Workplace Health and Safety
Bulletin
WORK SAFE ALBERTA

All Shook Up — Understanding Vibration

Many workers are exposed to vibration daily while using vibrating equipment or machinery. Workers operating hand-held equipment, such as chain saw or jackhammer, are exposed to hand-arm vibration. Workers sitting or standing on a vibrating floor or seat are exposed to whole-body vibration because the vibration affects almost their entire body. The risk of injury from exposure to either type of vibration depends on the intensity and frequency of the vibration, the duration of exposure (usually measured in years) and the part(s) of the body affected.

Hand-arm vibration

Hand-arm vibration damages blood vessels in the hands and fingers, reducing the flow of blood and harming the skin, nerves and muscles. This is called hand-arm vibration syndrome (HAVS), also known as "vibration-induced white finger (VWF)", "dead-finger" or "Raynaud's Syndrome". (Raynaud's Syndrome has many other causes, vibration being just one of them). Affected fingers turn white or blanch, especially when exposed to cold. Symptoms of HAVS include tingling fingers, numbness, loss of grip strength, clumsiness with the hands, fingertips that turn white or blue, coldness and pain in the hands. The chances of getting HAVS increase with exposure to vibration, particularly in combination with risk factors such as cold exposure and smoking. Both of these reduce the flow of blood to the hands.

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Major sources of vibration among hand tools are grinders, sanders, drills, impact wrenches, jackhammers, riveting and chipping hammers and chain saws. Hand tools with accelerations greater than 2.5 m/s^2 (metres per second squared) are associated with increased rates of injury. Unfortunately, there isn't any protective equipment that workers can wear to *prevent* exposure to vibration.

Gloves are available with vibration-damping material built into the palms and fingers, but they have not been proven effective. If the gloves fit well however, and don't cause the worker to tighten his or her grip, it may not hurt to try them. Regular work gloves and warm clothing are important in cold weather to keep hands warm and dry, since operating a vibrating tool with cold hands increases the risk of injury.

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Reducing exposure to hand-arm vibration

The best way to avoid injury is to work with non-vibrating tools whenever possible. If a vibrating tool must be used, use one that has effective anti-vibration features built in. Some new designs can reduce tool vibration by more than 50 percent.

To reduce exposure to hand-arm vibration:

- Limit the amount of time (hours per day and days per week) vibrating tools are used.
- Take a 10-minute break for every hour spent working with a vibrating tool.
- Alternate work with vibrating and non-vibrating tools.
- Let the tool do the work. Use as light a grip as possible to keep the tool under control. A tight grip restricts blood flow in the hands and fingers and allows more vibration to pass from the tool to the body.
- Maintain tools properly. Tools that are worn, blunt or misaligned vibrate more.

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The American Conference of Government Industrial Hygienists (ACGIH) has published Threshold Limit Values (TLVs) for hand-arm vibration. TLVs represent conditions under which it is believed that nearly all workers may be repeatedly exposed day after day without adverse health effects. Although these hand-arm vibration TLVs are not recognized in law in Alberta, they may be useful when assessing exposure.

Whole-body vibration

The effects of whole-body vibration are poorly understood. Whole-body vibration can cause fatigue, insomnia, headaches and "shakiness" during or shortly after exposure. The symptoms are similar to those that many people experience after a long car or boat trip. After daily exposure over a number of years, whole-body vibration can affect the entire body and result in a number of health disorders.

The effects of whole-body vibration are poorly understood.

While there is substantial evidence that whole-body vibration is associated with lower back and neck injuries, it is difficult to identify practical ways for employers to determine whether vehicles or other equipment produce hazardous exposure. Operators of off-road vehicles are likely to have the most hazardous exposures, although this depends on how long they work and the quality of the vehicle's suspension system, shock absorbers, seats and tires.

Methods of controlling whole-body vibration in vehicles may include "air-ride" suspended seats, suspended cabs, maintaining vehicle suspension systems, and inflating tires to their proper pressure. Seats with arm rests, lumbar support, an adjustable seat back, and an adjustable seat pan are also useful.

Unlike hand tools and hand-arm vibration, whole-body vibration acceleration values are unavailable for specific vehicle models or other equipment. ACGIH does publish TLVs for whole-body vibration.

Resource materials

American Conference of Governmental Industrial Hygienists. *2003 Threshold Limit Values for Chemical Substances and Physical Agents & Biological Exposure Indices*. ACGIH, Ohio.

http://employment.alberta.ca/documents/WHS/WHS-PUB_erg021.pdf
Alberta Employment and Immigration Safety, Safety Bulletin *ERG021 Musculoskeletal Injuries – Part 5 Assessing Ergonomic Hazards*. Helps assess whether hand tools present a hand-arm vibration hazard.

www.ccohs.ca/oshanswers/phys_agents/vibration/vibration_effects.html
Canadian Centre for Occupational Health and Safety (CCOHS). General information about vibration and its health effects.

Umetech.niwl.se/vibration/HAVHome.html
National Institute for Working Life (NIWL), Sweden. Database of power tool acceleration data.

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