

CAUT Health and Safety Fact Sheet



Noise

ISSUE 16

Noise in academic workplaces is a hazard that can lead to physical impairment of hearing and to physiological effects. Noise is a constant in our lives, especially in the workplace. Even when it is “quiet”, there is usually some background hum from lighting or computers, or passersby. It may be one of the most pervasive workplace hazards, because we typically become accustomed to noise and literally tune it out of our conscious awareness.

This hazard is more complex than it seems. Damage to the tympanic membrane (eardrum) is what is commonly associated with noise, but there are other more troublesome aspects that will be explored in this fact sheet.

Several health and safety organizations define noise as “unwanted or unpleasant sound”¹ or alternatively, “Sound is what we hear. Noise is unwanted sound.”² In other words, noise is an irritant to our peace, well-being and ability to concentrate. Noise in the university or college setting has many sources – the volume of people, traffic, machinery, opening and closing of hundreds of doors, HVAC systems, class, hallway, and phone conversations.

Industrialization³ and working in compact numbers in large buildings, with machinery, human and white noises surrounding us every day, have significantly escalated physical trauma to the ear itself, and physiological and psychological impact on the rest of our body.

Disabled hearing, whether partial or total, or temporary or permanent, is of major concern because of interference with verbal communication. The natural process of sharing thoughts, ideas and feelings becomes compromised and isolates us to some degree from others.

This fact sheet will look at two ways noise affects us in the workplace: the physical impairment to hearing, and the physiological effects of its stress on our bodies and psyches.



Hearing loss begins
with exposures
above 75 decibels,



over an
eight-hour
period.

WHO⁴

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Mechanics of Hearing

According to the Canadian Hearing Society, hearing is “always turned on,”⁵ tuning us into the world around us by sounds, particularly spoken language. Hearing never shuts down, even when sleeping, and health care providers note that hearing is the “last thing to go” and the “first thing to come back” after anesthetics, head injuries and other traumatic medical events. This indicates how important hearing is for us for communication and protection.

However, as acute and necessary as hearing may be for us to function in the day-to-day world, particularly at work, our mechanism for hearing is particularly sensitive to excessive and lengthy exposure to noise. The ear’s simple internal structure of bones – the anvil, stapes and cochlea, and hair cells and fluid, enhanced by an outer structure acting as a funnel to capture sounds that vibrate against the tympanic membrane, is easily damaged by casual, prolonged, or inadvertent or deliberate exposures.

Hearing Loss

Although there are other reasons for hearing loss, such as medical conditions, recreational noise or birth defects, this fact sheet will concentrate on the types of hearing loss experienced through workplace exposures.

Acoustic trauma and noise-induced hearing loss are both permanent, with acoustic being immediate, severe and persistent from an intense short-duration sound

(gunfire), and noise-induced being gradual from repeated exposure that is typically not noticed until it is too late.

Permanent hearing loss, or Permanent Threshold Shift (PTS), happens when there is significant hair cell or nerve damage in the cochlea. Temporary hearing loss, or Temporary Threshold Shift (TTS), occurs when hair cells become temporarily bent or fluid levels change because of overstimulation. Although hearing usually returns to normal, repeated sessions of TTS can lead to permanent hearing loss.

Ototoxicity caused by exposure to high levels of noise and solvents or heavy metals at the same time, is cause for concern for anyone working in chemistry labs, engineering or other areas where these two hazards become combined.

Ménière’s Disease and Tinnitus are other hearing-related diseases that may be exacerbated by exposure to noise.

Physiological Effects

Noise has another, just as traumatic, effect on the body and psyche as it does to the tympanic membrane. It can induce stress, hypertension, sleep and respiratory disturbances, and fatigue. The startle reflex becomes active, muscles tense and heartbeat patterns change. Chronic exposure can lead to higher absenteeism rates among exposed workers.

Dr. David Behm, a professor of human kinetics at Memorial

University, conducted a three-part study⁶ on the effects of noise which shows that loud noise decreases reaction time and decision-making ability. It noted that complex tasks, like driving and video games, had markedly reduced reaction times when compounded by the effects of either loud or repetitious noise or music. The adverse effects of loud noise or music such as hard rock were specific to certain populations, in this case young males. This would seem to suggest that cognitive and reflex abilities can become compromised through exposure to loud noise or music.

Warning Signs

Look for these signs that may point to early hearing impairment:

- Ringing or buzzing (tinnitus) immediately after noise exposure
- Muffling of sounds after leaving a noisy area
- Difficulty in hearing high-pitched sounds
- Words running into each other
- Difficulty in hearing *s, sh, f and th*
- Loss of clarity of words, but not necessarily a loss in loudness

Precipitators

Noise intensity is measured by decibel (dB). Every increase of 3 dB doubles sound energy, which requires cutting exposure time by half to stay within safe limits. The scale below gives typical examples of this.

It is the intensity, frequency and duration of sound above a safe, comfort level that create the potential for temporary or permanent hearing loss and/or physiological distress. Some of the causes at campus work sites might be machinery in labs, engineering or woodworking shops; HVAC systems; computer hum; white noise from fluorescent lighting; hallway and classroom chatter; constant voice projection in large

rooms; proximity to entrance and exit ways; and external distractions like campus traffic.

Prevention

An ounce of prevention is worth a pound of cure, as they say, but with hearing loss, there is no cure. Any damage, no matter how big or small, is permanent. Work with your joint health and safety committee (JHSC) to identify ways to reduce or eliminate noise hazards in your workplace.

Eliminating the hazard at the source is ideal: engineering controls such as quieter machines, modifying existing equipment, isolating vibrating parts, or substituting noisy devices or processes.

Using barriers and sound-absorbing materials like acoustic tiles also helps.

Personal protective equipment (PPE) may be the only protection suitable in the circumstances, but should be a last resort after all other avenues have been exhausted. Hearing protection must be adequate for the hazard, and is only effective if used and maintained according to manufacturer's recommendations. Keep in mind that earplugs, earmuffs or other types of hearing protection do not guarantee elimination of risk of hearing damage. It will reduce it, but in some circumstances, even PPE cannot totally save your hearing. The Occupational Clinics for Ontario Workers recommends that the noise reduction number rate, (NRR) for the PPE you may be using should be reduced by 25% for earmuffs, 50% for formable plugs and 75% for ordinary plugs. The rates shown from the manufacturers do not reflect actual workplace conditions for usage. Using earplugs and/or earmuffs may be necessary in some work environments, they can also compromise vital safety communication between you and co-workers or supervisors. The acoustic barrier provided by earplugs and earmuffs can prevent you from hearing warnings or alerts. Ensure that your JHSC includes this possibility and a mechanism to deal with it in their noise assessment survey.

If you must work in a noisy environment, take all precautions necessary, and see your family physician to arrange regular hearing tests.



What are the noise exposure limits in Canadian jurisdictions?

Jurisdiction (federal, provincial, territorial)	Continuous Noise Maximum permitted exposure level for 8 hours: dB(A)
Canada	87
British Columbia	85
Alberta	85
Saskatchewan	85
Manitoba	85
Ontario (includes ceiling level of 140 dBC)	85
Quebec	90
New Brunswick	85
Nova Scotia	85
Prince Edward Island (references ACGIH TLVs)	85
Newfoundland	85
Northwest Territories	85
Nunavut	85
Yukon Territories	85

Adapted with permission from the CCOHS

Noise Abatement

If you or your colleagues are noting that you have to raise your voices to be heard, you have ringing in your ears at the end of the work day, the volume on radios or TVs has to be increased, or have problems hearing and understanding conversations in crowded rooms, you should trigger a workplace noise audit, under the auspices of the JHSC.



Like any other workplace hazard, exposure prevention is key. The Joint Health and Safety Committee should conduct a workplace noise audit, and then implement a noise abatement program. An effective program⁷ includes these key elements:

- A trained program co-ordinator
- Worker involvement through the JHSC or worker representative
- Noise surveys
- An engineering program with dates, progress checks and reduction priorities
- A maintenance program monitored by the JHSC
- Worker training and education
- Annual review/evaluation of the program

Regulations

In Canada, all provinces except Quebec and the Federal sector, use 85 decibels or Occupational Exposure Limits (OELs) as the “accepted or allowable” standard. Quebec’s is 90dB and it is 87dB in the Federal sector. Keep in mind that “accepted or allowable” does not mean safe. Health and safety activists continue to push for lowering OELs for all types of workplace exposures. Research shows that what was once an accepted standard can still produce harmful effects.

In fact, even though most OELs in Canada are set at 85 as a level for potential impairment, the World Health Organization sets the benchmark at 75.

Provincial workers’ compensation boards recognize occupational hearing loss as an industrial disease covered by compensation.

Tools

Canadian Centre for Occupational Health and Safety –

Noise – Basic Information;

Noise – Occupational Exposure Limits in Canada;

Noise – Measurement of Workplace Noise (Guidelines for Instrument Selection);

Noise Control in Industry: A Basic Guide

Canadian Hearing Society – *Hear to Stay – Make Noise about Noise Series*

OHCOW –

Noise Exposure Calculator;
Noise Worksheet

Provincial and federal ministries of labour

References

Canadian Centre for Occupational Health and Safety
www.ccohs.ca

Canadian Hearing Society
www.chs.ca

National Institute of Occupational Safety and Health
www.cdc.gov

Occupational Health Clinics for Ontario Workers
www.ohcow.on.ca

Workers Health and Safety Centre
www.whsc.on.ca

Notes

- 1 OHCOW Noise Damages Hearing
- 2 CCOHS Noise – Basic Information
- 3 NIOSH – NIOSH Safety and Health Topic: Noise and Hearing Loss Prevention
- 4 World Health Organization
- 5 CHS – Hear to Stay: Make Noise About Noise, Noise Facts
- 6 Dalton, Behm et al. 2007
- 7 WHSC, Resource Lines – Noise: A resounding problem, Fall 2001

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