

Hearing Conservation Program

OCCUPATIONAL HEALTH & SAFETY

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Glossary

A-weighted decibel (dB(A)): The A-weighted decibel or dBA, is a type of decibel measurement which closely represents the manner in which a human ear responds to noise.

Attenuation: The noise reducing capacity of hearing protection devices.

Leq: equivalent continuous sound level. Sound levels that vary over time, resulting in a single decibel value, which takes into account the total sound energy over the period of time of interest.

Audiogram: A chart, graph or table resulting from an audiometric test showing an individual's hearing threshold levels as a function of frequency.

Baseline Audiogram: The audiogram against which future audiograms are compared.

C weighted decibel (dB(C)): the power ratio of a signal to a carrier signal, expressed in decibels.

Continuous Noise: Noise intervals of one second or less.

Criterion Level (Lc): is the steady noise level permitted for a full eight-hour work shift.

Decibel (dB): Unit of measurement of sound level.

Exchange Rate: the amount by which the permitted sound level may increase if the exposure time is halved.

Hertz (Hz): Unit of measurement of frequency, numerically equal to cycles per second.

Intermittent Noise: Broadband sound pressure level exposure several times throughout the day.

Impulsive/Impact: Sharp burst of noise.

Noise: Unwanted sound that causes harm, either by causing hearing loss or stress, or interferes with communication.

Noise Reduction Rating (NRR): unit of measurement used to determine the effectiveness of hearing protection devices to decrease sound exposure.

Sound Level: Ten times the common logarithm of the ratio of the square of the measured A-weighted sound pressure to the square of the standard reference pressure of 20 micropascals. Unit: decibels (dB).

Standard Threshold Shift (STS): A change in hearing threshold relative to the baseline audiogram of an average of 10 dB or more at 2000, 3000 and 4000 hertz in either ear.

Time weighted average (TWA): The time-weighted average (TWA) represents the average (noise) exposure measured over a typical 8-hour workday.

Purpose

The purpose of the Algonquin College Hearing Conservation Program is to prevent worker exposure to excessive noise that can cause hearing loss.

Scope

The hearing conservation program identifies hazards, and outlines procedures, controls and training to protect workers from excessive noise exposure, as required by the OHSA and O.Reg 381/15. This program applies to all Algonquin College staff who may be exposed to elevated noise levels throughout the course of their duties.

Roles and Responsibility

Managers

- Identifying noise hazards and employees who may be exposed
- Contacting OHS regarding any potential overexposures
- Consulting with OHS regarding engineering and/or administrative controls, as necessary
- Arranging audiometric evaluations, through Health Services for employees
- Maintaining all audiometric test records. Records must be kept on file even after term of employment
- Providing all necessary hearing protection to employees
- Supervising and ensuring the correct use of hearing protection devices

Employees

- Using hearing protection as required
- Participating in annual audiograms, as required
- Participating in training
- Inspecting and maintaining hearing protection devices
- Seeking replacement or repair of hearing protection devices when necessary.

Occupational Health and Safety

- Developing and maintain the Noise Conservation Program
- Conducting all personal and/or area noise monitoring
- Providing guidance regarding control measures and hearing protection
- Notifying all employees exposed at or above an 8-hour **time weighted average (TWA)** of 85 **decibels** (dB) of the monitoring results
- Ensuring proper initial fitting of all hearing protection devices
- Ensuring all employees are trained on noise related hazards and the Hearing Conservation Program
- Maintaining all exposure measurement records.

Joint Occupational Health and Safety Committee

- Report any actual or suspected elevated noise level
- Be present during any noise testing
- Be provided with a copy of any noise monitoring in order to have the opportunity to provide recommendations to the employer

Applicable Legislation

- Occupational Health and Safety Act (OHSA)
- Ontario Regulation 381/15: Noise
- CSA Standard Z94.2-02, "Hearing Protection Devices- Performance, election, Care and Use".
- CSA Standard Z107.4-M86, "Pure Tone Air Conduction Audiometers for Hearing Conservation and for Screening".
- CSA Standard Z107.51-M1980 (R1999), "Procedure for In-situ Measurement of Noise from Industrial Equipment".
- CSA Standard Z107.56-06, "Procedures for the Measurement of Occupational Noise Exposure".
- CSA Standard Z107.6-16, "Audiometric Testing for use in Hearing Loss Prevention Programs"

Sound Surveys and Exposure Monitoring

Employee and/or area monitoring shall be performed when exposure is suspected of being at or above the criterion level, or **Lc**, of an 8-hour TWA of 85 dB(A).

Factors, which suggest that noise exposures in the workplace may be at or above 85 dB(A), include employee complaints about the loudness of noise, indications that employees are losing their hearing, or noisy conditions which make normal conversation difficult.

All **continuous**, **intermittent** and **impulse/impact** sound levels from 80 dB to 130 dB shall be incorporated into the noise measurement survey.

The degree of noise reduction required shall be determined by comparing the measured levels with acceptable noise levels as presented in Table 1.

Monitoring shall be repeated whenever a change in processes, production, equipment or controls increases noise exposure to the extent that additional employees may be exposed at or above the action level, or the **attenuation** provided by hearing protection devices being used by employees may be rendered inadequate.

Affected employees, or their representatives, shall be provided an opportunity to observe any noise measurements.

Table 1 indicates Occupational Health and Safety Act's permissible noise exposure limits:
Noise Exposure Limits when Criterion Level= 85 dB(A)

Allowable Sound Level – in dB(A) for Exchange Rate of 3 dB(A)	Maximum Daily Duration
85	8
88	4
91	2
94	1
97	.5
100	.25

Note: Exposures to impulse/impact noise shall not exceed 140 dB peak sound pressure level.

Exchange Rate

When the sound level increases above the criterion level, the allowed exposure time must be decreased. The allowed maximum exposure time is calculated by using a trading ration. The exchange rate is the amount by which the permitted sound level may increase if the exposure time is halved. In Ontario, the exchange rate is 3 dB(A).

Control Measures

When employees are subjected to sound exceeding those levels listed in Table 1, feasible engineering and administrative controls shall be utilized as the first step in noise control. If these controls fail to reduce sound to acceptable levels, hearing protection devices shall be used. During the implementation of administrative and/or engineering controls, affected employees shall be provided with hearing protection devices and trained in accordance with this program.

Administrative Controls

Administrative controls normally involve a change in work schedules or operations that reduce noise exposures. Examples modifications to job design such as operating a noisy machine on the second or third shift when fewer people are exposed, job rotation where an employee has intermittent exposure to noise throughout a shift, or shifting an employee to a less noisy job once a hazardous daily noise dose has been reached.

Engineering Controls

Engineering controls shall be used when any modification or replacement of equipment, or related physical change at the noise source, or along the transmission path can be altered, which reduces the noise level to the employee's ear.

Typical engineering controls may involve the following:

1. Reducing noise at the source;
2. Interrupting the noise path;
3. Reducing reverberation;
4. Reducing structure-borne vibration;
5. Employee/equipment isolation; and
6. Equipment/process substitution.

Hearing Protection Devices

Hearing protection devices shall be made available to all employees exposed to an 8-hour TWA of 85 dB or greater at no cost to the employees. Hearing protection devices shall be replaced as necessary.

The use of hearing protection devices is mandatory for all employees exposed to an 8-hour TWA of 85 dB(A) or greater.

Audiometric Evaluations

Audiometric evaluations shall be made available at no cost to all College employees whose exposure equals or exceeds an 8-hour TWA of 85 dB(A).

Baseline Audiograms

Baseline audiograms shall be required within six months of an employee's first measured exposure at or above the **Lc** to compare subsequent audiograms.

Prior to the audiogram, employees shall be informed to avoid high levels of non-occupational noise exposure during the 14-hour period immediately preceding the audiometric examination.

Annual Audiograms

Audiograms shall be performed at least annually after obtaining the baseline audiogram for each employee exposed at or above the 8-hour TWA of 85 dB(A). Each employee's annual audiogram shall be compared to his/her baseline audiogram to determine if the audiogram is valid and if a standard threshold shift has occurred. If the annual audiogram shows that an employee has suffered a standard threshold shift, the employee may obtain a retest within 30 days and the retest results may be considered the annual audiogram. If a comparison of the annual audiogram to the baseline indicates a standard threshold shift, the manager and OHS shall inform the employee of this in writing within 21 days of the determination.

All audiometric tests and equipment calibration shall be performed in accordance with the criteria established by CSA Standard Z107.56-06, "Procedures for the measurement of Occupational Noise Exposure"

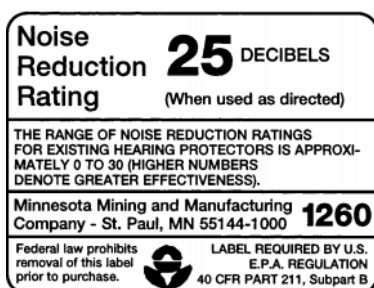
Hearing Protection Selection

In order to determine the level of protection required to protect workers and reduce the noise level to an acceptable level, the Noise Reduction Rate, or NRR, must be calculated.

Personal protective equipment is always the last line of prevention controls, and are applied when engineering and administrative controls are not suitable in reducing the potential of injury to an acceptable level. The hearing protection must provide noise reduction to on or below the noise criterion level.

First you must determine the noise level. This can be done by performing any of the evaluation methods described above.

Select an NRR rating (this number can be found on the hearing protector packaging).



Once these numbers are obtained, perform the following calculation:

- Subtract seven from the NRR number, which is given in decibels.
- Divide the result by two.
- Subtract the result from the original noise exposure level in decibels.

An Example of How to calculate the NRR:

1. 8-hour TWA noise exposure= 93 dB(A)
2. NRR of hearing protection= 29 dB
3. Subtract 7 dB from the NRR: 29 dB - 7 dB= 22 dB
4. Divide by 2= 11 dB
5. Subtract 11 dB from the 8-hour TWA: 93 dB – 11 dB= 82 dB
6. The hearing protection would reduce the noise exposure from 93 dB to **82 dB**.

C Weighted Decibel

The term dB(C) refers to the type of filter used to measure sound in decibels. A 'C' filter has a different sensitivity to various frequencies.

Measurements made using C filters are expressed in dBCs. Unlike dBA, its measurements suit low and high frequency sound levels. The C filter filters the sounds the microphone picks up in the sound level meter. The frequency response function, sometimes called a weighting characteristic, controls the tone by giving more weight to some frequencies than other less important frequencies.

Limitations of the NRR Method

When selecting hearing protection devices (HPDs), it is often incorrectly assumed that the Noise Reduction Rating (NRR) on the package accurately predicts the dBA reduction that the device will provide. This is untrue for two reasons.

First, the NRR is designed for use with C-weighted sound measurements. This means that if only A-weighted noise measurement data is available there must be an adjustment to account for the difference between A-weighting and C-weighting.

Second, the data used to determine the NRR for a device is normally obtained under laboratory conditions, so devices must be “de-rated” to account for the significantly reduced protection provided under “real world” conditions.

In order to account for the adjustment, the following calculation is used:

$$\text{Predicted A-weighted exposure} = \text{A-weighted exposure} + 3\text{dB} - \text{NRR}$$

Types of Hearing Protectors

Ear plugs are inserted in the ear canal. They may be pre-molded (preformed) or moldable (foam ear plugs). Disposable, reusable or custom molded ear plugs are available.



Semi-insert ear plugs which consist of two ear plugs held over the ends of the ear canal by a rigid headband.



Earmuffs consist of sound-attenuating material and soft ear cushions that fit around the ear and hard outer cups. They are held together by a headband.



The choice of hearing protectors is personal and depends on a number of factors including level of noise, comfort, and the suitability of the hearing protector for both the worker and his environment. Most importantly, the hearing protector should provide the desired noise reduction. It is best, where protectors must be used, to provide a choice of a number of different types to choose from.

Information and Training

Employees who may be exposed to noise at or above an 8-hour TWA of 85 dB shall receive training on the following:

1. Health effects of noise;
2. Purpose of hearing protection devices;
3. Advantages and disadvantages of hearing protection devices;
4. Attenuation of various types of hearing protection devices;
5. Instructions on selection, fitting, use and care of hearing protection devices; and
6. The purpose of audiometric testing including an explanation of the test procedure.

OHS shall conduct annual training for all employees included in the College's Hearing Conservation Program.

***See Appendix B for instructions on how to correctly insert ear plugs.

Recordkeeping

Exposure Measurements

All managers and OHS shall maintain accurate records of all employee exposure measurements for a period of two years.

Audiometric Tests

Records of all employee audiometric tests shall be retained for the duration of the affected employee's employment and thirty years from the date of termination. These records shall include:

- Name and job classification of the employee;
- Date of the audiogram;
- The examiner's name;
- Date of last acoustic or exhaustive calibration of the audiometer;
- Employee's most recent noise exposure assessment; and
- Background sound pressure level measurements in audiometric test rooms.

All records shall be made available upon written request to the employee or designee at any time without regard to employment status.

Reporting

If a worker suspects that a process, machine or area contains excessive noise, it should be reported immediately to their supervisor/ manager. Supervisors/ managers should contact Occupational Health and Safety to determine if noise monitoring is required. If hearing levels are determined to exceed the allowable limit, workers will be referred to their physicians for examination.

WSIB Claims

Noise-induced hearing loss arising from occupational noise exposure is a compensable occupational disease in Ontario. Human Resources will report cases of noise induced hearing loss to the WSIB, once written consent to release audiometric information has been obtained from the employee.

Appendix A



Audiometric and Identification Information

Test Date: _____ Test Time: _____
Test Type: _____ Time Since Last Exposure: _____ hours
Exposure Level: _____ dBA
Name: _____
Student/Employee No: _____
Campus: _____ Program/Department: _____
Coordinator/Supervisor: _____ Tele No/Ext.: _____

Self-Reported Employee Histories

Medical History (Y/N)

Diabetes: _____
Ear Surgery: _____
Head Injury: _____
High Fever: _____
Measles: _____
Mumps: _____
High Blood Pressure: _____
Ringing in Ears: _____
Ear Infection: _____
Other: _____

Hobby & Military History (Y/N)

Hunting: _____
Shooting: _____
Racing Cars: _____
Motorcycles: _____
Other Loud Vehicles: _____
Loud Music/Band: _____
Power Tools: _____
Military Service: _____
Branch: _____
Other: _____

Additional Information (Y/N)

Noisy 2nd Job: _____
Noisy Past Job: _____
Difficulty Hearing Right Ear: _____
Difficulty Hearing Left Ear: _____
Hearing Aid Right Ear: _____
Hearing Aid Left Ear: _____
Recent Change in Hearing: _____
See Physician about Ears: _____
See Prior History: _____
Other: _____

Audiogram

Test Frequency


Ear	500	1000	2000	3000	4000	6000	8000
Right							
Left							

Audiometer: _____ Serial Number: _____
Exhaustive Calibration Date: _____ Biological Calibration Date: _____
Tester Identification: _____ Test Reliability (Good/Fair/Poor): _____
Reviewer Identification: _____ Audiogram Classification Code: _____
Comments: _____

Appendix B- Inserting Ear Plugs


INSTRUCTIONS

1



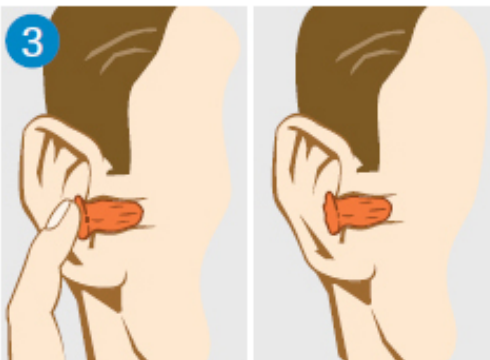
with clean hands, roll the entire earplug into narrowest possible crease-free cylinder

2



Reach over your head with a free hand, pull your ear up and back, and insert the earplug well inside your ear canal

3



Hold for 30-40 seconds, until the earplug fully expands in your ear canal. If properly fit, the end of the earplug should not be visible to someone looking at you from the front

Wear

Read and follow all earplug fitting instructions

Selection

Avoid overprotection in minimal noise environments – in selecting the best earplug for your situation, consider noise levels and your need to communicate with co-workers or hear warning signals on the job

Maintenance

Inspect earplugs prior to wear for dirt, damage or hardness – discard immediately if compromised

For proper hygiene, discard Single-Use earplugs after use

With proper maintenance, Multiple-Use earplugs can last for 2-4 weeks; clean with mild soap/water and store in a case when not in use

Do's and Don'ts

If either or both earplugs do not seem to be fitted properly, remove the earplug and reinsert.

Gently twist earplug while slowly pulling in an outward motion for removal.

In a noisy environment, with earplugs inserted, cup your hands over your ears and release. Earplugs should block enough noise so that covering your ears with your hands should not result in a significant noise difference.

Earplugs should only be worn in ears. Any other places may cause a harmful situation.

Please consult your doctor if having doubts when using these earplugs.

Keep earplugs away from small children.

For a manual in your own language, please navigate to the webshop where you bought these products and type after the domain-name: [/instructions](#)

Image taken from: https://easyinstructions.nl/docz/english_foamgeneral.jpg