

Noise Hazard Control & Hearing Conservation

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Farm Safety Association

Fact Sheet

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NOISE -- SOUND WITHOUT VALUE

INTRODUCTION

Poor Hearing -- a natural consequence of growing old? Such is not the case with many farmers. Studies have shown that some farmers experience substantial noise induced hearing loss by age 30. Many types of modern farm equipment emit noise far in excess of recommended levels. Prolonged exposure to excess noise levels can result in permanent hearing loss, unless some type of noise control measures are utilized.

SOUND AND NOISE

Sound is radiant energy that is transmitted through space by longitudinal pressure and is the objective cause of hearing. Normal ears can detect sounds of minute intensity as well as extreme intensity. Noise is best described as unwanted sound of sufficient intensity to damage hearing. The measurement of sound or noise is related to pressure, frequency and duration, and is commonly measured in units called decibels.

HOW NOISE DAMAGES HEARING

Noise-induced hearing loss seldom involves total hearing loss or deafness. However, the damage cannot be repaired and hearing aids can do little good. Constant exposure to noise affects the inner ear. The first sign of hearing damage is an inability to hear higher pitched sounds; with continued exposure to noise, the ability to tell musical tones apart becomes impossible. Eventually, with continual exposure to excess noise, the ability to hear normal conversation is impaired.

Noise is too loud when:

1. Your ears ring after prolonged exposure to noise (temporary threshold shift).
2. Speech and other sounds seem muffled after exposure.
3. You lose the ability to tell musical tones apart.
4. You fail to hear high pitched sound.

HEARING -- AN IMPORTANT ASSET

Next to eyesight, hearing is the most important asset humans have. Noise can lead to fatigue and reduce work output. Loss of hearing means that one of our most important warning devices is impaired.

DECIBEL -- A UNIT OF MEASUREMENT

The softest sound audible to humans is zero decibels; normal conversation measures approximately 65 decibels. Noise in excess of 120 decibels causes acute pain to the ear. Even brief exposure to noise levels of 120 decibels can result in a short lived hearing loss called temporary threshold shift. The ringing sensation that is sometimes experienced after operating a diesel tractor is a good example of this temporary shift. Normal hearing will usually return over a period of a few hours. However, continual exposure to noise at high decibel levels over a period of time may lead to permanent hearing loss.

The decibel measurement, similarly the ear, follows the inverse square law and as the distance from the source of the noise increases, the decibel level decreases as the square of the distance. For example, if you were located 5 feet from a noise source and moved 10 feet from the noise source, the noise level would drop to one-fourth of the level at 5 feet.

DECIBEL LEVELS OF COMMON SOUNDS

- 0 Acute threshold of hearing
- 15 Average threshold of hearing
- 20 Soft whisper
- 30 Leaves rustling
- 65 Normal conversation
- 70 Inside an automobile at 60 m.p.h.
- 80 Heavy traffic
- 90 Recommended level for 8 hour exposure
- 100 Tractor under load, motor cycle, snowmobile
- 120 Jack hammer, amplified rock music

Recommended levels for noise exposure have been incorporated into many types of safety and health legislation in Canada. These limits should serve as a guide to all persons involved in agricultural work. The Ontario Industrial Safety Act, 1971, sets forth the following limits:

Sound Level (Decibels) Exposure Period/24 Hours

90	8
92	6
95	4
97	3
100	2
102	1 1/2
105	1
110	1/2
115	15 minutes or less



Take **TEN** for safety

Noise Hazards

Leader's Notes - Noise Hazards

Noise-induced hearing loss is entirely preventable. Hearing can decrease gradually over time from exposure at workplaces where noise is too loud, or it can happen as a result of a sudden loud noise. The effects of noise induced hearing loss are often permanent and lead to dramatic changes in lifestyle and significant mental and physical stress. This safety talk will allow participants to identify areas with dangerous noise levels and provides steps to reduce noise at a worksite.

Note: these notes are intended to guide the trainer through a crew safety meeting on noise hazards. Review the slides and notes ahead of time. Demonstrate the use of ear plugs and ear muffs at the meeting. Gather any procedures, statistics, incident or accident reports available from your operation. Referring to these will make the subject more relevant to the audience.

Noise Hazards

Noise is defined as an unwanted sound and is considered a health hazard.

Overexposure to noise can cause:

- Temporary hearing loss
- Permanent hearing loss
- Increased blood pressure and stress
- Tinnitus (a ringing sound in the ears) *

Signs of Hearing Loss

- Trouble hearing consonants i.e. 'book' and 'cook' both sound like 'oo'
- Trouble hearing women's and children's voices
- Trouble hearing on the telephone *

Industry regulations set the exposure limit to:

85 dBA

As the maximum eight-hour equivalent exposure level without hearing protection.
(Effective July 1, 2007) *

Noise is an unwanted sound that can severely impede an individual's ability to hear. From 2002 to 2006, an average of 114 claims per year of Noise-Induced Hearing Loss (NIHL) from the mining sector were approved by the WSIB. Hearing loss can be temporary or permanent. Exposure to a loud sound or bang can result in temporary or permanent hearing loss. If a worker experiences temporary hearing loss more than once, without adequate time to recover, a hearing deficit can occur. Permanent hearing loss can also happen much more gradually: Daily or weekly exposure to noise can cause hearing to decrease gradually over years, eventually resulting in permanent loss.

Additional signs of hearing loss include: trouble hearing if multiple conversations are taking place, misunderstanding conversations and directions, and setting radio and TV volumes too loud for others. It is important to remember a hearing aid does not replace hearing, it simply amplifies sound.

Sound is measured in decibels. Regulation 851 for Industrial Establishments sets the noise limits for workers to a time-weighted average of 85 dBA, based on eight hours of work (i.e. a worker can be exposed to higher levels than 85 dBA, but the daily average must not exceed 85 dBA). The limit of 85 dBA must be adjusted for shift work that is longer than eight hours.

Note: Research has indicated that these limits should be altered somewhat. Future recommended levels will likely state 85 decibels for an eight hour exposure.

NOISE CONTROL

Noise control involves three distinct areas: (a) source of noise, (b) path along which the noise travels, and (c) the ear. Modifying the redesigning the source of noise can reduce noise levels. By interrupting the path of noise with a barrier such as an insulated tractor cab, noise can be reduced. Finally, noise damage to ears can be eliminated by using ear protection and limiting the exposure time.

FARM MACHINERY

The list of farm machinery capable of producing noise-induced hearing loss is endless. Many manufacturers of farm equipment are now designing their equipment to reduce noise.

However, the nature of farm equipment and the manner in which it is used, will continue to make noise a problem area for quite some time.

TRACTOR CABS

Fully insulated tractor cabs are now available for most popular makes of tractors. Improvements in mounting techniques and the use of acoustic materials have allowed many manufacturers to produce a cab that meets recommended noise levels.

EAR PROTECTION

If other means of noise reduction cannot reduce noise to acceptable levels, ear protection should be worn. Ear protection is available in two forms, acoustical ear muffs and ear plugs. Both ear muffs and ear plugs will effectively reduce the level of noise entering the ear, but will still allow you to hear your equipment running.

Ear muffs and plugs are available from safety supply companies and are also available from many farm supply outlets. When buying ear protection, remember that a good fit is compulsory in order for these devices to function properly.

The information and recommendations contained in this publication are believed to be reliable and representative of contemporary expert opinion on the subject material. The Farm Safety Association does not guarantee absolute accuracy or sufficiency of subject material, nor can it accept responsibility for health and safety recommendations that may have been omitted due to particular and exceptional conditions and circumstances.

Noise Hazards -- Leader's Guide

Noise Measurements

Noise is measured in units of decibels (dBA). An increase of 3 dBA doubles the volume of the sound (i.e. 93 dBA is twice as loud as 90 dBA).

dBA	Sound Source
140	Pain Threshold
120	Stroper
115	Mucking Machine
110	mp3 Player - Max Volume
80	Noisy Office
60	Conversation (at 3 feet)
40	Quiet Room

Not only are noise hazards present at work but hearing can be easily damaged through lifestyle choices. Most mp3 and portable music players produce levels of noise that can severely damage ears. Movie theatres and rock concerts can reach up to 120 dBA and often last for two to three hours.

Maximum noise/time exposure without hearing protection

dBA Level	Max. Daily Hours of Exposure
83.25	12
84	10
85	8
88	4
91	2
94	1
97	0.5
100	0.25

Workers must limit their exposure to noise to avoid hearing loss. Since 88 dBA is twice as loud as 85 dBA (sound volume doubles every three dBA), a worker should not spend more than four hours at 88 dbA without hearing protection, two hours at 91 dBA, and only 15 minutes at 100 dBA to avoid hearing damage. This table estimates the time it takes to reach an equivalent of eight hours of 85 dBA. NOTE: This table is only applies is the worker is working at the same sound level for the entire shift.

8-hr Equivalent Exposure Level

- The new regulation calculates all activity during any shift length as an eight hour exposure level ($L_{eq,8}$).

Activity	Exposure Time (hours)	Noise Level dBA
1	2	75
2	4	85
3	3	93
4	1	99
Total Hours	10	
	8-hr Equivalent	87.0
		Above $L_{eq,8}$ of 85 dBA

For longer shifts or shifts that involve different tasks that expose a worker to different noise levels, the eight-hour equivalent of 85 dBA must be found. The table shows the breakdown of a ten-hour shift with four different noise exposure levels. When this is adjusted to reflect an eight-hour shift (85.2 dBA/hour) the worker has exceeded the eight-hour exposure level. Lunch and rest breaks remove workers from noisy areas and helps reduce their L_{eq} . There are many computer programs available to perform these calculations, or various noise dosimeters can measure and calculate the equivalent exposure value.

Estimating Noise Levels

Column A shows the distance between two people who have to shout to hear each other. Column B gives the approximate corresponding noise level. Column C shows how much exposure time you should spend in those conditions without hearing protection.

A - Distance	B - dBA Level	C - Limit Exposure to:
1 metre	85 dBA	No more than 8 hours
30 cm	95 dBA	1 hour
Shout directly in your ear	105 dBA	3-4 minutes

To be able to gauge the volume of noise on the spot, you can test how easy it is to have a conversation. In general, if you have to shout at someone standing next to you, the noise levels is above 85 dBA. If you have to shout directly in his or her ear, the noise level is approximately 105 dBA. At 105 dBA, you should be wearing hearing protection or limiting your time in the area to 3 to 4 minutes a day. If you think an area you work in requires hearing protection, request a noise measurement survey.

Methods to Control Noise Exposure

To reduce and eliminate worker exposure to excessive noise, companies must have a policy to:

- Engineer out noise at the source
- Control noise along the path
- Use administrative controls
- Provide PPE (last resort) *

Hearing loss is preventable! On-site risk assessments can determine where noise exposure is high and steps can be made to reduce noise levels. The number one priority is to engineer out the problem of noise.

Noise Hazards-- Leader's Guide

Engineering Controls

This is by far the best way to reduce noise hazards. Noise levels can be engineered out by:

- Making low noise levels a priority when buying equipment
- Installing mufflers
- Installing noise sources away from work areas *




Purchasing departments can make noise reduction a priority when ordering new equipment. Equipment designs that take in to account noise reduction can play an important role in reducing noise levels at worksites.

Controlling Noise Along the Path

Noise can be controlled along the path by:

- Installing acoustical enclosures and barriers
- Reducing reverberation by installing sound-absorbing material


Source: WSR *



The next priority after trying to engineer out the problem of noise is to reduce noise along the path. An acoustic engineer can guide the placement and design of acoustical barriers and enclosures as well as the installation of sound-absorbing materials.

Controlling Noise through Administrative Controls

- Work schedules for employees can be rotated to reduce their daily exposure to acceptable levels
- Noisy equipment can be operated at times when employees are not in the area.
- Signs should indicate the dBA level in noisy areas and specify what hearing protection should be worn
- Regular maintenance on equipment to reduce noise levels. *



Employees can be moved away from noisy areas when they approach their maximum daily limit of 85 dBA. Signs in noise hazard areas should also be posted to warn workers to wear hearing protection. Signs should also be posted on hand tools to warn of sound levels when the tools are in use.

Using PPE to Reduce Noise Levels


Hearing protection should be the last method used to reduce noise. Ear plugs must be worn correctly to be effective.

Earplugs are:

- Small and light
- Comfortable
- Compatible with other safety equipment

but...


- Work loose
- Need fitting
- Get dirty *



PPE, while important, should be the last method used to reduce noise levels. Ear plugs can be effective, but are difficult to insert properly. Ear plugs come with an NRR rating: A rating of 29 db implies that wearing earplugs near a noise measuring 129 dBA will reduce the sound to 100 dBA. But due to the common difficulties fitting ear plugs properly and the fact that they often loosen while working, NIOSH recommends cutting the NRR rating by 50 per cent (i.e. a ear plug with an NRR rating of 29 db will probably only reduce noise volume by 14.5 dBA). CSA and OSHA also have de-rating formulas. Use the method your company has identified in its policies and procedures.

Noise Hazards - Leader's Guide

Follow the manufacturer's instructions to insert foam or PVC ear plugs for maximum protection.





Follow the manufacturer's directions carefully. Remember to stop and readjust if you feel the ear plugs working loose. Once ear plugs are dirty, they become less effective and should not be worn.

Earmuffs are:

- Easy to supervise
- Universal size
- Best fit over time

but...


- Must be worn tight to work
- Are uncomfortable in warm environments *



Earmuffs must be worn effectively with a tight seal formed around the muff.

Double Protection

For sound levels over 105 dBA, earmuffs and ear plugs should be worn together to create double protection for the worker. *



Double protection must be worn for noise measuring above 105 dBA.

MASHA recognizes that individual companies must develop health and safety policies and programs which apply to their workplaces and comply with appropriate legislation. The information contained in this reference material is distributed as a guide only to assist in developing those policies and programs.

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Ear care - quiz

How can you maintain healthy ears and protect your hearing? Test your knowledge with our quick health quiz.

1. How do you clean your ears?

- A. Wash the outer ear only.
- B. Wash the outer ear, and pick wax from the rim of the ear canal with a fingernail or cotton bud.
- C. Wash the outer ear, and remove wax from deep inside the ear canal with a cotton bud.

2. How loud do you think a noise has to be before it starts to damage your hearing?

- A. Extremely loud – when the noise hurts your ears.
- B. Very loud – when you can't hear what someone is shouting to you.
- C. Quite loud – when you have to shout to be heard.

3. Do you wear earplugs or ear muffs while using equipment around the home such as lawnmowers, whipper snippers and power tools?

- A. Sometimes.
- B. Always.
- C. Never.

4. When listening to music – on the stereo at home, in the car or via headphones – do you like to have the volume loud enough to drown out all other sounds?

- A. Of course – that's the only way to listen to music.
- B. Sometimes, if hosting a party for instance.
- C. Never – music should be pleasant background noise to conversation.

5. Are you frequently in noisy environments, such as workplaces with machinery, or motor racing events, discos or rock concerts?

- A. Occasionally or never.
- B. Sometimes.
- C. All the time.

6. Head injuries can sometimes cause hearing loss. How safety conscious are you?

- A. You always wear your seatbelt while travelling by car, and use protective equipment such as helmets while bicycling and playing contact sports.
- B. You usually take such safety precautions, but there are times when you just can't be bothered wearing protective equipment, such as on a hot day.
- C. You never bother to wear protective equipment, or else you sometimes don't worry about wearing your seatbelt on short car trips.

7. How do you treat upper respiratory tract infections?

- A. You take it easy for a few days, and take over-the-counter medication to help manage the symptoms.
- B. You see your doctor for prompt diagnosis and treatment.
- C. You let nature take its course.

Ear care – quiz answers

Correct answers

1. A= 3 points, B= 2 points and C= 1 point.

The best answer is A.

The ear canals are self-cleaning. Actions of the jaw, such as talking and chewing, help to 'massage' the wax out of the ear canal. Poking fingernails, cotton buds or other objects into the ear canal can compact earwax and cause ear damage.

2. A= 1 point, B= 2 points and C= 3 points.

The best answer is C.

It is a mistake to believe that only noises loud enough to cause earache are capable of causing hearing damage. Remember, if you need to shout to be heard over the noise, it's potentially damaging.

3. A= 2 points, B= 3 points and C= 1 point.

The best answer is B.

Equipment common to every household, like lawnmowers and power tools, can be loud enough to damage your hearing. It is important to wear ear muffs or earplugs (or both) each and every time you use noisy equipment.

4. A= 1 point, B= 2 points and C= 3 points.

The best answer is C.

Loud music can damage the tiny, delicate hairs on the cochlea, the spiral-shaped ear structure that picks up sound. Protect your ears by turning down the volume.

5. A= 3 points, B= 2 points and C= 1 point.

The best answer is A.

Exposure to loud noise can damage the tiny, delicate hairs on the cochlea, the spiral-shaped ear structure that picks up sound. If you are unavoidably exposed to loud noise, wear personal hearing protection such as earplugs, ear muffs or both.

6. A= 3 points, B= 2 points and C= 1 point.

The best answer is A.

The middle and inner ears are protected by the temporal bones, located at the base and sides of the skull. Head injury that involves trauma to the temporal bones can cause hearing loss. It is important to protect yourself from head injury at all times.

7. A= 2 points, B= 3 points and C= 1 point.

The best answer is B.

Upper respiratory tract infections can increase the risk of ear infections, particularly for young children. It is always best to seek your doctor's advice and treatment to help reduce the risk of secondary infections.

Your score

7-11: You could be flirting with serious hearing damage. It's in your best interests to find out more about how to protect your hearing, and make significant changes to your lifestyle.

12-16: You have a basic understanding of hearing safety, but some of your lifestyle choices could be putting your hearing at risk.

17-21: Congratulations, your lifestyle choices are substantially reducing your risk of hearing loss.

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