

SAFETY PROGRAM

Noise Control and Hearing Conservation Policy

Apr 2009; Rev Aug 2012

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Purpose

This policy and program aims to identify and protect employees of the South Carolina Department of Administration from the noise hazards which exist in facilities and from work processes by implementing a hearing conservation program with strategies to reduce noise and duration of exposure, identify noise hazard areas with warning signage, and provide personal protective equipment in the form of hearing protectors.

Hazard

Excessive intensity and duration of noise (i.e., being in an environment that has continuous, intermittent or impulse sounds that are too loud and/or for too long) is the primary reason for hearing loss. The risk of hearing loss is associated with unprotected exposure to sound levels at or above 85 decibels (dB); unprotected exposure below 85 dB is safe. Sound levels greater than 115 dB can be immediately harmful without protection. However, because it is usually painless and gradual, developing over a period of several years, hearing loss might not be noticed at first. Signs of hearing loss could start with a ringing in the ear (tinnitus) or trouble understanding what others say. Temporary hearing loss is when normal hearing returns after a period of rest. Damaged hearing may be partially but not fully restored. Fortunately noise-induced hearing loss is detectable with testing and is one-hundred percent preventable.

Hearing loss is one of the most prevalent health problems because noise is constantly all around us. Commitment to hearing conservation is very much a lifestyle choice just like cardiovascular fitness. Noise exposure is cumulative so employees must be aware not only of excessive noise at work but also when listening to loud music on an MP3 player; doing yard work with mowers, trimmers and blowers or home improvement projects with power tools; going to a rock concert; etc. Employees must be concerned enough so they take personal responsibility and actions to protect themselves against hearing loss both on and off the job.

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The following are examples of loudness (in decibels) for some common noise sources.

Event	dBA
Breathing	10
Whisper	20
Conversation	30 - 60
Typewriter	70
Rush hour traffic	80
Food blender	90
Passing train	100
Chainsaw	110
Passing jet	120
Shotgun blast	140

Definitions - see Attachment 1

References:

- Occupational Safety and Health Act (OSHA), Title 29 of the Code of Federal Regulations (29 CFR), Section [1910.95 - Occupational noise exposure](#).
- [OSHA Noise and Hearing Conservation E-Tool](#)
- Center for Disease Control / National Institute for Occupational Safety and Health: Noise and Hearing Loss Prevention - <http://www.cdc.gov/niosh/topics/noise/>

Policy

Any Department of Administration employee shall wear hearing protection when exposed to a hazardous noise level of 85 dB or above. Department of Administration management is to implement engineering controls and administrative work practices to reduce or eliminate unsafe noise levels and will provide hearing protectors at no cost to employees that are to be worn where noise levels remain hazardous. Such noise hazard areas will be identified and posted with warning signs. When any employee's work-related exposure is at or exceeds 85 dB with an eight hour time weighted average (TWA) then the Department of Administration Safety Office shall enter that employee into a hearing conservation program that includes annual hearing testing and mandatory wear of hearing protection. Occupational hearing loss must be documented and reported to OSHA. The Department of Administration Safety Office is responsible to train employees on the effects of hazardous noise, hearing protectors and elements of the hearing conservation program.

Procedures

1. The DOA will use a criterion level of 85 dB (A scale - dBA) and an exchange rate of 3 dBA for occupational exposure protection against workplace noise. This means

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where a worker is exposed to a sound level of 85 dB or greater, measures shall be taken to reduce the sound level to below 85 dB. (Generally, if someone must raise their voice in order to be heard by someone less than two feet away, hearing protection is recommended.) Hazardous workplace noise levels shall be eliminated or minimized by design, engineering controls at the source, and/or by documented administrative controls. Where such measures are not practicable or when implemented still do not reduce the sound level to 85 dB or less, persons shall wear hearing protection.

2. Department of Administration Safety will conduct work site noise assessment surveys, especially upon supervisor or employee request, to determine if hearing protection is required for specific equipment or work areas. Department of Administration Safety shall retain noise survey data indefinitely.
3. A Hearing Conservation Area shall be established where intermittent impulse or steady noise level exceeds 85 dB (TWA). Clearly visible warning signage shall be posted at all approaches to each identified Hearing Conservation Area saying, "Hearing Protection Required in This Area" or an equivalent; an associated pictogram and the maximum noise level measured are also recommended on the signs (see examples). The use of appropriate hearing protection shall be compulsory in any designated Hearing Conservation Area. Identified Hearing Conservation Areas in Department of Administration facilities are listed in Attachment 2.



4. Appropriate instruction about proper fit, care, use, and limitations of hearing protection shall be provided to employees by Department of Administration Safety and reinforced by supervisors. Management is responsible to provide employees and visitors with a selection of appropriate personal or disposable hearing protection.
 - A. The following table (29 CFR 1910.95, Table G-16 - Permissible Noise Exposures) lists the maximum amount of time an unprotected employee may be exposed to noise in the workplace. The OSHA permissible exposure limit (PEL) for noise is 90 dBA, as an 8-Hour TWA. The PEL is also referred to as a 100 percent "dose" noise exposure. Exposure to continuous steady-state noise is limited to a maximum of 115 dBA while exposure to impulse noise should not exceed 140 dB. Exposures are based on a 5 dBA exchange rate. It is believed nearly all workers may be repeatedly exposed to noise up to the 90 dB PEL without adverse effect on their ability to hear and understand normal speech. These values should be used as guides in the control of noise exposure and, due to individual susceptibility, should not be regarded as fine lines between safe and dangerous levels.

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Sound Level (dBA)	Duration per Day
90	8 Hours
92	6 Hours
95	4 Hours
97	3 Hours
100	2 Hours
102	1 ½ Hours
105	1 Hour
110	30 Minutes
115	15 Minutes or Less
140	Impulse

- B. However, as best industry practices are more current than the OSHA noise standard, the American Conference of Industrial Hygienists (ACGIH) has established more strict exposure guidelines for occupational exposure to noise in their Threshold Limit Values (TLVs) which the Board will follow. The PEL is 85 dBA. Based on a 3 dBA exchange rate, allowable TLVs for noise range from 80 dBA for a 24-hour period to 139 dBA for 0.11 seconds. No exposure to continuous, intermittent, or impact noise in excess of a peak sound level of 140 dB is allowed.

Hearing Conservation Program

A Hearing Conservation Program is required when workers are exposed to noise above the 85 dBA PEL / TLV level. Hearing conservation programs generally consist of the following five elements.

1. Workplace Sound Level Surveys - The noise hazard must first be identified and quantified. Measurements are done with a sound level meter to identify locations of concern and those personnel at risk. Risk is proportional to sound pressure amplitude and duration. If the preliminary survey indicates a TWA over 85 dBA, noise dosimetry in the workplace may be warranted. Consult the Department of Administration Safety Office, which has a noise dosimeter, for advice and assistance.
2. Noise Exposure Reduction - Feasible engineering or administrative controls must be used when employees are subjected to noise exceeding the 85 dBA PEL. Noise sources are prioritized with the loudest and most intense usually being addressed first.
 - A. Engineering controls attempt to eliminate the source of the noise which can include but are not limited to acoustic soundproofing insulation, curtains, blankets or enclosures; ceiling or wall panel baffles or barriers; attenuators or anti-vibration machine mountings; and/or component replacement. Existing equipment can also be modified or physically isolated from occupied

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- employee areas. New equipment should include noise insulation and/or “not to exceed” (85 dBA) specifications for noise pollution.
- B. Administrative practices may include shift rotation to limit the number of employees exposed and/or the duration of employee exposure, or turning off the equipment to accomplish required maintenance.
 - C. If such controls individually or in combination fail to reduce sound levels below the 85 dBA PEL, personal protective equipment (ear plugs, ear bands, ear muffs) must be provided and used to reduce sound levels to an acceptable level, e.g., below 85 dBA.
3. Information, Training and Warnings –
- A. Employees subject to loud levels of noise exposure are to be informed about the health effects of noise, exposure limits for hearing conservation, and about the proper selection, fit, care, use and limitations of hearing protectors.
 - B. Warning signs are to be posted in the workplace and on equipment as necessary to maintain awareness of hazardous noise levels.
 - C. The “Hearing Protection” module of the Board’s on-line safety training for “Personal Protective Equipment” discusses hearing protection and is supplemented with the Department of Administration’s [Hearing Protection Guidance](#) presentation. Should an employee be required to enter the Hearing Conservation Program, Safety will individually brief the employee on details of audiometric testing, medical surveillance and mandatory wear of hearing protection.
4. Hearing Protectors - In order to be effective, hearing protectors must be worn properly and continuously during the worker’s exposure to high noise levels.
- A. Hearing protection devices can be divided into three categories:
 - i. **Earplugs** - disposable polyurethane foam or reusable thermoplastic elastomer/polymer inserts that are fitted into the ear canal; typically sold separately as pairs or a pair with a connector cord.
 - ii. **Hearing bands** - semi-aural devices (external ear plugs) held against the ear canal by a headband
 - iii. **Earmuffs** - a headband with cups attached that fit over the entire ear
 - B. Hearing protectors are rated according to two methods based on attenuation values.
 - i. **Noise Reduction Rating System (NRR):** A NRR value, originally introduced by U.S. Environmental Protection Agency, represents the reduction in noise levels at ear level in dBA. Theoretically, an NRR value of 20 reduces the actual dBA by a value of 20. For example, a noise level of 100 dBA will be reduced to 80 dBA at ear level by a protector with a NRR value of 20.
Note: As of April 2012 the EPA is waiting for approval of its revised hearing protector labeling rule based on ANSI/ASA S12.6.2008 “Methods for Measuring Real-Ear Attenuation of Hearing Protectors” which is intended to replace current testing in near ideal lab conditions

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with testing closer to actual workplace conditions. At this point, the future of the rule is uncertain.

- ii. **ABC Rating System:** A Canadian system of hearing protection evaluation described by Canadian Standard Association CSA Z94.2-02. Depending on the level of noise exposure, either Class A, Class B, Class C or combination, such as Class A plug plus a Class A or a Class B earmuff, should be worn by individuals exposed to hazardous noise levels as shown in the following table.

Maximum Equivalent Noise Level, dBA (L _{EQ})	CSA recommended class of hearing protector	NRR equivalent
< 85	No protection required	
85 - 89	Class C	< 17
90 - 95	Class B	17
96 – 105	Class A	24
106 - 110	Class A plug + class A or class B muff	
>110	Class A plug + class A or class B muff and limited exposure	

C. Selecting hearing protection: Not all ears are the same; ear shape varies from person to person. It is important for employees to choose a hearing protection solution that best suits their needs and is comfortable so promotes 100% wear time. An employee’s hearing will only be adequately protected when hearing protection is worn and worn correctly. Additional consideration should ensure that hair length, eyewear and personal protective equipment such as eye protection, head protection, or a mask or respirator does not interfere with the protective seal of the ear.

- i. **Ear plugs** are best for people who work for extended times to all day. Ear plugs are small, light weight, comfortable, come in different sizes for custom fit, and are easy to use with other safety equipment such as hard hat, mask, respirator, safety glasses or goggles. They are inexpensive and also have a better NRR than ear muffs. However, they require more training to fit properly and can work loose and need refitting. They require washing one’s hands before insertion and can become soiled easily which can lead to irritation and infection. Reusable ear plugs can be cleaned while foam ear plugs will need to be discarded after becoming soiled. For the best fit use the following insertion method:

- (1) Foam plugs only: Roll the foam plug into a small diameter.
- (2) Reach around the back of your head, and gently pull your ear back and up
- (3) Insert and work the plug well into the ear canal

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- (4) Foam plugs only: Hold in place for a few seconds while it expands and forms a good seal



- see video on how to properly fit earplugs – <http://www.youtube.com/watch?v=ghNFKsxJuvY>
 - see video on how to fit banded hearing protection – <http://www.youtube.com/watch?v=itL5fnfqPU8&feature=related>
- ii. **Ear muffs** are easier to put on and take off than ear plugs, and one size fits all so are more convenient for persons who are intermittently exposed to noise. It is easier for supervisors to make a visual check that hearing protection is being used than for ear plugs. However, ear muffs are more expensive than ear plugs, can be uncomfortable especially when warm, are not easily worn with other safety equipment (such as hard hats, masks, respirator, safety glasses or goggles), the seal is affected by longer hair and wear of sun glasses and/or prescription eye glasses, and are not as effective at noise reduction as ear plugs.
- see video on how to put on earmuffs - <http://www.youtube.com/watch?v=nkWHwLL-K-k>
- iii. Both ear plugs and ear muffs should be worn for added protection when the noise level exceeds 105 dB. However, the amount of noise reduction from dual protection is not simply determined by adding the NRR of the two protectors but is only about 5 dB over the NRR of the highest individual NRR. Example: If the selected earplugs have a NRR-30 and earmuffs with NRR-23 are also worn, the combined NRR would only be $(30 + 5 =) 35$ (not $30 + 23 = 53$). **CAUTION:** Combining the wear of earmuffs over earplugs below 105 dB may block out needed ability to communicate with others.

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- iv. Hearing aids are not hearing protection. Turning off a hearing aid does not provide hearing protection. If hearing protection is needed, ear muffs should be worn over hearing aids.



Advantage – Earplug	Advantage – Earmuff
Noise attenuation - if fitted correctly earplugs provide the better noise protection /NRR attenuation as sealing the ear canal with an ear plug is more effective than sealing over the whole ear as with earmuffs	More consistent and repeatable levels of protection as they are easier to get proper fit (however, must ensure hair, glasses, etc. do not make gap in the seal around the ear). Ear plugs often work out and have to be reinserted.
Comfort due to light weight (ear muffs are larger, heavier and can result in wearer becoming hot and sweaty)	Convenient when going in and out of hazardous noise areas due to ease in donning (earplugs have to be rolled and held in place while they expand)
Foam style is disposable	Reusable and easy to clean (wearing soiled or damaged earplugs can lead to irritation and infection)
Foam style for “custom” fit while others can be true custom fit molded for individual ear canals	Can be used with hearing aids

- D. Maintenance: Hearing protectors should be inspected, cleaned, repaired or discarded in accordance with the manufacturer’s instructions. When not in use hearing protectors should be stored in a clean dry location, such as in a plastic bag inside the employee’s locker.
 - i. If disposable foam plugs become soiled, torn or stiff, discard them and get a new pair.

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- ii. Reusable earplugs can be cleaned using mild soap and water, and dried with a towel (not a blow dryer). As a general rule, earplugs should be replaced every six months or when they become torn or lose their elasticity and shape.
 - iii. Earmuff cushions can be cleaned using mild soap and water, and dried with a towel (not a blow dryer). As a general rule, earmuff cushions should be replaced at least every year.
5. Medical Surveillance - All employees exposed to TWA noise levels over 88 dBA on a daily consistent basis should have an initial audiometric baseline test. Each year thereafter the employee is to participate in annual audiometric testing where the results are compared against the baseline. If hearing loss is detected (there has been a standard threshold shift indicating susceptibility to noise) the employee must be informed within 21 days of the determination and may be referred for further clinical audiological evaluation or otological exam, especially when medical problems are suspected. If the work-related hearing loss is confirmed the threshold shift would become the new baseline and the employee will be required to wear hearing protection as directed. Annual audiometric testing and evaluation by an ear, nose and throat physician would then also be mandatory. Audiograms and medical hearing examinations for Department of Administration employees will be conducted by Carolina Occupational Healthcare or Healthworks as coordinated by Holly Bockow, Department of Administration Safety. Note: Audiograms are medical records subject to Health Insurance Portability and Accountability Act (HIPPA) privacy and OSHA reporting regulations and as such are only available to the employee and whomever the employee designates in writing. The physician will notify Department of Administration Safety of significant changes in the employee's hearing and the need for the employee to wear hearing protection but no other specifics.

Enforcement

Employees are responsible for protecting their hearing especially when working in areas identified by warning signs requiring the wear of hearing protection. However, coworkers, supervisors and Department of Administration Safety are to remind workers of the need to wear hearing protection when required. Failure to wear required hearing protection is subject to disciplinary action by the employee's supervisor in accordance with the Department of Administration personnel policy.

Contact Holly Bockow in the Department of Administration Safety Office at 803-737-2311 for further sound advice.

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Attachment 1

Definitions

See Occupational Safety and Health Act (OSHA), Title 29 of the Code of Federal Regulations (29 CFR), Section [1910.95 App I – Definitions](#)

Amplitude – the sound pressure deviation from ambient atmospheric pressure, measured in decibels (dB).

Attenuation – the reduction in sound pressure (typically 10 to 60 dBA) incident on the ear due to the use of a hearing protector (ear plugs and/or ear muffs).

Criterion sound level – the maximum sound level of 90 dB, expressed as a TWA that is permitted over an eight hour day for a 40 hour week.

Decibel (dB) – a logarithmic unit of measurement of sound level (pressure) with 0 dB defined as the faintest sound a person with normal hearing can hear. There is a ten fold increase in sound energy for each 1 dB increase.

Decibel A scale (dBA) – a measurement of sound pressure that has been modified to take into account that the ear is not equally sensitive to all frequencies of sound.

Duration – a length of time (the sound is heard).

Exchange rate – refers to how the sound energy is averaged over time; the amount by which the permitted sound level may increase if the exposure time is halved.

Frequency – the rate at which cycles of high and low sound pressures are produced by a source of sound. Frequency (Hz) is heard as the pitch of the sound. The human ear hears 20 to 20,000 Hz. Verbal communication is in the range 500 to 3000 Hz.

Hearing loss – caused by noise exposures, aging, and synergistic ototoxic effects of chemical exposures and therapeutic drugs.

Hearing protector – a device such as ear muffs or ear plugs that is worn to reduce the effect of noise on the auditory system.

Hertz (Hz) – the unit of measurement of frequency, i.e. cycles per second.

Impulse noise – a sudden burst of loud noise of short duration, e.g., a gunshot.

L_{EQ} – the preferred method to describe sound levels that vary over time, resulting in a single value which takes into account the total sound energy over the period of time.

Noise-induced hearing loss (NIHL) – occurs gradually without pain and for which there is no cure though some hearing loss is correctable.

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Noise – unwanted sound that causes hearing loss, stress, or interferes with communication.

Ototoxic – sound that causes functional impairment, e.g., hearing loss.

Presbycusis – age-related hearing loss.

Sound energy – the amount of energy transmitted to the ear by noise.

Sound pressure – noise creates fluctuations in air pressure which vibrate the ear drum; the louder the noise, the greater the changes in air pressure.

Standard Threshold Shift – an annual audiogram indicates an average shift in either ear of 10 dB or more at 2,000, 3,000 and 4,000 Hz.

Threshold Limit Value (TLV) – refers to sound pressure levels and durations of exposure that represent conditions under which it is believed that nearly all workers may be repeatedly exposed day after day without adverse health effects on their ability to hear and understand normal speech.

Time Weighted Average sound level (TWA) – That sound level, which if constant over an 8-hour exposure, would result in the same noise dose as is measured.

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Attachment 2

Hearing Conservation Areas in Department of Administration Facilities

The following locations or work processes require employees to wear hearing protection:

1. Archives and History Center, 8301 Parklane Road, Equipment Chiller Room 116
2. Columbia Mills Energy Facility, 301 Gervais Street (Rear)
3. DSIT Print Shop, 4430 Broad River Road, Computer Room Post Production Area (inserter or folder/sealer)
4. DSIT Print Shop, 1628 Browning Road
5. Facilities Management Energy Facility, 1121 College Street; Boiler and Chiller Rooms on the 1st Floor
6. Facilities Management Horticulture, powered grounds maintenance equipment such as but not limited to:
 - A. Grass trimmer
 - B. Edger
 - C. Leaf blower
 - D. Ride-on / Push lawn mower
 - E. Chain saw
7. Gressette Building, 1101 Pendleton Street, Penthouse Mechanical Fan Room
8. Rutledge Building, 1429 Senate Street, Penthouse Mechanical Room