GUIDE TO MANAGING RISKS OF EXPOSURE TO WHOLE-BODY VIBRATION IN WORKPLACES

This Guide provides information on how to manage risks associated with vibrating machinery in the workplace, and in particular whole-body vibration. A summary is available in the information sheet on *Whole-Body Vibration*.

This Guide is part of a series of guidance material on:

- *Measuring and assessing workplace exposure to whole-body vibration*
- *Managing risks of exposure to hand-arm vibration in workplaces*, and
- *Measuring and assessing workplace exposure to hand-arm vibration*.

What is whole-body vibration?

Whole-body vibration (WBV) is vibration transmitted to the whole body by the surface supporting it, for example through a seat or the floor. It is commonly experienced by drivers, operators and passengers in mobile plant when travelling over uneven surfaces. WBV may also be experienced while standing, for example standing on platforms attached to concrete crushing plant. WBV includes sharp impacts like shocks and jolts.

Exposure to WBV mainly occurs in vehicles used off-road or on un-sealed roads, for example on farms and construction, mine and quarry sites. It can also occur in other places like in small, fast boats and in helicopters.

Most people who drive vehicles on surfaced roads in good repair are not likely to experience harmful levels of WBV. When road-going vehicles are used off road this activity may result in higher levels of vibration.

What are the health effects of exposure to WBV?

Studies of long-term exposure to WBV show evidence of risks to health, mainly musculoskeletal disorders involving the lower spine, neck and shoulders. High WBV exposure increases the risk of lower-back pain, herniated discs and early degeneration of the spine.

Other factors may cause or contribute to back pain and shoulder and neck disorders, for example working posture, body size, muscle tone, physical workload and individual factors like age, pre-existing disorders and muscle force.

This makes linking symptoms directly to WBV difficult and therefore, a specific WBV health monitoring program is not recommended.

Workers should be asked to fill out the worker discomfort survey in the Code of Practice: *Hazardous manual tasks* to help identify if they are at risk. This may also help you work out if workers are affected by WBV and other musculoskeletal hazards.

Exposure to WBV may cause or make worse:

- cardiovascular, respiratory, neurological, endocrine and metabolic changes
- digestive problems
- reproductive organ damage in both men and women, and
- impairment of vision, balance or both.

Exposure to WBV may also cause discomfort, fatigue and other problems when work activities are being carried out. This could lead to incidents.

There is evidence workers who use vibrating plant and are exposed to noise at the same time are more likely to suffer hearing loss than workers exposed to the same level of noise alone. Exposure to both vibration and noise is also understood to increase musculoskeletal problems.

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Who has duties under the law?

Everyone in the workplace has a work health and safety duty. The main duties related to WBV are set out in Table 1.

Table 1 Duties in relation to WBV

Who	Duties
A person conducting a business or undertaking	**A person conducting a business or undertaking** has the primary duty to ensure, so far as is reasonably practicable, workers and other people are not exposed to health and safety risks arising from the business or undertaking. This duty includes eliminating exposure to WBV, so far as is reasonably practicable, and if it is not reasonably practicable to eliminate exposure to WBV, minimising the risks from exposure to WBV so far as is reasonably practicable. This includes ensuring so far as is reasonably practicable the: ■ provision and maintenance of safe plant, and ■ safe use, handling, storage and transport of plant. The duty covers businesses and undertakings with management or control of plant including those which own, lease or hire out plant.
Designers, manufacturers, importers, suppliers and installers	**Designers, manufacturers, importers, suppliers and installers of plant** must ensure, so far as is reasonably practicable, the plant they design, manufacture, import, supply or install is without risks to health and safety. This duty includes carrying out analysis, testing or an examination and providing adequate information about the plant. Information must, so far as is reasonably practicable, be passed on from the designer through to the manufacturer and supplier to the end user. Also see the *Guide to the safe design of plant*, *Guide for manufacturing safe plant* and *Guide to importing and supplying safe plant*.
Officers	**Officers**, such as company directors, have a duty to exercise due diligence to ensure the business or undertaking complies with the WHS Act and Regulations. Also see *Interpretive Guideline - model Work Health and Safety Act - the health and safety duty of an officer under section 27*
Workers and others	**Workers and other people at the workplace**, like visitors, must take reasonable care for their own health and safety, comply with reasonable policies, procedures and instructions and not adversely affect other people's health and safety.

How can WBV risks be managed?

The following steps should be used to make sure, so far as is reasonably practicable, workers and other people are not harmed by exposure to WBV in the workplace.

1. **Find out what could cause harm.**

- Observe the workplace to identify where workers may be exposed to WBV and how workers interact with plant.
- Visually inspect the plant before and during operation.
- Ask your workers about any problems they may have with plant including operation, inspection, maintenance, repair, transport and storage requirements.

- Review your incident and injury records looking for indicative symptoms e.g. disorientation, light headedness, numbness, tingling, back or joint pain following vibrating plant use.

2. Assess the risks—if necessary. When you have identified the hazards at your workplace you may need to assess the risks – **the likelihood of somebody being harmed by the hazard and how serious the harm could be.** Think about how incidents could happen and who might be harmed. The most important factors include:

- the magnitude of vibration (to help other duty holders minimise exposure to WBV, suppliers of plant are encouraged to provide information on the vibration emission of plant according to the relevant standards)
- whether shocks or jolts are transmitted to the worker, and
- how long workers are exposed to vibration, both day-to-day and over their working life.

The main factors influencing harmful WBV exposures are:

- Plant characteristics—vehicle type and design, resistance forces, vehicle activity, engine vibration, age and condition of plant, suspension design and maintenance, cab layout and design, plant speed.
- Work environment—rough road and surface conditions, unfavourable weather conditions, lighting and visibility.
- Work organisation—task design, duration of exposure, awkward postures, frequent twisting, long periods of sitting and physical workload.
- Individual characteristics—driver skill and awareness or stress.

A risk assessment can help you determine what action you should take to control the risk and how urgently the action needs to be taken. A vibration specialist or other competent person can assist you to make this assessment.

3. Take action to control the risk. The WHS laws require a business or undertaking do all that is reasonably practicable to eliminate or minimise risks.

The ways of controlling risks are ranked from the highest level of protection and reliability to the lowest. This ranking is known as the hierarchy of control. You must work through this hierarchy to manage risks.

Measures to eliminate or minimise exposure to WBV should be considered:

- at the source of vibration
- along the paths of the vibration, and
- at the position where the vibration enters the worker.

Consider if hazards from using vibrating plant can be completely removed from the workplace. For example, introducing remotely controlled mobile plant rather than plant driven by workers.

If it is not reasonably practicable to completely eliminate the risk then consider implementing the following options in the order they appear below to minimise risks, so far as is reasonably practicable:

- Substituting the hazard with something safer including purchasing or hiring mobile plant which has lower vibration emission or is more suited to the task e.g. where forklifts are regularly used in unpaved loading yards using a forklift designed for this use rather than one designed for indoor use.
- Isolating the hazard from people e.g. isolating or dampening a work platform to eliminate or minimise vibration from a motor using rubber mounts and flexible connection.
- Using engineering controls e.g. installing seats on mobile plant that are designed to minimise vibration, selecting tyre types suitable for the terrain, and maintaining suspension, roadways and tyres regularly.

If after implementing the above control measures a risk still remains, consider the following controls in the order below to minimise the remaining risk, so far as is reasonably practicable:

- Using administrative controls e.g. implementing speed limits on gravel or dirt roads or introducing a roster system to minimise how long each worker is exposed to WBV.
- Using personal protective equipment (PPE) e.g. workers standing on a vibrating platform may benefit from shoes with soles designed to reduce transmission of vibration to the feet. In most cases PPE is unlikely to be effective on its own as a control measure to reduce WBV exposures.

Cold weather or conditions may accelerate or worsen the severity of back pain so it is good practice to make sure those working in the cold are provided with warm and if necessary, waterproof clothing.

A combination of the controls set out above may be used if a single control is not enough to minimise the risks.

You should consider all possible control measures and make a decision about what is reasonably practicable for your workplace. Deciding what is reasonably practicable includes the availability and suitability of control measures, with a preference for using substitution, isolation or engineering controls to minimise risks before using administrative controls or PPE. Cost may be relevant but only after other factors have been taken into account.

4. Information, instruction and training must be provided to workers who use vibrating plant. This information, instruction and training should at least cover:

- health effects of WBV
- sources of WBV and how the vibration can be minimised e.g. with proper seat adjustment
- how to recognise and report symptoms, and
- where necessary, training in how to operate plant to minimise vibration.

5. Check your control measures regularly to make sure they are working as planned. Control measures should be regularly reviewed to make sure they remain effective, taking into consideration any changes, the nature and duration of work and whether the system is working as planned.

More information on the risk management process is in the Code of Practice: *How to manage work health and safety risks*.

More information on managing the risks of plant is in the Code of Practice: *Managing risks of plant in the workplace*.

Who is involved?

You must consult your workers and their health and safety representatives (if any) when deciding how to manage the risks of using vibrating plant in the workplace.

If there is more than one business or undertaking at your workplace you must consult them to share information, find out who is doing what and work together to eliminate or minimise risks, so far as is reasonably practicable. This may involve discussing site-specific requirements including the type of plant to use and operator training.

Further information on consultation requirements is in the Code of Practice: *Work health and safety consultation, co-operation and co-ordination*.

BEFORE USING VIBRATING PLANT

Choosing the right plant

You should make sure plant selected or allocated for tasks produces the lowest WBV practicable, is suitable and can do the work efficiently. The wrong type of plant may take much longer to complete the task and expose workers to more vibration for longer than is necessary.

The design of plant should be considered as part of eliminating or minimising WBV. For example:

- Cab layouts and control levers should be arranged so operators are able to maintain a comfortable upright posture and do not need to twist their body excessively or maintain twisted postures.
- Suitable tyres should be selected so the plant can handle the terrain. Tyre selection can be important as tyres absorb some effects of uneven ground. However, tyres cannot absorb the vibration from larger lumps and potholes and soft tyres on uneven ground can increase a plant's vertical motions.

Plant manufacturers, importers, suppliers and hire companies should be able to help you select the most suitable and safest plant for your particular needs.

The supplier may also be able to give technical support or advice on:

- how to use the plant safely and training requirements
- how to use the plant for specific tasks
- how to maintain the plant in good condition
- vibration reduction features
- applications of the plant believed to increase the risk of WBV injury, and
- training for workers recommended to control WBV exposures e.g. maintenance staff.

Pre-start checklist

The pre-start checklist in Table 2 can help you identify jobs which may expose workers to WBV. It should be completed every time an operator uses a different type of plant.

If an operator answers 'yes' to a question in Table 2 this indicates they may be exposed to hazardous vibration levels and action may need to be taken to minimise exposure.

Table 2 Pre-start checklist for workers

Item	Yes ✓	No ✓
Do you drive off-road or on un-sealed roads?	☐	☐
Do you drive on poorly maintained road surfaces?	☐	☐
Do you drive or operate vibrating plant for more than half the working day?	☐	☐
Do you drive plant on roadway conditions it is not designed for?	☐	☐
Are you exposed to shocks or jolts?	☐	☐
Do you need to be in awkward postures or perform manual handling tasks?	☐	☐
Do the manufacturers of plant you use warn of WBV risks?	☐	☐
Do you suffer from back disorders or discomfort due to work?	☐	☐

Suspension seats

Suspension seat systems should be:

- appropriate for the plant—a poor choice can easily result in a higher vibration exposure than without the suspension
- unlikely to hit its top or bottom end stops during typical use—striking the end stops creates shocks or jolts which increase the risk of back injury

- easy to get into and easy to adjust for the operator's weight and body size—height, fore-aft and backrest adjustments are especially important. The seat cushions should be ergonomically designed, and
- explained to drivers—drivers should be shown how to adjust them for their weight and given information about why these adjustments are important to their health. They should be shown how to set other seat controls—fore-aft position, height, and back-rest inclination—to achieve the best posture.

Drivers and maintenance technicians should be trained to recognise when plant components affecting vibration exposure and posture like the seat suspension system, need maintenance or replacing.

Maintenance

Regular servicing of plant and attachments and the roadways helps reduce vibration and shocks. It is important to:

- maintain road surfaces
- replace worn parts including seat suspension
- check and replace defective vibration dampers, bearings and gears
- tune engines
- maintain tyres and make sure they are inflated to the correct pressures for the surface and load conditions, and
- lubricate seats and other suspension systems.

Is it necessary to measure WBV?

If workers find WBV is uncomfortable it is likely their exposure to vibration is reaching levels which could pose a risk to their health. This may indicate a WBV problem and controls should be put in place to minimise exposure.

Measurement of WBV may be needed in situations where it is not clear whether a worker's exposure to WBV is contributing to lower back pain or other suspected WBV-related health effects, or if you are uncertain about the effectiveness of controls you have put in place to minimise exposure to WBV. This should be carried out by a competent person.

More information is in the *Guide to measuring and assessing workplace exposure to whole-body vibration*.

When to seek medical advice

Workers should seek medical advice or be referred to a medical practitioner if they experience discomfort, numbness, tingling or pain during use or following use of plant which exposes them to WBV. Seeking early medical advice may:

- help identify whether controls being used are effective
- help identify workers at particular risk because of pre-existing conditions, and
- prevent progression of disease.

Workers can complete an annual questionnaire about lower back pain and other symptoms to identify if they should be checked by a medical practitioner.

To help identify at risk workers you can also ask workers to fill out the worker discomfort survey in the Code of Practice: *Hazardous manual tasks*.

More information

- Safe Work Australia reports on vibration:
  - *Implementation and Effectiveness of the European Directive Relating to Vibration in the Workplace*
  - *National Hazard Exposure Worker Surveillance: Vibration exposure and the provision of vibration control measures in Australian Workplaces*
- Health and Safety Executive UK:
  - *HSE Information Sheet Whole-body Vibration in Agriculture AIS20 (revision)*
  - *Control back-pain risks from whole-body vibration - Advice for employers on the Control of Vibration at Work Regulations 2005 INDG 242*
  - *Drive away bad backs - Advice for mobile machine operators and drivers IND404*
  - *Whole-body vibration in ports*

For more information see the Safe Work Australia website (www.swa.gov.au).