HEARING CONSERVATION

Listen Up! *Shhhh…* Did you hear that?

Chances are you heard something, for we're constantly surrounded by sound both on and off the job. Unfortunately, many of the sounds we hear are unpleasant, whether it be pounding machinery or screeching traffic. In fact, millions of Americans are regularly exposed to loud, prolonged noise. Without proper protective equipment, noise can damage the tiny hair cells inside our ears and may even lead to permanent hearing loss.

In order to save our ears for life's pleasant sounds, we need to protect them against noise hazards.

The Anatomy Of The Ear

The ear consists of three parts: the outer ear, the middle ear and the inner ear.

The Outer Ear

Also called the pinna, the outer ear serves basically as a sound collector. It is made up of two parts called the ***auricle*** and the ***external auditory canal***. The auricle works like a funnel as it collects sound waves and directs them into the external auditory canal.

The opening you see if you look directly into the ear is the external auditory canal. This canal is made of cartilage and is about one inch long. Sound passes through the external auditory canal until it reaches a passageway called the ***tympanic membrane***, also called the ***eardrum***. The tympanic membrane leads from the outer ear to the middle ear and is lined with thousands of fine hairs and glands that produce wax. The hairs and wax trap dust, insects, dirt and other particles to prevent them from reaching the inner ear.

The Middle Ear

After sound passes through the outer ear and the eardrum, it reaches the middle ear, also known as the ***tympanic cavity***. The middle ear is a tiny air-filled chamber. It contains three bones that work like an amplifying system: the ***hammer, anvil*** and ***stirrup***. These three moveable bones are joined to each other and together make up the ***auditory ossicles***.

When sound waves reach the middle ear, vibrations from the eardrum cause the same movement in the hammer. Via these vibrations, the message is transmitted to the anvil and in turn, the stirrup. After sound waves pass through the stirrup, they reach the ***oval window***. The oval window links the middle ear to the inner ear.

The Inner Ear

Because the inner ear consists of a complex series of chambers and passageways, it is sometimes called a ***labyrinth***. The inner ear is not only essential for hearing, but it is also necessary for maintaining balance.

The three main parts of the inner ear are: the ***cochlea***, the ***estibule*** and the ***semicircular canals***. Of the three, the cochlea is considered central to the hearing process because it contains the send organ for hearing called the ***organ of Corti***. The cochlea is a very small bony structure resembling a snail shell. Essentially, its function is to convert sound waves to nerve impulses before they are transmitted to the brain.

In the middle of the inner ear is the vestibule. The vestibule serves largely as a link between the middle of the inner ear. Around the vestibule are three semicircular canals that work to maintain balance.

Now We Hear

As mentioned previously, the outer ear is designed to gather sound waves that are merely vibrations in the air. In order to be heard, however, these vibrations must be transformed into nerve impulses.

This transformation can take place only in the organ of Corti within the cochlea. Sound waves are able to reach this organ in one of three ways.

- Most common and important method of hearing occurs when the auricle funnels sound waves into the auditory canal. The sound waves travel through the outer ear and cause the eardrum to vibrate. The vibrations, in

turn, travel through the middle ear, ultimately causing the stirrup to move in and out of the oval window. This motion causes the fluid in the cochlea to move. While the fluid is in motion, it generates impulses. These impulses are picked up by the auditory nerve and finally transmitted to the brain where they are "heard."

- An alternate route for sound waves traveling to the inner ear is through the secondary eardrum. Sound waves may reach the secondary eardrum through the air or through a ruptured eardrum. In this case, the vibrations of a membrane within the secondary eardrum are transmitted to the inner ear. In the inner ear, the vibrations cause the fluid in the cochlea to move, again generating impulses that are transmitted to the brain.

- A less common method of hearing occurs when sound waves travel directly through the skull to the inner ear. When they reach the inner ear, vibrations cause the fluid in the cochlea to move. This sets nerve impulses in motion until they reach the hearing center in the brain.

Regardless of how sound waves reach the ears, they must eventually get to the cochlea. Inside the fluid-filled chamber of the cochlea are microscopic hair cells that convert the vibrations into electrical signals. These signals then travel to the brain via the auditory nerve.

The microscopic hair cells are crucial to the hearing process. Many of them die off naturally as we age, often resulting in gradual hearing loss. However, this process is accelerated by prolonged exposure to loud noise. Continued exposure to excessive noise may fatigue the hair cells and make them less responsive. Over time, the hair cells may become damaged or even die. As a result, deafness may occur.

Acceptable Noise Levels

Research has determined that the maximum safe noise level for the human ear is 90 decibels. Decibels measure the intensity of a sound, not its loudness. If people must be exposed for long periods to sound levels higher than approximately 85 decibels, they should wear some form of hearing protection.

- Disposable plugs are inserted into the ear canal to block out noise. Usually, they're made of an expandable foam material. Thin when inserted, they expand inside the ear canal to seal out noise. Wash your hands before inserting the plugs to keep them free from grease and dirt.

➢ Reusable plugs are inserted into the ear canal to block out noise. They're preformed, come in different styles, and are usually made of rubber or silicon. To prevent losing them, a cord often joins them. Use plugs that are the right size for your ear. Clean your plugs often with warm, soapy water. Deformed, hard or torn plugs should be replaced. You should be able to wear them for one to six months before replacing them.

➢ Muffs cover the external ear to provide a barrier against noise. The soft plastic cushions are filled with either foam or liquid. Some people wear earplugs and muffs together if they're exposed to very loud noise. The combination of muffs and plugs gives approximately 3 to 5 more decibels of protection. Keep the cushions clean by wiping them with a damp cloth. Replace the cushions if they're worn, stiff or torn. ***Note: If you're having any problems with hearing protectors, see your supervisor.***

Take Care Of Your Ears

In addition to protecting your ears on the job, here are some other ways you can keep them healthy.

➢ *Hygiene*. Never insert anything into the ear canal. You could run the risk of puncturing your eardrums. Clean your outer ears with a washcloth.

➢ *Keep Water Out*. Wear earplugs while swimming and avoid letting water run into your ears while showering. Moisture can cause infection.

➢ *Check-ups*. Have ears checked during regular physical exams. If you have symptoms of infection such as muffled hearing or an earache, see your physician or an ear, nose and throat specialist. If you experience hearing loss, see an audiologist who can measure your hearing.

➢ *At-Home Hearing Protection*. Wear hearing protection at home while working with power tools or lawn mowers. Keep the volume low on the stereo and avoid blasting your ears with earphones.

Put Your Ears To The Test. Here are some questions to test your hearing protection knowledge.

1) The maximum safe noise level for the human ear is 100 decibels so there's no need to wear hearing protection at this noise level. *False*. The maximum safe level is approximately 90 decibels, but if you're

exposed to noise levels above 85 decibels you should wear hearing protection.

2) Hearing protection can reduce noise as much as a 25 to 30 decibels. *True*. That's why you should make it a habit to wear hearing protection.

3) It's dangerous to wear earplugs and muffs at the same time. *False*. The combination gives you about 3 to 5 more decibels of protection. If you're exposed to very loud noise, the extra protection is well worth it.

4) Water in the ear can cause an infection. *True*. While swimming, wear earplugs designed for that purpose. Avoid letting water run into your ears while showering.