signed HCP Annual Training documentation in the medical record.
- The **Safety Officer** of the supported command must also **maintain a roster** of personnel trained when they perform their annual HCP stand down training.
- Commands should **retain annual training records for 5 years**.

Educational Resources

- **Regional Occupational Audiologist** is your first resource for materials, ideas, and contacts. Education and training is a major area of their responsibility and expertise. They likely have brief power point slides they've developed and will share with you; but you need to ask!
- This **student workbook** and training PowerPoint slides; see the materials and resources list.
- Navy and Marine Corps Public Health Center (**NMCPHC**) **website** has many resources, including the training PowerPoint slides.
- **Internet sources** related to Safety, OSHA, audiology/medical sites, public consumer groups related to hearing health (Better Hearing and Speech), universities, hearing conservation and noise related businesses and organizations (E-A-R)
- **Guest speakers** with hearing loss – use local resources: active military and veterans who have hearing loss, industrial hygienists and safety specialists, physicians (ENT), musicians who have hearing loss, motorcyclists, hunters, etc.

Summary



STUDY GUIDE (HEARING CONSERVATION EDUCATION & MOTIVATION)

1. How often is hearing conservation education required for personnel in the HCP?
 - a. monthly
 - b. quarterly
 - c. semi-annually
 - d. annually

2. Who is responsible for providing annual refresher training?
 - a. the hearing conservation department providing monitoring audiometry
 - b. the command's safety department of noise-exposed personnel
 - c. the command's skipper
 - d. the regional industrial hygiene department
 - e. a and b

3. What are the four P's associated with a noise-induced hearing loss?
 - a. pain, patient, permanent, pathology
 - b. patent, performance, painful, progressive
 - c. pension, pentagon, penicillin, pentathlon
 - d. permanent, painless, preventable, progressive

4. What is the goal of the Hearing Conservation Program?
 - a. to oversee hearing loss compensation claims
 - b. to prevent occupationally related noise-induced hearing loss
 - c. to eliminate all noise hazards in the workplace
 - d. all of the above

5. What information must be presented during initial hearing conservation training?
 - a. overview of the HCP and role of the OHC technician
 - b. symptoms of a noise-induced hearing loss and quality of life issues
 - c. elements and rationale of the HCP; use, care and maintenance of HPDs; local command HCP and responsibilities; and off duty hearing health practices
 - d. goal of the HCP, role of the OHC tech, HCP differences between services

6. Who might you contact for assistance with preparing/presenting annual training?
 - a. regional occupational audiologist
 - b. HCP student workbook
 - c. occupational health clinic
 - d. internet sources (CDC, NMCPHC, etc.)
 - e. all of the above

7. List 4 things that might motivate personnel to comply with the HCP
 - a.
 - b.
 - c.
 - d.

8. What training documentation is required?
 - a. documentation of hearing conservation training in employee medical records and unit training rosters
 - b. rosters must be kept on file for 5 years
 - c. copy of rosters must be maintained by the unit safety officer
 - d. all of the above

9. What optional educational information can you present during annual training?
 - a. anatomy of the ear, where hearing loss occurs in the ear
 - b. symptoms of a noise-induced hearing loss
 - c. quality of life issues relating to permanent hearing loss
 - d. films, posters, pamphlets on hearing conservation
 - e. all of the above

10. Documented annual hearing conservation education is required for
 - a. all personnel in the HCP
 - b. all military personnel
 - c. all DOD civilians
 - d. b and c

11. Which of the following is NOT an effective way to educate and motivate patients after annual testing?
 - a. tell patient whether they passed or must return for follow up testing
 - b. orient patient to the audiogram before explaining his/her results
 - c. explain whether today's hearing levels are within normal hearing range
 - d. complement patient on maintaining hearing levels and reinforce consistent HPD use.
 - e. explain the comparison of today's hearing levels with the reference levels and whether there are significant changes
 - f. all of the above are effective

12. T or F The OHC Technician is expected to interact with patients professionally but due to the repetitive nature of hearing testing, he or she cannot affect patient motivation in any significant way.

RECORDKEEPING and PROGRAM EVALUATION

Learning Objectives

1. Explain the timelines for maintaining records for test equipment, noise surveys, and personnel in the HCP
2. Explain regulations related to OHC technician training and certification
3. Describe the STS reporting procedures for military and civilian personnel

Recordkeeping Is A Critical Responsibility

- Keeping certain records is required by **federal and state laws**.
- Specific records and recordkeeping procedures are required by **military instructions** and guidelines.
- Medical records are **medical-legal documents** and must uphold under scrutiny and be handled with care and confidentiality.
- Invalid or inaccurate data could result in the awarding of unjust **compensation claims**.

Keys To Effective Recordkeeping

- **Accuracy** of data: test results, date of test, patient demographic information, technician name and certification, and equipment (audiometer) information.
- **Thoroughness** of data: ALL information should be included, e.g. who, what, when, and disposition
- **Organization** of data: information must be easily found within the record and the record itself must be easily found when stored..
- **Legibility** of data: electronic records must have correct spelling and grammar; handwritten notations and signatures are still necessary and must be legible. NOTE: DOEHRS-HC does not automatically spell check!
- **Retrievability** of data: effective records must be accessible with reasonable ease electronically or physically
 - The DOEHRS-DR is a **web based data repository**; however, computers can still crash & data can still get corrupted.
 - Necessary for everyone to upload to the DR before any hearing data can be retrieved.
 - **Written medical records** must be available for reference because audiology testing sites still are too variable in their use of medical record software (both DOEHRS and patient encounter software).
- **Effective records are accurate, thorough, organized, legible, and are easily retrievable.** Accurate audiometric records and data entered into the microprocessor audiometer system are **critical** for good patient care and service.

HIPAA Overview

- HIPAA is the **Health Insurance Portability and Accountability Act** of 1996
- Ensures that medical information is kept **private and protected**. NOTE: **Auditory privacy** is not always possible in occupational hearing testing situations.
 - **Group testing situations** limit total privacy in discussing hearing concerns and test results
 - However, the OHC technician should **respect** any individual patient who **requests** communication privacy.
 - The HCP audiology testing area should have a **sign posted** that states that auditory privacy is not always possible.

- Sets **rules and limits** on who can look at and receive health information
- For detailed information, go to: <http://www.hhs.gov/ocr/hipaa/>

List of Records - Responsibility

- Instructions specify which types of **records** must be **maintained for five years** in the audiology test area.
 - Sound booth certification
 - Audiometer electroacoustic calibration
 - Daily biological calibration check DD Form 2217
 - Technician training certificates
 - Local copies of the DD Forms 2215 and 2216 for each employee for the duration of employment PLUS five (5) years in situations where DOEHRS-HC is not being used or uploading to the DR is not available

Sound Booth Certification

- Valid for **one year** – certified annually or whenever booth moved to different location
- Booths on **ships** must be certified both pier side AND underway
- **Documentation posted** on the booth where it is clearly visible
- Re-certified **annually** by Industrial Hygiene or Audiologist; OHC Technician cannot certify.
- Retain booth certifications for **5 years** in the test area.
- Booth certification guide posted on NMCPHC website.

Audiometer Electroacoustic Calibration

- Each audiometer and associated headset must have an electroacoustic calibration completed and recorded at least once a year (every 365 days). In other words, electroacoustic calibration is **valid for one year**.
- DOEHRS-HC software will begin to **notify the user** that the calibration due date is approaching 90 days in advance.
- Calibration must be completed by the Navy and Marine Corps Public Health Center (NMCPHC) Calibration Lab prior to that due date; DOEHRS-HC **will not operate after** that renewal date.
- A **calibration label** is placed on each audiometer to identify date of last calibration and due date for next calibration.
- Keep and maintain certificates of calibration for each audiometer with the equipment or in record files for **five (5) years**. Each certificate must include audiometer make, model and serial number.

Daily Biological Calibration Check DD Form 2217

- A daily biological calibration check will generate a **DD Form 2217** record.
- Must **be performed daily** and documented on a DD 2217. When using a microprocessor audiometer, the 2217 will be stored electronically and can be printed as needed.
- DOEHRS-HC software **will not operate** without recording a daily biological calibration check.
- An **individual DD 2217 form must be established** for each designated listener, whether human or electro-acoustic ear (Bio-Joe).



- A **new DD 2217 baseline** test must be established for each listener each time the audiometer is electro-acoustically calibrated (annually), moved to different location, or serviced/repaired.
- **Printed copies** of a complete month of 2217 records for each audiometer should be done at the end or beginning of each month. DOEHRS-HC will notify the user approximately 3 days before the last day of a month that a monthly print out of 2217s should be done.
- **Maintain** a record file or notebook of these monthly reports for **five (5) years** that is easily accessible in the test area. NOTE: These printed records are a review item during inspection of certifying agencies, i.e. ATG, INSERV, Joint Commission and MEDIG

Technician Training Certificates – Evidence of Technician Competence

- OHC Technician certification is **valid for five (5) years WITH annual proficiency evaluations** by your regional occupational audiologist (HCP Manager).
- Certificates (or copies) should be **posted** in the hearing test area clearly visible to patients.
- A **copy** of the certificate should be maintained in a **file or notebook** kept in the test area.
- Certification can be **renewed** after attending a one (1) day re-certification course and successfully passing a written exam.
- **Retain certificates** in clinic files for **5 years**.

Organization of Hearing Tests within Medical Records

- **Audiograms** should **never be removed** from a patient’s medical record. If the information on an audiogram is invalid, or a reference audiogram is superseded by a new one after the follow-up process, draw a diagonal line across the form and write “see revised reference audiogram dated ___”, as applicable.
- The medical record is organized with “Preventive Medicine and Occupational Health” Information filed on the **left** (Part 1). The most current **DD 2215** should be filed **on top**, followed by older/invalidated DD 2215’s. Beneath these are DD 2216s ordered with the most recent on top.

Other Records and Data Management Related to HCP

The OHC Technician is not directly responsible for these records but needs to know about them and how to access them. Details are presented in sections below.

- **Noise survey** data are kept for 40 years by Industrial Hygiene department and command.
- **Rosters of personnel** exposed to hazardous noise and enrolled in HCP.
- **Summaries and attendance rosters** of hearing conservation education and training activities
- **Lists of hearing injuries** of patients with verified PTS; data are stored in DOEHRS-HC.

Noise Survey Data

- Results of noise surveys are completed on a **DD Form 2214**.
- Documentation of individual noise exposure measurements must be **permanently retained** in the individual’s medical record. The DOEHRS-IH (Industrial Hygiene) software or the IH office stores data and documentation about individual employees and their history of noise exposure. This documentation includes **time weighted average (TWA)** exposure to noise data collected on the individual, typically through dosimeter measurements.
- Noise surveys must be retained by the Industrial Hygienist (or IH department) and the Command for **duration of employment plus forty (40) years**.
- If the OHC technician needs noise survey data for individual workers or work units, he or she can contact the Industrial Hygiene department or Safety officer assigned to that work area or command.

HCP Enrollment Rosters of Noise-Exposed Personnel

- Per the IH survey recommendations, command safety creates the HCP Roster, identifying all personnel who are **routinely exposed** (roughly 2 days/month or 16 hrs/month) to hazardous noise. An individual worker with a measured TWA \geq 85dBA must be enrolled in the HCP. If an IH survey has not been completed, then all workers exposed to potentially hazardous noises will be included until an IH survey is completed.
- **Ashore, Safety Officers** organize the enrollment rosters, ensure workers show up for annual hearing tests and provide number of individuals enrolled on the HCP to those personnel responsible for medical surveillance and health education.
- **Afloat, the Division Officer (DIVO)** has the responsibility for ensuring HCP personnel obtain hearing tests.
- **Command Safety** must provide (semi-annually) the total number of personnel enrolled in the HCP to the **MTF** responsible for providing surveillance/testing. Feedback from medical (memo, roster of workers tested) must be returned to the sponsoring unit's Safety Officer or DIVO; indicating workers who passed and workers who need for follow-up testing.
- The command must maintain these rosters for **five (5) years**.

Annual Hearing Conservation Training Education

- Records of in-service training provided to noise-exposed personnel (sign-in logs) should be kept for a **minimum of five years** by the unit's command (occasionally by the medical unit).
- Training provided in conjunction with annual monitoring must be **documented in the health record** by the OHC Technician. It is critical that the OHC Technician recognizes that the brief time spent counseling patients about their test results and correct use of HPDs may be the **only annual training** they receive in hearing conservation.

Patients with Significant Threshold Shifts (STS) and Permanent Threshold Shifts (PTS).

- Recordkeeping for **patients with an STS & PTS** involves the OHC Technician and Occupational Health professionals – the audiologist or medical staff.
- The **OHC Technician is responsible** for the following:
 - Typing appropriate **remarks** on the patient **DD Form 2216**. DOEHRs-HC software generates a remarks entry after each test that reveals STS on the 2216 audiogram.
 - Obtaining **patient's signature** on the DD Form 2216 to indicate that the patient acknowledges decreased hearing (positive STS) and the need for follow-up testing.
 - Placing the audiogram in the proper order inside the patient's permanent **medical record**.
- An STS must be verified as a **Permanent Threshold Shift (PTS)** by an Audiologist or Occupational Physician, who is responsible for sending a **letter, memo or e-mail** to the patient & his/her supervisor notifying them of the hearing injury.
 - The Navy Safety Center or OSHA shall be notified within **twenty-one (21) days of the documented PTS**.
 - Military hearing injuries (PTSs) must be communicated to the **Navy Safety Center via WESS-II system**. Civilian PTSs that meet OSHA recordable criteria must be communicated on **an OSHA-300 log via WESS-II system to OSHA**.

- **OSHA Regulations**

- An OSHA **Recordable PTS** must meet four criteria. The hearing loss must be permanent, occupationally related, must have a positive STS present (average shift of ≥ 10 dB at 2000, 3000, and 4000 Hz in either ear), and the hearing thresholds must show an average of ≥ 25 dB at 2000, 3000 and 4000 Hz for the shifted ear. If the **average** threshold less than 25 dB, it is not recordable because hearing is still considered to be within normal limits.
- Once a patient has sustained one OSHA recordable PTS, **any PTS they incur** after that will also be recordable, as it will already have met ≥ 25 dB average threshold at 2000-4000 Hz.
- The PTS must also be **consistent with occupational noise exposure** to warrant inclusion on the OSHA-300 Log (not due to a conductive hearing problem).
- OSHA requires that all personnel who sustain a PTS, (after follow-up testing and confirmation by an Audiologist or Occupational Physician), must receive **written notification of this “injury” within 21 days**. This may be accomplished immediately when test results indicate an STS (after the 2nd follow-up test), or following a diagnostic test battery by an Audiologist confirming the STS.
- Consult with the local Audiologist or Occupational Medicine Physician to determine the **protocol for PTS reporting** and whether the OHC Technician has a responsibility in the process.
- Supervisors of personnel demonstrating STS must also be notified in writing within 21 days to ensure the worker receives closer surveillance for compliance with personal protective equipment. Lists of hearing injuries must be **maintained for five (5) years**

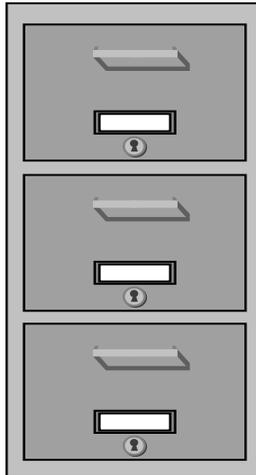
Evaluation of Hearing Conservation Program Effectiveness

- Good compliance with all parts of the HCP still does not necessarily keep employees from losing their hearing. It is not enough to go through the motions; effectiveness of the program must continually be evaluated to determine where and how improvements can be made.
- Occupational Audiologists prepare **periodic reports** (at least annually) on the **effectiveness of the HCP**, communicating these metrics with the commands within their AOR.
- Major **data analysis metrics** include compliance, STS rate, TTS rate, and PTS rate.
 - **Compliance** = the number who reported for annual testing divided by the number enrolled in the HCP
 - **STS rate** = the number with positive STS (decreased hearing) on the annual audiogram divided by the number who received an annual test
 - **TTS rate** = the number of STS’s that resolved during follow-up testing
 - **PTS rate** = the number of personnel with deteriorated hearing whose baseline (DD2215) was revised/re-established, divided by the number who received an annual test
- Additional metrics may include a computerized **trend analysis**, or number of workers with compensable hearing loss, etc.
- Audiologists use these data analysis metrics and consultations with other HCP team professionals and command personnel **to improve efforts** toward meeting the HCP goals (prevention of hearing injuries and ensuring mission readiness).

Audiology Workload Reporting

Workload refers to recording **patient encounters**: who, what for, when, results, disposition.

- The Hearing Conservation **MEPRS Code is FBN_**. The last character is determined by the command/work site. Specific protocol for reporting workload may vary between commands. However, all audiometric testing for hearing conservation purposes, as well as any other work involving hearing conservation (HPD fitting, HCP education/training, Diagnostic testing by Audiologist) should be recorded under this code.
- Utilization of **CHCS** (Composite Health Care System) and **AHLTA** (Armed Forces Health Longitudinal Technology Application) allow much information to be captured electronically related to patients seen, clinic site, provider (OHC Tech), type of appointment/hearing test, symptoms, test procedures, disposition, etc.
- **DOEHRS-HC** also readily captures daily workload information, such as individual patient, type of hearing test, and UIC. End of Day report in DOEHRs-HC can be printed and used to quickly complete AHLTA encounters.
- OHC Technicians are responsible for recording their **daily** patient encounter information according to command SOP to determine workload and staffing needs and requirements.



THE KEYS TO RECORDKEEPING

Accuracy, Thoroughness, Organization, Legibility, and Retrievability

STUDY GUIDE (RECORDKEEPING & HC PROGRAM EVALUATION)

1. Match the following forms to their appropriate uses:
 - a. DD Form 2217
 - b. DD Form 2215
 - c. DD Form 2216
 - d. DD Form 2214
 1. Results of noise hazard surveys
 2. Results of reference audiogram testing
 3. Biological calibration check results
 4. Results of annual hearing test or 5100/18

2. T or F DD2215/2216 Forms are subject to the Privacy Act and must be handled appropriately in accordance with HIPAA.

3. The following documentation must be kept locally for 5 years:
 - a. biologic calibration records
 - b. audiometer electro-acoustic calibration records
 - c. audiometric test booth certifications
 - d. annual hearing conservation education rosters
 - e. all of the above

4. Hearing conservation forms (DD 2215/2216) are electronically exported to
 - a. center for health promotion and preventive medicine
 - b. your commanding officer
 - c. navy environmental health center
 - d. the DOD hearing conservation data repository

5. Which of the following documents must be posted in plain view of the patients and for inspection purposes?
 - a. audiometric test booth certification
 - b. technician training certificates
 - c. noise survey results
 - d. hearing conservation education documents
 - e. a and b

6. T or F A DD Form 2217 must be established on all potential listeners, both human and Electro-acoustic Ear, and they must be re-established annually immediately after the audiometer has been electro-acoustically calibrated.

7. T or F The OHC Technician certification is valid for five (5) years with annual evaluations by your regional occupational audiologist (HCP Manager).

8. The following is valid for one year:
- audiometer electro-acoustic calibration
 - technician training certificates
 - hearing test booth certification
 - a and c
9. Match the following task to those responsible for performing them.
- | | |
|---|--|
| a. Audiometer electroacoustic calibration | 1. Certified HC technician |
| b. Hearing test booth certification | 2. NMCPHC/MERC/Med Maint |
| c. Noise surveys | 3. Industrial Hygienist |
| d. Biologic calibration check | 4. Industrial Hygienist or Audiologist |
| e. Functional listening check | |
10. T or F Forms utilized in the military's hearing conservation program will never be used outside of this purpose; therefore, absolute data accuracy is not critical.
11. If the annual audiogram shows a PTS relative to the baseline, OSHA requires that the employee be notified in writing within ____ days of this determination.
- 21 days
 - 30 days
 - 45 days
 - 180 days

REGULATIONS and COMPENSATION

Learning Objectives

1. Recognize the federal legislation and agencies regulating hearing conservation
2. Identify the regulations that contain HCP instructions for DoD employees
3. Name who to notify for hearing injuries (PTS) for military and civilian personnel
4. Locate the website resources for military regulations and instructions for HCP
5. Discuss general concepts related to compensation awards

Federal Legislation

- **Title 29, Code of Federal Regulations, Section 1910.95, Occupational Noise Exposure (April 1983)** is known as the Occupational Noise Exposure Law.
 - This legislation contains the **Occupational Safety and Health Administration (OSHA)** regulation regarding hearing conservation. OSHA regulates and monitors **hearing conservation for business and industry**. It directs that all programs must:
 - **Limit** noise exposure when levels are ≥ 85 dBA
 - **Monitor** hearing of those exposed to noise ≥ 85 dBA
 - Provide **hearing protection** for those exposed ≥ 90 dBA, or ≥ 85 dBA if an STS has been documented
 - Hearing conservation programs must **meet or exceed** these guidelines (minimum).
- **Title 29, Code of Federal Regulations, Part 1904, Occupational Injury and Illness Recording and Reporting Requirements (July 2002)**; mandatory effective 01 Jan 2004
 - This law was added in 2004 to mandate **requirements for recording and reporting** hearing loss to OSHA for **civilians** enrolled in a hearing conservation program.
 - Specifies that every worker with PTS results based on average loss of > 25 dB at 2000, 3000, and 4000 Hz should be reported on an OSHA 300 Log (for civilians in the HCP). Stated another way, average HL @ 2, 3 & 4kHz equals or exceeds 30dBHL in the same ear as the PTS.

OSHA vs. DoD Military Regulations

- **DoD regulations** are based on federal OSHA law but **are more stringent** due to longer work/exposure hours and more extreme noise levels. However, **combat** operations are exempt from meeting these guidelines.
- Some **similarities** between OSHA and DoD regulations include definition of STS, HCP action noise level of ≥ 85 dBA, hearing conservation education and training requirements, and posting requirements of hazardous noise signs
- Some **differences** between OSHA and DoD regulations include certification of OHC technicians (DoD yes), decibel allowances for biologic calibration of audiometers (DoD require smaller), using age correction factor for determining STS (DoD none), and allowing the use of HPDs to equal a 14 hour auditory rest period before hearing testing (DoD none)

- **DoDI 6055.12, DoD Hearing Conservation Program**
 - Department of Defense (DoD) instruction that **implements hearing conservation** goals and procedures. It applies to tri-service secretariat level.
 - DoD **policy/goal** is to protect all DoD personnel from hearing loss resulting from occupational noise exposure through continuing, effective, and comprehensive Hearing Conservation Programs (HCP).
 - Mandates that each service **meets or exceeds** DoD general (minimal) guidelines and **develops service-specific regulations** for a comprehensive HCP.
 - Applies to all military and civilian personnel and operations worldwide.

DoD Mandate: Instructions of Each Service Branch Must Discuss Procedures to Achieve HCP Elements

- Overview of the HCP and its five elements
- Responsibilities of those involved in implementation of the HCP
- Fitness for duty issues
- Forms and processes involved in hearing conservation
- Evaluation of statistics on the effectiveness of hearing conservation programs

Specific Regulations of Military Service Branches

- **Army – Hearing Conservation Regulation – DA PAM 40-501**
 - Specific to soldiers and civilian employees on **Army installations**
 - Includes requirements, responsibilities, hearing loss reporting criteria
 - All **active duty personnel** are now enrolled in the Army’s Hearing Program. **Civilians** are enrolled in the HCP depending on Industrial Hygienist recommendations.
 - **Major differences** with other military service HCPs: command hierarchy and titles, Fitness for Duty ratings
 - **Major similarities** with other military service HCPs: procedures and protocols, forms used.
 - Army Hearing Conservation Program **Manager** is located at the United States Army Public Health Command (USAPHC), Aberdeen Proving Ground, MD.
- **Air Force Hearing Conservation Regulation – AFOSH Standard 48-20**
 - Specific to airmen and civilian employees on **Air Force installations**
 - **Major differences** with other military service HCPs: command hierarchy and titles, Fitness for Duty ratings, and forms used.
 - **Major similarities** with other military service HCPs: requirements of enrollment in HCP, procedures and protocols
 - Air Force Hearing Conservation Program Headquarters is located at the USAF’s School of Aerospace Medicine, Wright-Patterson AFB in Dayton, OH.
- **Marine Corp Hearing Conservation Program – MCO 6260.1 series**
 - Specific to marines and civilian employees on Marine Corp training installations
 - **Similar** to Navy’s NAVOSH Ashore instructions with some **significant differences**
 - **All marines are enrolled** in HCP regardless of daily noise exposure or MOS
 - **Double protection** requirement at 100 dB Peak
 - HCP manager is located in the Safety Division, Washington, DC
 - Navy medical services perform all hearing monitoring and evaluation responsibilities as well as some educational training activities

- **Navy Hearing Conservation Program** – two instructions and one technical manual
 - **OPNAVINST 5100.23 series, Chapter 18**
 - Also known as **NAVOSH ASHORE**
 - Includes all aspects of occupational health and safety in Navy workplaces; factors in both active duty and civilian personnel since both will work on shore facilities.
 - **Chapter 18** establishes and describes the Navy **HCP** elements and procedures for on-shore installations
 - **OPNAVINST 5100.19 series, Chapter B4**
 - Also known as **NAVOSH AFLOAT**
 - Includes **all aspects** of occupational health and safety for the Fleet; factors in only active duty personnel since civilians normally will not deploy.
 - **Chapter B4** covers information on the Hearing Conservation Program on ships.
 - Not significantly different from 5100.23.
 - Navy Hearing Conservation Program **Manager** is located at the Navy and Marine Corps Public Health Center (NMCPHC) in Portsmouth, VA
 - **NMCPHC Technical Manual, TM 6260.51.99 series-2 (Sept 2008)**
 - Navy and Marine Corps Public Health Center technical manual covers all public health issues, including occupational audiology and hearing conservation.
 - Provides guidance and clarification on instructions, clinical case management, training, personal hearing protection, record keeping, and many other areas of Medical Department responsibility.
 - Available on the NMCPHC website
 - **Local Command Regulations**
 - May have **local policies** to implement the HCP that are specific to that installation or military environment.
 - Installation Supplemental Regulations or the **Standard Operating Procedure (SOP)** will include these specific policies, instructions, and procedures, i.e. referral procedures, one-station vs. multi-station hearing testing, population needs (ships only, marines only, tri-service testing, OHC technician and HCP training requirements).
 - Occupational Audiology testing sites and facilities are typically **housed** in military treatment facilities (MTF).

OHC Technician's Concern With Regulations

- Knowledge of regulations assists you in performing **job responsibilities**.
- Regulations provide a **reference** for HCP general information, procedures, protocols certification requirements
- Technicians are required to **keep copies accessible (e-copies sufficient)** in testing area to be used as references for visiting command personnel, inspection team, and technicians themselves.
- **Counseling tip** for HCP patients: citing regulations for a particular military service may increase motivation & compliance.



DISABILITY and COMPENSATION -- HEARING and TINNITUS

- Hearing loss and tinnitus are currently the **top two reasons** for disability claims and highest category of compensation costs according to the 2010 Annual Benefits Report by the Department of Veterans Affairs Veterans Benefits Administration.
- **Reasons why** hearing loss and tinnitus are top disabilities
 - Young workforce who is exposed to multiple work sites, many of which are noisy.
 - Service members are paid to be combat ready whether they are ever in combat or not
 - Mission readiness and combat involves shooting, explosions and other war activities so the tools of the trade are inherently noisy
 - US military's heavy involvement in combat situations in recent years
 - Compensation awards to veterans are lifetime awards and can be modified/increased with age so overall growth in costs is exponential
- In addition to compensation costs, there are **other hearing related costs**, e.g., physical exams, hearing aids and batteries, hearing aid repairs and accessories, assistive listening devices and cochlear implants, adjudication and appeals, etc.
- Major facts about determining disability, particularly hearing and tinnitus, and compensation awards for military and civilian personnel are summarized in the table below.

Major Facts in Determining Disability and Compensation Awards

MILITARY PERSONNEL	CIVILIAN PERSONNEL
Amounts determined by Veteran's Administration (VA)	Amounts determined by Office of Worker's Compensation Programs (OWCP)
Lifetime award – percent hearing loss is percentage of monthly salary for life	One-time award – additional if condition aggravated during employment
Payments often in form of tax exemption on retirement pay	Prohibits collecting from multiple employers for same loss concurrently (VA plus OWCP)
Medical Board determines disability & award or disability claim filed with VA upon termination of service	Professional review of each claim by professional provider, i.e. physician, audiologist, etc
	Awarded only for work related noise exposure (≥ 85 dBA TWA)
Disability rating determined to establish degree of handicap.	Awarded only for noise-induced hearing loss (no other etiology)
Multiple health conditions yield cumulative percentage of disability	Awarded only for portion of loss incurred during federal employment
Factors considered: hearing thresholds for 1000, 2000, 3000, and 4000 Hz, speech understanding scores, salary, age, medical board findings	Factors considered: hearing thresholds for 500, 1000, 2000, & 3000 Hz, monaural or binaural loss, salary, dependents

(Discussion of slides with data related to hearing related costs as reported by the VAMC in 2010. This information is NOT in your student work book because of its time-linked details. However, these costs clearly demonstrate the importance of hearing conservation.)

Only Solution is Conserve Hearing and Prevent Rising Costs

- Tax dollars are limited so government decision makers and DoD have to address multiple needs in the **Operational Budgets** that are in conflict. For example, the need for increasing veteran benefits may affect dollars available for military ships, tanks, planes, hospitals, bases, and personnel salaries.
- Critical for OHC Technician and Audiologist to assist in **preventing** hearing injuries and **conserving** hearing through an efficient and effective HCP
 - Accurate hearing testing with accurate patient demographic data input
 - Conscientious follow-up of STS results and referrals
 - Careful fitting and re-fitting of HPDs coupled with effective instruction in use and care
 - Effective counseling about current hearing status that encourages the individual worker/patient to have good hearing health behaviors on and off the job.
 - Meaningful hearing health education that is realistic and motivational.
 - Enforced HPD use by supervisors, safety officers, command officers
 - Successful HCP management through analysis of statistical data about STSs and PTSs

SUMMARY: Decreasing Compensation Costs graphic

STUDY GUIDE (REGULATIONS & COMPENSATION)

1. For which population is the compensation award considered a lifetime award?
 - a. military veterans
 - b. civilian workers
 - c. all DOD employees
 - d. all of the above

2. According to the Federal Regulation (Title 29 CFR, Section 1910.95, Occupational Noise Exposure), all hearing conservation programs must
 - a. eliminate or reduce the noise level to below hazardous levels
 - b. limit noise exposure
 - c. monitor hearing
 - d. b and c
 - e. all of the above

3. What procedure might decrease hearing loss compensation costs?
 - a. enforce the wearing of HPDs in noise
 - b. perform annual audiometric monitoring to identify changes in hearing early
 - c. health education on noise-induced hearing loss, including noisy recreation activities
 - d. effective engineering controls and noise abatement programs
 - e. all of the above

4. T or F All of the requirements for the Navy, Army and Air Force Hearing Conservation Programs are identical.

5. Compensation is determined by (which office or organization) _____ for civilian workers and by _____ for military veterans.

6. T or F DoD Instructions apply to all DoD military and civilian personnel and operations worldwide.

7. Which of the following mandate requires minimum guidelines to be established for limiting noise exposure and to monitor hearing?
 - a. Title 29 CFR, Section S 1910.95
 - b. DODI 6055.12
 - c. DA PAM 40-501
 - d. AFOSH 161-20/AFI 48-20
 - e. OPNAVINST 5100.23
 - f. MCO 6260.1

8. T or F Title 29, CFR Part 1904 Occupational Injury and Illness is a federal regulation mandating that a (verified) STS must be recorded in the medical record and reported to OSHA (civilians) or Command Safety (military).

9. T or F Back Injuries and Carpel Tunnel Syndrome are the top two disabilities that Veterans report for compensation?

10. In which of the following circumstances should civilian hearing loss compensation be denied?
- hearing loss is not noise-induced
 - hearing loss is due to recreational activities
 - individual is not exposed to hazardous noise at work
 - all of the above
11. Which of the below applies to a specific installation or environment?
- DODI 6055.12
 - DA PAM 40-501
 - MCO 6260.1
 - Local Regulation / SOP
 - Federal Legislation
12. What are the 4 Navy/Marine Corps Occupational Health/Hearing Conservation Instructions?
- -
 -
 -
13. Which regulation/instruction covers hearing conservation for the Army?
- Title 29 CFR, Section S 1910.95
 - DODI 6055.12
 - DA PAM 40-501
 - AFOSH 161-20/AFI 48-20
 - OPNAVINST 5100.23
 - MCO 6260.1
14. Which instruction covers occupational safety and health for the Marine Corps?
- NEHC Technical Manual, TM 6260.51.99
 - MCO 6260.1
 - OPNAV INST 5100.23
 - OPNAV INST 5100.19
 - AR 40-501
 - AFOSH 161-20/ AFI 48-20
15. T or F Prior to patients receiving a reference audiogram, s/he must wear hearing protection during the 14 hours before the test.

THE OCCUPATIONAL HEARING CONSERVATION TECHNICIAN: ROLE AND RESPONSIBILITIES

Learning Objectives

1. Identify the role of the OHC Technician as a team member of the HCP
2. Describe the responsibilities of the OHC Technician
3. Describe the limitations of the OHC Technician duties

OHC Technician Attributes

- **Technical competence** and willingness to upgrade skills when necessary.
- **Passion for hearing conservation** & preventing injuries due to hazardous noise exposure.
- **Practical knowledge** that can be confidently communicated to personnel to motivate them to preserve their hearing.
- **DOES NOT have expertise** in acoustics, audiology, noise control, and/or anatomy and physiology of the auditory system.

Critical Role in the HCP

- In order to achieve the goal of the OHCP -- to ensure auditory fitness for duty & to prevent occupationally related hearing loss – OHC technicians are needed to perform **accurate air conduction hearing tests and counsel** personnel about hearing status & how to protect it.
- Purpose of providing annual audiogram tests is to **monitor personnel enrolled in the HCP** so their hearing does not degrade with time and exposure to noise.
- These monitoring tests should be performed only on **active duty and civilian employees routinely exposed** to hazardous noise as defined by an Industrial Hygienist.
- In addition, the OHC technician promotes hearing health awareness by administering **Non-HCP hearing tests**. These “courtesy” audiograms are completed for medical and work requirements, i.e., “pre-hire” employees, PHAs, non-HCP flight physicals, non HCP fork lift physicals, 2-3 year occupational screenings (truck driver physicals).
- OHC Technicians are seen as the **“FACE” of the HCP** because the technician . . .
 - sees personnel first,
 - fits HPDs,
 - educates and motivates personnel during their routine tests to conserve their hearing by using HPDs properly, answers their questions and refers to the appropriate professional.
- Occupational Audiologists see less than five (5%) percent of these employees for full audiology evaluations (referrals). The majority of Navy employees never see an audiologist except during a training session (Stand Down).

Technician Responsibilities – details following

- Certification
- Equipment
- Administer Pure Tone Air Conduction Audiometric (Hearing) Tests
- Follow Up Care
- Fit Hearing Protection Devices
- Provide Hearing Conservation Education and Motivation
- Complete Required Recordkeeping and Data Management Tasks
- Professional Behavior and Ethics

Certification as OHC Technician

- Certification must be current. **Certification must be renewed every five years** in order to maintain status as an Occupational Hearing Conservationist
- **Annual proficiency review** of professional skills and work habits by an OHC audiologist must be positive.
- **Re-certification** requires attendance at a re-certification course (minimum of 8 hours) with successful completion of an examination.
- **Know regulations** and instructions regarding HCP.

Equipment

- **Annual calibration of audiometer** must be scheduled with and completed by the NMCPHC Calibration Lab.
- **Annual certification of the sound booth** must be scheduled with and completed by an Industrial Hygienist, trained Industrial Hygiene Technician or Audiologist.
- **Daily perform a Functional Listening Check/Visual Inspection and a Biological Calibration Check** of audiometer prior to using the equipment.
- Documentation of daily biologic calibration checks requires use of **DD Form 2217**; data is stored in DOEHRs-HC.
- Monthly, the DD Form 2217s should be **printed and stored** in a binder/file in the test area for 5 years (Joint Commission Inspection Item).
- Use basic working knowledge of equipment to **troubleshoot** problems when audiometer fails daily calibration, functional listening checks and/or visual inspection reveals malfunctions.

Administer Pure Tone Air Conduction Audiometric (Hearing) Tests

- Hearing threshold levels are recorded or plotted on a chart called an **audiogram**. DOD uses **DD 2215, DD 2216 and Non-HCP audiogram forms** that record threshold levels in “boxes”. Audiologists record thresholds using symbols on a graph “audiogram”.
- **Determine reason and type of hearing test needed:** reference audiogram (DD Form 2215), annual monitoring (DD Form 2216) for all HCP personnel, or Non-HCP audiogram.
- A **Reference audiogram DD 2215** is used for all military personnel and usually obtained at basic training. It is also required for all civilians prior to employment in a hazardous noise environment. A DD 2215 will be re-established after an STS is found to be permanent.
- An **Annual audiogram DD 2216** is used for periodic or annual testing of personnel enrolled in the HCP, pre/post deployment, termination of HCP enrollment, and retirement or separation from active duty.
- A **Non-HCP audiogram** is used for personnel not enrolled in the HCP. It can be used for periodic physicals for general health, commissioning, overseas screening, pre-hire employment screening or special skill licensing.
- **Follow-Up Test 1 and/or 2** are administered when an annual audiogram (DD 2216) indicates a **Significant Threshold Shift (STS)**. Make appropriate decision about **re-establishing Reference/Baseline audiogram (DD 2215)** per local SOP, or refer to occupational audiologist or physician as appropriate.
- Ensure test procedures and monitoring of responses result in thresholds that are as **accurate and valid** as possible under test and patient conditions.
- Enter **accurate demographic** data into testing software (DOEHRs-HC) for each patient. The patient **medical record should be checked** for verification of previous audiograms

- Conduct **otoscopy and tympanometry** for follow-up testing and during referral procedures. Check local SOP for protocol.

Follow-Up Care

- **Referrals**
 - Refer to **Medical Officer** if medical condition is apparent (draining ear, pain, head cold, sinus problem).
 - Refer to Occupational **Audiologist** if patient sustains an STS after follow-up testing, does not meet baseline criteria, or complains of hearing problems or problematic tinnitus.
- **Counseling Patients**
 - Explain **how to read the audiogram**, what the frequencies and thresholds mean. It is NOT appropriate or professional to only tell the patient “You Passed” and dismiss him/her.
 - Educate patients on **what is normal hearing** and what is considered a **hearing loss**.
 - Explain what a **Significant Threshold Shift (STS)** is.
 - Explain reasoning behind **follow-up testing** if there is an STS (TTS versus PTS).
 - **Temporary Threshold Shift (TTS)** – An STS detected during monitoring audiometry that resolves after a period of auditory rest
 - Usually bilateral
 - Often accompanied by tinnitus
 - Usually recovers in hours to days
 - **Permanent Threshold Shift (PTS)** - A significant threshold shift that does not resolve after auditory rest
 - Usually bilateral
 - Often accompanied by tinnitus
 - Greater loss in high frequencies (4000 Hz usually affected first, known as “noise notch”)
 - PTS is typically not noticed until communication is compromised
 - Communication problems noticed in background noise environments

Fit Hearing Protection Devices

- All noise-exposed personnel are required to be provided hearing protection that is appropriate for the work setting and purchased by the individual’s unit/shop/command.
- For patients who sustain a positive STS, **re-fit & re-educate** on proper **wear and maintenance** of HPDs. Technicians should be comfortable in demonstrating and requesting patient to **demonstrate correct insertion** of hand-formed or pre-formed earplugs.
- Instruct that simply wearing HPDs will not prevent hearing loss. HPDs must be worn **consistently**, both **on/off duty** and most importantly, as **deeply as comfortably possible in the ear canals**.
- **Document** on the current DD2215/2216 hearing test the **size & type of earplugs** fit for each ear (use section on demographic form).

Provide Hearing Conservation Education and Motivation

- Annual refresher training can be **tailored to the individual** in conjunction with results of the annual audiogram.
- OHC Technicians may provide HC education & motivation in **other situations** other than during patient counseling & referral procedures. They **may assist** with initial & annual HC education & motivation activities, particularly when deployed on ships or in remote areas.
- Be aware of **opportune “moments” to positively reinforce** HPD use, showing up for hearing test & any follow-up tests.

- OHC Technician is typically the POC for the HCP. The technician is responsible for **answering questions** within his or her scope of knowledge and experience and should know **when to refer** questions/concerns to an Audiologist and/or Industrial Hygienist.

Complete Required Recordkeeping and Data Management Tasks

- Recordkeeping and data management includes both physical paper records, electronic records in DOEHRS and patient encounter databases.
- Regulations concerning **privacy of patient health information** should be stringently followed.
- All **input of patient data** into DOEHRS should be as **accurate and valid** as possible.
- **Document all tests** administered and their results, referrals, and educational activities in all required record systems (physical medical record, DOEHRS, electronic patient database such as AHLTA).
- Samples of **clinical forms** used in everyday practice (i.e. patient demographic form) and audiometric calibration records (DD Form 2217) require **organized storage** in test area.
- Copies of DoD and branch service **instructions** need to be easily assessable and organized, as well as **local command SOP** for the hearing conservation program (can be stored on PC).
- The OHC Technician provides assistance, when requested, with monitoring the **effectiveness of and compliance with the HCP**.
- OHC Technicians may be requested to report observations of compliance and other events related to the HCP.

Maintain Professional Behavior and Ethics

- OHC Technicians are responsible for conducting their duties with a **professional attitude and professional behavior**.
- Diligence concerning **patient rights, privacy (HIPAA)**, and **satisfaction** should be practiced always. Be sensitive to patient needs and requests for auditory privacy regardless of group testing situations.
- Always **treat each patient as an individual**. It is very easy to become “robotic” or “sing-song” in delivering the same instructions and explanations of test results again and again. Repetitive nature of technician’s work can result in what may appear as an uncaring attitude to the individual patient. It may be his or her first hearing test (particularly for civilian personnel).
- OHC Technician is not only the daily representative of HCP to employees but also in medical clinics and work sites. All **interaction with clinical staff** and other HCP team members should be as professional as possible.
- Maintain high professional **standards**
 - Remember **integrity** is what you do when no one is watching
 - Follow established **instructions & procedures**.
- Develop & maintain good professional work habits
 - Punctuality, dependability, flexibility
 - Neat appearance with appropriate uniform or civilian dress
 - Use of appropriate language for the professional work place
 - Consideration of fellow workers
 - Clean orderly work area.
- **Change is inevitable!** OHC Techs must stay up to date with changes in regulations, computer software, & local SOP.

Limitations of OHC Technicians Role and Responsibilities

OHC Technicians **CANNOT...**

- Conduct any audiometric **testing other than** air conduction audiometry and screening tympanometry
- **Professionally interpret audiograms** in terms of what type of hearing loss, specific cause of hearing loss, and recommendations or critique of treatment. **Diagnose** hearing disorders or ear disease. Use caution when performing/interpreting otostomy and tympanometry. Although you can make general statements of whether there is an indication of outer/middle ear problems (pathology), working as an OHC technician you do not have the authority or enough assessment data to diagnose hearing disorders. Regardless of your medical knowledge, be careful not to diagnosis a specific ear disorder but refer to a Medical Officer or Occupational Audiologist.
- Assume the role of a **professional supervisor** of audiometric monitoring, i.e. audiologist, who verifies a patient's STS and performs other tasks/activities related to monitoring a patient's hearing and communication abilities.
- Assume the role of an **instructor** of other OHC's.
- **Certify** other personnel to be an OHC technician.
- **Conduct noise surveys and analyses.** However, it is highly recommended that a OHC technician knows how to access & understand an IH Noise survey/report in order to answer questions about HCP enrollment for specific UICs, etc
- Provide **engineering or noise-control solutions.**
- Independently **evaluate HCP effectiveness.**

Responsibilities to the patient

- **Professional concern and interest** in each individual patient and the conservation of his or her hearing. Project an **attitude** of competence, organization and service.
- Provide **valid/accurate audiograms.**
- Ensure **patient understanding** of test purpose, results and follow-up when indicated. It is not enough to tell a patient that he or she "Passed".
- Promote **adherence** to the Hearing Conservation Program.
- **Fit earplugs** properly for each ear individually.
- Demonstrate and counsel patients on **how to insert** plugs properly and how to **clean** HPD's.
- Demonstrate a **variety** of hearing protective devices - allow the **patient to choose.**
- Provide a neat, clean area for testing and maintain a professional appearance.
- Protect **patient privacy**, ensure **confidentiality**, and follow **HIPAA** rules.



<p style="text-align: center;">CRITICAL ROLE in Hearing Conservation Program</p>	<p style="text-align: center;">The "FACE" of the HCP</p> <ul style="list-style-type: none">☛ See personnel first☛ Fit HPDs☛ Educate & motivate☛ Answer questions
---	--

STUDY GUIDE (OHC TECHNICIAN ROLE AND RESPONSIBILITIES)

1. Which of the following are limitations of OHC Technicians' abilities?
 - a. training other corpsmen to fit hearing protection
 - b. certifying other corpsmen to administer hearing tests
 - c. diagnosing hearing loss or ear disease
 - d. b and c
 - e. all of the above

2. Which of the following elements of the Hearing Conservation Program are the responsibilities of the hearing conservation technician?
 - a. noise hazard identification/evaluation
 - b. engineering controls
 - c. audiometric testing
 - d. fit hearing protection
 - e. hearing conservation education
 - f. c, d and e

3. Which instruction(s) should the hearing conservation technician be familiar with and have on hand at all times?
 - a. DODI 6055.12
 - b. service-specific regulation/instruction
 - c. local hearing conservation instruction
 - d. all of the above

4. T or F Hearing conservation technicians are responsible for recommending methods of engineering controls to reduce or eliminate noise in the workplace.

5. Which of the following tasks does the hearing conservation technician perform?
 - a. perform pure tone air conduction hearing tests on personnel in the HCP
 - b. counsel patients on results of testing
 - c. fit hearing protection
 - d. refer patients for follow-up care when necessary
 - e. provide annual hearing conservation training to personnel in the HCP
 - f. all of the above

6. T or F OHC Technicians can have the largest impact in preventing hearing loss during annual examinations because they encounter more opportunities to teach, counsel and motivate.

7. OHC Technician certification last for _____ years. Re-certification requires these three tasks:
 - a.
 - b.
 - c.

8. Name three (3) tasks that an OHC Technician must do daily re: equipment.
 - a.
 - b.
 - c.

APPENDIX

	Pages
Practice Audiograms	147
Ototoxins	162
Tympanogram Summary	163
Hearing Conservation Health Education Materials	164
Audiometer Calibration and Repair Contact Information	165
Benson Medical Instruments Price List	166
Example of DOEHRS Practical Exam	167
How to Read an Audiogram	168
Counseling Aid: Know Your Numbers (Level to Hear)	169
Hearing Protection Devices and Communication Ability	170
How to Correctly Wear Hearing Protection Devices	171

PRACTICE AUDIOGRAMS

For each of the following audiograms, determine the following information:

1. Degree of Hearing Loss
 - a. Normal
 - b. Mild
 - c. Moderate
 - d. Severe
 - e. Profound

2. Type of Hearing Loss
 - a. Conductive
 - b. Sensorineural
 - c. Mixed
 - d. Functional / Non-organic
 - e. Normal hearing / Not applicable

3. Likely Cause of Hearing Loss
 - a. Outer or middle ear pathology
 - b. Ambient room noise
 - c. Normal hearing / Not applicable
 - d. Malingering
 - e. Noise-induced
 - f. Other, explain

4. What action would you take next?
 - a. Re-test in 12 months
 - b. Schedule patient for 1st follow-up test
 - c. Schedule patient for 2nd follow-up test
 - d. Re-establish DD 2215
 - e. Refer patient to Audiologist
 - f. Refer patient to physician
 - g. Other, explain

REFERENCE AUDIOGRAM										1. ZIP CODE/APO/FPO/PAS			
<i>(This form is subject to the Privacy Act of 1974 - use Blanket PAS - DD Form 2005)</i>										45020 (TEST LOCATION)			
2. DOD COMPONENT					3. SERVICE COMPONENT								
A - ARMY F - AIR FORCE C - COAST GUARD N - NAVY M - MARINE CORPS 1 - OTHER					R - REGULAR G - NATIONAL GUARD V - RESERVE 1 - OTHER								
4. SOCIAL SECURITY NUMBER		5. NAME (Last, First, Middle Initial)					6. DATE OF BIRTH		7. SEX				
111111111		SAILOR, MARY D.					10 Apr 1989		F M - MALE F - FEMALE				
8. PAY GRADE UNIFORMED SERVICES		9. PAY GRADE CIVILIAN		10. SERVICE DUTY OCCUPATION CODE		11. MAILING ADDRESS OF ASSIGNMENT		40442 MSFSC NORFOLK VA (00259) (Patient's UIC) UIC of Command Responsible for HCPM NORFOLK VA 23511					
E1				9999									
12. LOCATION - PLACE OF WORK					13. MAJOR COMMAND			14. DUTY TELEPHONE (Include area code)					
DECK DEPT					MSCPAC			(757) 555-5555					
AUDIOMETRY													
15. REASON FOR CONDUCTING AUDIOGRAM													
L: 3 1 - REFERENCE ESTABLISHED PRIOR TO INITIAL 2 - REFERENCE ESTABLISHED FOLLOWING 3 - REFERENCE RE-ESTABLISHED AFTER R: 3 DUTY IN HAZARDOUS NOISE AREAS EXPOSURE IN NOISE DUTIES FOLLOW-UP PROGRAM													
16. AUDIOMETRIC DATA		LEFT					RIGHT						
RE: ANSI S3.6		500	1000	2000	3000	4000	6000	500	1000	2000	3000	4000	6000
17. DATE OF AUDIOGRAM													
L: 22 Aug 2000		00	05	20	25	25	25	00	05	20	25	25	25
R: 22 Aug 2000													
18. MEETS REFERRAL CRITERIA			19. MILITARY TIME OF DAY (Optional)			20. HOURS SINCE LAST NOISE EXPOSURE		21. EAR, NOSE, AND THROAT PROBLEM AT TIME OF TEST					
L: 1 1 - NO R: 1 2 - YES			L: 08:22 R: 08:22			L: 14 R: 14		L: 1 1 - NO R: 1 2 - YES 3 - UNKNOWN					
22. EXAMINER													
a. NAME (Last, First, Middle Initial)				b. TRAINING CERTIFICATION NUMBER			c. SERVICE DUTY OCCUPATION CODE		d. OFFICE SYMBOL				
L: WAYNE, JOHN R: WAYNE, JOHN				L: 008901N R: 008901N			L:0640 R:0640		L: MEDICAL R: MEDICAL				
23. AUDIOMETER													
a. TYPE			b. MODEL			c. MANUFACTURER		d. SERIAL NUMBER		e. LAST ELECTROACOUSTIC CALIBRATION DATE			
L: 3 1 - MANUAL R: 3 2 - SELF-RECORDING (Automatic) 3 - MICROPROCESSOR			L: CCA-200 R: CCA-200			L: Benson Co. R: Benson Co.		L: 00123 R: 00123		L: 02 Jan 2000 R: 02 Jan 2000			
24. PERSONAL HEARING PROTECTION													
a. TYPE ISSUED				b. SIZE EARPLUGS			c. DOUBLE PROTECTION		d. GLASSES WORN		e. FREQUENCY GLASSES WORN		
1 - SINGLE FLANGE (V51R) 5 - NOISE MUFFS 2 - TRIPLE FLANGE 6 - OTHER 3 - HANDFORMED EARPLUG 7 - NONE 4 - EAR CANAL CAPS				L R 1 - XS 4 - L 2 - S 5 - XL 3 - M			USED 1 - NO 2 - YES		1 1 - NO 2 - YES		3 1 - ALWAYS 2 - SELDOM 3 - N/A		
25. REMARKS (Include Exposure Data)													
Navy 8 kHz Left Ear : NT Navy 8 kHz Right Ear : NT Steady Noise Exp(TWA dBA): Not Entered, Impulse Noise Exp(dBP): Not Entered, *****TRAINING AUDIOGRAM***** If this is a re-established 2215 Reference, type in the reason for this decision/action. Examples are... 1. Today's annual audiogram thresholds and follow-up testing indicated a negative STS and were all within normal limits. Therefore, a new reference 2215 audiogram was established. 2. No reference 2215 audiogram was found in patient medical record or in DOEHRS-DR database. Today's annual audiogram establishes a current reference.													

HEARING CONSERVATION DATA

(This form is subject to the Privacy Act of 1974 - use Blanket PAS - DD Form 2005)

1. ZIP CODE/APO/FPO/PAS

68546

2. DOD COMPONENT										3. SERVICE COMPONENT					
A - ARMY N - NAVY		F - AIR FORCE M - MARINE CORPS		C - COAST GUARD 1 - OTHER		R - REGULAR V - RESERVE		G - NATIONAL GUARD 1 - OTHER		1					
4. SOCIAL SECURITY NUMBER				5. NAME (Last, First, Middle Initial)				6. DATE OF BIRTH		7. SEX					
222222222				DOOLITTLE, JACK - ANNUAL				08 Nov 1954		M M - MALE F - FEMALE					
8. PAY GRADE UNIFORMED SERVICES		9. PAY GRADE CIVILIAN		10. SERVICE DUTY OCCUPATION CODE		11. MAILING ADDRESS OF ASSIGNMENT		40085 NAVFAC MID ATLANTIC (68546)							
WG10		3101		NORFOLK		VA		23511							
12. LOCATION - PLACE OF WORK						13. MAJOR COMMAND		14. DUTY TELEPHONE (Include area code)							
WC545						NAVSEA		(757) 555-5555							
15. AUDIOMETRY		2		a. PURPOSE			1 - 90 DAY		2 - ANNUAL		3 - TERMINATION		4 - OTHER		
AUDIOMETRIC DATA RE: ANSI S3.6				LEFT						RIGHT					
				500		1000		2000		3000		4000		6000	
b. CURRENT AUDIOGRAM DATE		07 Jun 2012		35		30		15		15		10		20	
c. REFERENCE AUDIOGRAM DATE		L: 07 Aug 2003 R: 07 Aug 2003		5		0		5		10		10		15	
d. SIGNIFICANT THRESHOLD SHIFT (STS)		e. THRESHOLD SHIFT		L: 1 R: 1		1 - NO 2 - YES		----->		30		10		5	
										0		35		20	
f. REMARKS (Include Exposure Data)										g. TYPE OF PERSONAL HEARING PROTECTION USED					
Steady Noise Exp(TWA dB): Not Entered, Impulse Noise Exp(dB): Not Entered, Construction work occurring outside the building near the hearing test area while this test was administered. Normal appearing otoscopic examination and tympanometry results.										3					
*****TRAINING AUDIOGRAM*****										1 - SINGLE FLANGE (V51R) 2 - TRIPLE FLANGE 3 - HAND FORMED EARPLUG 4 - EAR CANAL CAPS 5 - NOISE MUFFS 6 - OTHER 7 - NONE					
h. EXAMINER NAME (Last, First, Middle Initial)						i. TRAINING CERTIFICATE NO.		j. SERVICE DUTY OCCUPATION CODE		k. OFFICE SYMBOL					
TECHNICIAN, LARRY						555555N		0640		MEDICAL					
l. AUDIOMETER TYPE		m. MODEL		n. MANUFACTURER		o. SERIAL NUMBER		p. LAST ELECTROACOUSTIC CALIBRATION DATE							
3 1 - MANUAL 2 - SELF-RECORDING 3 - MICROPROCESSOR (Automatic)		CCA-200m		Benson Co.		10123		02 Jan 2010							
16. FOLLOW-UP NO. 1				a. MINIMUM 14 HOURS NOISE FREE SINCE CURRENT AUDIOGRAM (See Item 15.B)											
AUDIOMETRIC DATA RE: ANSI S3.6				LEFT						RIGHT					
				500		1000		2000		3000		4000		6000	
b. CURRENT AUDIOGRAM DATE															
c. REFERENCE AUDIOGRAM DATE															
d. SIGNIFICANT THRESHOLD SHIFT (STS)				e. THRESHOLD SHIFT		1 - NO 2 - YES		----->							
f. EXAMINER NAME (Last, First, Middle Initial)						g. TRAINING CERTIFICATE NO.		h. SERVICE DUTY OCCUPATION CODE		i. OFFICE SYMBOL					
j. AUDIOMETER TYPE		k. MODEL		l. MANUFACTURER		m. SERIAL NUMBER		n. LAST ELECTROACOUSTIC CALIBRATION DATE							
1 - MANUAL 2 - SELF-RECORDING 3 - MICROPROCESSOR															
17. FOLLOW-UP NO. 2				a. MINIMUM 14 HOURS NOISE FREE SINCE CURRENT AUDIOGRAM (See Item 15.B)											
AUDIOMETRIC DATA RE: ANSI S3.6				LEFT						RIGHT					
				500		1000		2000		3000		4000		6000	
b. CURRENT AUDIOGRAM DATE															
c. REFERENCE AUDIOGRAM DATE															
d. SIGNIFICANT THRESHOLD SHIFT (STS)				e. THRESHOLD SHIFT		1 - NO 2 - YES		----->							
f. EXAMINER NAME (Last, First, Middle Initial)						g. TRAINING CERTIFICATE NO.		h. SERVICE DUTY OCCUPATION CODE		i. OFFICE SYMBOL					
j. AUDIOMETER TYPE		k. MODEL		l. MANUFACTURER		m. SERIAL NUMBER		n. LAST ELECTROACOUSTIC CALIBRATION DATE							
1 - MANUAL 2 - SELF-RECORDING 3 - MICROPROCESSOR															

HEARING CONSERVATION DATA

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1. ZIP CODE/APO/FPO/PAS

68546

2. DOD COMPONENT										3. SERVICE COMPONENT					
A - ARMY N - NAVY		F - AIR FORCE M - MARINE CORPS		C - COAST GUARD 1 - OTHER		R - REGULAR V - RESERVE		G - NATIONAL GUARD 1 - OTHER							
N						1									
4. SOCIAL SECURITY NUMBER				5. NAME (Last, First, Middle Initial)				6. DATE OF BIRTH		7. SEX					
333333333				STAPES, SALLY P. - ANNUAL				08 Nov 1954		M M - MALE F - FEMALE					
8. PAY GRADE UNIFORMED SERVICES E4		9. PAY GRADE CIVILIAN		10. SERVICE DUTY OCCUPATION CODE BM 3101		11. MAILING ADDRESS OF ASSIGNMENT 40085 NORFOLK VA 23511		NAVFAC MID ATLANTIC (68546)							
12. LOCATION - PLACE OF WORK WC545						13. MAJOR COMMAND NAVSEA		14. DUTY TELEPHONE (Include area code) (757) 555-5555							
15. AUDIOMETRY		2		a. PURPOSE 1 - 90 DAY			2 - ANNUAL		3 - TERMINATION		4 - OTHER				
AUDIOMETRIC DATA RE: ANSI S3.6		LEFT						RIGHT							
		500	1000	2000	3000	4000	6000	500	1000	2000	3000	4000	6000		
b. CURRENT AUDIOGRAM DATE 07 Jun 2012		5	-5	0	45	20	10	5	15	45	45	55	50		
c. REFERENCE AUDIOGRAM DATE L: 07 Aug 2003 R: 07 Aug 2003		5	0	5	10	10	15	5	0	-5	15	5	5		
d. SIGNIFICANT THRESHOLD SHIFT (STS) L: 2 R: 2		e. THRESHOLD SHIFT ----->		-5	-5	35	10		15	50	30	50			
1 - NO 2 - YES															
f. REMARKS (Include Exposure Data) Steady Noise Exp(TWA dB): Not Entered, Impulse Noise Exp(dB): Not Entered. Patient reports ringing in the both ears; participated in mosh-pit @ Red Hot Chili Pepper's concert recently. Patient signs here indicating an understanding that s/he must return for follow up testing. _____.								g. TYPE OF PERSONAL HEARING PROTECTION USED							
								3 1 - SINGLE FLANGE (V51R) 2 - TRIPLE FLANGE 3 - HAND FORMED EARPLUG							
								4 - EAR CANAL CAPS 5 - NOISE MUFFS 6 - OTHER 7 - NONE							
h. EXAMINER NAME (Last, First, Middle Initial) TECHNICIAN, LARRY						i. TRAINING CERTIFICATE NO. 555555N		j. SERVICE DUTY OCCUPATION CODE 0640		k. OFFICE SYMBOL MEDICAL					
l. AUDIOMETER TYPE 1 - MANUAL 2 - SELF-RECORDING 3 - MICROPROCESSOR		m. MODEL CCA-200m		n. MANUFACTURER Benson Co.		o. SERIAL NUMBER 10123		p. LAST ELECTROACOUSTIC CALIBRATION DATE 02 Jan 2010							
1 - MANUAL 2 - SELF-RECORDING 3 - MICROPROCESSOR															
16. FOLLOW-UP NO. 1				a. MINIMUM 14 HOURS NOISE FREE SINCE CURRENT AUDIOGRAM (See Item 15.B)											
AUDIOMETRIC DATA RE: ANSI S3.6				LEFT				RIGHT							
				500	1000	2000	3000	4000	6000	500	1000	2000	3000	4000	6000
b. CURRENT AUDIOGRAM DATE															
c. REFERENCE AUDIOGRAM DATE															
d. SIGNIFICANT THRESHOLD SHIFT (STS) 1 - NO 2 - YES				e. THRESHOLD SHIFT ----->											
f. EXAMINER NAME (Last, First, Middle Initial)						g. TRAINING CERTIFICATE NO.		h. SERVICE DUTY OCCUPATION CODE		i. OFFICE SYMBOL					
j. AUDIOMETER TYPE 1 - MANUAL 2 - SELF-RECORDING 3 - MICROPROCESSOR		k. MODEL		l. MANUFACTURER		m. SERIAL NUMBER		n. LAST ELECTROACOUSTIC CALIBRATION DATE							
17. FOLLOW-UP NO. 2				a. MINIMUM 14 HOURS NOISE FREE SINCE CURRENT AUDIOGRAM (See Item 15.B)											
AUDIOMETRIC DATA RE: ANSI S3.6				LEFT				RIGHT							
				500	1000	2000	3000	4000	6000	500	1000	2000	3000	4000	6000
b. CURRENT AUDIOGRAM DATE															
c. REFERENCE AUDIOGRAM DATE															
d. SIGNIFICANT THRESHOLD SHIFT (STS) 1 - NO 2 - YES				e. THRESHOLD SHIFT ----->											
f. EXAMINER NAME (Last, First, Middle Initial)						g. TRAINING CERTIFICATE NO.		h. SERVICE DUTY OCCUPATION CODE		i. OFFICE SYMBOL					
j. AUDIOMETER TYPE 1 - MANUAL 2 - SELF-RECORDING 3 - MICROPROCESSOR		k. MODEL		l. MANUFACTURER		m. SERIAL NUMBER		n. LAST ELECTROACOUSTIC CALIBRATION DATE							

HEARING CONSERVATION DATA

(This form is subject to the Privacy Act of 1974 - use Blanket PAS - DD Form 2005)

1. ZIP CODE/APO/FPO/PAS

68546

2. DOD COMPONENT										3. SERVICE COMPONENT			
A - ARMY N - NAVY		F - AIR FORCE M - MARINE CORPS		C - COAST GUARD 1 - OTHER		R - REGULAR V - RESERVE		G - NATIONAL GUARD 1 - OTHER					
N						1							
4. SOCIAL SECURITY NUMBER				5. NAME (Last, First, Middle Initial)				6. DATE OF BIRTH		7. SEX			
333333333				STAPES, SALLY. - FOLLOW UP #1				08 Nov 1954		M M - MALE F - FEMALE			
8. PAY GRADE UNIFORMED SERVICES		9. PAY GRADE CIVILIAN		10. SERVICE DUTY OCCUPATION CODE		11. MAILING ADDRESS OF ASSIGNMENT		NAVFAC MID ATLANTIC (68546)					
E4				BM3101		40085 NORFOLK VA 23511							
12. LOCATION - PLACE OF WORK						13. MAJOR COMMAND		14. DUTY TELEPHONE (Include area code)					
WC545						NAVSEA		(757) 555-5555					
15. AUDIOMETRY		a. PURPOSE		1 - 90 DAY		2 - ANNUAL		3 - TERMINATION		4 - OTHER			
AUDIOMETRIC DATA RE: ANSI S3.6		LEFT						RIGHT					
		500	1000	2000	3000	4000	6000	500	1000	2000	3000	4000	6000
b. CURRENT AUDIOGRAM DATE 07 Jun 2012		5	-5	0	45	20	10	5	15	45	45	55	50
c. REFERENCE AUDIOGRAM DATE L: 07 Aug 2003 R: 07 Aug 2003		5	0	5	10	10	15	5	0	-5	15	5	50
d. SIGNIFICANT THRESHOLD SHIFT (STS)		e. THRESHOLD SHIFT											
L: 2 R: 2		1 - NO 2 - YES		----->		-5 -5 35 10		15 50 30 50					
f. REMARKS (Include Exposure Data)								g. TYPE OF PERSONAL HEARING PROTECTION USED					
Steady Noise Exp(TWA dBA): Not Entered, Impulse Noise Exp(dBP): Not Entered, Health Ed Prov. Patient reports better understanding after 14 hours auditory rest								3					
TRAINING AUDIOGRAM*								1 - SINGLE FLANGE (V51R) 2 - TRIPLE FLANGE 3 - HAND FORMED EARPLUG 4 - EAR CANAL CAPS 5 - NOISE MUFFS 6 - OTHER 7 - NONE					
h. EXAMINER NAME (Last, First, Middle Initial)						i. TRAINING CERTIFICATE NO.		j. SERVICE DUTY OCCUPATION CODE		k. OFFICE SYMBOL			
TECHNICIAN, SARAH						999999N		0640		MEDICAL			
l. AUDIOMETER TYPE		m. MODEL		n. MANUFACTURER		o. SERIAL NUMBER		p. LAST ELECTROACOUSTIC CALIBRATION DATE					
3 1 - MANUAL 2 - SELF-RECORDING 3 - MICROPROCESSOR		(Automatic) CCA-200m		Benson Co.		11123		02 Jan 2007					
16. FOLLOW-UP NO. 1		14		a. MINIMUM 14 HOURS NOISE FREE SINCE CURRENT AUDIOGRAM (See Item 15.B)									
AUDIOMETRIC DATA RE: ANSI S3.6		LEFT						RIGHT					
		500	1000	2000	3000	4000	6000	500	1000	2000	3000	4000	6000
b. CURRENT AUDIOGRAM DATE 08 Jun 2012		0	0	5	15	10	15	0	-5	10	10	5	5
c. REFERENCE AUDIOGRAM DATE L: 07 Aug 2003 R: 07 Aug 2003		5	0	5	10	10	15	5	0	-5	15	5	5
d. SIGNIFICANT THRESHOLD SHIFT (STS)		e. THRESHOLD SHIFT											
L: 1 R: 1		1 - NO 2 - YES		----->		0 0 5 0		-5 15 -5 0					
f. EXAMINER NAME (Last, First, Middle Initial)						g. TRAINING CERTIFICATE NO.		h. SERVICE DUTY OCCUPATION CODE		i. OFFICE SYMBOL			
TECHNICIAN, WAYNE H						222222N		0640		MEDICAL			
j. AUDIOMETER TYPE		k. MODEL		l. MANUFACTURER		m. SERIAL NUMBER		n. LAST ELECTROACOUSTIC CALIBRATION DATE					
3 1 - MANUAL 2 - SELF-RECORDING 3 - MICROPROCESSOR		CCA-200m		Benson Co.		11123		02 Jan 2011					
17. FOLLOW-UP NO. 2		a. MINIMUM 14 HOURS NOISE FREE SINCE CURRENT AUDIOGRAM (See Item 15.B)											
AUDIOMETRIC DATA RE: ANSI S3.6		LEFT						RIGHT					
		500	1000	2000	3000	4000	6000	500	1000	2000	3000	4000	6000
b. CURRENT AUDIOGRAM DATE													
c. REFERENCE AUDIOGRAM DATE													
d. SIGNIFICANT THRESHOLD SHIFT (STS)		e. THRESHOLD SHIFT											
1 - NO 2 - YES		----->											
f. EXAMINER NAME (Last, First, Middle Initial)						g. TRAINING CERTIFICATE NO.		h. SERVICE DUTY OCCUPATION CODE		i. OFFICE SYMBOL			
j. AUDIOMETER TYPE		k. MODEL		l. MANUFACTURER		m. SERIAL NUMBER		n. LAST ELECTROACOUSTIC CALIBRATION DATE					
1 - MANUAL 2 - SELF-RECORDING 3 - MICROPROCESSOR													

HEARING CONSERVATION DATA

(This form is subject to the Privacy Act of 1974 - use Blanket PAS - DD Form 2005)

1. ZIP CODE/APO/FPO/PAS

68546

2. DOD COMPONENT										3. SERVICE COMPONENT					
A - ARMY N - NAVY		F - AIR FORCE M - MARINE CORPS		C - COAST GUARD 1 - OTHER		R - REGULAR V - RESERVE		G - NATIONAL GUARD 1 - OTHER							
N						1									
4. SOCIAL SECURITY NUMBER				5. NAME (Last, First, Middle Initial)				6. DATE OF BIRTH		7. SEX					
444444444				ENGINEER, JOE D. - ANNUAL				08 Nov 1954		M M - MALE F - FEMALE					
8. PAY GRADE UNIFORMED SERVICES		9. PAY GRADE CIVILIAN		10. SERVICE DUTY OCCUPATION CODE		11. MAILING ADDRESS OF ASSIGNMENT		12. LOCATION - PLACE OF WORK							
		WG10		0896		40085 NORFOLK VA 23511		NAVSEA (757) 555-5555							
12. LOCATION - PLACE OF WORK				13. MAJOR COMMAND				14. DUTY TELEPHONE (Include area code)							
WC545				NAVSEA				(757) 555-5555							
15. AUDIOMETRY		2		a. PURPOSE 1 - 90 DAY			2 - ANNUAL		3 - TERMINATION		4 - OTHER				
AUDIOMETRIC DATA RE: ANSI S3.6				LEFT				RIGHT							
				500	1000	2000	3000	4000	6000	500	1000	2000	3000	4000	6000
b. CURRENT AUDIOGRAM DATE		07 Jun 2012		35	25	15	35	30	50	35	25	15	15	15	5
c. REFERENCE AUDIOGRAM DATE		L: 07 Aug 2003 R: 07 Aug 2003		5	0	5	10	30	15	5	0	-5	15	5	5
d. SIGNIFICANT THRESHOLD SHIFT (STS)		e. THRESHOLD SHIFT													
L: 2 R: 2		1 - NO 2 - YES		----->		25 10 25		0		25 20		0 10			
f. REMARKS (Include Exposure Data)										g. TYPE OF PERSONAL HEARING PROTECTION USED					
Steady Noise Exp(TWA dBA): Not Entered, Impulse Noise Exp(dBP): Not Entered, Upon brief questioning, patient reports head cold/congestion symptoms. Patient signs here indicating an understanding that s/he must return for follow up testing. _____										3					
										1 - SINGLE FLANGE (V51R) 2 - TRIPLE FLANGE 3 - HAND FORMED EARPLUG					
										4 - EAR CANAL CAPS 5 - NOISE MUFFS 6 - OTHER 7 - NONE					
h. EXAMINER NAME (Last, First, Middle Initial)						i. TRAINING CERTIFICATE NO.		j. SERVICE DUTY OCCUPATION CODE		k. OFFICE SYMBOL					
TECHNICIAN, LARRY						555555N		0640		MEDICAL					
l. AUDIOMETER TYPE				m. MODEL		n. MANUFACTURER		o. SERIAL NUMBER		p. LAST ELECTROACOUSTIC CALIBRATION DATE					
3 1 - MANUAL 2 - SELF-RECORDING 3 - MICROPROCESSOR (Automatic)				CCA-200m		Benson Co.		10123		02 Jan 2010					
16. FOLLOW-UP NO. 1				a. MINIMUM 14 HOURS NOISE FREE SINCE CURRENT AUDIOGRAM (See Item 15.B)											
AUDIOMETRIC DATA RE: ANSI S3.6				LEFT				RIGHT							
				500	1000	2000	3000	4000	6000	500	1000	2000	3000	4000	6000
b. CURRENT AUDIOGRAM DATE															
c. REFERENCE AUDIOGRAM DATE															
d. SIGNIFICANT THRESHOLD SHIFT (STS)				e. THRESHOLD SHIFT											
				1 - NO 2 - YES				----->							
f. EXAMINER NAME (Last, First, Middle Initial)						g. TRAINING CERTIFICATE NO.		h. SERVICE DUTY OCCUPATION CODE		i. OFFICE SYMBOL					
j. AUDIOMETER TYPE				k. MODEL		l. MANUFACTURER		m. SERIAL NUMBER		n. LAST ELECTROACOUSTIC CALIBRATION DATE					
17. FOLLOW-UP NO. 2				a. MINIMUM 14 HOURS NOISE FREE SINCE CURRENT AUDIOGRAM (See Item 15.B)											
AUDIOMETRIC DATA RE: ANSI S3.6				LEFT				RIGHT							
				500	1000	2000	3000	4000	6000	500	1000	2000	3000	4000	6000
b. CURRENT AUDIOGRAM DATE															
c. REFERENCE AUDIOGRAM DATE															
d. SIGNIFICANT THRESHOLD SHIFT (STS)				e. THRESHOLD SHIFT											
				1 - NO 2 - YES				----->							
f. EXAMINER NAME (Last, First, Middle Initial)						g. TRAINING CERTIFICATE NO.		h. SERVICE DUTY OCCUPATION CODE		i. OFFICE SYMBOL					
j. AUDIOMETER TYPE				k. MODEL		l. MANUFACTURER		m. SERIAL NUMBER		n. LAST ELECTROACOUSTIC CALIBRATION DATE					

HEARING CONSERVATION DATA

(This form is subject to the Privacy Act of 1974 - use Blanket PAS - DD Form 2005)

1. ZIP CODE/APO/FPO/PAS

68546

2. DOD COMPONENT										3. SERVICE COMPONENT			
A - ARMY N - NAVY		F - AIR FORCE M - MARINE CORPS		C - COAST GUARD 1 - OTHER		R - REGULAR V - RESERVE		G - NATIONAL GUARD 1 - OTHER					
N						1							
4. SOCIAL SECURITY NUMBER				5. NAME (Last, First, Middle Initial)				6. DATE OF BIRTH		7. SEX			
444444444				ENGINEER, JOE D. - FOLLOW UP #1				08 Nov 1954		M M - MALE F - FEMALE			
8. PAY GRADE UNIFORMED SERVICES		9. PAY GRADE CIVILIAN		10. SERVICE DUTY OCCUPATION CODE		11. MAILING ADDRESS OF ASSIGNMENT		11. MAILING ADDRESS OF ASSIGNMENT					
WG10		WG10		8602		40085 NORFOLK VA 23511		NAVAFAC MID ATLANTIC (68546)					
12. LOCATION - PLACE OF WORK						13. MAJOR COMMAND		14. DUTY TELEPHONE (Include area code)					
WC545						NAVSEA		(757) 555-5555					
15. AUDIOMETRY		2		a. PURPOSE 1 - 90 DAY			2 - ANNUAL		3 - TERMINATION		4 - OTHER		
AUDIOMETRIC DATA RE: ANSI S3.6		LEFT						RIGHT					
		500	1000	2000	3000	4000	6000	500	1000	2000	3000	4000	6000
b. CURRENT AUDIOGRAM DATE 07 Jun 2012		35	25	15	35	30	50	35	25	15	15	15	5
c. REFERENCE AUDIOGRAM DATE L: 07 Aug 2003 R: 07 Aug 2003		5	0	5	10	30	15	5	0	-5	15	5	5
d. SIGNIFICANT THRESHOLD SHIFT (STS)		e. THRESHOLD SHIFT											
L: 2 R: 2		1 - NO 2 - YES		----->		25 10 25 0		25 20 0 10					
f. REMARKS (Include Exposure Data)								g. TYPE OF PERSONAL HEARING PROTECTION USED					
Steady Noise Exp(TWA dBA): Not Entered, Impulse Noise Exp(dBP): Not Entered, Early warning for a decrease in hearing _____, Health Ed Prov. **TRAINING AUDIOGRAM*****								3 1 - SINGLE FLANGE (V51R) 2 - TRIPLE FLANGE 3 - HAND FORMED EARPLUG 4 - EAR CANAL CAPS 5 - NOISE MUFFS 6 - OTHER 7 - NONE					
h. EXAMINER NAME (Last, First, Middle Initial)						i. TRAINING CERTIFICATE NO.		j. SERVICE DUTY OCCUPATION CODE		k. OFFICE SYMBOL			
TECHNICIAN, LARRY						999999N		0640		MEDICAL			
l. AUDIOMETER TYPE		m. MODEL		n. MANUFACTURER		o. SERIAL NUMBER		p. LAST ELECTROACOUSTIC CALIBRATION DATE					
3 1 - MANUAL 2 - SELF-RECORDING 3 - MICROPROCESSOR (Automatic)		CCA-200m		Benson Co.		11123		02 Jan 2007					
16. FOLLOW-UP NO. 1		14		a. MINIMUM 14 HOURS NOISE FREE SINCE CURRENT AUDIOGRAM (See Item 15.B)									
AUDIOMETRIC DATA RE: ANSI S3.6		LEFT						RIGHT					
		500	1000	2000	3000	4000	6000	500	1000	2000	3000	4000	6000
b. CURRENT AUDIOGRAM DATE 21 Jun 2012		0	0	5	15	25	15	0	-5	10	10	5	5
c. REFERENCE AUDIOGRAM DATE L: 07 Aug 2003 R: 07 Aug 2003		5	0	5	10	30	15	5	0	-5	15	5	5
d. SIGNIFICANT THRESHOLD SHIFT (STS)		e. THRESHOLD SHIFT											
L: 1 R: 1		1 - NO 2 - YES		----->		0 0 5 -5		-5 15 -5 0					
f. EXAMINER NAME (Last, First, Middle Initial)						g. TRAINING CERTIFICATE NO.		h. SERVICE DUTY OCCUPATION CODE		i. OFFICE SYMBOL			
TECHNICIAN, SUSAN H						999999N		0640		MEDICAL			
j. AUDIOMETER TYPE		k. MODEL		l. MANUFACTURER		m. SERIAL NUMBER		n. LAST ELECTROACOUSTIC CALIBRATION DATE					
3 1 - MANUAL 2 - SELF-RECORDING 3 - MICROPROCESSOR		CCA-200m		Benson Co.		11123		02 Jan 2011					
17. FOLLOW-UP NO. 2		a. MINIMUM 14 HOURS NOISE FREE SINCE CURRENT AUDIOGRAM (See Item 15.B)											
AUDIOMETRIC DATA RE: ANSI S3.6		LEFT						RIGHT					
		500	1000	2000	3000	4000	6000	500	1000	2000	3000	4000	6000
b. CURRENT AUDIOGRAM DATE													
c. REFERENCE AUDIOGRAM DATE													
d. SIGNIFICANT THRESHOLD SHIFT (STS)		e. THRESHOLD SHIFT											
		1 - NO 2 - YES		----->									
f. EXAMINER NAME (Last, First, Middle Initial)						g. TRAINING CERTIFICATE NO.		h. SERVICE DUTY OCCUPATION CODE		i. OFFICE SYMBOL			
j. AUDIOMETER TYPE		k. MODEL		l. MANUFACTURER		m. SERIAL NUMBER		n. LAST ELECTROACOUSTIC CALIBRATION DATE					

HEARING CONSERVATION DATA

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1. ZIP CODE/APO/FPO/PAS

68546

2. DOD COMPONENT										3. SERVICE COMPONENT			
A - ARMY N - NAVY		F - AIR FORCE M - MARINE CORPS		C - COAST GUARD 1 - OTHER		R - REGULAR V - RESERVE		G - NATIONAL GUARD 1 - OTHER					
N						1							
4. SOCIAL SECURITY NUMBER				5. NAME (Last, First, Middle Initial)				6. DATE OF BIRTH		7. SEX			
55555555				PILOT, PETER - ANNUAL				08 Nov 1954		M M - MALE F - FEMALE			
8. PAY GRADE UNIFORMED SERVICES		9. PAY GRADE CIVILIAN		10. SERVICE DUTY OCCUPATION CODE		11. MAILING ADDRESS OF ASSIGNMENT		12. LOCATION - PLACE OF WORK					
O3				8501		40085 NORFOLK VA 23511		NAVFAC MID ATLANTIC (68546)					
12. LOCATION - PLACE OF WORK						13. MAJOR COMMAND		14. DUTY TELEPHONE (Include area code)					
WC545						NAVSEA		(757) 555-5555					
15. AUDIOMETRY		2		a. PURPOSE 1 - 90 DAY			2 - ANNUAL		3 - TERMINATION		4 - OTHER		
AUDIOMETRIC DATA RE: ANSI S3.6		LEFT						RIGHT					
		500		1000		2000		3000		4000		6000	
b. CURRENT AUDIOGRAM DATE		5		-5		5		15		40		20	
c. REFERENCE AUDIOGRAM DATE		5		0		5		10		30		15	
L: 07 Jun 2012													
R: 07 Aug 2003													
d. SIGNIFICANT THRESHOLD SHIFT (STS)		e. THRESHOLD SHIFT											
L: 1 R: 1		1 - NO 2 - YES		----->		-5		0		5		10	
f. REMARKS (Include Exposure Data)								g. TYPE OF PERSONAL HEARING PROTECTION USED					
Steady Noise Exp(TWA dBA): Not Entered, Impulse Noise Exp(dBP): Not Entered, Early warning for a decrease in hearing _____.								3					
****TRAINING AUDIOGRAM**** These patients do not need follow-up testing, however, EDUCATE them on proper HPD fit/use so that this pattern does not continue.								1 - SINGLE FLANGE (V51R) 2 - TRIPLE FLANGE 3 - HAND FORMED EARPLUG					
4 - EAR CANAL CAPS 5 - NOISE MUFFS 6 - OTHER 7 - NONE													
h. EXAMINER NAME (Last, First, Middle Initial)				i. TRAINING CERTIFICATE NO.				j. SERVICE DUTY OCCUPATION CODE		k. OFFICE SYMBOL			
TECHNICIAN, LARRY				555555N				0640		MEDICAL			
l. AUDIOMETER TYPE		m. MODEL		n. MANUFACTURER		o. SERIAL NUMBER		p. LAST ELECTROACOUSTIC CALIBRATION DATE					
3		1 - MANUAL 2 - SELF-RECORDING 3 - MICROPROCESSOR (Automatic)		CCA-200m		Benson Co.		10123		02 Jan 2010			
16. FOLLOW-UP NO. 1		a. MINIMUM 14 HOURS NOISE FREE SINCE CURRENT AUDIOGRAM (See Item 15.B)											
AUDIOMETRIC DATA RE: ANSI S3.6		LEFT						RIGHT					
		500		1000		2000		3000		4000		6000	
b. CURRENT AUDIOGRAM DATE													
c. REFERENCE AUDIOGRAM DATE													
d. SIGNIFICANT THRESHOLD SHIFT (STS)		e. THRESHOLD SHIFT											
1 - NO 2 - YES		----->											
f. EXAMINER NAME (Last, First, Middle Initial)				g. TRAINING CERTIFICATE NO.				h. SERVICE DUTY OCCUPATION CODE		i. OFFICE SYMBOL			
j. AUDIOMETER TYPE		k. MODEL		l. MANUFACTURER		m. SERIAL NUMBER		n. LAST ELECTROACOUSTIC CALIBRATION DATE					
1 - MANUAL 2 - SELF-RECORDING 3 - MICROPROCESSOR													
17. FOLLOW-UP NO. 2		a. MINIMUM 14 HOURS NOISE FREE SINCE CURRENT AUDIOGRAM (See Item 15.B)											
AUDIOMETRIC DATA RE: ANSI S3.6		LEFT						RIGHT					
		500		1000		2000		3000		4000		6000	
b. CURRENT AUDIOGRAM DATE													
c. REFERENCE AUDIOGRAM DATE													
d. SIGNIFICANT THRESHOLD SHIFT (STS)		e. THRESHOLD SHIFT											
1 - NO 2 - YES		----->											
f. EXAMINER NAME (Last, First, Middle Initial)				g. TRAINING CERTIFICATE NO.				h. SERVICE DUTY OCCUPATION CODE		i. OFFICE SYMBOL			
j. AUDIOMETER TYPE		k. MODEL		l. MANUFACTURER		m. SERIAL NUMBER		n. LAST ELECTROACOUSTIC CALIBRATION DATE					
1 - MANUAL 2 - SELF-RECORDING 3 - MICROPROCESSOR													

HEARING CONSERVATION DATA

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1. ZIP CODE/APO/FPO/PAS

68546

2. DOD COMPONENT										3. SERVICE COMPONENT			
A - ARMY N - NAVY		F - AIR FORCE M - MARINE CORPS		C - COAST GUARD 1 - OTHER		R - REGULAR V - RESERVE		G - NATIONAL GUARD 1 - OTHER		1			
4. SOCIAL SECURITY NUMBER				5. NAME (Last, First, Middle Initial)				6. DATE OF BIRTH		7. SEX			
666666666				MECHANIC, BOB D. - ANNUAL				08 Nov 1954		M M - MALE F - FEMALE			
8. PAY GRADE UNIFORMED SERVICES		9. PAY GRADE CIVILIAN		10. SERVICE DUTY OCCUPATION CODE		11. MAILING ADDRESS OF ASSIGNMENT		40085 NAVFAC MID ATLANTIC (68546)					
WG10		8602				NORFOLK VA 23511							
12. LOCATION - PLACE OF WORK						13. MAJOR COMMAND		14. DUTY TELEPHONE (Include area code)					
WC545						NAVSEA		(757) 555-5555					
15. AUDIOMETRY		2		a. PURPOSE 1 - 90 DAY			2 - ANNUAL		3 - TERMINATION		4 - OTHER		
AUDIOMETRIC DATA RE: ANSI S3.6		LEFT						RIGHT					
		500	1000	2000	3000	4000	6000	500	1000	2000	3000	4000	6000
b. CURRENT AUDIOGRAM DATE 07 Jun 2012		5	-5	5	35	30	50	5	0	15	30	50	50
c. REFERENCE AUDIOGRAM DATE L: 07 Aug 2003 R: 07 Aug 2003		5	0	5	10	30	15	5	0	-5	15	50	20
d. SIGNIFICANT THRESHOLD SHIFT (STS)		e. THRESHOLD SHIFT											
L: 1 R: 2		1 - NO 2 - YES		----->		-5 0 25 0		0 20 15 0					
f. REMARKS (Include Exposure Data)								g. TYPE OF PERSONAL HEARING PROTECTION USED					
Steady Noise Exp(TWA dBA): Not Entered, Impulse Noise Exp(dBP): Not Entered, Patient signs here indicating an understanding that s/he must return for follow up testing.								3 1 - SINGLE FLANGE (V51R) 2 - TRIPLE FLANGE 3 - HAND FORMED EARPLUG 4 - EAR CANAL CAPS 5 - NOISE MUFFS 6 - OTHER 7 - NONE					
****TRAINING AUDIOGRAM****													
h. EXAMINER NAME (Last, First, Middle Initial)						i. TRAINING CERTIFICATE NO.		j. SERVICE DUTY OCCUPATION CODE		k. OFFICE SYMBOL			
TECHNICIAN, LARRY						555555N		0640		MEDICAL			
l. AUDIOMETER TYPE		m. MODEL		n. MANUFACTURER		o. SERIAL NUMBER		p. LAST ELECTROACOUSTIC CALIBRATION DATE					
3 1 - MANUAL 2 - SELF-RECORDING 3 - MICROPROCESSOR (Automatic)		CCA-200m		Benson Co.		10123		02 Jan 2010					
16. FOLLOW-UP NO. 1		a. MINIMUM 14 HOURS NOISE FREE SINCE CURRENT AUDIOGRAM (See Item 15.B)											
AUDIOMETRIC DATA RE: ANSI S3.6		LEFT						RIGHT					
		500	1000	2000	3000	4000	6000	500	1000	2000	3000	4000	6000
b. CURRENT AUDIOGRAM DATE													
c. REFERENCE AUDIOGRAM DATE													
d. SIGNIFICANT THRESHOLD SHIFT (STS)		e. THRESHOLD SHIFT											
1 - NO 2 - YES		----->											
f. EXAMINER NAME (Last, First, Middle Initial)						g. TRAINING CERTIFICATE NO.		h. SERVICE DUTY OCCUPATION CODE		i. OFFICE SYMBOL			
j. AUDIOMETER TYPE		k. MODEL		l. MANUFACTURER		m. SERIAL NUMBER		n. LAST ELECTROACOUSTIC CALIBRATION DATE					
1 - MANUAL 2 - SELF-RECORDING 3 - MICROPROCESSOR													
17. FOLLOW-UP NO. 2		a. MINIMUM 14 HOURS NOISE FREE SINCE CURRENT AUDIOGRAM (See Item 15.B)											
AUDIOMETRIC DATA RE: ANSI S3.6		LEFT						RIGHT					
		500	1000	2000	3000	4000	6000	500	1000	2000	3000	4000	6000
b. CURRENT AUDIOGRAM DATE													
c. REFERENCE AUDIOGRAM DATE													
d. SIGNIFICANT THRESHOLD SHIFT (STS)		e. THRESHOLD SHIFT											
1 - NO 2 - YES		----->											
f. EXAMINER NAME (Last, First, Middle Initial)						g. TRAINING CERTIFICATE NO.		h. SERVICE DUTY OCCUPATION CODE		i. OFFICE SYMBOL			
j. AUDIOMETER TYPE		k. MODEL		l. MANUFACTURER		m. SERIAL NUMBER		n. LAST ELECTROACOUSTIC CALIBRATION DATE					
1 - MANUAL 2 - SELF-RECORDING 3 - MICROPROCESSOR													

HEARING CONSERVATION DATA

(This form is subject to the Privacy Act of 1974 - use Blanket PAS - DD Form 2005)

1. ZIP CODE/APO/FPO/PAS

68546

2. DOD COMPONENT										3. SERVICE COMPONENT			
A - ARMY N - NAVY		F - AIR FORCE M - MARINE CORPS		C - COAST GUARD 1 - OTHER		R - REGULAR V - RESERVE		G - NATIONAL GUARD 1 - OTHER		1			
4. SOCIAL SECURITY NUMBER 666666666				5. NAME (Last, First, Middle Initial) MECHANIC, BOB D. - FOLLOW UP #1				6. DATE OF BIRTH 08 Nov 1954		7. SEX M M - MALE F - FEMALE			
8. PAY GRADE UNIFORMED SERVICES WG10		9. PAY GRADE CIVILIAN WG10		10. SERVICE DUTY OCCUPATION CODE 8602		11. MAILING ADDRESS OF ASSIGNMENT 40085 NORFOLK VA 23511		NAVAFAC MID ATLANTIC (68546)					
12. LOCATION - PLACE OF WORK WC545						13. MAJOR COMMAND NAVSEA		14. DUTY TELEPHONE (Include area code) (757) 555-5555					
15. AUDIOMETRY		2		a. PURPOSE 1 - 90 DAY			2 - ANNUAL		3 - TERMINATION		4 - OTHER		
AUDIOMETRIC DATA RE: ANSI S3.6		LEFT						RIGHT					
		500	1000	2000	3000	4000	6000	500	1000	2000	3000	4000	6000
b. CURRENT AUDIOGRAM DATE 07 Jun 2012		5	-5	5	35	30	50	5	0	15	30	50	50
c. REFERENCE AUDIOGRAM DATE L: 07 Aug 2003 R: 07 Aug 2003		5	0	5	10	30	15	5	0	-5	15	50	20
d. SIGNIFICANT THRESHOLD SHIFT (STS) L: 1 R: 2		e. THRESHOLD SHIFT ----->		-5	0	25	0	0	20	15	0		
f. REMARKS (Include Exposure Data) Steady Noise Exp(TWA dBA): Not Entered, Impulse Noise Exp(dBP): Not Entered, Early warning for a decrease in hearing _____, Health Ed Prov. **TRAINING AUDIOGRAM*****								g. TYPE OF PERSONAL HEARING PROTECTION USED 3 1 - SINGLE FLANGE (V51R) 2 - TRIPLE FLANGE 3 - HAND FORMED EARPLUG 4 - EAR CANAL CAPS 5 - NOISE MUFFS 6 - OTHER 7 - NONE					
h. EXAMINER NAME (Last, First, Middle Initial) TECHNICIAN, LARRY						i. TRAINING CERTIFICATE NO. 999999N		j. SERVICE DUTY OCCUPATION CODE 0640		k. OFFICE SYMBOL MEDICAL			
l. AUDIOMETER TYPE 1 - MANUAL 2 - SELF-RECORDING 3 - MICROPROCESSOR		m. MODEL CCA-200m		n. MANUFACTURER Benson Co.		o. SERIAL NUMBER 11123		p. LAST ELECTROACOUSTIC CALIBRATION DATE 02 Jan 2007					
16. FOLLOW-UP NO. 1		14		a. MINIMUM 14 HOURS NOISE FREE SINCE CURRENT AUDIOGRAM (See Item 15.B)									
AUDIOMETRIC DATA RE: ANSI S3.6		LEFT						RIGHT					
		500	1000	2000	3000	4000	6000	500	1000	2000	3000	4000	6000
b. CURRENT AUDIOGRAM DATE 08 Jun 2012								0	-5	10	35	50	50
c. REFERENCE AUDIOGRAM DATE L: 07 Aug 2003 R: 07 Aug 2003		5	0	5	10	30	15	5	0	-5	15	50	20
d. SIGNIFICANT THRESHOLD SHIFT (STS) L: 1 R: 2		e. THRESHOLD SHIFT ----->							-5	15	20	0	
f. EXAMINER NAME (Last, First, Middle Initial) TECHNICIAN, SUSAN H						g. TRAINING CERTIFICATE NO. 999999N		h. SERVICE DUTY OCCUPATION CODE 0640		i. OFFICE SYMBOL MEDICAL			
j. AUDIOMETER TYPE 1 - MANUAL 2 - SELF-RECORDING 3 - MICROPROCESSOR		k. MODEL CCA-200m		l. MANUFACTURER Benson Co.		m. SERIAL NUMBER 11123		n. LAST ELECTROACOUSTIC CALIBRATION DATE 02 Jan 2011					
17. FOLLOW-UP NO. 2		a. MINIMUM 14 HOURS NOISE FREE SINCE CURRENT AUDIOGRAM (See Item 15.B)											
AUDIOMETRIC DATA RE: ANSI S3.6		LEFT						RIGHT					
		500	1000	2000	3000	4000	6000	500	1000	2000	3000	4000	6000
b. CURRENT AUDIOGRAM DATE													
c. REFERENCE AUDIOGRAM DATE													
d. SIGNIFICANT THRESHOLD SHIFT (STS) L: 1 R: 2		e. THRESHOLD SHIFT ----->											
f. EXAMINER NAME (Last, First, Middle Initial)						g. TRAINING CERTIFICATE NO.		h. SERVICE DUTY OCCUPATION CODE		i. OFFICE SYMBOL			
j. AUDIOMETER TYPE 1 - MANUAL 2 - SELF-RECORDING 3 - MICROPROCESSOR		k. MODEL		l. MANUFACTURER		m. SERIAL NUMBER		n. LAST ELECTROACOUSTIC CALIBRATION DATE					

HEARING CONSERVATION DATA

(This form is subject to the Privacy Act of 1974 - use Blanket PAS - DD Form 2005)

1. ZIP CODE/APO/FPO/PAS

68546

2. DOD COMPONENT										3. SERVICE COMPONENT			
A - ARMY N - NAVY		F - AIR FORCE M - MARINE CORPS		C - COAST GUARD 1 - OTHER		R - REGULAR V - RESERVE		G - NATIONAL GUARD 1 - OTHER		1			
4. SOCIAL SECURITY NUMBER				5. NAME (Last, First, Middle Initial)				6. DATE OF BIRTH		7. SEX			
666666666				MECHANIC, BOB D. - FOLLOW UP #2				08 Nov 1954		M M - MALE F - FEMALE			
8. PAY GRADE UNIFORMED SERVICES		9. PAY GRADE CIVILIAN		10. SERVICE DUTY OCCUPATION CODE		11. MAILING ADDRESS OF ASSIGNMENT		40085 NAVFAC MID ATLANTIC (68546)					
WG10		8602		NORFOLK		VA		23511					
12. LOCATION - PLACE OF WORK						13. MAJOR COMMAND		14. DUTY TELEPHONE (Include area code)					
WC545						NAVSEA		(757) 555-5555					
15. AUDIOMETRY		a. PURPOSE		1 - 90 DAY		2 - ANNUAL		3 - TERMINATION		4 - OTHER			
AUDIOMETRIC DATA RE: ANSI S3.6		LEFT						RIGHT					
		500	1000	2000	3000	4000	6000	500	1000	2000	3000	4000	6000
b. CURRENT AUDIOGRAM DATE 07 JUN 2012		5	-5	5	35	30	50	5	0	15	30	50	50
c. REFERENCE AUDIOGRAM DATE L: 07 Aug 2003 R: 07 Aug 2003		5	0	5	10	30	15	5	0	-5	15	50	20
d. SIGNIFICANT THRESHOLD SHIFT (STS)		e. THRESHOLD SHIFT											
L: 1 R: 2		1 - NO 2 - YES		----->		-5 0 25 0		0 20 15 0					
f. REMARKS (Include Exposure Data)								g. TYPE OF PERSONAL HEARING PROTECTION USED					
Steady Noise Exp(TWA dBA): Not Entered, Impulse Noise Exp(dBP): Not Entered, Early warning for a decrease in hearing _____, Health Ed Prov. ***TRAINING AUDIOGRAM***								2 1 - SINGLE FLANGE (V51R) 2 - TRIPLE FLANGE 3 - HAND FORMED EARPLUG 4 - EAR CANAL CAPS 5 - NOISE MUFFS 6 - OTHER 7 - NONE					
h. EXAMINER NAME (Last, First, Middle Initial)						i. TRAINING CERTIFICATE NO.		j. SERVICE DUTY OCCUPATION CODE		k. OFFICE SYMBOL			
TECHNICIAN, LARRY E						555555N		0640		MEDICAL			
l. AUDIOMETER TYPE		m. MODEL		n. MANUFACTURER		o. SERIAL NUMBER		p. LAST ELECTROACOUSTIC CALIBRATION DATE					
3 1 - MANUAL 2 - SELF-RECORDING 3 - MICROPROCESSOR (Automatic)		CCA-200m		Benson Co.		12123		02 Jan 2007					
16. FOLLOW-UP NO. 1		14		a. MINIMUM 14 HOURS NOISE FREE SINCE CURRENT AUDIOGRAM		(See Item 15.B)							
AUDIOMETRIC DATA RE: ANSI S3.6		LEFT						RIGHT					
		500	1000	2000	3000	4000	6000	500	1000	2000	3000	4000	6000
b. CURRENT AUDIOGRAM DATE 08 JUN 2012								0	-5	10	35	50	50
c. REFERENCE AUDIOGRAM DATE L: 07 Aug 2003 R: 07 Aug 2003		5	0	5	10	30	15	5	0	-5	15	50	20
d. SIGNIFICANT THRESHOLD SHIFT (STS)		e. THRESHOLD SHIFT											
L: 1 R: 2		1 - NO 2 - YES		----->				-5 15 20 0					
f. EXAMINER NAME (Last, First, Middle Initial)						g. TRAINING CERTIFICATE NO.		h. SERVICE DUTY OCCUPATION CODE		i. OFFICE SYMBOL			
TECHNICIAN, SUSAN						999999N		0640		MEDICAL			
j. AUDIOMETER TYPE		k. MODEL		l. MANUFACTURER		m. SERIAL NUMBER		n. LAST ELECTROACOUSTIC CALIBRATION DATE					
3 1 - MANUAL 2 - SELF-RECORDING 3 - MICROPROCESSOR		CCA-200m		Benson Co.		12123		02 Jan 2011					
17. FOLLOW-UP NO. 2		14		a. MINIMUM 14 HOURS NOISE FREE SINCE CURRENT AUDIOGRAM		(See Item 15.B)							
AUDIOMETRIC DATA RE: ANSI S3.6		LEFT						RIGHT					
		500	1000	2000	3000	4000	6000	500	1000	2000	3000	4000	6000
b. CURRENT AUDIOGRAM DATE 08 Jun 2012								0	0	10	35	50	50
c. REFERENCE AUDIOGRAM DATE L: 07 Aug 2003 R: 07 Aug 2003		5	0	5	10	30	15	5	0	-5	15	50	20
d. SIGNIFICANT THRESHOLD SHIFT (STS)		e. THRESHOLD SHIFT											
R: 2		1 - NO 2 - YES		----->				0 15 20 0					
f. EXAMINER NAME (Last, First, Middle Initial)						g. TRAINING CERTIFICATE NO.		h. SERVICE DUTY OCCUPATION CODE		i. OFFICE SYMBOL			
TECHNICIAN, SUSAN						999999N		0640		MEDICAL			
j. AUDIOMETER TYPE		k. MODEL		l. MANUFACTURER		m. SERIAL NUMBER		n. LAST ELECTROACOUSTIC CALIBRATION DATE					
3 1 - MANUAL 2 - SELF-RECORDING 3 - MICROPROCESSOR		CCA-200m		Benson Co.		12123		02 Jan 2012					

HEARING CONSERVATION DATA

(This form is subject to the Privacy Act of 1974 - use Blanket PAS - DD Form 2005)

1. ZIP CODE/APO/FPO/PAS

68546

2. DOD COMPONENT										3. SERVICE COMPONENT			
A - ARMY N - NAVY		F - AIR FORCE M - MARINE CORPS		C - COAST GUARD 1 - OTHER		R - REGULAR V - RESERVE		G - NATIONAL GUARD 1 - OTHER					
N						1							
4. SOCIAL SECURITY NUMBER				5. NAME (Last, First, Middle Initial)				6. DATE OF BIRTH		7. SEX			
77777777				JUMPER, DIZZY D. - ANNUAL				08 Nov 1954		M M - MALE F - FEMALE			
8. PAY GRADE UNIFORM GRADE E7		9. PAY GRADE CIVILIAN		10. SERVICE DUTY OCCUPATION CODE 8500		11. MAILING ADDRESS OF ASSIGNMENT 40085 NORFOLK VA 23511		NAVFAC MID ATLANTIC (68546)					
12. LOCATION - PLACE OF WORK WC545						13. MAJOR COMMAND NAVSEA		14. DUTY TELEPHONE (Include area code) (757) 555-5555					
15. AUDIOMETRY		2		a. PURPOSE 1 - 90 DAY			2 - ANNUAL		3 - TERMINATION		4 - OTHER		
AUDIOMETRIC DATA RE: ANSI S3.6		LEFT						RIGHT					
		500	1000	2000	3000	4000	6000	500	1000	2000	3000	4000	6000
b. CURRENT AUDIOGRAM DATE 07 Jun 2012		5	-5	5	15	10	20	5	0	0	30	50	80
c. REFERENCE AUDIOGRAM DATE L: 07 Aug 2003 R: 07 Aug 2003		5	0	5	10	10	15	5	0	-5	15	50	70
d. SIGNIFICANT THRESHOLD SHIFT (STS) L: 1 R: 1		e. THRESHOLD SHIFT ----->		-5	0	5	0		0	5	15	0	
f. REMARKS (Include Exposure Data) Steady Noise Exp(TWA dBA): Not Entered, Impulse Noise Exp(dBP): Not Entered, Early warning for a decrease in hearing _____. Asymmetry requires masking. Patient reports "ringing in both ears normally, but always more in the right ear". No evidence of prior examination by Audiologist or ENT . *****TRAINING AUDIOGRAM*****								g. TYPE OF PERSONAL HEARING PROTECTION USED 3 1 - SINGLE FLANGE (V51R) 2 - TRIPLE FLANGE 3 - HAND FORMED EARPLUG 4 - EAR CANAL CAPS 5 - NOISE MUFFS 6 - OTHER 7 - NONE					
h. EXAMINER NAME (Last, First, Middle Initial) TECHNICIAN, LARRY						i. TRAINING CERTIFICATE NO. 555555N		j. SERVICE DUTY OCCUPATION CODE 0640		k. OFFICE SYMBOL MEDICAL			
l. AUDIOMETER TYPE 3 1 - MANUAL 2 - SELF-RECORDING 3 - MICROPROCESSOR (Automatic)		m. MODEL CCA-200m				n. MANUFACTURER Benson Co.		o. SERIAL NUMBER 10123		p. LAST ELECTROACOUSTIC CALIBRATION DATE 02 Jan 2010			
16. FOLLOW-UP NO. 1		a. MINIMUM 14 HOURS NOISE FREE SINCE CURRENT AUDIOGRAM (See Item 15.B)											
AUDIOMETRIC DATA RE: ANSI S3.6		LEFT						RIGHT					
		500	1000	2000	3000	4000	6000	500	1000	2000	3000	4000	6000
b. CURRENT AUDIOGRAM DATE													
c. REFERENCE AUDIOGRAM DATE													
d. SIGNIFICANT THRESHOLD SHIFT (STS) 1 - NO 2 - YES		e. THRESHOLD SHIFT ----->											
f. EXAMINER NAME (Last, First, Middle Initial)						g. TRAINING CERTIFICATE NO.		h. SERVICE DUTY OCCUPATION CODE		i. OFFICE SYMBOL			
j. AUDIOMETER TYPE 1 - MANUAL 2 - SELF-RECORDING 3 - MICROPROCESSOR		k. MODEL		l. MANUFACTURER				m. SERIAL NUMBER		n. LAST ELECTROACOUSTIC CALIBRATION DATE			
17. FOLLOW-UP NO. 2		a. MINIMUM 14 HOURS NOISE FREE SINCE CURRENT AUDIOGRAM (See Item 15.B)											
AUDIOMETRIC DATA RE: ANSI S3.6		LEFT						RIGHT					
		500	1000	2000	3000	4000	6000	500	1000	2000	3000	4000	6000
b. CURRENT AUDIOGRAM DATE													
c. REFERENCE AUDIOGRAM DATE													
d. SIGNIFICANT THRESHOLD SHIFT (STS) 1 - NO 2 - YES		e. THRESHOLD SHIFT ----->											
f. EXAMINER NAME (Last, First, Middle Initial)						g. TRAINING CERTIFICATE NO.		h. SERVICE DUTY OCCUPATION CODE		i. OFFICE SYMBOL			
j. AUDIOMETER TYPE 1 - MANUAL 2 - SELF-RECORDING 3 - MICROPROCESSOR		k. MODEL		l. MANUFACTURER				m. SERIAL NUMBER		n. LAST ELECTROACOUSTIC CALIBRATION DATE			

NON-HEARING CONSERVATION HEARING TEST

ZIP CODE/APO/FPO/PAS

(This report contains data subject to the Privacy Act of 1974.)

32556

DOD COMPONENT				SERVICE COMPONENT			
A - ARMY	F - AIR FORCE	C - COAST GUARD		R - REGULAR	G - GUARD		
N	N - NAVY	M - MARINE CORPS	1 - OTHER	1	V - RESERVE	1 - OTHER	

SOCIAL SECURITY NUMBER	NAME <i>(Last, First, Middle Initial)</i>	DATE OF BIRTH	SEX
888888888	SUPPORT, ADMIN	13 Jul 1980	F

PAY GRADE <small>UNIFORMED SERVICES</small>	PAY GRADE <small>CIVILIAN</small>	SERVICE DUTY OCCUPATION CODE	MAJOR COMMAND <i>(Optional)</i>	ENT PROBLEM AT TIME OF TEST
	GS 7	0318	BUMED	1 - NO 2 - YES 3 - UNKNOWN
				1

HEARING TEST (Audiometric Data RE: ANSI S3.6 - 1989)

AUDIOGRAM DATE	LEFT						RIGHT					
	500	1000	2000	3000	4000	6000	500	1000	2000	3000	4000	6000
06 Jul 2012	5M	5M	5M	30M	30M	5M	5M	5M	5M	25M	30M	5M

EXAMINER

NAME <i>(Last, First, Middle Initial)</i>	TRAINING CERTIFICATE NO.	SERVICE DUTY OCCUPATION CODE
TECHNICIAN, SARAH	121234N	HM8404

AUDIOMETER

TYPE	MODEL	MANUFACTURER
1	GSI-61	GSI

SERIAL NUMBER	LAST ELECTROACOUSTIC CALIBRATION DATE
120099	02 Jan 2012

******TRAINING AUDIOGRAM**** Discussion Points**

Patient in a HCP?
 What do we do with this patient?
 Any responsibility getting this patient seen by Occupational Audiology?
 Differences if patient is military vs. civilian?

NON-HEARING CONSERVATION HEARING TEST

ZIP CODE/APO/FPO/PAS

(This report contains data subject to the Privacy Act of 1974.)

32556

DOD COMPONENT				SERVICE COMPONENT			
A - ARMY	F - AIR FORCE	C - COAST GUARD		R - REGULAR	G - GUARD		
N	N - NAVY	M - MARINE CORPS	1 - OTHER	R	V - RESERVE	1 - OTHER	

SOCIAL SECURITY NUMBER	NAME <i>(Last, First, Middle Initial)</i>	DATE OF BIRTH	SEX
999999999	POTENTIAL EMPLOYEE; PRE-HIRE OCC HEALTH AUDIO	13 Jul 1980	M

PAY GRADE	PAY GRADE CIVILIAN	SERVICE DUTY OCCUPATION CODE	MAJOR COMMAND <i>(Optional)</i>	ENT PROBLEM AT TIME OF TEST
	GS 7	3806	CINPACFLT	1
				1 - NO 2 - YES 3 - UNKNOWN

HEARING TEST (Audiometric Data RE: ANSI S3.6 - 1989)

AUDIOGRAM DATE	LEFT						RIGHT					
	500	1000	2000	3000	4000	6000	500	1000	2000	3000	4000	6000
06 Jul 2012	25M	25M	25M	60M	70M	90M	20M	25M	25M	65	70M	85M

EXAMINER

NAME <i>(Last, First, Middle Initial)</i>	TRAINING CERTIFICATE NO.	SERVICE DUTY OCCUPATION CODE
TECHNICIAN, SAM	121234N	HM8404

AUDIOMETER

TYPE	MODEL	MANUFACTURER
1	GSI-61	GSI
SERIAL NUMBER	LAST ELECTROACOUSTIC CALIBRATION DATE	
120099	02 Jan 2012	

*******TRAINING AUDIOGRAM*******

Patient is applying for Sheet Metal Mechanic position. What is the responsibility of the OHC Technician?

HEARING CONSERVATION DATA

(This form is subject to the Privacy Act of 1974 - use Blanket PAS - DD Form 2005)

1. ZIP CODE/APO/FPO/PAS

68546

2. DOD COMPONENT N		A - ARMY N - NAVY	F - AIR FORCE M - MARINE CORPS	C - COAST GUARD 1 - OTHER	3. SERVICE COMPONENT NAVSEA		R - REGULAR	G - NATIONAL GUARD 1 - OTHER
4. SOCIAL SECURITY NUMBER 101011010			5. NAME (Last, First, Middle Initial) SEAL, Kevin W			DATE OF BIRTH 08 Nov 1954		7. SEX M M - MALE F - FEMALE
8. PAY GRADE UNIFORMED SERVICES WG10		9. PAY GRADE CIVILIAN WG10		10. SERVICE DUTY OCCUPATION CODE 8602		11. MAILING ADDRESS AVFAC MID ATLANTIC (68546) VA 23511		
12. LOCATION - PLACE OF WORK WC545					13. TELEPHONE (757) 555-5555			

**YOU MAY SEE THIS TYPE
AUDIOGRAM IN MEDICAL
RECORD. DUE TO
PREVIOUS DOEHR'S
SOFTWARE PROBLEM.**

15. AUDIOMETRY		2. ANNUAL		3 - TERMINATION				4 - OTHER					
a. PURPOSE 1 - 90 DAY		LEFT				RIGHT							
RE: ANSI S3.6		500	1000	2000	3000	4000	6000	500	1000	2000	3000	4000	6000
b. CURRENT AUDIOGRAM DATE 21 May 2007		5	0	5	15	35	10	0	-5	25	20	50	15
c. REFERENCE AUDIOGRAM DATE L: 07 Aug 2003 R: 07 Aug 2003		5	0	5	10	30	15	5	0	-5	15	50	20
d. SIGNIFICANT THRESHOLD SHIFT (STS) L: 1 R: 2		e. THRESHOLD SHIFT ----->		0	0	5	5	-5	30	5	0		

f. REMARKS (Include Exposure Data)
Steady Noise Exp(TWA dBA): Not Entered, Impulse Noise Exp(dBP): Not Entered, Early warning for a decrease in hearing _____, Health Ed Prov. *****TRAINING AUDIOGRAM***** Note that software does not print out correct initial or first follow-up tests; manually line out both tests!!!! 3rd test is the only valid test.

g. TYPE OF PERSONAL HEARING PROTECTION USED
2
1 - SINGLE FLANGE (V51R) 4 - EAR CANAL CAPS
2 - TRIPLE FLANGE 5 - NOISE MUFFS
3 - HAND FORMED EARPLUG 6 - OTHER
7 - NONE

h. EXAMINER NAME (Last, First, Middle Initial) TECHNICIAN, LARRY E		i. TRAINING CERTIFICATE NO. 555555N		j. SERVICE DUTY OCCUPATION CODE 0640		k. OFFICE SYMBOL MEDICAL	
l. AUDIOMETER TYPE 3 1 - MANUAL 2 - SELF-RECORDING (Automatic) 3 - MICROPROCESSOR		m. MODEL CCA-200m		n. MANUFACTURER Benson Co.		o. SERIAL NUMBER 12123	
						p. LAST ELECTROACOUSTIC CALIBRATION DATE 02 Jan 2007	

16. FOLLOW-UP NO. 1		14		a. MINIMUM 14 HOURS NOISE FREE SINCE CURRENT AUDIOGRAM (See Item 15.B)									
RE: ANSI S3.6		LEFT				RIGHT							
DATE 14 May 2004		0	0	0	15	45	20	0	-5	5	35	50	30
DATE L: 07 Aug 2003 R: 07 Aug 2003		5	0	5	10	30	15	5	0	-5	15	50	20
L: 1 R: 2		e. THRESHOLD SHIFT ----->		0	-5	5	15	-5	10	20	0		

17. FOLLOW-UP NO. 2		14		a. MINIMUM 14 HOURS NOISE FREE SINCE CURRENT AUDIOGRAM (See Item 15.B)									
RE: ANSI S3.6		LEFT				RIGHT							
DATE 08 Jun 2012								0	0	10	35	50	50
DATE L: 07 Aug 2003 R: 07 Aug 2003		5	0	5	10	30	15	5	0	-5	15	50	20
R: 2		e. THRESHOLD SHIFT ----->						0	15	20	0		

OTOTOXINS

Caution should be used when using hand-formed earplugs (foamies) for HPDs if working around these dangerous chemicals. If any of these chemicals are accidentally rubbed on the earplug and placed in the ear canal, there is a high risk for permanent hearing loss and/or dizziness.

ORGANIC SOLVENTS	METALS
Toluene (printing) **	Mercury and derivatives
Xylenes (plastics) **	Lead and derivatives
Styrenes (plastics) **	Arsenic (atoxyl)
Trichloroethylene (degreaser) **	Manganese
Carbon Disulfide (textile)	Trimethyltin (organic tine)
Stoddard/white spirits	Cobalt
N-hexane	
Fuels (JP-8 fuel)	
Ethyl benzene	DRUGS
Perchloroethylene	Aminoglycosides
Butyl Nitrite	Loop diuretics
Methylene chloride	Anti-neoplastic agents
	ASA
	Qunine compounds
ASHPHYXIANTS	
Carbon Monoxide **	
Cyanide	OTHERS
	Chemical Warfare nerve agents
	Organophosphate (pesticide)
	Paraquat (pesticide)
**Army ID as high-priority	



TYMPANOGRAM SUMMARY

Purpose: Tympanogram is a test of the middle ear (ME) function

- Identifies patients requiring medical referral (Tympanogram other than Type A)
- Separates probable noise-induced etiologies (Type A) from those due to other causes
- Tracks the progress of middle ear pathologies that are under medical treatment (Progresses from a

Type A to Type C to Type B and when resolving, from Type B to Type C to Type A)

Equipment: Probe tip has three open tubes that need to be checked for blockage & periodically cleaned.

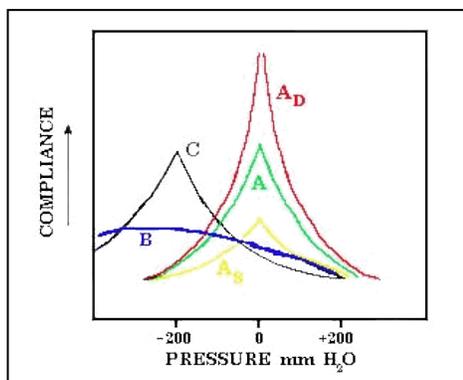
- Manometer (pump) varies air pressure against TM (controls mobility)
- Speaker introduces 220Hz probe tone
- Microphone measures loudness in ear canal

Using the equipment properly:

- Air-tight seal: An air-tight seal is made by placing the correct size probe tip in the ear canal. A seal is often gained by making a slight twist of the probe tip in the ear canal.
- Correct angle: The probe tip is angled down the canal. It is important that the probe tip is not angled to hit the canal wall, as this will give a false reading of low compliance.
- Hold steady: Either do not hold probe or hold very steady while the test is being performed.

Interpreting the results

- Compliance (height of peak – flexibility of the ME system)
- Peak Pressure (pressure within the ME space)
- Volume (volume of air in the canal and possibly the ME)



Normal Values

Compliance: **.2 – 1.8 mm**

Peak Pressure: **+50 – (-150) mm daPa**

Volume: **0.5 – 1.5 cm³**
 Adult males w/ large canals
 can have canal volumes
 closer to 2.0 cm³

<u>Type</u>	<u>Compliance</u>	<u>Peak Pressure</u>	<u>Volume</u>	<u>Simple Interpretation</u>
Type A	.2 – 1.8	+50 – (-150)	0.5 – 1.5	Normal ME
Type B – normal Vol	Low - NR	No peak pressure	0.5 – 1.5	Fluid filled ME
Type B – high Vol	No peak	No peak pressure	Greater than 2.0	Perforation?
Type C	.2 – 1.8	Greater than -150	0.5 – 1.5	Start/end of ME infection?

If you obtain a result other than a **Type A** Tympanogram, repeat the test and ensure proper equipment use.

HEARING CONSERVATION HEALTH EDUCATION MATERIALS

1. **<http://www.cdc.gov/niosh/topics/noise/>** The National Institute for Occupational Safety and Health (NIOSH) maintains this hearing loss prevention site, with a wide variety of information on every aspect of noise exposure and prevention. There are several good publications available at no charge or via free download, such as “Preventing Occupational Hearing Loss – A Practical Guide” and the “Industrial Noise Control Manual,” a practical guide to engineering controls in industry.
2. **<http://www.aearo.com/>** Aero Company has long been one of the best sources for comprehensive hearing conservation training information. Start your search here! Everything from posters to training videos is available at little or no charge.
3. **<http://www.audiology.org/resources/consumer/Pages/default.aspx>** The American Academy of Audiology has useful information about how the ear works, interpreting audiograms, understanding tinnitus, and so forth.
4. **<http://militaryaudiology.org/site/>** The Military Audiology Association homepage is primarily for professionals, but has a lot of specialized information, including PowerPoint presentations and/or abstracts from professional meetings and links to the hearing conservation websites of individual Services.
5. **<http://www.asha.org/aud/>** The American Speech-Language-Hearing Association website is similar to the American Academy of Audiology site. Click on “public” and take your pick.
6. **<http://www.hearingconservation.org/>** The National Hearing Conservation Association website contains excellent public and professional information of interest.
7. **<http://www.caohc.org/index.php>** The Council for the Accreditation in Occupational Hearing Conservation, while professionally oriented, contains information that will be useful to Hearing Conservation Technicians.
8. **<http://www.nonoise.org/>** The Noise Pollution Clearinghouse website has as its mission to create more civil cities and more natural and wilderness areas by reducing noise pollution at the source.
9. **<http://www.chchearing.org/noise-center>** The purpose of the Noise Center at the Center for Hearing and Communication is to promote hearing conservation and noise awareness through education, advocacy and outreach

VIDEO TAPES

Sound Advice: Keep Your Hearing for Life
Naval Medical Education and Training Command
Visual Information Directorate
8901 Wisconsin Avenue
Bethesda, MD 20889-5611
(301)-295-5595

Time: 8:36 min

The Hearing Video
(604) 232-9704 or toll free @ 1-866-319-9704
E-mail: customer.service@worksafebcstore.com
www.worksafebc.com

Time: 17:00 min

AUDIOMETER CALIBRATION & REPAIR CONTACT INFORMATION

Navy Audiometer Calibration and Repairs:

Navy and Marine Corps Public Health Center
ATTN: Calibration Lab
620 John Paul Jones Circle
Suite 1100 Bldg 3
Portsmouth, VA 23708-2103

(757) 953-0786, 0788, 0789, 0790, 0700; DSN 377

Air Force Audiometer Calibration and Repairs:

Contact the local servicing MERC for audiometer calibration and repair problems.

If the MERC can't handle the repair problem, they will forward the audiometer to an authorized manufacturer's repair facility.

Army Audiometer Calibration and Repairs:

Medical Maintenance Operations Division
ATTN: MCMR-MMM-DP
Warehouse 4, Bay 1
11 Hap Arnold Blvd
Tobyhanna, PA 18466-5063

(570) 895-7134

(410) 795-7134

Updated 06JUN2012

BENSON MEDICAL INSTRUMENTS REPLACEMENT PARTS

The following replacement parts and accessories may be purchased individually. Prices are for US Military. Most current list located under “**parts link**” from **bensonmedical.com./military** Order by calling **612-827-2222** and choose option #4 to reach government sales. Terms are VISA, freight additional, minimum order \$40.00 exclusive of freight charges.

Description	Part Number	Price	CCA-200mini	CCA-200
Response Switch	250273	\$44.00	X	X
Patch cord, 6 in., 2 conductor	300394-001	\$16.00	X	X
USB Computer Interface Cable	500228	\$350.00	X	
Computer Interface Cable	500164	\$145.00		X
Audiometer Interconnect Cable	300383	\$20.00	X	
Audiometer Interconnect Cable	500165	\$59.00		X
Headset Cable	250260	\$49.00	X	X
Headset Wrench	250237	\$5.00	X	X
Power Cable, 6 ft. (for 250183 or 250541)	250182	\$8.00	X	X
Audiometer Power Supply	250541	\$120.00	X	
Audiometer Power Supply	250183	\$120.00		X
Headset, Supra-aural	500117	\$250.00	X	X
Headband, Supra-aural	250142	\$59.00	X	X
Headset, Circum-aural	500264	\$425.00		X
Cushion, Circum-aural cup, set	250193	\$25.00		X
Audiocups, set	250156	\$200.00		X
Audiocups Leads, pair	250240	\$20.00		X
Ear Cushions, Red and Blue, set	250188	\$16.00	X	X
Transducer, TDH39	250140	\$80.00	X	X
Calibration Hardware Key USB (for medical maintenance)	300356-06	\$295.00	X	X
Booth Mounting Plate	300258	\$28.00	X	
Simulator Wall Mount Bracket	300173	\$23.00	X	X
Serial Extension Cable, 6 ft.	300382-01	\$25.00	X	
Serial Extension Cable, 12 ft.	300382-02	\$35.00	X	
Serial Extension Cable, 25 ft.	300382-03	\$50.00	X	
Serial Extension Cable, 6 ft.	500129-001	\$80.00		X
Serial Extension Cable, 12 ft.	500129-002	\$100.00		X
Serial Extension Cable, 25 ft.	500129-003	\$140.00		X
Memory Back-up Battery	250279	\$8.00		X
Serial Communication IC	250277	\$10.00		X

EXAMPLE OF DOEHRS-HC PRACTICAL EXAM

1. DOEHRS-HC APPLICATION

- a. Locate DOEHRS-HC User Manual in the Help Menu
- b. Assistance & Problem Reporting

2. SECURITY

- a. Logging Into DOEHRS-HC as an Administrator
- b. Logging Into DOEHRS-HC
- c. Adding a New User
- d. Updating Examiner Data
- e. Changing Your Password

3. CALIBRATION

- a. Performing a Functional Listening Check
- b. Performing a Daily Calibration
- c. Deleting a DD 2217 Biological Calibration Check

4. ADMINISTRATIVE DEFAULTS

- a. Creating Multiple Administrative Defaults
- b. Options Window - Defining Mode of Data Exports (internet connected or not)

5. PATIENT DEMOGRAPHICS

- a. Entering Patient Demographics in the Run Test Window
- b. Editing Patient Demographics
- c. Searching for a Patient
- d. Creating, Editing & Deleting a UIC/WIC

6. TESTING

- a. Manually Determining a Subject's Threshold
- b. Performing a DD 2215 Hearing Test
- c. Performing a DD 2216 Hearing Test
- d. Manually Entering a DD 2215 Hearing Test
- e. Re-establishing a Reference Audiogram
- f. Editing or Deleting a Hearing Test
- g. Adding an Audiometer (for audiograms entered from other sources/Audiologists)
- h. Audiometry Summary
- i. Interpreting Audiograms, Determining Need for Referral and Counseling Patients

7. DATA MANAGEMENT

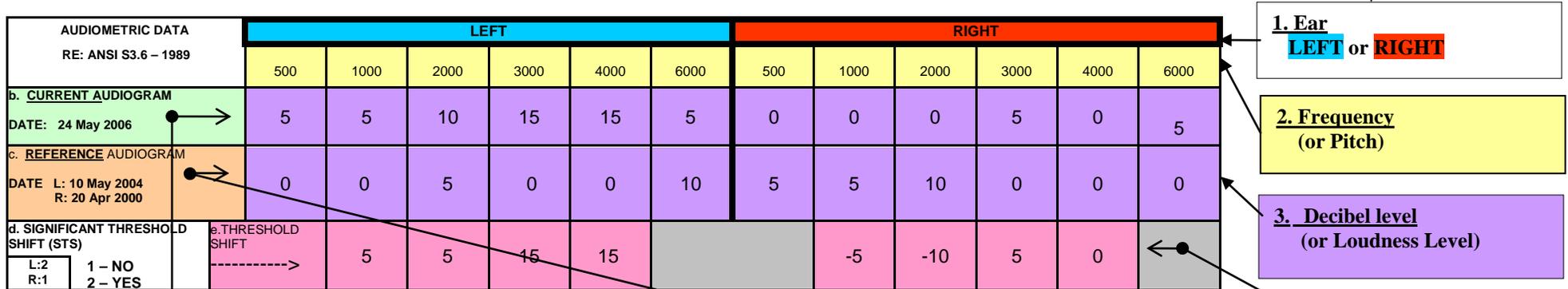
- a. Restoring the DOEHRS-HC Database
- b. Backing up the Database on a network drive or external media
- c. Exporting DOEHRS-HC Data to a Local Workstation
- d. Importing DOEHRS-HC Data
- e. Requesting Records from the Data Repository (DR) - "DR Inquire"
- f. Exporting Data to the Data Repository (DR)

8. REPORTS

- a. Viewing Lists
- b. Viewing Forms and Reports
- c. Viewing Audit Trail

HOW TO READ AN AUDIOGRAM

There are three (3) dimensions you need to understand in order to interpret your audiogram:



Determining if you have a change in your hearing

Today's hearing Current Audiogram is compared to your baseline Reference Audiogram to determine if a change Threshold Shift has occurred. A threshold shift occurs if there is an average of 10 dB or more change for 2000Hz, 3000Hz, and 4000Hz combined. A negative shift (negative number) means that hearing is better today, compared to your reference audiogram. In the above example, the left ear has a positive threshold shift ($5+15+15=35$; $35/3=11.6$), therefore hearing has decreased significantly in the left ear since the reference audiogram.

Frequency (or Pitch):

Just like a piano keyboard, the pitches are low on the left side (500 Hz) and then gradually climb to higher pitches on the right side (6000Hz). Human speech is made up of all the frequencies tested above. Many of the constant sounds (V, F, SH, PH, TH) are high pitched sounds 2000-3000 Hz, where as vowels are low pitched sounds 500-1000 Hz.

Decibel Level

The loudness scale goes from very soft (-10 dB) to very loud (100 dB). Hearing is classified in degrees based on a decibel range.

- 10 to 25dB – Normal hearing
- 30 to 45 dB – Mild hearing loss
- 50 to 65 dB – Moderate hearing loss
- 70-85 dB – Severe hearing loss
- 90+ – Profound hearing loss

COUNSELING AID: KNOW YOUR NUMBERS (LEVEL TO HEAR)

Know your numbers (level to hear)

-10 Super hearing

-5

0 Avg

5

10

15

20

25

Normal Range

	LEFT						RIGHT					
	500	1000	2000	3000	4000	6000	500	1000	2000	3000	4000	6000
dB HL	5	10	15	30	60	45	5	10	20	25	40	25



30 Mild Hearing Loss

40

50 Moderate Hearing Loss

60

70 Severe Hearing Loss

80

90 Profound Hearing loss



above 25 is HEARING LOSS

**Larger the Number
Greater the Hearing Loss**

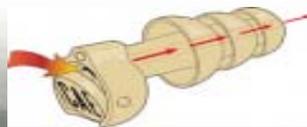
HPDs and Communication Ability

Wear HPD when exposed to hazardous noises

Noise Situations: Communication Not Critical
Basic Foamies, Quad Flange, Ear Muffs



Noise Situations: Communication Critical
Combat Arms Earplugs, TCAPS



HOW TO CORRECTLY WEAR HEARING PROTECTION DEVICES

How to correctly wear hearing protection.

Right



Foamies:

- Roll or squish the earplug
- Pull back on ear w/opposite hand
 - Straightens ear canal for DEEPER insertion
- Insert the earplug
- Should not be able to see your buddy's foamie if looking directly at him or yourself if looking directly in a mirror

Wrong



