

GUIDE

# Hearing Conservation and Noise Control



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# GUIDE

## Hearing Conservation and Noise Control

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# INTRODUCTION

Workplace exposure to high levels of noise can cause noise-induced hearing loss (NIHL). This exposure can also be linked to other health effects, such as headaches, stress, increased blood pressure and increased irritability. High noise levels in the workplace can also affect a worker's ability to work safely.

In workplaces with high noise levels, a hearing conservation program must be implemented to reduce the noise exposure and protect workers' hearing.

A hearing conservation program involves the following steps:

- Workers know their noise exposure (personal dosimetry).
- Sound control measures to reduce noise levels.
- Workers are trained on noise-induced hearing loss (NIHL) and how to protect themselves.
- Workers are provided with appropriate hearing protection devices. Hearing protection is mandatory in some cases.
- Warning signs are posted about high noise levels.
- Biennial audiometric (hearing) testing is provided for noise-exposed workers as per Part 12 of the Legislation.
- The biennial hearing conservation report is reviewed within the workplace safety and health committee and appropriate followup actions are taken.

This guide provides practical help in developing and maintaining a hearing conservation program in your workplace. A workplace where workers are likely to be exposed to noise exposure levels of more than 80 dBA (Lex) (total exposure over an entire work day), must develop and implement a hearing conservation program. The program must be tailored to the severity of noise exposure at your workplace.

A hearing conservation program will not be effective unless it is ongoing and evaluated regularly. Because noise-induced hearing loss develops slowly, with subtle changes, your exposure to workplace noise and your hearing tests must be monitored regularly. Whenever you detect a problem, take action to correct it.

## ***WORKPLACE SAFETY AND HEALTH REGULATION REQUIREMENTS***

Part 12 of the *Workplace Safety and Health Regulation* (M.R. 217/2006), regarding Hearing Conservation and Noise Control, requires employers to ensure workers are not exposed to noise levels that may cause hearing loss.

This part of the regulation follows three principles:

1. It is more effective to reduce the noise levels in the workplace than to rely on hearing protection devices to protect workers.
2. Effective training and periodic hearing tests will provide workers with appropriate knowledge about the effects of high noise exposure levels.
3. When it is not possible to reduce noise levels, the use of personal hearing protection devices are required.

### **Employer responsibilities under the *Regulation***

Every employer must understand that a safe and healthy workplace is a legal obligation and a practical necessity.

Part 12 of the *WSH Regulation* requires the employer to assess the workplace for noise exposure in accordance with CSA Standard Z107.56-06 Measurement of Occupational Exposure to Noise. If the worker is exposed to 85 dBA (Lex) or more, the employer must assess for the use of sound control measures where possible and/or

provide hearing protection (at no cost to the worker) that reduces the worker's exposure to below 85 dBA (Lex).

The employer is also responsible for providing biennial audiometric testing (at no cost to the worker) for all workers exposed to noise levels above 85 dBA (Lex). When workers are exposed to noise levels above 80 dBA (Lex), the employer must provide hearing protection for workers who request it.

- (i) an initial baseline test as soon as is reasonably practicable but not later than six months after the worker is initially exposed to that noise level,
- (ii) a further test at least once every two years after the initial baseline test.

Hearing testing and subsequent reporting must be done in accordance with WSH Regulations. The biennial hearing report can be emailed to **hearing@gov.mb.ca**.

### **Worker Responsibilities**

The more workers understand what hearing conservation is about, the more they will be able to help make the hearing conservation program effective. Workers should make it their business to learn about noise hazards and hearing loss. They'll be able to make suggestions and avoid dangers if they understand the risks.

Workers must also ensure they follow the employer's hearing conservation program. This includes:

- following procedures outlined by the employer
- using control measures designed for reducing noise
- wearing hearing protection devices where required.

Workers can also tell the employer what is working to reduce noise levels or offer suggestions on what might help reduce noise levels.



# WHAT IS SOUND?

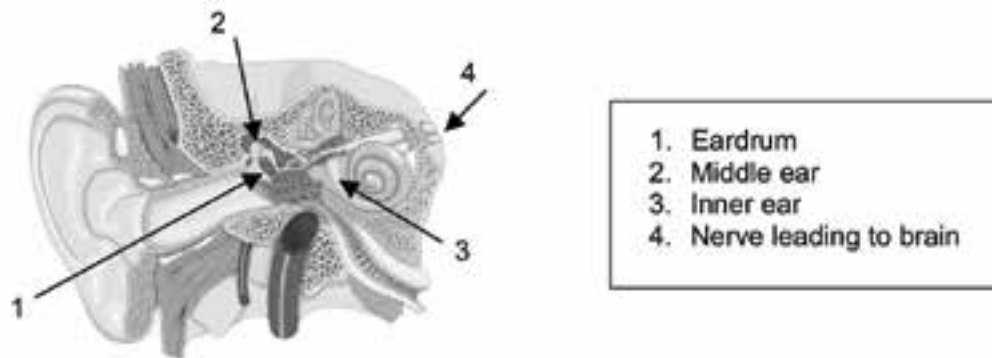
Sound is a series of waves or air pressure changes that make our eardrums vibrate. Tiny nerves in our ears respond to the vibrations and send signals to our brains where they are recognized as sound.

Frequency, intensity and duration must all be taken into account when describing sound and its impact on hearing. Frequency is the pitch (high or low), intensity is the volume or sound level (quiet or loud) and duration is the amount of time (continuous, intermittent, impulse).

## Sound can be dangerous

Your hearing can be damaged without you knowing it. Volume, or loudness, is your impression of how intense sound is, but sounds can be more intense than you realize. The effect on your hearing depends on both intensity and how long you are exposed to intense sound.

## What high noise levels do to you



When the eardrum vibrates, it moves three tiny bones in your middle ear. This movement transmits the vibration to fluid in your inner ear. Movement of this fluid is picked up by tiny hair cells, called cilia, that transfer the movement to nerves. The nerves send signals to your brain where they are recognized as sound.

Exposure to high-decibel sound for a long time can eventually damage the tiny hair cells. Consequently, fewer signals are sent to the brain and you don't hear as well. **Because the hair cells cannot be replaced or restored, the damage is permanent.** Hearing aids only amplify the sounds for your ear. They do not restore proper function to a damaged inner ear; therefore, it is very important to protect your hearing.

## HOW IS SOUND MEASURED?



*Sound level meter*

An instrument called a sound level meter measures the decibel level. A sound level meter measures the intensity at a specific time and place. Accurate measurements are important because a difference of only a few decibels can have an enormous effect on your hearing. Manitoba uses meters that measure decibels that are A-weighted (dBA). The A-weighting allows the sound level meter to detect sound much like a human ear by measuring intensity within the frequency range normal human ears can hear.

Measuring the decibel level and exposure time shows the amount of sound energy you are exposed to in the workplace. The term dBA (Lex) describes a worker's total sound exposure over an entire work shift. This exposure value is determined using a noise dosimeter. Knowing your dBA (Lex) exposure level is the first step in hearing conservation.



*Noise dosimeter*



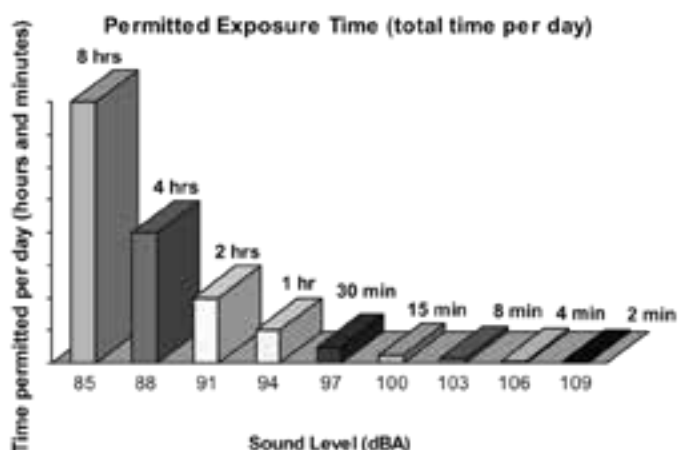
# WHEN IS SOUND HARMFUL?

It is important to recognize that the exposure of a worker is determined by measuring both the sound intensity and the length of time the worker is exposed to that noise. A noise dosimeter is able to calculate these average exposure values.

## How long is too long?

If people are exposed repeatedly and for long periods, sounds starts to be harmful at about 80 dBA. At 90 dBA, sound seems about twice as loud, but it's much more dangerous. This 10 decibel increase means the sound is **10 times** more intense. At 100 decibels - a 20 decible increase - the sound is **100 times** more intense than 80 decibels.

As sound levels (volume) increase, exposure times for each worker must be reduced. In Manitoba, a three decibel exchange rate is used. This means that for every three decibel increase in sound, there is a reduction of permissible exposure time that will decrease in half. That exposure means that for every three dBA (Lex) increase in the noise exposure above 85 dBA (Lex), the worker's exposure duration must be reduced by one-half without exceeding the exposure limit.



Generally, you must be exposed to a high noise level for an extended period before you notice hearing loss. By that time, serious damage may have been done. Although the noise exposure may not have seemed uncomfortable, it could cause permanent damage to your inner ears' hair cells and the damage cannot be reversed.

## How much exposure is dangerous?

The higher the noise exposure, the less time it takes for damage to occur. In Manitoba, hearing conservation measures must begin whenever workers are exposed to more than 80 dBA. In general, if you can't understand a loud voice from a distance of one metre (one yard) because of background sound, you're likely in a harmful noise environment.



# NOISE EXPOSURE ASSESSMENTS

Employers must determine what noise levels workers are exposed to before putting a hearing conservation program in place. To do this, a noise exposure assessment must be conducted according to the requirements of the CSA Standard Z107.56-13 - *Measurement of noise exposure*.

A noise exposure assessment is needed when:

- a worker is likely to be exposed to noise levels above 80 dBA
- an alteration, renovation or repair of the workplace may change the noise levels
- new equipment (that may change the noise levels) is introduced into the workplace
- changes to a work process may change the noise levels
- a worker provides the employer with evidence of noise-induced hearing loss (NIHL) that may be attributed to the workplace.

A noise exposure assessment evaluates both the sound volume or intensity of the noise and the length of time a worker is exposed to it.

During a noise exposure assessment, a worker will wear a noise dosimeter for their work shift, which will measure their noise exposure throughout the day and give them their average noise exposure. A worker's average noise exposure is used to determine whether the worker is exposed to noise over 80 dBA (Lex).

Employers must post written reports of the noise assessment in a prominent location at the workplace, ideally on the safety and health bulletin board, and all workers must be informed and trained on the noise level they will experience at work and the hazards that presents.

## **Part 12 of the WSH Regulation requires the following:**

- If the average noise exposure is over 80 dBA (Lex):
  - periodic noise exposure measurements must be taken and workers informed of the results
  - all workers must receive training about the hazards of the level of noise they experience or are likely to experience
  - the employer must provide hearing protectors and instruct the worker in selection, use and maintenance of hearing protection, if requested by the worker.
- If the average noise exposure is 85 dBA (Lex) or more:
  - all measures taken for 80 dBA (Lex) exposure must also be taken for 85 dBA (Lex) exposure
  - warning signs indicating that the area has a harmful noise level must be posted prominently at the entrance to all work areas where sound is 85 dBA (Lex) or more
  - employers must determine the practicality of using sound control measures (see page 8 of this guide for more about sound control measures)
  - work practice controls must be considered, if sound control measures are not practical.

If sound control measures do not limit the exposure to 85 dBA (Lex) or less:

- hearing protection is mandatory
- information on hearing protector limitations and instruction on their fitting and care must be provided to workers
- periodic reassessment of the practicality of engineering and work practice controls to limit noise exposure is required



- audiometric tests must be performed on workers no later than six months after workers are initially exposed to the workplace noise level and once every two years after the initial test.

## SOUND CONTROL MEASURES

It is more effective to reduce the noise levels in the workplace than to rely on hearing protection to protect workers.

If a noise exposure assessment indicates that workers are exposed to noise levels above 85 dBA (Lex), employers must attempt to use sound control measures to reduce the noise exposures to 85 dBA (Lex) or less.

Sound control measures are engineering or administrative controls that eliminate, control or reduce noise exposure, including:

- replacing, changing or eliminating noisy equipment
- distancing workers from sound sources
- enclosing noisy processes or machines
- changing buildings or structures (e.g., installing sound dampening walls and barriers)
- administrative controls such as limiting the length of time a worker is exposed to noise or alternating workers doing noisy jobs.

## TRAINING ON NOISE-INDUCED HEARING LOSS

Effective training will provide workers with appropriate knowledge about the effects of high noise exposure levels. All workers should “know their noise” exposure level at work: knowing your dBA (Lex) exposure level is the first step in hearing conservation. The term dBA (Lex) describes a worker’s total sound exposure over an entire work shift. This exposure value is determined using a noise dosimeter (see pages 7-8 of this guide for more on noise exposure assessments).

Training is required when exposure to sound levels is more than 80 dBA (Lex) to make sure workers are aware of noise hazards. Be sure to discuss with workers the fitting, care and use of the hearing protection provided to them. Workers exposed to noise exposure levels of 85 dBA (Lex) or higher need further education about the limitations of hearing protection devices and instruction on inserting the devices correctly (see page 9 of this guide for more on hearing protection devices).

# HEARING PROTECTION DEVICES



Employers must provide hearing protection on request by workers exposed to noise levels between 80 dBA (Lex) to 85 dBA (Lex). Hearing protection devices must always meet the requirements of CSA Standard Z94.2-14 - *Hearing protection devices - Performance, selection, care, and use*, and must be used when noise exposure levels are at 85 dBA (Lex) or higher. Hearing protection is mandatory when noise is over 85 dBA (Lex).

There are two types of hearing protection devices available:

- earmuffs consisting of a headband and ear cup with a soft outer ring or cushion fitting tightly against the ear or sides of the head around the ear
- earplugs worn in the external ear canal or in the entrance to the external ear canal.

The type of hearing protection selected depends on the noise exposure levels. You want the workers' noise exposure reduced to below 85 dBA; however, you don't want it reduced too much or workers can be overprotected and not able to hear other safety warnings in the workplace, such as forklift horns.

There are four classes of hearing protection:

- **Class A or AL** — used when noise exposure levels are greater than 95 dBA (Lex), up to and including 105 dBA (Lex). Generally, hearing protection devices with a noise reduction rating (NRR)\* of at least 24 will fit into this category.
- **Class B or BL** — used when noise levels are greater than 90 dBA (Lex), up to and including 95 dBA (Lex). Generally, hearing protection devices with a NRR from 17 to 24 will fit into this category.
- **Class C** — used when noise levels are equal to or less than 90 dBA (Lex). Generally, hearing protection devices with a NRR of less than 17 will fit into this category.
- **Dual hearing protection** — used when noise levels are greater than 105 dBA (Lex), using earplugs and earmuffs together is recommended.

At noise levels above 105 dBA (Lex), limiting noise exposure time and implementing engineering controls and administrative controls such as work rotation are also recommended.

Select and fit hearing protection carefully to make sure they give effective protection and cause minimum discomfort to the user. Repair or replace any worn-out seals promptly. Let workers choose from several effective types of hearing protection devices. They are more likely to use equipment that is comfortable for them. Instruct workers to replace disposable earplugs every day and clean reusable ones regularly.

Hearing protection must be worn — and worn correctly — at all times when working in harmful noise environments, and workers must be trained to properly insert hearing protection devices. Properly selected and worn hearing protection devices can provide effective protection from high noise exposures.

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\*The noise reduction rating (NRR) lists the amount of decibels that hearing protection devices will reduce the noise levels. For more information on applying NRR ratings calculations, please refer to *CSA Standard Z94.2-14 - Hearing protection devices - Performance, selection, care, and use*.



# WARNING SIGNS



All entrances to the workplace areas where hearing protection is required must have warning signs posted. It is a good idea to have the noise levels for each machine or workstation posted as well so workers “know their noise.”

# BIENNIAL HEARING TESTING

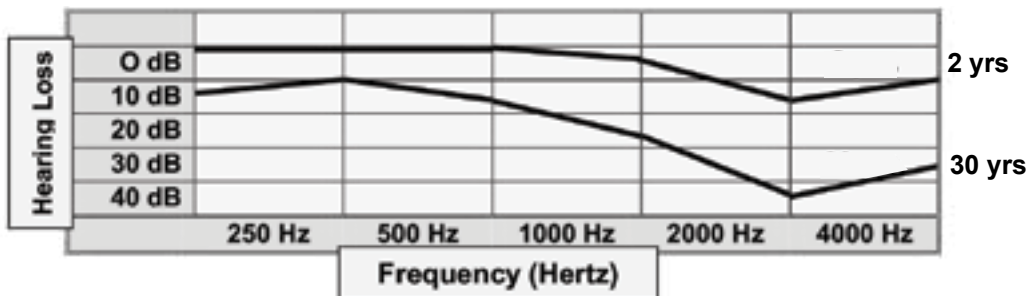
An audiometric (hearing) test measures how well you hear sounds at different frequencies or pitches. The pitch or frequency of a noise is expressed in Hertz or Kilohertz. The audiogram tests frequencies between 500 Hz and 8000 Hz. A graph called an audiogram shows test results. Biennial audiometric testing at workplaces may only be conducted by someone who has a valid Industrial Audiometric Technician License (LIAT) from the Manitoba Workplace Safety and Health Branch. You can find more information on the LIAT at [http://www.gov.mb.ca/labour/safety/train\\_iat\\_lic.html](http://www.gov.mb.ca/labour/safety/train_iat_lic.html).

Reviewing audiograms over the years will show any changes to your hearing sooner than you are able to notice. The audiogram is an important tool because often the first sign of noise-induced hearing loss is when it detects significantly reduced ability to hear high-pitched sounds (about 4,000 Hz). Early warning is vital to correcting problems in the workplace before more harm happens.

In Section 12.4(2)(c) of Part 12 of the *WSH Regulation*, the employer is required to provide audiometric tests for workers exposed to noise levels 85 dBA (Lex) or more. The employer must arrange for a baseline test as soon as reasonably practicable within six months of first exposure to noise. After the initial baseline test, audiometric testing is required every two years.

### Audiogram

Hearing loss compared at 2 years and 30 years of noise exposure:  
*An example of the potential effects of exposure to high noise levels*



# BIENNIAL HEARING CONSERVATION REPORT

The biennial hearing testing will conclude with a hearing conservation report. This report does not contain the individual audiograms of workers, which are confidential medical information and must be treated as such by the Licensed Industrial Audiometric Technician (LIAT). The hearing conservation report is a summary of the number of workers who had baseline audiograms conducted (new workers) and the number of workers who had hearing testing conducted. The report also includes the number of abnormal baseline audiograms, as defined below:

“Abnormal audiogram” means an audiogram that indicates:

- a) the threshold in either ear is more than 25 dB at 500, 1000 or 2000 Hz;
- b) the threshold in either ear is more than 60 dB at 3000, 4000 or 6000 Hz; or
- c) there is one-sided hearing loss with the difference in hearing threshold level between the better and the poorer ear exceeding the average of 30 dB at 3000, 4000 and 6000 Hz.

The hearing conservation report should also include the number of workers with an abnormal shift in their hearing (a change from their baseline audiogram to now), as defined below:

“Abnormal shift” means a threshold shift, in either ear, of 15 dB at two consecutive test frequencies from 1000 Hz up to and including 6000 Hz, when compared to the baseline test. The baseline will change once there is an abnormal shift. The shift will become the new baseline.

When workers have an abnormal shift, the annual report will also mention if it is noise-induced and if it is work-related. If the shift in the worker’s hearing is from noise exposure at work, it is important that the worker’s supervisor is informed that the worker has an abnormal shift in their hearing. For the supervisor and employer, the worker’s abnormal shift in hearing will mean ensuring the worker has proper hearing protection, re-testing the worker’s noise exposure and ensuring the worker wears hearing protection at all times when exposed to noise.

It is also required that the information from every biennial hearing conservation report be submitted to Workplace Safety and Health at [hearing@gov.mb.ca](mailto:hearing@gov.mb.ca).



# SUMMARY

Workplaces where noise exposure may be a problem must have the noise exposure levels assessed. If average noise exposure levels in a workplace are 80 dBA or lower, no action is required. However, noise exposure levels need periodic checking to ensure they remain at safe levels. If your workplace noise exposure level is above 80 dBA, a hearing conservation program is required, as show below:

All Workplaces Above 80 dBA (Lex)	All Workplaces Above 85 dBA (Lex)
<ul style="list-style-type: none"> <li>• Periodic noise exposure measurements must be taken and workers informed of the results.</li> <li>• All workers must receive training about the hazards of the level of noise they experience or are likely to experience.</li> <li>• If requested by a worker, the employer must provide hearing protectors and instruct the worker in selection, use and maintenance of hearing protection.</li> </ul>	<ul style="list-style-type: none"> <li>• All measures taken for 80 dBA exposure must also be taken for 85 dBA exposure.</li> <li>• Employers must determine the practicality of using sound control measures.</li> <li>• If sound control measures are not practical, work practice controls must be considered.</li> <li>• If sound control measures do not limit the exposure to 85 dBA (Lex) or less:</li> <li>• Hearing protection is mandatory.</li> <li>• Information on hearing protector limitations and instruction on their fitting and care must be provided to workers.</li> <li>• Periodic reassessment of the practicality of engineering and work practice controls to limit noise exposure is required.</li> <li>• Audiometric tests must be performed on workers no later than six months after workers are initially exposed to the workplace noise level and once every two years after the initial test.</li> <li>• Warning signs indicating that the area has a harmful noise level must be posted prominently at the entrance to all work areas where sound is above 85 dBA.</li> </ul>

# GLOSSARY

**hearing conservation report:** A summary of the number of workers who had baseline audiograms conducted (new workers) and the number of workers who had annual hearing testing conducted at the workplace. The report should also include the number of abnormal baseline audiograms. Annual hearing conservation reports are required in a hearing conservation program. (See page 12 of this guide for more information.)

**audiometric test:** A hearing test that measures how well you hear sounds at different frequencies or pitches. Employers are required to provide audiometric tests for workers exposed to noise levels above 85 dBA (Lex). The employer must arrange for a baseline test within six months of a worker's first exposure to the noise level at that workplace. After the initial baseline test, audiometric testing is required every two years. Audiometric testing is reported in hearing conservation reports. (See page 11 of this guide for more information.)

**audiogram:** A graph that shows the results of an audiometric test.

**cilia:** Tiny hair cells in the ears. Exposure to high-decibel noise for a long time can eventually damage cilia, causing hearing loss.

**dB(A):** Decibels that are A-weighted. A-weighting decibels allows sound level meters to detect sound much like a human ear by measuring intensity within the frequency range normal human ears can hear. Manitoba uses sound level meters that measure A-weighted decibels.

**dB(A) (Lex):** The unit of measurement that describes a worker's total noise exposure averaged over the entire work day.

**decibel (dB):** The unit of measurement for the intensity of sound. Sound intensity is perceived by us as volume (or loudness).

**frequency:** The pitch of sound (how high or low it sounds). As sound wavelengths are reduced, sound increases in frequency. Frequency is measured in Hertz (Hz).

**hearing conservation program:** Steps taken to reduce noise exposure and protect workers' hearing in the workplace. A hearing conservation program is required where workers are likely to be exposed to noise exposure levels of more than 80 dBA (Lex).

**hearing protection devices:** Earmuffs and/or earplugs worn to protect workers' hearing. Hearing protection devices must always meet the requirements of CSA Standard Z94.2-14 - *Hearing protection devices - Performance, selection, care, and use*, and must be used when noise exposure levels are at 85 dBA (Lex) or higher. Employers must provide hearing protection on request by workers exposed to noise levels over 80 dBA (Lex).

**Hertz (Hz):** The unit of measurement for sound frequency (pitch).

**integrating sound level meter:** An instrument that measures the decibel level and exposure time to show the amount of sound energy you are exposed to in the workplace, averaged over the entire work day. See also "noise dosimeter."

**Lex:** The level of a worker's total noise exposure averaged over the entire work day.



**noise dosimeter:** An instrument that measures the decibel level of noise and exposure time to show the amount of noise energy you are exposed to in the workplace, averaged over the entire work day. See also “integrating sound level meter.”

**noise exposure assessments:** An evaluation of the sound pressure level of noise and the length of time a worker is exposed to it. An assessment must be conducted according to the requirements of the CSA Standard Z107.56-13 - *Measurement of noise exposure*, and before putting a hearing conservation program in place. (See page 7-8 in this guide for more information.)

**noise-induced hearing loss (NIHL):** Hearing loss caused by exposure to high levels of noise.

**noise reduction rating (NRR):** The number of decibels that hearing protection devices will reduce noise levels. For more information on NRR ratings, please refer to CSA Standard Z94.2-14 - *Hearing protection devices - Performance, selection, care, and use*.

**sound:** A series of waves or air pressure changes that make our eardrums vibrate. Tiny nerves in our ears respond to the vibrations and send signals to our brains where they are recognized as sound.

**sound control measures:** Engineering or administrative controls that eliminate, control or reduce noise exposure. Sound control measures must be a part of a workplace hearing conservation program. (See page 8 of this guide for more information.)

**sound level meter:** An instrument that measures the decibel level of sound. It measures sound intensity at a specific time and place.











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