

AUDIOMETRIC TESTING

EMPLOYER RESOURCE

SETTING YOUR EMPLOYEES UP FOR SUCCESS





ACCORDING TO THE CCOHS (CANADIAN CENTRE FOR OCCUPATIONAL HEALTH AND SAFETY), NOISE IS ONE OF THE MOST COMMON OCCUPATIONAL HAZARDS. FOR MILLIONS OF CANADIANS, THIS MEANS EXPOSURE TO HIGH LEVELS OF NOISE THAT CAN LEAD TO DEVASTATING HEARING LOSS.

AUDIOMETRIC TESTING IS A CRITICAL TOOL IN DETECTION AND PREVENTION OF HEARING LOSS, AND IN MANY CANADIAN JURISDICTIONS, IT IS MANDATORY. WHERE IT IS NOT COMPULSORY, AN OPPORTUNITY FOR HEARING CONSERVATION STILL EXISTS FOR EMPLOYERS AND THEIR WORKERS.

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WORKPLACE NOISE EXPOSURE

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Sound is what we hear, and noise is unwanted sound. What is categorized as “Noise” is often dependent on the listener and their taste. However, any sound can be a hazard if it is loud enough, and someone is exposed to it long enough and often enough.

Noise-induced hearing loss (also known as NIHL) is a common occupational health hazard, particularly in certain industries such as manufacturing, farming, construction and even hospitality. Long term or even short-term exposure to significant noise can result in permanent damage or hearing loss. In turn, this can result in additional health problems and a reduction in the quality of life for employees.

Because of this, provincial and federal regulators have imposed strict limits on the level of noise that workers can be exposed to. Regulators measure occupational noise exposure limits by the level of noise (measured in decibels) and the length of exposure time. Noise exposure limits in Canada are governed by each province/territory (in many cases), and by the federal government for specific industries that fall under federal jurisdiction, such as mining and energy.

Occupational exposure limits (aka OELs) for noise are typically provided as the maximum duration of exposure permitted for various noise levels. The allowable steady noise level for an entire eight-hour work shift is 85 dBA in most jurisdictions. However, in Quebec, it is 90 dBA, and for organizations that follow the Canadian federal noise regulations, it is 87 dBA. For each decibel above the limit, employers must decrease the exposure time for employees.

To calculate this decrease, governments use an exchange rate. Most provinces and territories follow a 3 dBA rule that halves the exposure time for every 3 decibels rise in noise level above the limit. Quebec uses a 5 dBA rule that halves exposure time for every 5 decibels above the established

limits. Some provinces and territories have more complex exchange rates. It is essential to confirm the current regulations for your industry and province or territory as they can and do change. Employers are expected to know these regulations and comply with them.

Noise can be variable, intermittent, or impulse (noise that is sharp or sudden and short in duration) depending on how it changes over time. Variable noise occurs when sounds change with the operations conducted, while intermittent noise generally includes noisy and quiet periods. Manufacturing noise can be variable and intermittent. Impulse noise is very loud but lasts for less than a second. Gunfire is an example of this type of noise. Several provinces and territories, although not all, also set maximum limits for exposure to impulse noise.

Employers must carefully monitor noise levels in their workplace. This can be done with a sound level meter (SLM). Free SLMs, in the form of smartphone apps, are available from a variety of sources and NIOSH offers a free SLM for download on their website. The SLM, which usually includes a filter for A-weighting, is sufficient for most workplaces. However, it is limited to measuring instantaneous noise.

Workplaces with intermittent or variable noise levels, or where workers are consistently changing location, may want to use a noise dosimeter. The dosimeter is a small, lightweight device worn by a worker that has a microphone clipped to the worker's collar near the ear. This device records the average noise levels the worker is exposed to while wearing the device, giving a more thorough picture of potentially hazardous situations.

The integrating sound level meter (ISLM) is another hand-held device like the SLM, but it provides data that is similar to the dosimeter.



NOISE-INDUCED HEARING
LOSS (NIHL) SIGNIFICANTLY
DECREASES A WORKERS'
ABILITY TO CLEARLY
COMMUNICATE WITH
OTHERS, LEADING TO
INCREASED SAFETY
RISKS FOR EVERYONE
ON THE JOB.

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HOW AUDIOMETRIC TESTING WORKS

TESTING

During an audiometric test, a worker is seated in either a soundproof booth or a soundproof room and provided with either a set of headphones or inserts placed directly into the ears. When the worker is ready, and the earphones are in place, the technician activates a device called an audiometer.

The audiometer sends a series of tones at different frequencies and different levels into each of the worker's ears. The worker will then signal if the tone is heard, often using a button. The technician records the results either on a graph, which is known as an audiogram, or numerically on a chart.

PPE

In addition to the test, workers also get advice and counseling on the necessity, use, maintenance, and replacement of hearing-related personal protective equipment (PPE) like custom-molded ear plugs, headphones, etc.

SUREHIRE PROTOCOL

Test result values must be kept confidential and can only be viewed/accessed by medical professionals including the audiometric technician, employer designated audiologist, and worker. Employers only receive the overall outcome - normal, abnormal, shift, etc.

RESULTS

Test results show how loud a tone must be in order to be heard at a variety of different pitches and frequencies. Early hearing loss is often defined by loss of the ability to identify high-pitched sounds. As hearing loss progresses, individuals fail to hear noises at a variety of pitches. People with advanced hearing loss often experience muffling of everyday sounds such as speech.

This is why employees exposed to specific noise levels should have a baseline test to establish initial hearing levels early on. Baseline testing provides an opportunity for the technician and the employer, as well as the worker, to evaluate any ongoing hearing loss resulting from occupational noise exposure.

The technician will classify the test results for audiometric testing as within the normal or abnormal range. Workers can also be diagnosed with an abnormal shift, defined as 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.

Normal results mean no further testing is required. With abnormal results, the audiologist may review and advise on following up with a medical professional for additional testing.

DEFINITIONS OF HEARING LOSS

Slight hearing loss indicates hearing thresholds in the 20-25 dB range

Mild hearing loss indicates hearing thresholds in the 26-40 dB range

Moderate hearing loss indicates hearing thresholds in the 40-55 dB range

Severe hearing loss indicates hearing thresholds in the 71-90 dB range

Profound hearing loss indicates hearing thresholds above 90 dB

SureHire's Audiometric Technicians complete approved courses as per Director of Medical services or an approved equivalent, and must re-certify at least every 5 years.

The audiometers used in SureHire Power Centres are the Tremetrics RA300 and RA650 models, which meet the ANSI S3.6-2004/CSA3-Z105.4-M86(R2001) standards.

Each audiometric test completed will record the lowest value that is heard by the participant in both of their ears at all frequencies between 500-8000Hz.

Calibration certificates are issued to each audiometer, annually, upon successful re-calibration. Calibration checks are also performed daily prior to testing.

TEST TYPES

PERIODIC VS. ANNUAL TESTING

Employers may choose either periodic or annual testing as long as they meet the requirements of their specific jurisdiction. These jurisdictional requirements vary widely. Some require baseline testing for new employers and then additional testing annually or bi-annually. Others, however, either have no requirements for testing or require testing but do not mandate the particulars of the test, including frequency.

There are also factors to consider in addition to legislative requirements. Even in jurisdictions with no express testing requirements, periodic or annual testing is critical to health and safety, as hearing loss is typically progressive and irreversible.

Routine testing can provide you with aggregated data about the hearing health of your employees that can help inform health and safety initiatives around training, engineering controls, and administrative controls for noise reduction and management.

Annual testing can provide employers and employees with critical information about the ongoing effects of noise exposure that can help reinforce the importance of these initiatives in protecting a worker's hearing and save the company costs associated with health and safety claims and costly workers' compensation benefits.



TEST PREPARATION

While audiometric tests are relatively simple, some advanced preparation can help ensure your employees get the most accurate results and advice.

BRING LISTS

If the technician notes an abnormality with your test results, they may request additional information. In some Canadian jurisdictions, additional information, including medical records, are mandated. To ensure any issues are addressed, consider keeping notes on the circumstances where you have trouble hearing, especially in the period leading up to an audiometric test. Is it concerts? Normal conversations? In crowds? Bring a synopsis of your medical history, noting any chronic conditions, accidents or anything else that may have impacted your hearing.

AVOID LOUD NOISES PRIOR TO TESTING

Regardless of when or where your audiometric test takes place, try to avoid exposure to loud noises at least 16 hours before your appointment. While hearing loss is often the result of long term or cumulative noise exposure, even momentary exposure to loud noises can affect the results of an audiometric test. This holds true especially during an initial baseline test. If your baseline test results are affected by momentary exposure to noise, follow-up testing may not catch significant changes to your hearing.

CLEAN YOUR EARS

Wax buildup can affect the outcome of your audiometric tests. While for most people, ear wax is naturally expelled from the ear, for some, it can build up and block the ear canal, preventing sound from reaching the eardrum and reducing hearing capacity. If you have a problem with ear wax buildup, there are some products such as over-the-counter drops available to help eliminate it. However, if the problem is persistent and available products targeting this issue are not helping, speak to your doctor about removing it before your audiometric test.

DO NOT GO WHEN YOU ARE SICK

Hearing involves several bones and your tympanic membrane, also known as the eardrum, which vibrate when exposed to noise. Mucus buildup in the ear canal or middle ear from allergies, colds, flu, sinus or ear infections can affect this vibration and skew your test results. Rebook your appointment if you are sick to ensure you get the most accurate test results.

UNDERSTAND THE PROCESS

Audiometric testing is a non-invasive test and is straightforward, but it is always helpful to understand what happens during any medical examination and what you can expect. So, familiarize yourself with the process so you'll know what is going to happen. During an audiometric test, essentially, a series of sounds are played to you through a headset. You will indicate to a technician, audiologist or physician which sounds you can hear and which you cannot by pressing a button or signaling. Be sure to ask questions if there is something you are uncertain about, or if there's something you'd like clarified.



JURISDICTIONAL COMPLIANCE

The Canadian Centre for Occupational Health and Safety recommends audiometric testing for any worker exposed to noise levels that exceed 85 dBA. The CSA Standard Z1007 Hearing Loss Prevention Program Management further suggests that this audiometric testing involve:

- an initial hearing test
- a hearing test at least once every 12 months after baseline, or
- a hearing test more frequently, should the noise level exceed 105 dBA

Most jurisdictions in Canada also have requirements for audiometric testing tied directly to noise limits. Audiometric Testing is required when noise exposure exceeds maximum permitted exposure levels as specified in the chart below.

The chart below outlines the noise limits for both an eight-hour shift and for impulse noise, as well as the audiometric testing requirements currently in place for all Canadian provinces, territories, and federally regulated industries. Again, these should be clarified with local regulators, as legislation can and does change frequently.

Jurisdiction	Maximum Permitted Exposure Level for 8 Hours: Continuous Noise, dB(A)	Maximum Peak Pressure Level: Impulse Noise, dB(peak)	Maximum Number of Impacts: Impulse Noise
Canada	87	-	-
British Columbia	85	140	-
Alberta	85	-	-
Saskatchewan	85	-	-
Manitoba	85	-	-
Ontario	85	-	-
Québec	90	140	100
New Brunswick	85	140	-
Nova Scotia	85	140	-
Prince Edward Island	85		-
Newfoundland and Labrador	85	140	-
Northwest Territories	85	140	100
Nunavut	85	140	-
Yukon	85	140	90



RINGING IN THE EARS, OR TINNITUS, STARTS IN THE INNER EAR. MOST OFTEN, IT IS CAUSED BY DAMAGE TO OR THE LOSS OF SENSORY HAIR CELLS IN THE COCHLEA, OR THE INNER EAR.

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EMPLOYER OBLIGATIONS

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	Employer Responsibilities	Employee Obligations	Professional Requirements	Baseline Testing and Additional Tests Required
BC	<ul style="list-style-type: none">• ensure tests are administered by a tester authorized by WorkSafe BC• ensure that the authorized tester sends the test results to WorkSafe BC• keep test results for employees for as long as they are employed by the company• guarantee the confidentiality of all test records and results	N/A	N/A	<ul style="list-style-type: none">• baseline as soon as possible after employment starts and no later than 6 months after start of employment• subsequent tests every 12 months after initial test
AB	<ul style="list-style-type: none">• identify employees exposed to excess noise and ensure they have hearing tests conducted by a licensed audiometric technician• designate a physician, audiologist, or occupational health nurse to work with the audiometric technician• ensure a record is kept (by the audio tech.) of all tests completed• pay the costs associated with a hearing test• keep a logbook containing audiometer calibration data• ensure testing contractors are aware of all regulations	<ul style="list-style-type: none">• must cooperate with all mitigation efforts including audiometric testing	<ul style="list-style-type: none">• tester must be certified by the Alberta Labour Department• tester must keep records of audiometric testing for 10 years• physician or audiologist must inform worker of abnormal or abnormal shift results within 30 days• physician or audiologist must also inform the employer and the appropriate Director of Medical Services and evaluate the employer's noise mitigation efforts	<ul style="list-style-type: none">• baseline no later than 6 months after start of employment• followed by one test 12 months later and subsequent tests every 2 years
SK	<ul style="list-style-type: none">• arrange audio testing and counselling for employees who regularly work in noise levels of an average exposure of 85 dBA during an 8-hour workday or regularly in areas with noise levels equal to or greater than 90 dBA• ensure testing occurs during normal working hours and employees are reimbursed for costs• ensure employees receive a copy of their test and that the results are explained to them	<ul style="list-style-type: none">• employees are not required to participate in testing and are encouraged but not required to share the results of their tests with their employer	<ul style="list-style-type: none">• audiometric tech should have adequate training and be under the supervision of a health professional (physician, audiologist or registered nurse with certification in audiology)• audiometric tech must refer abnormal results to health professional• health professionals must maintain records for as long as the employer operates in Saskatchewan• health professionals must provide summary reports with aggregate data on hearing loss to employer	<ul style="list-style-type: none">• baseline testing encouraged but not required• testing and counselling at least once every 24 months
MB	<ul style="list-style-type: none">• provide free audiometric testing to exposed workers• submit an aggregate report of abnormal and abnormal shift tests to Manitoba Workplace, Safety and Health• submit an annual report to the Manitoba government regarding abnormal and abnormal shift results and mitigation efforts	<ul style="list-style-type: none">• provide relevant medical history to physician or audiologist if requested	<ul style="list-style-type: none">• tester must maintain records of the test for 10 years and provide a record to the worker• audiometric techs must be licensed by the province• abnormal results must be sent to a physician or audiologist if the tester is not one• physician or audiologist must prepare a report for the employer on abnormal results with recommendations	<ul style="list-style-type: none">• an initial baseline test as soon as is possible but no later than 6 months after worker is initially exposed to that noise level• a further test at least once every 2 years after the initial baseline test
ON	N/A	N/A	N/A	N/A
QC	N/A	N/A	N/A	N/A
NB	N/A	N/A	N/A	N/A
NS	N/A	N/A	N/A	N/A
PEI	<ul style="list-style-type: none">• provide audiometric testing to all exposed workers at no cost	<ul style="list-style-type: none">• testing to be conducted by an audiologist or other "certified administrator"	N/A	N/A
NFLD	<ul style="list-style-type: none">• provide audiometric tests to exposed workers• maintain testing records for as long as worker is employed with company	<ul style="list-style-type: none">• supervised by an audiologist, physician or certified, registered nurse	N/A	N/A
NWT	<ul style="list-style-type: none">• provide testing during normal working hours to exposed workers• pay costs if worker is not insured	N/A	N/A	N/A
NV	No specific legislation, Nunavut defers to existing NWT legislation			
YK	<ul style="list-style-type: none">• provide audiometric testing to exposed workers• maintain testing records for as long as worker is employed with company	<ul style="list-style-type: none">• all audiometric testing must include a personal medical history	<ul style="list-style-type: none">• testing must be conducted by a certified tech, physician or audiologist• if test is abnormal, results must be sent to physician or audiologist within 30 days	<ul style="list-style-type: none">• baseline testing within 6 months of employment (must include personal medical history)• annual testing thereafter• additional follow-ups required for excessive exposures or changes in hearing

Note: there are significant proposed changes to the NWT legislation around audiometric testing.

TESTING OPTIONS FOR EMPLOYERS

OFF-SITE (IN-FACILITY) VS. MOBILE TESTING

There are 2 standard audiometric testing options available to employers:

- off-site (in-facility) testing, or
- mobile testing

There are benefits and drawbacks to each; the option you choose depends on what would best suit your worksite and workforce.

Off-Site Testing

Testing off your job site at a facility means you do not have to find an appropriate space for a mobile setup. The facilities are already in place and provide a sense of privacy and anonymity for employees. However, off-site testing facilities do require transportation and additional downtime for employees.

Mobile Testing

Mobile testing offers more convenience for employees. There is far less downtime and fewer missed or delayed tests. It can also reduce possible liability for employers related to the travel involved in visiting an off-site testing facility. There may be higher participation in areas where employees can be requested but not required to participate in audiometric testing. However, the trade-off with mobile testing can be a perceived loss of privacy and anonymity. In some locations, workplace noise levels can make on-site testing problematic. In addition, sites must submit to sound level assessment to ensure test can be conducted within the defined noise parameters.

SureHire offers state of the art mobile testing facilities for a seamless participant testing experience.

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INTERPRETING RESULTS

Audiometric results from SureHire come in the form of a graph called an audiogram. This is essentially a numerical chart with a series of values. It also tracks the frequency level tested and the volume level at which you could hear that frequency. You may also see an “S,” which provides information about how well you hear with both ears simultaneously.

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The Y-axis or vertical line measures volume of sound. It is measured in decibels (Db) and ranges from 0 to 99+ on the audiogram. It can go as low as a whisper and as high as a jackhammer. The X-axis or horizontal line measures the frequency or the pitch of the sound. The numbers run from 500 to 8,000 and measure hertz (Hz). Thunder is an example of a low-frequency sound, while whistling is an example of a high-frequency sound.

The top of the graph indicates normal hearing ranges. We can hear all sounds from 250 to 8,000 Hz at a very low volume with normal hearing. Any areas where the test lines drop below 20dB indicates a loss of hearing. A sharp drop indicates a significant hearing loss.

As hearing loss tends to be incremental and, at least initially, often goes unnoticed. Any hearing loss or change in hearing is important and requires follow-up.

Abnormal Results

SureHire reports all results into SureLink, our secure online client portal. Our clients will see their worker's results as normal, abnormal, or abnormal shift.

When a result is Abnormal or and Abnormal shift is identified, the technician will inform the worker of their test results and send all relevant information to an audiologist, including the test result, baseline result, and workers health history.

The technician will also:

- provide a copy of the result to the worker
- retain hearing results for 10 years from date of test
- only share results with consent from the worker unless otherwise stated under OHS code 223(2)(a) - sharing results with physician/audiologist.

Every participant receives a copy of their results at the time of their audiometric screen along with a brief explanation of their results.

Anytime an audiogram is deemed abnormal or an abnormal shift occurred that individual's test results, as well as any relevant medical history or previous test results, are sent to a third party audiologist who will complete a thorough review and who can provide further recommendations to employers.

Can my workers return to work after an abnormal result?

The purpose of audiometric screens is to assess the effectiveness of your workplace controls and noise conservation programs, *not* to determine an employees fitness for work. Once your worker receives test results, they need to see an Ear, Nose, and Throat specialist who will complete a comprehensive assessment, provide a diagnosis, and make recommendations on appropriate treatments.

IMPORTANT NOTES

- Employers must review data provided by a physician or audiologist when completing annual review of their hearing conservation program and its effectiveness.
- Designate a knowledgeable person to oversee your hearing conservation program; one who converses with the technician & audiologist, familiar with hearing protection, worksite noise levels, personal dosimetry results, etc.
- As an employer, you must identify work related hazardous noise and eliminate it or provide adequate noise control measures.
- OHS Alberta officers may request an employer for an annual report of their noise exposed workers at any time, a sample report can be found online.

[Get more information about jurisdictional compliance](#)



RISK PREVENTION TIPS

While audiometric testing can detect occupational hearing loss, being proactive about preventing exposure to noise levels in the workplace is the only sure way to avoid it. It starts with recognizing excessive noise in the workplace but also with identifying and mitigating other risks. For example, several types of chemicals, including certain pesticides, solvents, and pharmaceuticals containing toxic substances, can actually impact hearing.

It's also important to recognize that both long-term exposure to noise and short-term exposure to higher levels of noise can adversely affect hearing and that choices, both at work and home, can impact the severity of hearing loss. Risk prevention should take a multi-prong approach that includes training and education, engineering controls, administrative controls and PPE.

Training and Education

Training should include education on the nature of hearing loss, particularly noting that it is not always detectable without audiometric testing because the brain will compensate for hearing loss in other ways. It should also include mitigating factors that could put workers at higher risk, including smoking, diabetes and listening to loud music.

PPE is only effective when it is worn and worn correctly, so workers should be trained on the availability and appropriate uses of PPE in their workplace and receive information about company policies and regulations pertaining to occupational noise and hearing loss prevention, including their obligations and the employer's obligations.

Engineering Controls

Engineering controls can be one of the most effective weapons in preventing hearing loss in workplaces with high noise levels. Start by purchasing noise-reducing equipment and retrofitting existing equipment to reduce noise exposure. Routine maintenance should also focus on reducing noise levels through lubrication and replacing worn parts or faulty equipment. When purchasing new equipment, ask about noise levels and look specifically for quieter models whenever possible.

Consider enclosed cabs for heavy equipment operators and enclosed operating areas to keep workers away from noisy operations. Construct noise barriers where appropriate and isolate noisy equipment as much as possible.

Administrative Controls

Administrative controls are another opportunity to control noise exposure in the workplace. Use scheduling to prevent workers from being in areas of high noise levels for too long. Consider placing hard limits on daily noise exposure for employees and individual employees as necessary. You may also wish to consider administrative transfers or accommodations for employees that have already suffered demonstrable damage. Also, make sure to identify and post warning signs whenever possible where noise dangers are present and strongly encourage workers to avoid these areas when they do not need to be there.

Personal Protective Equipment (PPE)

Despite the dangers of hearing loss, 24% of noise-exposed workers report that they often fail to wear noise protection PPE regularly. Mandate and provide PPE designed to prevent or mitigate hearing damage, including earplugs and earmuffs. Reinforce the message with training, education and direct counselling for workers in conjunction with their audiometric testing.

There are various styles of hearing protection PPE you can get for your employees, and the right selection depends on a variety of factors, from the nature of the job to your employees' comfort. Learn more in our article: "Choosing the Right Hearing Protection: What to Consider."

[READ THE ARTICLE](#)

Technology

Consider purchasing technology that automatically monitors noise levels in the workplace. For individual workers, technologies are available to both monitor and track personal noise exposure. These technologies help ensure appropriate responses and take the guesswork and time required to monitor noise levels manually.