

Whole-body vibration in agriculture

HSE information sheet

Agriculture Information Sheet No 20

Introduction

This information sheet outlines the risk of developing back pain from whole-body vibration (WBV) in agriculture and explains what you can do to reduce exposure to it. It should be read in conjunction with the leaflet INDG242(rev1) *Control back pain risks from whole-body vibration*.¹

What is whole-body vibration (WBV)?

Whole-body vibration 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 machinery. 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 which may cause pain.

There are many causes of back pain other than WBV, which must be adequately controlled. The most likely cause of back pain should be tackled first. See leaflet INDG242 for more information, and leaflets INDG143² and INDG383³ for guidance on assessing and managing the risks from manual handling.

The law

The Control of Vibration at Work Regulations 2005⁴ (the Vibration Regulations) require you to control the risks from WBV and shock, by a combination of:

- identifying sources of exposure and possible exposure controls;
- minimising exposure by maintaining or modifying machinery and following good practice measures to control exposure; and
- training operators to ensure controls are effective.

HSE also recommends health monitoring to identify and minimise the risk of back pain from all sources, not just from WBV.

What are the action and limit values?

Vibration exposure is measured in $m/s^2 A(8)$. The Vibration Regulations set an exposure action value (EAV) which is the amount of daily exposure to WBV above which you are required to take action to reduce risk. They also set an exposure limit value (ELV) that should not be exceeded.

Exposures for those using agricultural machinery are likely to be above the EAV and in some cases need careful management to remain 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 types of agricultural machinery on at least some days.

What action should I take?

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

- If you have identified that the work will not reach the EAV (eg Group 1 tasks), or only occasionally exceed it, you need to take 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 to vibration and shock. You should also consider modifying or replacing unsuitable machinery.
- If you have taken action and exposures are still likely to exceed the ELV (eg Group 4 tasks) then you need to limit how long you spend doing the task.

Exposures for some tasks vary by the type of holding (arable, livestock, mixed). If you operate machinery or perform tasks not listed in Table 1 you may find information from manufacturers, your trade association, or elsewhere to identify what level of control action is 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 Agriculture 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 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 exposure action value, it is highly likely that there will be some exposure to significant shocks.	<ul style="list-style-type: none"> ■ Combining ■ Hedging and ditching ■ Self-propelled foragers ■ Duties requiring power take-off not otherwise listed 	<ul style="list-style-type: none"> ■ 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) 	<ul style="list-style-type: none"> ■ 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)

<p>Group 1: WBV unlikely to be a risk</p> <ul style="list-style-type: none"> ■ Exposure is likely to be below the EAV (0.5 m/s² A(8)) with no significant shocks. ■ Low-cost vibration-reduction measures and management of WBV will reduce maintenance and the likelihood of back pain. <p>Group 2: You must manage exposure to WBV</p> <ul style="list-style-type: none"> ■ Exposures are likely to exceed the EAV (0.5 m/s² A(8)) 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. 	<p>Group 3: WBV is a likely cause of back pain</p> <ul style="list-style-type: none"> ■ 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. <p>Group 4: You must restrict exposure to WBV</p> <ul style="list-style-type: none"> ■ To comply with the ELV (1.15 m/s² A(8)) you must restrict how long people are exposed to WBV. <p>* 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.</p> <p>† Investigation of your specific activities may, in some cases, show that the tasks can continue for longer than stated.</p>
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Controls to reduce the risk of WBV

Precautionary measures

- Establish who is responsible for managing the control of risk from exposure to WBV or shock.
- Find out what can reduce shock, such as good practice when driving over headlands or adequate maintenance of tracks.
- Find out what can reduce vibration, such as limiting speed or good maintenance of machinery suspensions.
- Find out vibration information when purchasing or hiring machinery.
- Provide information and training for operators on how to minimise exposure to WBV and shock and how to recognise and report symptoms.

Construction and maintenance of farm tracks

- 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 and maintain roads to be even to avoid poor posture, high vibration and shock.
- Design road cambers to avoid or minimise poor posture.
- Construct roadways with good drainage to help reduce deterioration.

Maintenance and adjustment of seats

- Machine manufacturers/suppliers must ensure the seat adjustment controls are readily accessible and easy to use.
- Train operators to set seats correctly. 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) will probably need replacing several times during the life of the seat. 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

The seat will probably need replacing several times during the life of the machine. Replacement seats need to take account of other factors such as roll-over protective structures (ROPS) and seat belts as well as vibration. The current requirements of seating standards for vibration are not necessarily compatible with the requirements of the Vibration Regulations.

Modifications of the seat suspension 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 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. The seats can be effective in reducing vibration, although many operators choose to lock the fore-aft suspension because, when active, the suspension reduces their confidence in their ability to maintain control of the machine.

Selecting suitable machinery

Farm managers should ensure that machinery:

- is suitable for the intended task;
- is properly maintained in accordance with the manufacturer's recommendations; 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 machinery other than agricultural tractors, farm managers 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 Control of Vibration at Work 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 indistinguishable. However, if you find out that there are large differences in the vibration of machines, choose the alternative with lower WBV emission levels, as long as the machines are otherwise equivalent.

Comparing spot vibration levels is only meaningful if the measurements have been made using the same method and, at present, there are no industry standard test methods.

ATVs

Riders of all-terrain vehicles (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 footrests 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 in the saddle.

Headlands

Most exposure to vibration and shock during field working occurs 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 into pain or injury. The risk from shock could be increased when in an awkward posture, for example when 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. Plan cultivation to minimise sources of shock.

Travelling on roads

Most agricultural machinery produces the 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 exposure during travel to, from, or between fields is usually only a small part of the working day.

An exception is trailer transport where vibration is high and the duration can be many hours. This is perhaps the most common cause of exposures exceeding the ELV.

Consider introducing limits on the time spent driving on roads, as well as speed limits.

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 farm workers and give them information regarding:

- the risks of lower back pain which arise in their job;
- the factors that are within their control (such as choice of speed and route); and
- the situations where these are important.

Monitor and control

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

Management measures, such as restricting how long machines are used for or reducing travelling speed, may be required to reduce vibration exposure to below the ELV in addition to the control measures above. Restrictions on route or speed may help reduce exposure to a minimum and so may be considered essential to adequate management of WBV exposure. In some farming situations it may be possible to introduce unmanned machinery.

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

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

2 *Getting to grips with manual handling: A short guide* Leaflet INDG143(rev2) HSE Books 2004 (single copy free or priced packs of 15 ISBN 978 0 7176 2828 5) www.hse.gov.uk/pubns/indg143.pdf

3 *Manual handling assessment charts* Leaflet INDG383 HSE Books 2003 (single copy free or priced packs of 10 ISBN 978 0 7176 2741 7) www.hse.gov.uk/pubns/indg383.pdf

4 *Whole-body vibration. The Control of Vibration at Work Regulations 2005. Guidance on Regulations* L141 HSE Books 2005 ISBN 978 0 7176 6126 8

5 *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

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This leaflet contains notes on good practice which are not compulsory but which you may find helpful in considering what you need to do.

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