

SAFETY TRAINING GOUGE #5

HEARING CONSERVATION

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About This Resource

If you're an afloat safety officer or division officer, you have a challenging, important role at your command. This series of pamphlets will help you meet your bi-monthly training requirements. Modify and use them at quarters or muster. You can also check the Naval Safety Center website at

<http://www.public.navy.mil/navsafecen/Pages/safety-gouge/SafetyGouge.aspx> for the latest issues. We welcome feedback so we can continue to provide you with topics you need. Email LTJG Melissa Balint at melissa.balint@navy.mil.

This series is prepared by the Naval Safety and Environmental Training Center and the Naval Safety Center.

Your Hearing Can Save Your Life

In operational or military training environments, good hearing and effective communication are critical. Dr. John Monroe of the National Ground Intelligence Center interviewed hundreds of Army front-line combat veterans from World War II and the Korean War. They said they could identify aircraft, tanks, artillery and machine guns by sound more frequently than by sight or other means. They needed good hearing to distinguish these sounds in order to take appropriate action.

Hearing loss is a serious concern within the Navy. Education is vital to the overall success of a good hearing-conservation program within your work centers. Noise-induced hearing loss is often



A seaman participates in an annual hearing test in USS *Kitty Hawk's* aviation medicine lab.

underrated because there are no visible signs of injury. Protecting your hearing from noise-related

trauma or injury is not only a military requirement; it is simply the wise thing to do.

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Did you know?

- **Noise-induced hearing loss is the fleet's #1 occupational hazard.**
- **Noise-induced hearing loss is permanent.**
- **Most noise-induced hearing loss occurs between the 5th and 10th year of exposure to hazardous noise levels.**



A seaman uses a needle gun to chip away rust and paint on a mooring line cleat aboard an

How can I protect myself?

The best hearing protection is:

- Chosen by the individual from approved sources.
- Meets the needs and requirements of the work environment.
- Comfortable.
- Appropriately fitted.
- Worn consistently during noise exposure.

Several types of protection are available through the National Stock Number (NSN) system, including earplugs, noise muffs, ear canal caps, helmets, musician's earplugs, and communication devices (for special populations).

Sailors have the freedom to choose the type they prefer to wear from among the approved devices, unless contra-indicated. For example, mechanics should not wear foam earplugs, since dirt and oil from their hands can transfer into the plug and subsequently into the ear, potentially causing an infection. Helmets and communication devices are also only available to the population who require them for operational needs.

“Prolonged exposure to hazardous noise can lead to elevated blood pressure, stress-related diseases, sleep disturbance, gastrointestinal changes, disruption of attention or concentration, fatigue, tension, nervousness, anxiety and hostility.”

Why is testing important?

Navy employees who do not have a reference audiogram filed in their medical record shall not be assigned to duty in designated hazardous noise areas until they receive a reference hearing test. Hearing tests, or audiograms, are required of workers who are routinely exposed to hazardous noise. Periodic monitoring allows the Navy to identify hearing loss before it becomes severe or to correct potential problems with hearing –protection devices.

REGULATIONS

OPNAVINST 5100.19E, Chapters B4

NEHC-TM6290.91-2, REV B - Industrial Hygiene Field Operations

What can cause hearing loss?

Gunfire and rocket fire produce high-intensity impulse or blast noises that can cause hearing loss. Hearing loss can also result from the continuous or intermittent noises of aircraft and marine engines, as well as industrial activities. The noise of saws, lathes, grinders, forging hammers, or internal combustion engines also creates a hazard to your hearing.



An aviation ordnanceman adjusts his goggles while moving ordnance across the flight deck aboard USS

What is a Noise Reduction Rating (NRR)?

For example, suppose the noise within your work center has been measured to be 90 dB(A). If you wear an earplug with an NRR of 20 dB, you will still be exposed to 83.5 dB(A). This is below the hazard level of greater than 84dB. The NRR is listed on earplug and earmuff packaging. Confused? Why can't you just subtract 20 dBs from the measured level of 90 dB(A) and arrive at an NRR of 70 dB's of exposure?

The exposure level at the

ear is closer to 83.5 dB(A) because field evaluations of hearing-protective devices suggest the direct use of the manufacturer's published NRRs will overestimate hearing-protector performance.

The Occupational Safety and Health Administration (OSHA) has instructed field compliance inspectors to derate the NRRs by 50%. When applying NRRs to measured sound pressure levels, remember that derated NRRs may be sub-

tracted directly from dB(C) sound pressure levels: $TWA\ dB(C) - (NRR \times 0.5)$. When using dB(A) sound pressure levels subtract 7 from the NRR, derate this value, then subtract from the TWA dB(A) value to arrive at the sound pressure level expected at the wearer's ear: $TWA\ dB(A) - ((NRR - 7) \times 0.5)$.

So, our formula is: $90\ dB(A) - ((20 - 7) \times 0.5)$ or $90\ dB(A) - (13 \times 0.5)$ or $90\ dB(A) - 6.5\ dB(A) = 83.5\ dB(A)$.

If noise cannot be reduced below occupational standards, Sailors working in designated hazardous-noise areas shall wear hearing protection devices that have been tested and assigned a noise reduction rating (NRR).

How do you know if you need hearing protection?

Noise measurements are taken as part of the industrial hygiene survey or the workplace monitoring program for the commands with periodic sampling requirements. The work areas where the sound level, continuous or intermittent, is routinely greater than 84 dB(A) or where the peak sound pressure level caused by

impulse or impact noise, routinely exceeds 140 dB are considered hazardous noise areas. These areas and equipment are then labeled to warn of the noise hazard. In areas where noise levels exceed 104 dB(A), Sailors must wear both earplugs and earmuffs.

How do I report an injury?

You must make an entry into the Web-Enabled Safety System (WESS) for any work-related significant threshold shift (STS) in hearing.

This means an STS averaging 10 dB or more at 2000, 3000, and 4000 Hz in one or both ears, and the person's total hearing level is 25 decibels or more above audiometric

zero in the same ears (averaged at 2000, 3000, 4000 Hz). Names are not to be added if an audiologist, otologist, or occupational medicine physician confirms the shift is not of occupational origin.

When a reportable hearing loss occurs from an instantaneous event (e.g., acoustic trauma

from a one-time blast or over-pressure), report the hearing loss as an injury. The medical staff must tell the safety officer when an STS occurs.



An Industrial Hygiene Officer uses a sound level meter to demonstrate the high decibel levels during work on the flag bridge while in dry dock.

What can you do?

- Comply with hazardous noise warning labels whenever they appear.
- Ensure that Sailors wear and maintain clean and serviceable hearing protection at all times. Foam plugs are disposable, and therefore, should not be washed and re-used, as this affects the plug and its ability to protect you. Pre-formed earplugs should be washed routinely with warm water and soap, and allowed to air dry completely before re-insertion into the ears. Dried, cracked or hard muffs should be replaced.
- Teach Sailors about off-duty activities that can cause hearing loss (such as firearms, lawn equipment, power tools, loud music, NASCAR races, headphones hooked to a music player) and protective measures they can take (more info at http://www.audiologyonline.com/articles/article_detail.asp?article_id=2396).
- Ensure that Sailors wear hearing protection when exposed to gunfire during training or to artillery or missile firing.
- Complete audiograms when designated.
- Ensure Sailors report if they experience ringing in the ears when they leave an area, have difficulty hearing a normal conversation after work, if they experience headaches or feel dizzy from noise exposure.

Make sure your personnel receive instruction and understand why the hearing conservation program is important.

ARE YOU INSPECTION READY?

Print out the INSURV Checklist for your hearing-conservation program review: http://www.public.navy.mil/fltfor/insurv/Getting_Inspected/Pages/Deck_Pages/NAVOSH_EP.aspx

Hearing Conservation	
AUDIOGRAMS	REFERENCE
(a) All personnel assigned to duties in designated noise-hazardous areas or operating noise-hazardous equipment are included in the hearing conservation program.	(a) B0402e(1) & B0407
(b) All personnel assigned to duties in designated noise-hazardous areas or operating noise hazardous equipment have received an annual audiogram.	(a) B0402d(4), B0402e(5), & B0407b
(c) ___ of ___ persons who are under medical surveillance for hearing conservation do not have a current baselines, annual audiometric examinations, or follow-up examinations.	(a) B0402e(6), B0407a & B0407b
NOISE HAZARD LABELING	
(a) NAVMED 6260/2 is used for posting/labeling noise-hazardous areas. Required at entrances.	(a) B0404c(1)(b) & B0404c(2)
(b) Equipment/tools designated as noise-hazardous are properly labeled with NAVMED 6260/2A.	(a) B0404c(1)(b)
(c) Noise hazardous warning signs and labels properly annotate noise hazardous conditions.	(a) B0404c(1)(b)
*(1) Exteriors of military combatant equipment are excluded from the labeling requirement. (2) Normally, outside of doors/hatches leading into a noise-hazard area shall be posted. However, topside and weathered surfaces of a ship shall not be posted.	
NOISE SURVEYS	
(a) Noise surveys are conducted/completed as part of the baseline or any follow-up industrial hygiene surveys.	(a) B0402b(2) (b) NEHC-TM, Chap. 2, Appendix 2-A
(b) The safety officer maintains a copy of the current noise survey.	(a) B0402b(2)
PPE	
(a) Circumaural ear muffs are in good working condition.	
(b) Fitted hearing protection is available from the MDR.	(a) B0402e(4)
(c) Hearing-protective devices (plugs or muffs) are available to personnel working in noise hazardous areas.	(a) B0406a
(d) Hearing protection worn as required.	(a) B0402f(1)

Training Scenario #1

You are assigned to work in a machinery space or a space in which your IH survey has indicated that the noise level in your work space is above 84 dB(A). As a DSPO, you are aware that there are several actions that you and your team should take prior to and after entering the noise hazard situation to preserve your hearing and avoid noise-induced hearing loss or tinnitus. What actions do you take?

- Arrange and document hearing conservation training from medical personnel.
- Before entering the work space, appropriate hearing protection devices should be utilized for steady-state noise.
- If your IH survey has found your work space to exceed 104 dB(A), double protection should be used due to noise and other health hazards of operating noise-hazardous equipment (earplugs and earmuffs).
- Report for scheduled hearing examinations to monitor your hearing levels, or sooner if symptoms arise.
- Repeat training annually.

Hearing Conservation, cont.	
THRESHOLD SHIFTS	REFERENCE
(a) Follow-up examinations of personnel with threshold shifts are conducted.	(a) B0402D(5) & B0402E(6)
(b) All permanent threshold shifts reported by medical department are logged and reviewed by the safety officer. The log entry includes name, rate or rank, workcenter, and time onboard.	(a) B0402B(3) & B0402E(8)
TRAINING	
(a) Documentation is available to verify that personnel included in hearing conservation receive training relative to hearing conservation prior to working in noise-hazardous areas or with noise-hazardous equipment.	(a) B0408a
(b) MDR ensures that annual refresher training is performed in conjunction with the annual audiogram (stamp or notation on audiogram that training was conducted and when it was done; or must have separate roster).	(a) B0408b
PROGRAM ROSTER	
(a) The MDR maintains a roster of all personnel who routinely work in designated noise-hazardous areas.	(a) B0402e(1) & B0409c
(b) The roster of all personnel who routinely work in designated noise hazardous areas is updated at least semi-annually by the MDR.	(a) B0409c
(c) The MDR maintains a tickler file for scheduling audiometric exams, updated monthly with exam results (significant threshold shifts).	(a) B0409c
*Tickler file and roster can be hard copy or electronic.	

Ref (a): OPNAVINST 5100.19E; Ref (b): NEHC-TM6290.91-2, REV B - Industrial Hygiene Field Operations Manual

Helpful Websites

National Hearing Conservation Association (NHCA): <http://nhca.affiniscape.com/displaycommon.cfm?an=1&subarticlenbr=17>

From the NHCA website, you can download the following to show the effects of hearing loss:

- Tinnitus Simulator: Represents the “ringing or screaming in the ears” sound experienced by a person with tinnitus.
- Hearing Loss Simulator: A simulated individual's age can be entered along with the years of exposure to noise.
- Video of how the inner ear processes sound: The video shows how sound travels through the ear and is processed by the cochlea.

NKO Course: Hearing Conservation (NMCPHC-HC-1.0)

Training Scenario #2

Off-Duty Recreation Hearing Protection & Firearms

Studies show that over 80% of hunters don't use hearing protection and given the right circumstances, a single shot can permanently damage your hearing.

However, the proper and consistent use of hearing protection will protect the shooter. The only action hunters need to take to select the hearing protection device that works best--for both fit and features--and make sure

that it is always used right!

Target Shooting: The best target-shooters will tell you (and research supports it) that better hearing protection leads to greater accuracy and less flinching. Shooting at the range can be a social event so you want to be able to communicate with your buddies while protecting your hearing.

There are specially designed "level-dependent" hearing

protectors with a filter or valve mechanism and electronic protectors to allow quiet sounds to pass while providing increased hearing protection for louder sounds.

"The most important factor in selecting hearing protection is to choose one that you will wear because no matter what the NRR or cost of the hearing protector, if you aren't using it when a shot is fired, it provides no protection at all."

RISK FACTORS ABOUT FIREARMS

- Shooting in an indoor firing range or from an enclosed structure like a hunting blind can redirect the energy wave back at the shooter, increasing the noise levels in the ear.
- The caliber of the firearm can be a factor as well.
- Larger calibers can generate higher energy sound waves.
- Short-barreled guns move the muzzle, the source of sound, closer to the ear increasing the risk.
- Adding muzzle ports or a muzzle brake increases sound exposure by sending the shock wave back toward the shooter instead of out of the front of the muzzle.

HOW TO TELL IF GUNFIRE NOISE IS AFFECTING YOUR HEARING

- People with noise induced hearing loss (NIHL) think that others mumble.
- "Fullness" in the ear or muffled sound after shooting.
- Temporary reduced ability to hear speech and quiet sounds.
- Tinnitus or ringing in the ears. If you hear a ringing or rushing sound in your ears after leaving a noisy environment, it was probably too loud.

How To Wear Foamies

Right**Wrong**

- ✓ Roll or squish the earplug
- ✓ Pull back on ear w/opposite hand (*this straightens ear canal for deeper insertion*)
- ✓ Insert the earplug
- ✓ Should not be able to see the foamie if looking directly at the wearer (or at yourself in a mirror)