

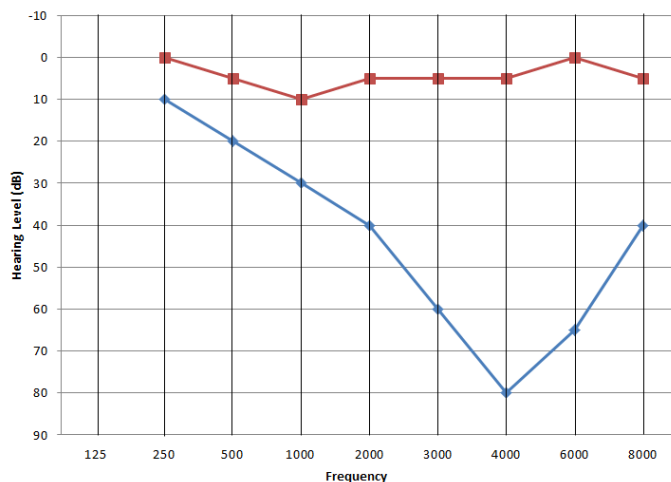
Sounds and noises surround us from birth, and are blended into our culture and livelihood. Musical sounds give us enjoyment, listening to others helps us at home and work, and the sound of approaching cars helps keep our families safe. If we don't protect our hearing against too much sound, it can slip away over time, and leave us with permanent hearing loss.

Sound is most commonly measured in decibels (dB), a logarithmic scale that is somewhat difficult to understand. Some typical noises and sound levels are found in the chart below.

Weighted scales (A, B, C) account for differences in how frequencies are perceived in your ear. The "A" scale (dBA) is used to estimate how people hear sounds, and cited in legislation for maximum sound levels.

Long term exposure to loud noise can result in a condition called **Noise Induced Hearing Loss (NIHL)**. This is an irreversible condition that occurs over time, resulting in a reduced ability to hear certain frequencies. This condition is diagnosed by audiometric testing, and typically shows a distinctive "notch" appearing at the 4,000 Hz range. NIHL is not usually recognized until permanent damage occurs because it doesn't cause pain.

Sounds	dB
Rocket Launching	180
Jet Engine	140
Thunderclap, Air Raid Siren (1m)	130
Jet Takeoff (200ft)	120
Rock Concert	110
Firecrackers, Subway Train	100
Heavy Truck (15m), City Traffic	90
Alarm Clock (1m), Hair Dryer	80
Noisy Restaurant, Business Office	70
Air Conditioning Unit, Conversational Speech	60
Light Traffic (50m), Average Home	50
Living Room, Quiet Office	40
Library, Soft Whisper (5m)	30
Rustling Leaves	20
Threshold Of Hearing	0



The results of a normal audiogram (red) compared to a person with NIHL (blue). Note the distinctive dip, or notch at 4000Hz.

Legislation

Noise exposure is recognized as a hazard under legislation. Before July 2016, industrial workplaces in Ontario have been bound by section 139 of the Regulation for Industrial Establishments. After July 2016, Ontario Regulation 381/15, "Noise" came into force. This regulation extends the industrial limits to include farming and construction projects.

Workplaces under Federal jurisdictions are covered by part VII of the Canadian Occupational Safety and Health Regulations (COSHR).

The regulations express limits of hazardous sound levels using an equivalent sound exposure level expressed over an 8-hour shift. 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 energy as that generated by the actual sound levels. In Ontario, the allowable limit, $L_{ex,8}$, is 85dBA. It is expressed over an 8 hour shift, so the equivalent sound exposure value must be adjusted if the actual number of hours worked are different. For example 2 dB must be added to an 8 hour measured exposure to convert it to an equivalent value representing a 12-hour shift. For a more detailed explanation of Ontario sound exposure limits please see the MOL [Guideline](#).

The most effective method to determine noise exposure levels is to measure it during actual working shifts with noise dosimeters. These instruments provide high quality information if precise testing methods are followed. Ideally, a number of tests are conducted on several workers who are exposed to noise during the course of their duties. Noise monitoring also provides an opportunity to gain input from workers regarding noise sources and ideas for noise exposure reduction.

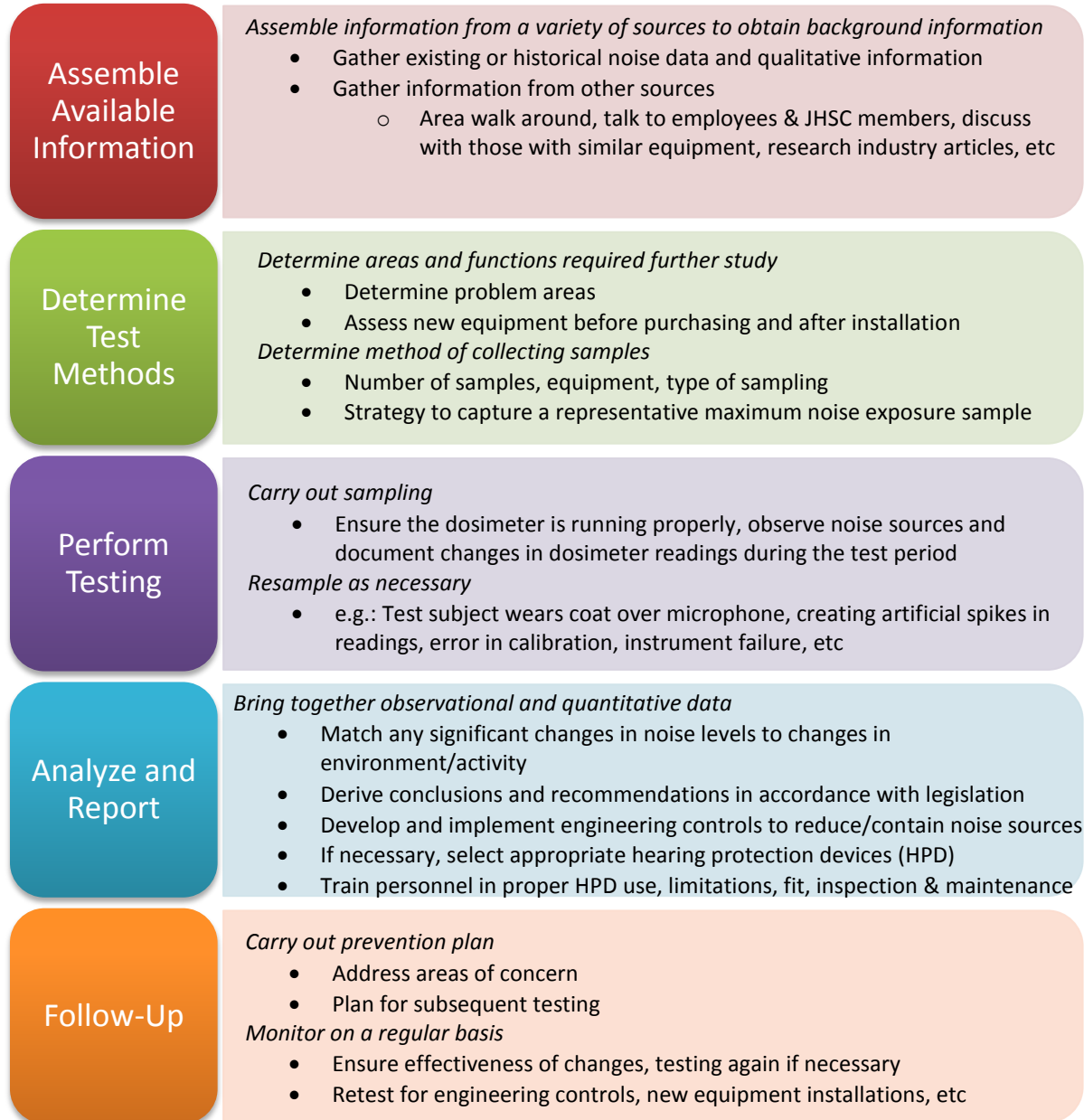
In Ontario, if a worker's exposure, $L_{ex,8}$, is greater than 85dBA, then the 2016 noise regulation requires employers to take all measures reasonably necessary in the circumstances to protect workers following a hierarchy of controls:

- Reduce exposure with engineering controls and work practices
- Require hearing protection devices (HPD) only if engineering controls:
 - Are not in existence, or obtainable
 - Are not reasonable or practical because of the duration or frequency of the exposures, or because of the nature of the process, operation or work
 - Are rendered ineffective due to a temporary breakdown of controls, or
 - Are ineffective because of an emergency.
- Post clearly visible warning signs at every approach to areas regularly exceeding 85dBA
- Select HPD appropriate in the circumstances to protect personnel from noise.
- Provide adequate training and instruction in HPD care and use, limitations, proper fitting, inspection, maintenance, and cleaning.

There are many styles and types of HPD, and they are labelled with Noise Reduction Ratings (NRR) to indicate the amount of noise protection provided. These NRR ratings are determined in a laboratory, and must be "de-rated" to reflect real-life usage and working situations. CSA Z94.2 (2014) "Hearing Protection Devices – Performance, Selection, Care & Use" provides guidance to select the appropriate HPD for measured exposure levels, and confirm that the selected HPD will adequately protect workers from noise exposure.

Noise Testing Strategy

To make the most use of noise testing resources, an overall testing strategy is recommended:



Acting in accordance with these suggestions will help protect workers against the risk of NIHL, and provide due diligence for your company and management.

Prevention and Regulatory Solutions Ltd has experience in noise measurement and noise control strategies, and can help develop a comprehensive hearing conservation program. Please contact us for a free estimate.