

## APPENDIX D

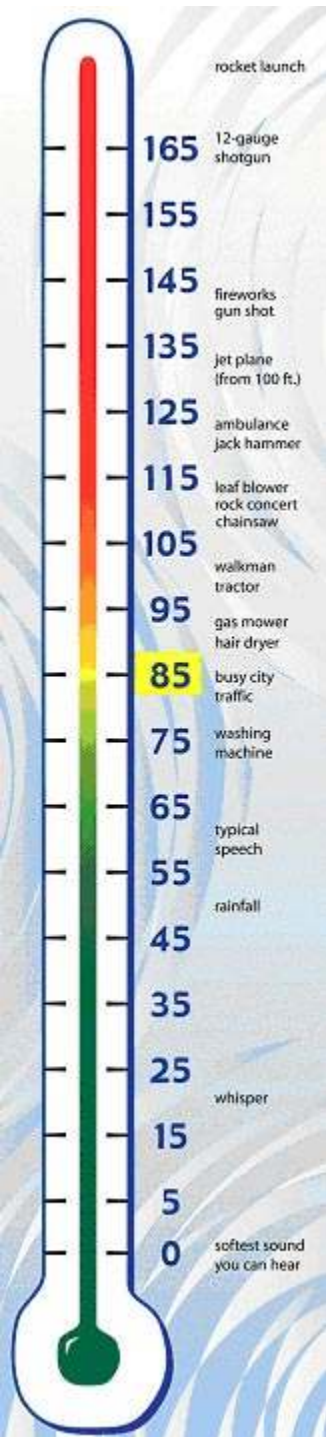
### Resources Used in Development of Section 401-3-V-Energy Generating Devices (copies attached)

Source: American Speech-Language-Hearing Association ([www.asha.org](http://www.asha.org))  
“Noise and Hearing Loss”

Source: [www.dangerousdecibels.org](http://www.dangerousdecibels.org)  
“Noise-Induced hearing Loss”

Source: [www.nationalwind.org](http://www.nationalwind.org)  
Table – “Typical Environmental & Industry Sound Levels”

Source: [www.sierraclub.org/coal/oh/downloads/ohio-wind-map-hi-res.pdf](http://www.sierraclub.org/coal/oh/downloads/ohio-wind-map-hi-res.pdf)  
**Ohio Wind Maps – 30, 50, and 70 meters**



SOURCE: <http://www.dangerousdecibels.org/hearingloss.cfm> 4/17/2010

Dangerous Decibels focuses on noise-induced hearing loss.

### Noise-Induced Hearing Loss (NIHL)

Of the roughly 40 million Americans suffering from hearing loss, 10 million can be attributed to noise-induced hearing loss (NIHL). NIHL can be caused by a one-time exposure to loud sound as well as by repeated exposure to sounds at various loudness levels over an extended period of time. Damage happens to the microscopic hair cells found inside the cochlea. These cells respond to mechanical sound vibrations by sending an electrical signal to the auditory nerve. Different groups of hair cells are responsible for different frequencies (rate of vibrations). The healthy human ear can hear frequencies ranging from 20Hz to 20,000 Hz. Over time, the hair cell's hair-like stereocilia may get damaged or broken. If enough of them are damaged, hearing loss results. The high frequency area of the cochlea is often damaged by loud sound.

Sound pressure is measured in decibels (dB). Like a temperature scale, the decibel scale goes below zero. The average person can hear sounds down to about 0 dB, the level of rustling leaves. Some people with very good hearing can hear sounds down to -15 dB. If a sound reaches 85 dB or stronger, it can cause permanent damage to your hearing. The amount of time you listen to a sound affects how much damage it will cause. The quieter the sound, the longer you can listen to it safely. If the sound is very quiet, it will not cause damage even if you listen to it for a very long time; however, exposure to some common sounds can cause permanent damage. With extended exposure, noises that reach a decibel level of 85 can cause permanent damage to the hair cells in the inner ear, leading to hearing loss. Many common sounds may be louder than you think...

- A typical conversation occurs at 60 dB - not loud enough to cause damage.
- A bulldozer that is idling (note that this is idling, not actively bulldozing) is loud enough at 85 dB that it can cause permanent damage after only 1 work day (8 hours).
- When listening to music on earphones at a standard volume level 5, the sound generated reaches a level of 100 dB, loud enough to cause permanent damage after just 15 minutes per day!

- A clap of thunder from a nearby storm (120 dB) or a gunshot (140-190 dB, depending on weapon), can both cause immediate damage.

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## Noise and Hearing Loss

### Noise is difficult to define!

People who study acoustics define noise as complex sound waves that are aperiodic, in other words, sound waves with irregular vibrations and no definite pitch.

In engineering, noise is defined as a signal that interferes with the detection of or quality of another signal.

The combined disciplines of psychology and acoustics (psychoacoustics) study the response of humans to sound. They define noise as unwanted sound.

Is music noise? Is the hum of tires on a highway noise? Is the surround-sound movie theater noise? Is the philharmonic concert noise? And what about the accompanying beat for aerobic exercises at the health club? Sounds that are soothing for some are irritating to others.

An expert on noise, K.D. Kryter (1996) in his text , *Handbook of Hearing and the Effects of Noise*, (New York Academic Press) defined noise as "acoustic signals which can negatively affect the physiological or psychological well-being of an individual."

Basically, noise is unwanted sound. It is a pollutant and a hazard to human health and hearing. In fact, it has been described as the most pervasive pollutant in America.

Noise in our environment affects physical health. Noise also has psychological and social implications and affects our well being and quality of life.

Unfortunately, public awareness of the hazardous effects of noise is low - especially noise considered to be non-occupational. To this end, the fourth Wednesday in April has been declared International Noise Awareness Day (INAD). As part of International Noise Awareness Day, a "Quiet Diet" is encouraged and is launched by observing 60 seconds of no noise from 2:15 to 2:16 PM. The reduction, if not stopping of everyday noises around us raises our awareness of the impact noise has on health and hearing.

According to the National Institute on Deafness and Other Communication Disorders ( [NIDCD](#)) more than 30 million Americans are exposed to hazardous sound levels on a regular basis. Of the 28 million Americans who have some degree of hearing loss, over one-third have been affected, at least in part, by noise. Visit the ["Wise Ears" Web site](#) for more information on noise-induced hearing loss.

### Damage to the Inner Ear

Your ear receives sound waves and sends them through a delicately balanced system to the brain. Part of this remarkable system, the cochlea, is a chamber in the inner ear filled with



fluid and lined with thousands of tiny hair cells. The hair cells signal the auditory nerve to send electrical impulses to the brain. The brain interprets these impulses as sound. When you are exposed to loud or prolonged noise, the hair cells are damaged and the transmission of sound is permanently altered.

## Noise Levels

Both the amount of noise and the length of time you are exposed to the noise determine its ability to damage your hearing. Noise levels are measured in decibels (dB). The higher the decibel level, the louder the noise. Sounds louder than 80 decibels are considered potentially hazardous. The noise chart below gives an idea of average decibel levels for everyday sounds around you.

### Painful

150 dB = rock music peak

140 dB = firearms, air raid siren, jet engine

130 dB = jackhammer

120 dB = jet plane take-off, amplified rock music at 4-6 ft., car stereo, band practice

### Extremely Loud

110 dB = rock music, model airplane

106 dB = timpani and bass drum rolls

100 dB = snowmobile, chain saw, pneumatic drill

90 dB = lawnmower, shop tools, truck traffic, subway

### Very Loud

80 dB = alarm clock, busy street

70 dB = busy traffic, vacuum cleaner

60 dB = conversation, dishwasher

### Moderate

50 dB = moderate rainfall

40 dB = quiet room

### Faint

30 dB = whisper, quiet library

## Warning Signs of Hazardous Noise

- You must raise your voice to be heard
- You can't hear someone two feet away from you
- Speech around you sounds muffled or dull after leaving a noise area
- You have pain or ringing on your ears (tinnitus) after exposure to noise.

## Hazardous Noise

Sounds louder than 80 decibels are considered potentially dangerous. Both the amount of noise and the length of time of exposure determine the amount of damage. Hair cells of the inner ear and the hearing nerve can be damaged by an intense brief impulse, like an explosion, or by continuous and/or repeated exposure to noise.

Examples of noise levels considered dangerous by experts are a lawnmower, a rock concert, firearms, firecrackers, headset listening systems, motorcycles, tractors, household appliances (garbage disposals, blenders, food processors/choppers, etc.) and noisy toys. All can deliver sound over 90 decibels and some up to 140 decibels.

Read more information on [noisy toys](#).

## Can't my ears "adjust" and "get used" to regular noise?

If you think you have "gotten used to" the noise you are routinely exposed to, then most likely you have already suffered damage and have acquired a permanent hearing loss. Don't be fooled by thinking your ears are "tough" or that you have the ability to "tune it out"! Noise induced hearing loss is usually gradual and painless, but, unfortunately, permanent. Once destroyed, the hearing nerve and its sensory nerve cells do not regenerate!

An audiologist certified by the American Speech-Language-Hearing Association (ASHA) can conduct a hearing evaluation to determine if you do have a hearing loss. If you are routinely exposed to noise, you should have your hearing checked by an ASHA-certified audiologist on a regular basis, at least once a year. In almost all states, a license to practice audiology is also required.