Hand-arm vibration in amenity horticulture and how to control the risk

Introduction

This guidance advises employers in amenity horticulture how to protect workers from the risk of hand-arm vibration. As an employer, it will help you identify when exposure may cause harm, understand how to comply with the Control of Vibration at Work Regulations 2005 (the Vibration Regulations) and take practical steps to control the vibration risk.

Why hand-arm vibration is an issue

Hand-arm vibration is vibration transmitted into workers' hands and arms. This can come from hand-held and guided power tools, such as hedge trimmers, and powered mowers. It can also be transmitted through the steering wheel of driven equipment such as ride-on mowers.

Regular and frequent exposure to hand-arm vibration can lead to permanent ill health. The two main health conditions associated with hand-arm vibration exposure are:

- hand-arm vibration syndrome (HAVS);
- carpal tunnel syndrome (CTS).

Signs and symptoms of HAVS include:

- tingling and numbness in the fingers which can result in an inability to do fine work or everyday tasks such as fastening buttons;
- loss of strength in the hands which might affect the ability to work safely;
- fingers going white (blanching) and then becoming red and painful on recovery, reducing the ability to work in cold or damp conditions, for example outdoors.

Symptoms and effects of CTS can also occur and include tingling, numbness, pain and weakness in the hands which can interfere with work and everyday tasks and might affect the ability to work safely.

Symptoms of both conditions may come and go but with continued exposure to vibration they may become prolonged or permanent and cause pain, distress and sleep disturbance. This can happen after only a few months of exposure, but more typically it will happen over a few years.

The requirements of the Vibration Regulations

The Vibration Regulations require you to:

- ensure the health and safety of workers by making sure that risks from vibration are controlled;
- provide information, instruction and training to workers on the risk and the actions being taken to control risk;
- provide suitable health surveillance where appropriate.

The Vibration Regulations include an exposure action value (EAV) and an exposure limit value (ELV) based on a combination of the vibration at the gripping point(s) on the equipment or workpiece and the time spent gripping it. The exposure action and limit values are:

- a daily EAV of 2.5 m/s^2 A(8) or 100 HSE points, representing a clear risk requiring management;
- a daily ELV of 5 m/s^2 A(8) or 400 HSE points, representing a high risk above which workers should not be exposed.

Identify problems that should be managed

If you identify problems with vibration exposures in your workplace, consider if there any other ways of doing the work that do not involve vibration exposure.

If there are, consider whether it is reasonable for you to use these alternative methods. You should take all reasonable steps to minimise the risk of vibration exposure.

To assess if there is a risk from vibration exposure in your workplace, which you should manage, check whether:

- workers regularly use tools for more than about 15 minutes a day;
- workers complain about symptoms such as tingling, numbness and finger blanching.

If they do, you should assess the vibration risk in more detail. As an example, tasks requiring the prolonged use of chainsaws, hedge trimmers and brush cutters etc will expose workers above the EAV and should be properly managed.

Preventing disability

Your duties are to reduce workers' risk from vibration to the lowest level reasonably practicable. You must not allow exposures to exceed the ELV. If you comply with the Vibration Regulations you will prevent disability from

HAVS and vibration-related CTS. Some people will develop HAVS or CTS even with low vibration exposures. For example, signs and symptoms of HAVS may appear in people susceptible to vibration injury who are regularly exposed to vibration below the EAV for some years. Health surveillance should identify any harm early on, so you can take appropriate action at the point symptoms are identified and prevent disability.

Do a vibration risk assessment

To do a vibration risk assessment, you should carry out a brief survey of your work. Find out who is exposed to hand-arm vibration and what is causing the exposure. The aim of the risk assessment is to help you control and manage the risk.
To estimate how much your workers are exposed to vibration, find out:

- which tools they use;
- who uses them;
- how long they use them for.

To estimate daily vibration exposure you need to know the exposure time and the vibration magnitude (the amount of vibration coming from the surface of the tool).

Exposure time

Estimate how much time workers operate each piece of equipment each day. This is the amount of time the operator is in contact with a vibrating surface, such as holding a power tool that is switched on and running. It may be referred to as the 'trigger time', but the tool does not have to be actively being used to transmit vibration. For example, if an operator is carrying a chainsaw that is idling, this will count towards their exposure. You can estimate exposure time by:

- observing the work practice and watching workers and timing it with a stop watch;
- checking operator work sheets; or
- using tool timers.

Although some exposure monitoring may help you do your risk assessment, it is not a requirement of the regulations that you continuously monitor vibration exposure and/or trigger time.

Vibration magnitude data

The vibration magnitude is the amount of vibration coming from the vibrating surface in contact with the hand. Obtain reliable in-use vibration data from a credible source. Sources of vibration data include manufacturers' handbooks and websites, HSE's vibration website at www.hse.gov.uk/vibration/hav/index.htm, as well as independent

databases. Whichever data you use, the values must represent real work use. If possible you should check any data you intend to use in your risk assessment by looking for more than one source of similar data.

Vibration magnitudes for a range of common tools are provided in Table 1. These are based on HSE field studies.

Table 1 Typical vibration magnitudes for commonly used equipment*

Tool type	*Range - lower (10%ile) (m/s^2)*	*Range - upper (90%ile) (m/s^2)*	*Recommended initial value (75%ile)(m/s^2)*
Pedestrian-controlled mower	3	8	6
Ride-on mower	3	6	5
Hedge trimmer†	3	14	7
Brush cutter	3	5	5
Strimmer	2	7	7
Chainsaw	3	7	7

* HSE data is continually evolving as we test new machines, so there may be slight changes year on year as new information is added.

† Higher vibration values are possible for hedge trimmers. The data in this table represents operations on hedges with hedge branches well within the capability of the machines. Vibration values may be higher if the hedge trimmer often has to work hard to cut thicker branches.

You can use the '**recommended initial value**' in Table 1 with the exposure durations you observe in your workplace (trigger times) to make an initial estimate of daily vibration exposure. In many cases, this will be enough for you to:

- determine your duties under the Vibration Regulations;
- prioritise your actions;
- review your control measures;
- revise control measures where you need to.

HSE's vibration web pages provide a calculator for vibration to help you estimate daily exposures: www.hse.gov.uk/vibration/hav/index.htm. This can help you establish the level of risk so you can plan work schedules. It also describes and incorporates the HSE points system which can be used to add together different tasks and tools to plan work days.

Develop a control action plan

Once you have done your risk assessment, you can identify which processes are the greatest risk to your workers and which workers are at the greatest risk from vibration exposure. You can then develop an action plan. Your action plan will describe your control measures and how you plan to put them in place with realistic timescales.

You should review your control action plan periodically. You should also review it when there are changes to the work situation or work processes that affect vibration exposures, for example when you introduce new equipment or tasks into the work routine.

Eliminate and control the vibration risk

Knowing the vibration exposure is important to allow you to identify significant risk and determine how to control it. Wherever possible, eliminate the risk, for example don't do the work, or question if you really need to do it in a particular way. Consider whether you have to do the work or could use other methods to do it. For example, it is often practical for you to take strategic decisions which reduce vibration, such as:

- creating meadows;
- using growth inhibitors;
- planting less vigorous plant varieties;
- discontinuing tree crown work;
- stopping unnecessary leaf blowing or using a broom or vacuum;
- leaving hedges and shrubs to grow for longer.

Elimination reduces vibration exposure so designers, planners and those controlling the work should incorporate it wherever practicable. Wherever possible mechanise the work. Use vehicle-mounted equipment rather than hand power tools, for example trim hedges with a vehicle-mounted side-arm flail.

Begin to set priorities. With some jobs you will see that the operating time of the equipment is actually very short and may not exceed the EAV. Concentrate on putting controls on the jobs and tool use most likely to create a risk. Extended seasonal tasks like summer grass cutting, hedge trimming and tree crown work are likely to fall into this category.

In situations where work is seasonal or variable it may be helpful to construct some typical days with various tasks. Consult with workers to get a real understanding of tools, tasks and practices. Factors such as weight, awkward postures and grip forces are important ergonomic factors which can make conditions associated with hand-arm vibration worse.

Choose the best tool for the job

Select tools that are suitable for the task and of lower vibration design. Make sure you seek vibration information from your tool suppliers to help you choose the lower vibration equipment. The greater the difference between the 'Range - lower' and 'Range - upper' values in Table 1, the higher the likelihood that there are big differences in vibration hazards of competing models of a tool type. For example, hedge trimmer has a 'Range-lower' of 3 and a 'Range-upper' of 14, which means that there are big differences in vibration levels among the hedge trimmers tested and it is more likely that a

lower vibration tool can be found. But, for brush cutters, the vibration levels are likely to be similar.

The wider the range in Table 1, the more likely it is that there is scope for you to reduce vibration exposure by using vibration magnitude to choose between models of a tool type, for example using vibration data for real use from reliable sources. Selection on the basis of vibration should be made from a shortlist of tools that have already been shown to be well suited to the work.

Look out for new aids to help reduce risk, for example:

- Choose leaf blowers with body support harnesses. These reduce the forces needed to hold the tool.
- Choose brush cutters with body support harnesses. If using strimmer heads, use guards fitted as recommended by the manufacturer. Improper setting of strimmer wire lengths can cause imbalance and high levels of vibration

Tool maintenance

Consumables can have an effect on vibration, for example properly tensioned and lubricated chains for saws will reduce vibration. Select consumables which are suitable for the task, compatible with the tool and, where technically possible, reduce vibration. Ensure they are properly fitted and maintained.

Good maintenance helps to keep vibration levels to a minimum. Planned periodic maintenance and daily user checks both help. Follow manufacturers' guidance and instruction and adjust or replace worn parts. Remove tools that are no longer fit for purpose. For example:

- Vibration on ride-on mowers may be increased if the machine is not properly maintained and tyre pressures are incorrect.
- Pole saws may be susceptible to high vibration with just the slightest pole misalignment.
- A properly adjusted, sharp chain on a saw will do the work more quickly.

Workers should not buy and use their own work tools. You should have control over the equipment workers are using so you can manage vibration exposures.

Work schedules

Plan the work to avoid individuals being exposed to vibration for long, continuous periods. Where tools require continual or frequent use, such as mowers, strimmers and hedge trimmers, introduce employee rotas to limit exposure times. Make sure workers understand the reason for the rota and follow the rota system. You can use the HSE points system to plan work days by:

- identifying all individual exposures above the EAV (100 points per day) and reducing them so far as is reasonably practicable;

- controlling daily exposure to below the ELV (400 points per day).

Some employers have introduced systems based on vibration points related to fuel use. Here they have determined that using a particular piece of equipment for one fuel tank is equivalent to a set number of HSE points. This enables supervisors to detail individual and team tasks for the day to minimise risk.

It may be beneficial to hire a contractor with appropriate skills and equipment to do certain work, but you should carry out suitable checks to ensure they use safe working practices.

Keep warm and dry

You should help keep workers warm and dry. This includes providing workers with shelter and protective clothing. Keeping warm and dry helps maintain good blood circulation which should protect them from developing vibration white finger. Gloves will also help to keep hands warm, but they are not particularly effective at reducing the frequency-weighted vibration associated with risk of HAVS. They can also increase vibration at some frequencies. Select gloves that are suitable for the tasks carried out. Avoid gloves that increase the amount of grip strength needed to carry out a particular task, as wearing them may cause problems such as fatigue, or create a safety hazard, if it is more difficult to control machinery.

Information, instruction and training

Training does not have to be lengthy. An initial session with occasional refresher sessions would normally be sufficient. Training on vibration risks can be combined with other topics. Give managers and supervisors additional training to make sure they understand that it is their job to manage and control vibration. Aim to provide workers with the following information:

- the health effects of hand-arm vibration;
- sources (tools and jobs) of hand-arm vibration;
- how the vibration has been minimised, for example the choice of process or equipment;
- whether they are at risk, including how their exposure compares with the exposure action and limit values:
- the risk factors, such as levels of vibration for particular jobs, daily exposures and duration, regularity of exposures over weeks, months and years and their impact:
- how to recognise and report any symptoms and what happens when they are reported:

- how health surveillance can help them remain at work and what your arrangements are for managing affected workers;
- the steps you have taken or are going to take to minimise risk and steps workers can take, including:
  - changes to work practices to reduce vibration;
  - correct selection, use and maintenance of equipment;
  - correct techniques (for low vibration tools), grip strengths, push forces etc;
  - keeping warm, taking breaks, cutting down on smoking etc.

Health surveillance

All workers who, despite action to reduce and control their risk, are likely to be regularly exposed above the EAV or considered at risk for any other reason must be included in a programme of health surveillance.

When a worker is diagnosed with HAVS and/or CTS by an occupational health physician, you should ensure that the advice or recommendations made by the physician is followed. It is important that the results of the health surveillance are referred to and used to make sure that the control measures you have adopted are working. If workers are developing signs and symptoms of HAVS or CTS you need to re-evaluate exposures to identify the cause and reduce exposures further where necessary.

Further information

HSE's vibration web pages: www.hse.gov.uk/vibration/index.htm provide more information about hand-arm vibration, such as the vibration calculator, case studies and health surveillance guidance. Equipment manufacturers' websites can also be helpful, particularly for methods of tool use and maintenance. Industry associations may also have useful information. Other HSE publications:

Hand-arm vibration. The Control of Vibration at Work Regulations 2005. Guidance on Regulations L140 HSE Books 2005 www.hse.gov.uk/pubns/priced/l140.htm

Hand-arm vibration at work: A brief guide Leaflet INDG175(rev 3) HSE 2012 www.hse.gov.uk/pubns/indg175.htm

Hand-arm vibration; Advice for employees Leaflet INDG296(rev 2) HSE 2014 www.hse.gov.uk/pubns/indg296.htm

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This leaflet is available at: www.hse.gov.uk/pubns/indg480.htm.

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