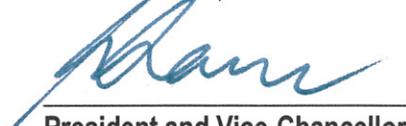


Complete Program Title: Noise Control and Hearing Protection Program	Risk Management Manual (RMM) Number: 403
Approved by:  Vice-President, Administration  President and Vice-Chancellor	Date of Most Recent Approval: November 2015
Date of Original Approval: April 2002	Supersedes/Amends Program dated: December 2009
Responsible Executive: Vice-President, Administration	Enquiries: Environmental and Occupational Health Support Services (EOHSS) eohtss@mcmaster.ca
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1 PURPOSE

1.1 To provide for protection from noise levels that may cause hearing loss, by ensuring that a hearing conservation program, which includes the following components is in place:

- Adoption by the University of a criterion level of 85 dBA and an exchange rate of 3 dBA for occupational exposure protection against workplace noise; Where noise levels are in excess of 82dBA, the area shall be investigated to review opportunities to reduce the noise levels if possible and protect workers from exposure.
- Workplace sound level surveys;
- Noise reduction initiatives;
- Medical surveillance;
- Employee awareness through posting of warning signs and hearing protection training;
- Informed use of hearing protection equipment; and
- Periodic audits of the effectiveness of the program.

- 1.2 To ensure compliance with the Occupational Health and Safety Act. O. Reg. 851, standards and applicable regulations as a best practice, i.e. R.R.O. 1990 Industrial Establishments, Section 139.

2 SCOPE

- 2.1 All faculty, staff, students, visitors and contractors who may be exposed to hazardous noise levels.

3 Related Documents

- 3.1 Occupational Health and Safety Act and Industrial Regulations R.R.O. 1990
3.2 CSA Standard Z94. 2-02, Hearing Protection Device.
3.3 CSA Standard Z107.56-06, Procedures for the Measurement of Occupational Noise Exposure.

4 DEFINITIONS

- 4.1 **Supervisor:** Person who has charge of a workplace or authority over a worker(s);
- 4.2 **Worker:** means any of the following, but does not include an inmate of a correctional institution or like institution or facility who participates inside the institution or facility in a work project or rehabilitation program:
1. A person who performs work or supplies services for monetary compensation.
 2. A secondary school student who performs work or supplies services for no monetary compensation under a work experience program authorized by the school board that operates the school in which the student is enrolled.
 3. A person who performs work or supplies services for no monetary compensation under a program approved by a college of applied arts and technology, university or other post-secondary institution.
 4. A person who receives training from an employer, but who, under the *Employment Standards Act, 2000*, is not an employee for the purposes of that Act because the conditions set out in subsection 1 (2) of that Act have been met.
 5. Such other persons as may be prescribed who perform work or supply services to an employer for no monetary compensation; (“travailleur”);
- 4.3 **Amplitude:** The sound deviation pressure from ambient atmospheric pressure measured in decibels (dB);
- 4.4 **Attenuation:** The reduction in sound pressure (typically 10 to 60 dBA) effect on the ear due to the use of a hearing protector;
- 4.5 **Criterion Level:** The maximum sound level, expressed as a TWA that is permitted over an eight-hour day for a 40-hour week;

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- 4.6 **Duration:** The time a sound is heard;
- 4.7 **Exchange Rate:** The dBA level by which a sound (noise) can be increased provided the exposure time is reduced by a factor of two;
- 4.8 **Frequency:** The rate at which cycles of high and low sound pressure 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 of 500 to 3,000 Hz;
- 4.9 **Hearing Loss:** Caused by noise exposure, aging and synergistic ototoxic effects of chemical exposures and therapeutic drugs;
- 4.10 **Hearing Protector:** A device that is worn to reduce the effect of noise on the auditory system;
- 4.11 **Impulse Noise:** A sudden loud burst of noise of short duration, e.g. a gunshot;
- 4.12 **Noise:** Unwanted sound that causes harm, e.g. hearing loss, stress or interferes with communication;
- 4.13 **Ototoxic:** Causing functional impairment of the ear e.g. hearing loss;
- 4.14 **Synergistic:** The combined effect of exposure to two or more chemicals, physical agents or surroundings (i.e. noise and stress), or drugs;
- 4.15 **Sound Pressure:** Fluctuations in air pressure caused by noise; the louder the noise the greater the changes in air pressure. These fluctuations cause the eardrum to vibrate;
- 4.16 **Acronyms:**
- ACGIH:** American Conference of Governmental and Industrial Hygienists
- CSA:** Canadian Standards Association
- dB:** Decibel, a logarithmic measurement of sound pressure, 0 dB is defined as the faintest sound a person with normal hearing can hear.
- dBA:** Decibel A scale; 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.
- EOHSS:** Environmental and Occupational Health Support Services
- FHS** Faculty of Health Sciences
- EHS** Employee Health Services
- Hz:** Hertz the unit of frequency, i.e. one cycle per second.
- JHSC:** Joint Health and Safety Committee.
- Leq:** Average equivalent noise level; an average of noise calculated from measurements of noise that varies over time.
- RMSG** Risk Management Support Group
- TLV:** Threshold Limit Value; refers to sound pressure levels and duration of exposure that represent conditions under which nearly all workers may

be repeatedly exposed day after day without adverse health effects on their ability to hear normal speech.

TWA: Time Weighted Average; a measure of the total noise exposure over a specified period of time.

5 RESPONSIBILITIES

5.1 Role of Senior Management: (Deans/Directors/Chairs/Managers):

Senior Managers shall:

- provide the resources and support necessary to implement and maintain hearing conservation or noise reduction programs within their area of responsibility.

5.2 Role of Supervisors (Academic and Administrative):

Supervisors shall:

- identify areas where noise levels are perceived to be potentially harmful;
- arrange through EOHSS or FHS to conduct a sound level survey in the designated area;
- initiate noise reduction and control strategies as recommended by EOHSS or FHS in which engineering controls need to be considered initially;
- initiate and maintain hearing conservation programs as recommended by EOHSS or FHS;
- provide hearing protection equipment as necessary;
- post “Hearing Protection Required” areas and supervise the compulsory use of hearing protection in such areas (See Appendix C);
- ensure that people working with portable machinery that has been identified as producing noise above the criterion levels, wear the hearing protection provided;
- arrange for persons required to wear hearing protection on an ongoing basis to enroll themselves in an audiometric testing program coordinated by EHS and
- provide instruction on the use, fit, care and limitations of the Hearing Protection, to persons required to wear such equipment.

5.3 Role of Authorized Person (Worker/Student):

People authorized to work in hearing protection required areas shall:

- wear hearing protection while working in posted “Hearing Protection Required” areas or with portable equipment or machinery that has been identified as requiring such protection to operate;
- enroll in an audiometric testing program as required by this program; and participate in the Hearing Conservation Training Program.

5.4 **Role of Central Joint Health and Safety Committee:**

The CJHSC shall:

- Review the Noise Control and Hearing Program on a scheduled basis.

5.5 **Role of Joint Health and Safety Committees (JHSC's)**

The Joint Health and Safety Committees shall:

- review and provide comment on Hearing Conservation Programs;
- assign a member to participate in workplace noise surveys where legally entitled under the OHSA;
- include "Hearing Protection Required" areas in joint health and safety audits of the workplace; and
- report on the effectiveness of such programs.

5.5 **Role of Risk Management Support Group (RMSG):**

The RMSG shall:

- conduct sound level surveys as required;
- consult on noise reduction and control strategies;
- arrange for annual audiometric testing of persons who are required to work in posted "Hearing Protection Required" areas or with designated portable equipment or machinery which produce hazardous noise levels; and
- provide hearing conservation training.

6 **Procedures**

6.1 **General Procedures**

6.1.1 **Noise Level Surveys:** Shall be arranged by the workplace supervisor in consultation with RMSG and the JHSC;

6.1.2 **Noise Reduction and Control:** Workplace noise levels shall be minimized by design, engineering controls at the source and / or documented administrative controls;

6.1.3 **Designation and Posting of Hearing Conservation Areas:** When noise reduction efforts fail to reduce the eight-hour TWA below 85dBA, the area will be posted with a

sign, which reads *Hearing protection required in this area*. Such signs, and their locations, will be reviewed by EOHSS or FHS;

- 6.1.4 **Personal Protective Equipment:** The wearing of appropriate hearing protection is compulsory in *Designated hearing protection required areas*. NB. All such protective equipment must be approved by EOHSS or FHS;
- 6.1.5 **Audiometric Testing:** Identified persons required to work in designated hearing conservation areas shall enroll in an audiometric testing program coordinated by EHS;
- 6.1.6 **New Machinery and Equipment:** Noise factors will be considered and identified when ordering new machinery and equipment. When appropriate suppliers will be required to provide noise level data for the equipment being considered; and
- 6.1.7 **Training:** All persons required to work in a designated Hearing Protection area or with machinery and/or equipment that has been designated as requiring the use of hearing protection shall receive training as prescribed by EOHSS or FHS (See Section 7 Training).

7 TRAINING

Persons required to work in designated hearing conservation areas or with machinery or equipment that has been designated to require hearing protection, shall receive training which includes but is not limited to the following:

- Noise Control and Hearing Protection definitions (See Section 4);
- Responsibilities (See Section 5);
- General Procedures (See Section 6);
- Regulatory requirements (See Appendix 1);
- Hearing Protection Guidelines (See Appendix B); and
- Medical Surveillance (See Appendix B).

8 RECORDS

- 8.1 **Retention:** To facilitate external audits by regulatory agencies and investigation of employee claims for hearing loss, records of noise level surveys and the names of persons registered in audiometric testing programs shall be retained indefinitely.
- 8.2 **Filing:** Copies of these records will be maintained by the supervisor and RMSG.

Appendix A:

Requirements of O. Reg.851 Industrial Regulations Section 139

139. (1) In this section,

“dBA” means a measure of sound level in decibels using a reference sound pressure of 20 micropascals when measured on the A-weighting network of a sound level meter;

“decibel” means a unit of measurement of sound pressure level that is equal to 20 times the logarithm to the base 10 of the ratio of the pressure of a sound, divided by the reference pressure of 20 micropascals;

“equivalent sound exposure level” is the steady sound level in dBA which, if present in a workplace for eight hours in a day, would contain the same total energy as that generated by the actual and varying sound levels to which a worker is exposed in his or her total work day, determined in accordance with the formula set out in subsection (2). O. Reg. 565/06, s. 2.

(2) The formula for determining the equivalent sound exposure level is as follows:

$$L_{ex,8} = 10 \log_{10} \left(\frac{\left[\sum_{i=1}^n (t_i \times 10^{0.1 SPL_i}) \right]}{8} \right)$$

where,

$L_{ex,8}$ is the equivalent sound exposure level in 8 hours,

\sum is the sum of the values in the enclosed expression for all activities from $i = 1$ to $i = n$,

i is a discrete activity of a worker exposed to a sound level,

t_i is the duration in hours of i ,

SPL_i is the sound level of i in dBA,

n is the total number of discrete activities in the worker’s total workday.

O. Reg. 565/06, s. 2.

(3) Every employer shall take all measures reasonably necessary in the circumstances to protect workers from exposure to hazardous sound levels. O. Reg. 565/06, s. 2.

(4) The protective measures shall include the provision and use of engineering controls, work practices and, subject to subsection (7), personal protective equipment. O. Reg. 565/06, s. 2.

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- (5) Any measurement of sound levels in the workplace that is done in order to determine what protective measures are appropriate shall be done without regard to any use of personal protective equipment. O. Reg. 565/06, s. 2.
- (6) Without limiting the generality of subsections (3) and (4), every employer shall ensure that no worker is exposed to a sound level greater than an equivalent sound exposure level of 85 dBA, $L_{ex,8}$. O. Reg. 565/06, s. 2.
- (7) Except in the circumstances set out in subsections (8) and (9), the employer shall protect workers from exposure to a sound level greater than the limit described in subsection (6) without requiring them to use and wear personal protective equipment. O. Reg. 565/06, s. 2.
- (8) If this subsection applies, workers shall wear and use personal protective equipment appropriate in the circumstances to protect them from exposure to a sound level greater than the limit described in subsection (6). O. Reg. 565/06, s. 2.
- (9) Subsection (8) applies if engineering controls are required by subsections (3) and (4) and,
- (a) are not in existence or are not obtainable;
 - (b) are not reasonable or not practical to adopt, install or provide because of the duration or frequency of the exposures or because of the nature of the process, operation or work;
 - (c) are rendered ineffective because of a temporary breakdown of such controls; or
 - (d) are ineffective to prevent, control or limit exposure because of an emergency. O. Reg. 565/06, s. 2.
- (10) A clearly visible warning sign shall be posted at every approach to an area in the workplace where the sound level, measured as described in subsection (5), regularly exceeds 85 dBA. O. Reg. 565/06, s. 2.

Appendix B

Guidelines:

Hearing loss is one of the most prevalent health problems because noise is present everywhere. Once hearing has been damaged it cannot be restored. Hearing conservation cannot be perceived only as a workplace initiative, it is a lifestyle choice, similar to cardiovascular fitness. Understanding the risk must translate into a personal commitment to protect ones hearing both on and off the job.

The decibel levels of some common noise sources are:

breathing	10 dBA	food blender	90 dBA
whisper	20 dBA	passing train	100 dBA
conversation	30-60 dBA	chain saw	110 dBA
typing	70 dBA	jet engine	120 dBA
rush hour traffic	80 dBA	shot gun blast	140 dBA

Sound Level TLVs for Unprotected Occupational Exposures

Duration of Exposure (hours)	Sound Level (dBA)
8	85
4	88
2	91
1	94
0.5	97
0.25	100
No exposure	Over 103

These ACGIH – recommended TLVs for sound pressure levels, represent conditions under which it is believed that nearly all workers may be repeatedly exposed 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. ***A hearing conservation program is necessary when persons are exposed to noise levels at or above the TLV levels.***

Sound Level Surveys

The noise level must first be identified and quantified. Measurements are done with a sound level meter to identify locations of concern and those persons at risk. Risk is proportional to sound level amplitude and duration. If the preliminary survey indicates a TWA over 82 dBA,

noise dosimetry (i.e. measurements of Leq) in the workplace may be warranted. EOHSS or FHSc will arrange for such surveys when indicated by the preliminary survey.

Medical Surveillance:

An annual audiometric testing program is offered to all persons exposed to TWA noise levels over 85 dBA. Pre-placement testing is mandatory for persons assigned to work in such areas. Risk Management Services (EHS) will arrange for such testing.

Noise Exposure Reduction

Noise exposure reduction initiatives are approached on the basis of “can the noise source be eliminated or reduced to an acceptable level?”. New equipment should be specified to meet noise pollution standards; engineering controls (e.g. insulated enclosures) can be applied to a source that cannot be replaced; noise sources might be physically isolated from occupied areas; administrative controls can restrict the number of persons exposed and the duration of exposure. Individuals can be provided hearing protection that meets CSA standards.

Information Training and Warnings

All persons entering the workplace shall be informed about health effects of noise exposure, exposure limits for hearing conservation and the proper selection, fit, care use and limitations of hearing protectors. Warning signs shall be posted in the workplace and on equipment as necessary to maintain awareness (See Appendix C- Sign Specifications).

Hearing Protectors

Hearing protection devices can be divided into three categories; earplugs; semi-aural devices (hearing bands held against the ear canal by a head band) and; ear muffs (which fit over the ears). Hearing protectors are rated according to CSA Standard Z94.2 as Class A, Class B, or Class C protection based on the following values.

Maximum Equivalent Noise Level (Leq)	Recommended Hearing Protector
< 85 dBA	No protection required
85-90 dBA	Class C
89-95 dBA	Class B
95-100 dBA	Class A plug + Class A or Class B muff
105-110 dBA	Class A plug + Class A or Class B muff and limited exposure

EOHSS/FHS can arrange for each situation to be assessed individually and can provide direction as to the Class of and type of hearing protection required in the circumstance. In general, reusable earplugs should be replaced at least every six months, (or when they lose their elasticity and overall shape) and earmuff cushions should be replaced at least every year.

Appendix C

Noise Level Sign Specifications:

2" WARNING
SOUND LEVELS OF 85 dB HAVE
3/4 " BEEN MEASURED IN THIS AREA
MAXIMUM ALLOWABLE EXPOSURE IS
8 HOURS PER 24 HOUR DAY
OR HEARING PROTECTION REQUIRED

Black on Orange