Whole-body vibration in agriculture

HSE information sheet

Agriculture Information Sheet No 20 (Revision 2)

Introduction

This information sheet describes how whole-body vibration (WBV) from agricultural work can cause back pain. It explains what action employers, employees and the self-employed can take to reduce exposure to WBV and comply with their legal duties under health and safety legislation. It should be read in conjunction with the leaflet INDG242(rev1) *Control back-pain risks from whole-body vibration* – see 'Further reading'.

What is whole-body vibration?

WBV is the vibration and shock you feel when you sit or stand on a vehicle or machine travelling over rough ground or along a track, or the vibration when you work near powerful machinery such as milling machines. Shocks can occur, for example, when driving over bumps or potholes. Exposure to WBV at low levels is unlikely on its own to cause back pain, but it can aggravate existing back injuries that may cause pain.

There are many causes of back pain other than WBV: some may be more important than WBV and must be adequately controlled. The most likely cause(s) of back pain should be tackled first – see 'Further reading'.

When is whole-body vibration important?

The Control of Vibration at Work Regulations 2005 (the Vibration Regulations) set an exposure action value (EAV) and an exposure limit value (ELV).

The EAV is 0.5 m/s² A(8) and is the amount of daily exposure to WBV above which you are required to take action to reduce exposure. The ELV is 1.15 m/s² A(8) and should not be exceeded.

People using agricultural machinery are likely to be exposed to vibration above the EAV. In some cases, action may be required to make sure exposure is kept below the ELV (see Table 1). You should not usually need to measure WBV exposures to know where and how the Regulations apply. However, action to reduce workplace exposure to WBV is required for most operators using most agricultural machinery on at least some days.

What action should I take?

You can control the risks by a combination of:

- identifying how and when people may be exposed;
- minimising the exposure by implementing control measures;
- providing information, instruction and training to those at risk.

The kind of action you need to take varies with the degree of risk. Table 1 gives examples of agricultural tasks split into four groups according to the likely exposure to WBV.

- If you have identified that the work will not reach the EAV (eg Group I tasks), or only occasionally exceed it, you need to take the precautionary measures to ensure that exposure is as low as reasonably practicable.
- If exposure is often above the EAV (eg Group 2 and 3 tasks) then you need to make changes to your working practices to reduce exposure. You should also consider modifying or replacing unsuitable machinery.
- HSE recommends health monitoring for Group 3 tasks. Health monitoring can identify and minimise the risk of back pain from all sources, not just WBV.
- If you have taken action and the exposures are still likely to exceed the ELV (eg Group 4 tasks) then you will need to limit how long you spend doing the task.

Exposures for some tasks vary according to the type of holding (arable, livestock, mixed etc). If you operate machinery or perform tasks not listed in Table 1, information may be available from manufacturers, trade associations or elsewhere to help you identify the level of control action required. Exposures should be reduced so far as is reasonably practicable. You may wish to get advice from a person who has the qualifications, knowledge and expertise to help you determine what you need to do.

Table 1 Agricultural tasks grouped according to likely exposure

Group 1: WBV unlikely to be a risk	Group 2: You must manage exposure to WBV	Group 3: WBV is a likely cause of back pain	Group 4: You must restrict exposure to WBV*†
It is unusual for machinery-related tasks in agriculture to fall into this category. Even if machinery is shared among a large workforce and exposure durations are short enough for exposures to be below the EAV, it is highly likely that there will be some exposure to significant shocks.	■ Combining ■ Hedging and ditching ■ Self-propelled foragers ■ Duties requiring use of power take-off shaft not otherwise listed	■ Baling ■ Drilling ■ Foraging ■ Spraying ■ Ploughing ■ Harrowing ■ Primary cultivation (up to 5½ hours) ■ Mowing (up to 8 hours) ■ Tedding (up to 5 hours) ■ Transport using unsuspended tractors (up to 4½ hours) ■ Transport using tractors with suspended cab or chassis (up to 7 hours) ■ ATV (all-terrain vehicle/ quad bike) (up to 5½ hours)	■ Primary cultivation (over 5½ hours) ■ Mowing (over 8 hours) ■ Tedding (over 5 hours) ■ Transport using unsuspended tractors (over 4½ hours) ■ Transport using tractors with suspended cab or chassis (over 7 hours) ■ ATV (all-terrain vehicle/ quad bike) (over 5½ hours)

Group 1: WBV unlikely to be a risk

- Exposure is likely to be below the EAV with no significant shocks.
- Low-cost vibration-reduction measures and management of WBV will reduce maintenance and the likelihood of back pain.

Group 2: You must manage exposure to WBV

- Exposures are likely to exceed the EAV on at least some days, but shocks are expected to be small.
- The risk of back pain from WBV is likely to be low and back pain is more likely to be caused by other factors.
- You must have low-cost vibration-reduction and management measures in place, but costly or difficult measures are unlikely to be reasonably practicable.

Group 3: WBV is a likely cause of back pain

- Exposures are likely to be much higher than the EAV and/or contain large shocks.
- You must have effective engineering and management controls.
- Health monitoring is recommended to confirm that the risk from WBV is under control.

Group 4: You must restrict exposure to WBV*†

- To comply with the ELV you must restrict how long people are exposed to WBV.

* A transitional period permits older agricultural machinery to continue in use until 2014, with operators exposed in excess of the ELV, so long as exposure is reduced so far as is reasonably practicable.

† Investigation of your specific activities may, in some cases, show that the tasks can continue for longer than stated.

Controls to reduce the risk from WBV

Low-cost vibration-reduction and management measures

- Find out what steps you can take to reduce shock, such as following good practice when driving over headlands or adequate maintenance of tracks.
- Find out what you can do to reduce vibration, such as limiting speed or good maintenance of machinery suspensions.
- Ask for vibration information when purchasing or hiring machinery.
- Maintain machinery in accordance with the manufacturer's recommendations.

Construction and maintenance of farm tracks

- Design, construct and maintain roadways and other vehicle manoeuvring areas to a high standard, according to the machinery that will use them.
- Repair potholes and other roadway damage and keep roadways clear of debris to avoid shocks.
- Design road cambers to avoid or minimise poor posture.
- Good drainage will help reduce deterioration.

Maintenance and adjustment of seats

- Machine manufacturers/suppliers must ensure the seat adjustment controls are readily accessible and easy to use.
- Incorrect seat adjustment is often the source of poor posture and unnecessary vibration.
- Check, lubricate and maintain seat suspensions (and cab and chassis suspensions) as recommended by the manufacturer.

Seat suspension components (especially the damper) may need periodic replacement. Inspect the seat assembly regularly for defects. The damper is likely to be defective if the seat easily hits the bottom end-stops while driving over relatively smooth terrain with the weight control correctly set or, when the machine is parked, if the seat cushion is easily pushed into the end-stops, for example with your knee.

Replacement seats

Many popular agricultural vehicle brands are supplied with air or mechanical suspension seats. Suspension seat mechanisms may wear out during the life of the machine. Replacement seats need to take account of factors such as roll-over protective structures (ROPS) and seatbelts as well as vibration.

The damping in some suspension seats is too light for the chosen use of the machine. Modifications of seat suspensions should be made only in discussion with the manufacturers of both the seat and the machine. For example, fitting a heavier damper will often reduce exposure to shock from end-stop impacts, and extend damper life, but will increase the average vibration.

Seats are available with fore-aft as well as vertical suspension. Fore-aft vibration can be important in applications such as tractor-trailer transport, or many self-propelled foragers and sprayers. It is advisable to try a machine with a fore-aft suspension seat before buying. These seats can be effective in reducing vibration.

Selecting suitable machinery

You should make sure that machinery is suitable for the intended task and will not cause unnecessary vibration exposure – using under-sized or under-powered machines is likely to increase exposure to WBV and shock.

When purchasing or hiring in machinery other than agricultural tractors, you should ask for information about how to use the machinery without risk from WBV. Manufacturers/suppliers have been obliged to provide this information since 1996.

Agricultural tractors must meet the vibration specification for the seat prescribed according to a standard test. However, you will still need to follow the guidelines in this information sheet to comply with the Vibration Regulations.

Vibration can change markedly from task to task, operator to operator, and day to day, so there is always a relatively wide range of vibration for a machine or task. Within this range, the vibration of directly competing machines is often the same. However, if you find out that there are large differences in the vibration of machines, choose the machine with the lowest WBV emission levels as long as the machines are otherwise equivalent.

All-terrain vehicles (ATVs)

Riders of ATVs such as quad bikes are exposed to very high levels of WBV. The risk of injury from riding quad bikes is unclear because the posture and muscle tone of the rider (whether seated or standing) is very different to that of a driver seated in a conventional agricultural machine. Even so, the exposure action and limit values of the Vibration Regulations still apply – both at the seat and at the footrests.

The common practice of standing on the footrest with bent knees, for example when crossing rough ground, appears likely to reduce the transmission of vibration into the driver's back and so reduces the risk of causing back pain compared to sitting on the seat.

Field work: Headlands

Most vibration and shock during field working occur at headlands where you are driving over unworked land or across tramlines. The higher levels of vibration at headlands will often contribute only slightly more to the daily vibration exposure because of the short time spent there, compared with that spent working the main field (with lower vibration).

However, the risk from shock is unlikely to average out between headland work and work in the main field because each shock could have the potential to cause microscopic damage which might add up over time to pain or injury. The risk from shock could be increased when in an awkward posture, for example when the driver is twisted or leaning to one side as the machine makes uneven progress across ruts.

Try not to spend a large proportion of a day working around headlands and plan cultivation work to minimise sources of shock.

Travelling on roads

Most agricultural machinery produces its highest vibration when travelling on roads, usually because it is being driven at a relatively high speed. In most cases, this contributes only a small part to the overall daily exposure because the duration of travel to, from, or between fields is usually only a small part of the working day.

An exception is hauling a trailer, where vibration is high and the duration can be many hours. This may be the most common cause of exposures exceeding the ELV.

To reduce the risks, consider introducing limits on the time spent by individual operators driving on roads, as well as moderating vehicle speed.

Information and training for workers

A competent and skilled farm worker who drives in a smooth and controlled manner will often generate lower exposure to vibration than a less skilled worker or someone working under pressure. Train machine operators in how to minimise WBV from the machinery they use and give them information on:

- the health risks from WBV, eg lower back pain;
- how to correctly adjust and set the driver's seat on machines they use;
- methods of work to reduce risks (such as choice of speed and route to be followed);
- the tasks/situations where risks are increased;
- how to recognise and report symptoms associated with WBV.

Monitor and control

All mobile agricultural machinery has the potential to cause exposure in excess of the ELV if controls are not implemented and followed. Actual exposures are usually between the EAV and ELV so controls are necessary and must be maintained.

Measures such as restricting how long machines are used, route planning, reducing travelling speed and monitoring driver behaviour may be required to reduce vibration exposure to below the ELV, in addition to the control measures above.

Using job rotation as a control action may actually increase the number of workers at risk because large shocks, especially if your back is twisted, can cause microscopic but permanent injury. Before job rotation is introduced, it is important that the risk of being exposed to large shocks is reduced or removed.

Further reading

Control back-pain risks from whole-body vibration: Advice for employers on the Control of Vibration at Work Regulations 2005 Leaflet INDG242(rev1) HSE Books 2005 www.hse.gov.uk/pubns/indg242.pdf

Manual handling at work: A brief guide Leaflet INDG143(rev3) HSE Books 2012 www.hse.gov.uk/pubns/indg143.htm

Manual handling assessment charts Leaflet INDG383(rev1) HSE Books 2012 www.hse.gov.uk/pubns/indg383.htm

Whole-body vibration. The Control of Vibration at Work Regulations 2005. Guidance on Regulations L141 HSE Books 2005 ISBN 978 0 7176 6126 8 www.hse.gov.uk/pubns/books/L141.htm

Non-binding guide to good practice for implementing Directive 2002/44/EC (Vibrations at work) European Commission ISBN 978 92 79 07533 9 Order or download free at www.bookshop.europa.eu

You can get further information on whole-body vibration from the HSE website: www.hse.gov.uk/vibration

Further information

For information about health and safety, or to report inconsistencies or inaccuracies in this guidance, visit www.hse.gov.uk/. You can view HSE guidance online and order priced publications from the website. HSE priced publications are also available from bookshops.

This guidance is issued by the Health and Safety Executive. Following the guidance is not compulsory, unless specifically stated, and you are free to take other action. But if you do follow the guidance you will normally be doing enough to comply with the law. Health and safety inspectors seek to secure compliance with the law and may refer to this guidance.

This leaflet is available at: www.hse.gov.uk/pubns/ais20.htm.