

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.

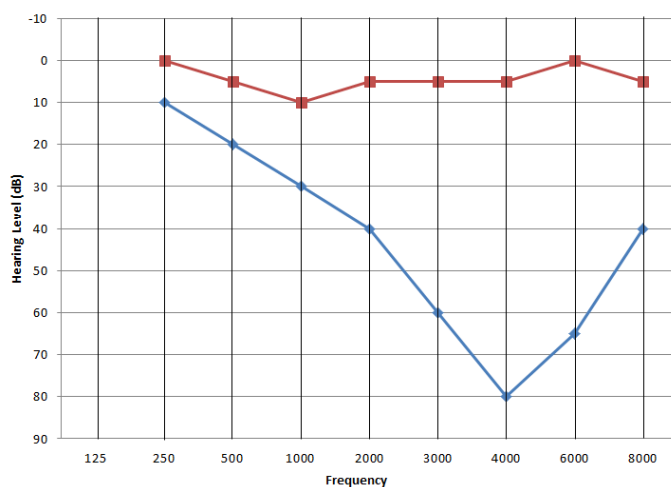
Sound is most commonly measured in decibels (dB), a logarithmic scale that is somewhat difficult to understand. A general rule is **for every 3dB increase, the sound intensity is doubled**. Some typical noises and sound levels are found in the chart at the right.

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

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.



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. Most industrial workplaces in Ontario are bound by section [139](#) of Regulation 851, Industrial Establishments, and enforced by the Ontario Ministry of Labour (MOL). Workplaces under Federal jurisdictions are covered by part [VII](#) of the Canadian Occupational Safety and Health Regulations (COSHR), and enforced by the Labour Program of Human Resources and Skills Development Canada.

Both 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 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. In Ontario, the allowable limit is 85dBA, including impulse noises, which can quickly cause an overexposure. For example a 140 dB impulse noise will exceed the 85 dBA limit in less than 1 second. Because the limit is expressed over an 8 hour time frame, the value of the allowable limit decreases as the number of actual hours worked increases beyond 8 hours. For example a 12 hour shift has a L_{ex} limit of 82dBA. For a complete list of sound exposure limits please see the [MOL Guideline](#).

In Ontario, if a worker's exposure, $L_{ex,8}$, is greater than 85dBA, then a number of actions are required:

- Protective measures must be put into place to ensure that no worker is exposed to noise levels over the limit
- Personal protective equipment (PPE) may only be used as a safeguard when all engineering controls are deemed unsuitable because:
 - They are not in existence, or obtainable
 - They 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
 - They are rendered ineffective due to an emergency or a breakdown occurring
- A clearly visible sign is posted preceding all areas over 85dBA

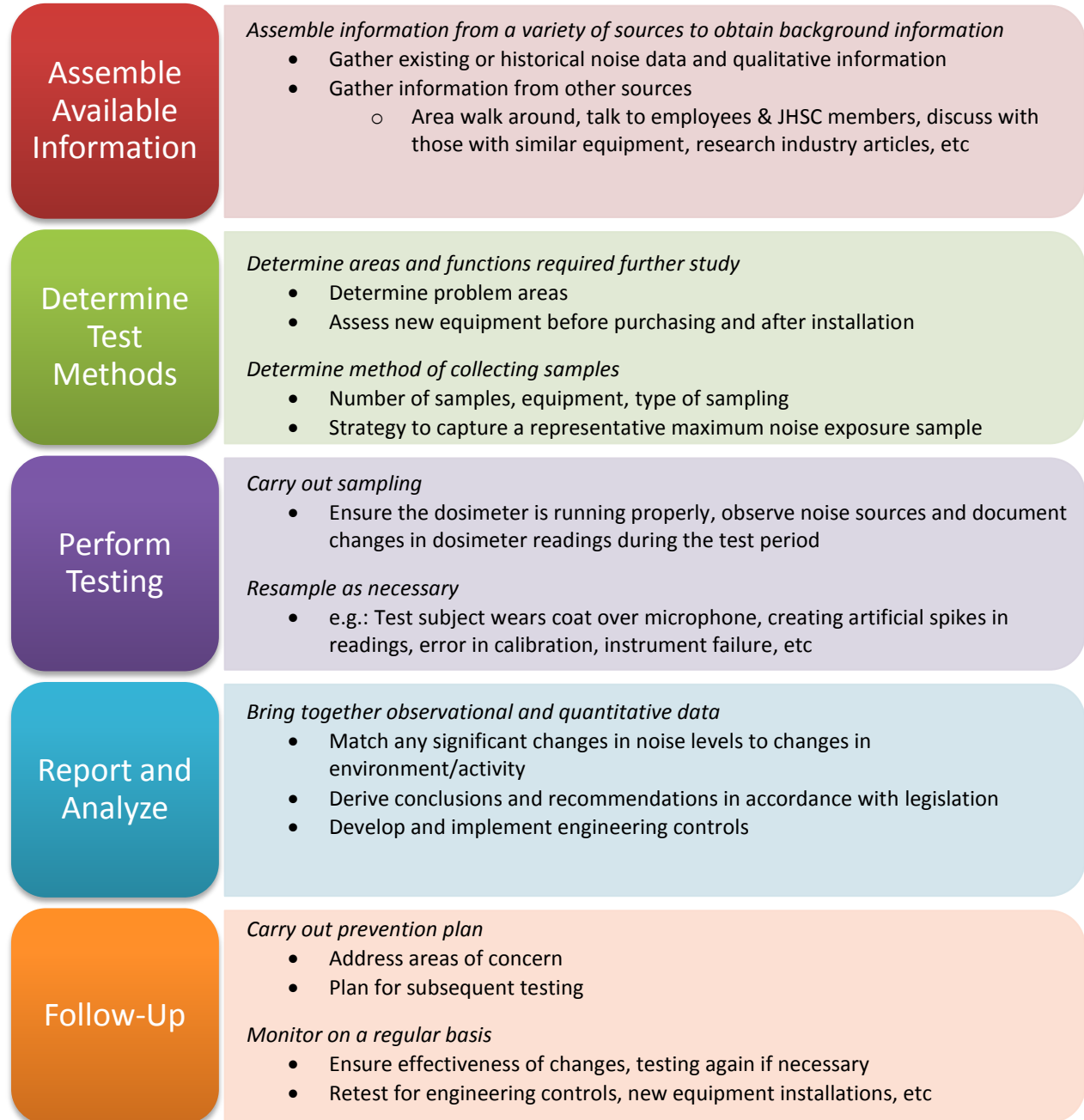
Due Diligence to meet Regulation

1. Know current, representative noise values in your workplace
2. Relate values to $L_{ex,8}$ specified in regulations.
3. Test noise exposures using methods conforming to proper industrial hygiene practices for accuracy and legal defense if needed.
4. Maintain and use test equipment in accordance with good industrial hygiene practices.
5. Maintain current data to ensure availability when requested.
6. Assess the need for additional testing following facility, equipment, or process changes.

Approved hearing protection PPE comes with a Noise Reduction Rating (NRR) to indicate the amount of noise protection offered. NRR ratings are set in a laboratory environment, and do not always reflect real-life protection levels. The MOL recommends using a NIOSH formula to de-rate the NRR by 25% for earmuffs, 50% for formable earplugs, and 70% for "other earplugs". CSA standard Z94.2-2002, entitled "Hearing Protection Devices – Performance, Selection, Care & Use" is helpful in selecting PPE based on noise levels and protection ratings. Additional information on NRR ratings for various hearing protection devices is available at this [link](#).

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