

# Hand-Arm Vibration



Ministry of  
Energy, Mines and  
Low Carbon Innovation



**THIS DOCUMENT** is intended to increase awareness about hand-arm vibration and its associated injuries.

## WHAT IS HAND-ARM VIBRATION?

Hand-arm vibration occurs when a person operates or guides vibrating tools or equipment with their hand, and the vibration is transmitted to the fingers, hand, and up through the arm.

## WHO IS AT RISK OF EXPOSURE?

Many mine workers, such as millwrights, welders, mechanics or conventional miners, are exposed daily. Hand-arm vibration is present in several different tasks, for example:

- Mobile equipment maintenance (handheld or bench grinders, chipping hammers, impact wrenches, drills)
- Building maintenance (pressure washers, small jackhammers, sanders, polishers)
- Underground mining (jackleg drills, long tom drills, stoper drills)

## WHAT FACTORS INFLUENCE EXPOSURE?

A person's exposure to hand-arm vibration can be affected by:

- Vibration frequency and amplitude<sup>i,ii</sup>
- Exposure frequency and duration
- Tool/equipment design characteristics
- Tool/equipment maintenance
- Workstation design
- Working environment temperature
- Personal factors (e.g. body composition, medical history, smoking)

## HEALTH EFFECTS OF EXPOSURE

Vibration transmitted from a tool or piece of equipment can affect the blood vessels, nerves, muscles and joints in the fingers, hand and arm. The collection of symptoms is called

hand-arm vibration syndrome (HAVS). Symptoms include one or more of the following:

- Intermittent periods of numbness in the fingers (with or without tingling)
- Occasional blanching (whitening) in the tips of one or more of the fingers
- Swelling and stiffness in the joints of the fingers, wrist and/or elbow
- Pain in the fingers, hand and/or arm
- Muscle fatigue and reduced grip strength
- Reduced sense of touch and temperature

The occasional blanching of fingers explains why HAVS is commonly referred to as vibration white finger (VWF). Over time these symptoms become more frequent, severe and extend beyond the body part initially affected. Severe cases may involve blue-black fingertips, loss of hand function, open sores and gangrene.

## CONSEQUENCES OF CUMULATIVE EXPOSURE

The negative health effects of hand-arm vibration exposure have a delayed onset, from a few months to several years after initial exposure. If symptoms are recognized early, and exposure is reduced or eliminated, symptoms may be reversible. However, if symptoms persist over time, there is potential for greater and often irreversible damage.

## RESPONSIBILITY

It is the employer's responsibility to ensure a healthy and safe workplace. This includes performing risk assessments, implementing safety measures following the hierarchy of controls (see WorkSafeBC resource in More Information section), and educating workers on how to identify risk, recognize health effects and use available control measures. System-level control measures (elimination, substitution and engineering controls) offer the highest level of protection and are more effective than administrative controls and personal protective equipment (PPE) for protection from exposure to

hand-arm vibration. If the worker seeks work-related medical treatment, the employer must report the incident to the Ministry of Energy Mines & Low Carbon Innovation, OHSC, local union and WorkSafeBC.

It is the worker's responsibility to report hazards and work-related symptoms to their supervisor. The worker should inform their healthcare provider if they believe their symptoms may be work-related and report to WorkSafeBC when they notice symptoms.

## EXPOSURE RISK IDENTIFICATION & ASSESSMENT

The following steps can be used by an employer to determine the potential for harmful exposure to hand-arm vibration and the need for intervention:

1. **Identify task and environmental factors causing vibration exposure** – Interview workers and supervisors, observe work activities and environment, list the tools/equipment used that can contribute to exposure, and review maintenance schedules.
2. **Estimate the duration of exposure** – Determine how often and how long tools/equipment are being used; consider shift rotation and length.
3. **Use manufacturer specifications to determine potential exposure intensity** – If unavailable, refer to online research on exposures for different types of hand-held and hand-guided tools and equipment.
4. **Compare the estimated exposure to recommended occupational exposure limits** – Refer to the American Conference of Government Industrial Hygienists' (ACGIH) Threshold Limit Values (TLVs).
5. **Implement controls** – Involve workers, supervisors, OHSC and local union to determine appropriate solutions and ensure effective communication (see Exposure Control section for examples).
6. **Re-assess to ensure controls are effective** – Involve the same stakeholders as above.

Note: In cases of excessive exposure or where exposure cannot be determined, a robust analysis may be required. An accelerometer is an instrument that calculates hand-arm vibration measurements that follow International Organization for Standardization (ISO) 5349. Mines interested in further information can contact [Mine.Ergonomics@gov.bc.ca](mailto:Mine.Ergonomics@gov.bc.ca)

## EXPOSURE CONTROL

Protecting workers from the health effects of hand-arm vibration exposure usually involve a combination of control measures, such as:

- **Purchase low vibration tools/equipment** – Built-in damping, vibration isolation, centre of gravity feature.
- **Consider handle grip design** – Position, girth, heated, damping, tool handle wrap (see note below).
- **Maintain tools/equipment** – Replace, sharpen, lubricate, tune.
- **Incorporate ergonomic workstation design and methods** – Appropriate height to maintain neutral postures, tool suspension system to reduce grip force.
- **Maintain warm body temperature** – 16°C+ indoor temperature, wear cold and wet resistant clothing/gloves for outdoor work, warm-up as necessary, store tools in a warm location.
- **Educate workers** – Tool/equipment selection, tool handling techniques, maintenance reporting requirements, ergonomic practices, environmental considerations, symptom recognition.
- **Reduce exposure duration and frequency** – Rotate between tasks without vibrating tools/equipment.
- **Appropriate use of PPE** – Anti-vibration gloves (see note below).

Note: Tool handle wraps may isolate some vibration but can compromise proper grip around the tool. Anti-vibration gloves that meet ISO 10819 standard may provide vibration-reducing benefits to workers using tools and equipment. If gloves are used, they should be fitted properly, maintain the dexterity required for the task and insulate against cold and wet environments. A combination of glove types is acceptable.

## RESOURCES

- Government of Alberta, "[Best Practices – Vibration at the Worksite](#)"
- Canadian Centre for Occupation Health & Safety (CCOHS), "[Vibration](#)"
- WorkSafeBC (WSBC), "[Controlling Risks](#)"

<sup>i</sup>Vibration frequency is the number of times an object (e.g. tool, body part) oscillates (moves back and forth) in a defined unit of time. Frequency is usually expressed in cycles per second, and the units are hertz (Hz).

<sup>ii</sup>Vibration amplitude is the distance that an oscillation moves from its resting position to the peak (or trough) of the oscillation.



## QUESTIONS

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