

Control the risks from hand-arm vibration

Advice for employers on the Control of Vibration at Work
Regulations 2005



Introduction

Who should read this leaflet?

You should read this leaflet if you are an employer whose business involves regular and frequent use of:

- hand-held power tools;
- hand-guided powered equipment;
- powered machines which process hand-held materials.

You may also find the leaflet helpful if you are:

- an employee, or self-employed person, who uses vibrating equipment;
- a trade union safety representative or an employee representative.

The leaflet will give you a brief introduction to:

- what hand-arm vibration (HAV) is;
- the ill health it can cause;
- what the Control of Vibration at Work Regulations 2005 require you to do;
- simple things you can do to control the risk;
- where you can get further information.

See HSE leaflet INDG242(rev1) for guidance on exposure to whole-body vibration.

HSE's priced book on hand-arm vibration will give you more information on all the topics in this leaflet. (Due to be published in autumn 2005, ISBN 0 7176 6125 3.)

Also see HSE's vibration web pages: www.hse.gov.uk/vibration.



The health effects of hand-arm vibration

What is hand-arm vibration?

Hand-arm vibration is vibration transmitted from work processes into workers' hands and arms. It can be caused by operating hand-held power tools, such as road breakers, and hand-guided equipment, such as powered lawnmowers, or by holding materials being processed by machines, such as pedestal grinders.

When is it hazardous?

Regular and frequent exposure to hand-arm vibration can lead to permanent health effects. This is most likely when contact with a vibrating tool or work process is a regular part of a person's job. Occasional exposure is unlikely to cause ill health.

What health effects can it cause?

Hand-arm vibration can cause a range of conditions collectively known as hand-arm vibration syndrome (HAVS), as well as specific diseases such as carpal tunnel syndrome.

What are the early symptoms?

Identifying signs and symptoms at an early stage is important. It will allow you, as the employer, to take action to prevent the health effects from becoming serious for your employee. The symptoms include any combination of:

- tingling and numbness in the fingers;
- not being able to feel things properly;
- loss of strength in the hands;
- the fingers going white (blanching) and becoming red and painful on recovery (particularly in the cold and wet, and probably only in the tips at first).

For some people, symptoms may appear after only a few months of exposure, but for others they may take a few years. They are likely to get worse with continued exposure to vibration and may become permanent.

What effects do these symptoms have?

The effects on people include:

- pain, distress and sleep disturbance;
- inability to do fine work (eg assembling small components) or everyday tasks (eg fastening buttons);
- reduced ability to work in cold or damp conditions (ie most outdoor work) which would trigger painful finger blanching attacks;
- reduced grip strength which might affect the ability to do work safely.

These effects can severely limit the jobs an affected person is able to do, as well as many family and social activities.

Which jobs and tools produce a risk?

Which jobs and industries are most likely to involve hand-arm vibration?

Jobs requiring regular and frequent use of vibrating tools and equipment and handling of vibrating materials are found in a wide range of industries, for example:

- building and maintenance of roads and railways;
- construction;
- estate management (eg maintenance of grounds, parks, water courses, road and rail-side verges);
- forestry;
- foundries;
- heavy engineering;
- manufacturing concrete products;
- mines and quarries;
- motor vehicle manufacture and repair;
- public utilities (eg water, gas, electricity, telecommunications);
- shipbuilding and repair.

What kinds of tools and equipment can cause ill health from vibration?

There are hundreds of different types of hand-held power tools and equipment which can cause ill health from vibration. Some of the more common ones are:

- chainsaws;
- concrete breakers/road breakers;
- cut-off saws (for stone etc);
- hammer drills;
- hand-held grinders;
- impact wrenches;
- jigsaws;
- needle scalers;
- pedestal grinders;
- polishers;
- power hammers and chisels;
- powered lawn mowers;
- powered sanders;
- scabblers;
- trimmers/brush cutters.

Legal duties

What do the Regulations require employers to do?

The Control of Vibration at Work Regulations require you to:

- assess the vibration risk to your employees;
- decide if they are likely to be exposed above the daily exposure action value (EAV) and if they are:
 - introduce a programme of controls to eliminate risk, or reduce exposure to as low a level as is reasonably practicable;
 - provide health surveillance (regular health checks) to those employees who continue to be regularly exposed above the action value or otherwise continue to be at risk;
- decide if they are likely to be exposed above the daily exposure limit value (ELV) and if they are:
 - take immediate action to reduce their exposure below the limit value;
- provide information and training to employees on health risks and the actions you are taking to control those risks;
- consult your trade union safety representative or employee representative on your proposals to control risk and to provide health surveillance;
- keep a record of your risk assessment and control actions;
- keep health records for employees under health surveillance;
- review and update your risk assessment regularly.

Exposure action value (EAV) and exposure limit value (ELV)

What is the exposure action value?

The exposure action value (EAV) is a daily amount of vibration exposure above which employers are required to take action to control exposure. The greater the exposure level, the greater the risk and the more action employers will need to take to reduce the risk. For hand-arm vibration the EAV is a daily exposure of $2.5 \text{ m/s}^2 A(8)$.

What is the exposure limit value?

The exposure limit value (ELV) is the maximum amount of vibration an employee may be exposed to on any single day. For hand-arm vibration the ELV is a daily exposure of $5 \text{ m/s}^2 A(8)$. It represents a high risk above which employees should not be exposed.

The Regulations allow a transitional period for the limit value until July 2010. This only applies to work equipment already in use before July 2007. The exposure limit value may be exceeded during the transitional period as long as you have complied with all the other requirements of the Regulations and taken all reasonably practicable actions to reduce exposure as much as you can.

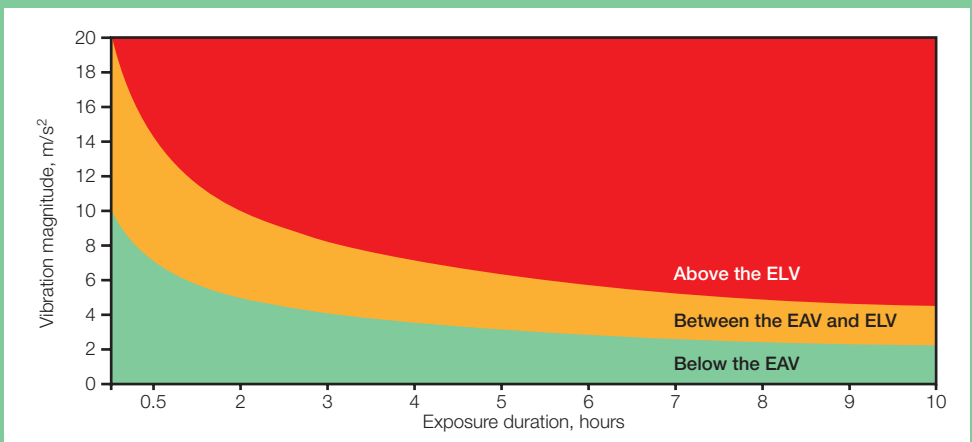


Figure 1 How vibration level and duration affect exposure

Assess the risks

How do I get started?

You will need to identify whether there is likely to be a significant risk from hand-arm vibration. You should:

- find out from your employees and their supervisors which, if any, processes involve regular exposure to vibration (eg processes using the equipment listed in 'Which jobs and tools produce a risk?' or other vibrating equipment);
- see whether there are any warnings of vibration risks in equipment handbooks;
- ask employees if they have any of the HAVS symptoms described in this leaflet and whether the equipment being used produces high levels of vibration or uncomfortable strains on hands and arms.

Consultation

It is important during this whole process to discuss hand-arm vibration with your supervisors, employees and the trade union safety representative or employee representative. You will need to develop and agree a policy for managing vibration risks which will provide reassurance to your employees about their job security and to explain why co-operating with your risk control measures and health surveillance programme will be in their best interests.

Assess who is at risk

If there is likely to be a risk you need to assess who is at risk and to what degree. The risk assessment needs to enable you to decide whether your employees' exposures are likely to be above the EAV or ELV and to identify which work activities you need to control. You could do the risk assessment yourself or appoint a competent person to do it for you.

The person who does the risk assessment should have read and understood this leaflet, have a good knowledge of the work processes used in your business and be able to collect and understand relevant information. They should also be able to develop a plan of action based on their findings and ensure it is introduced and effective. They will need to:

- make a list of equipment that may cause vibration, and what sort of work it is used for;
- collect information about the equipment from equipment handbooks (make, model, power, vibration risks, vibration information etc);
- make a list of employees who use the vibrating equipment and which jobs they do;
- note as accurately as possible how long employees' hands are actually in contact with the equipment while it is vibrating – in some cases this 'trigger time' may only be a few minutes in several hours of work with the equipment;
- ask employees which equipment seems to have high vibration and about any other problems they may have in using it, eg its weight,

- awkward postures needed to use the tool, difficulty in holding and operating it;
- record the relevant information they have collected and their assessment of who is likely to be at risk.

How should I use this information?

Group your work activities according to whether they are high, medium or low risk. Plan your action to control risks for the employees at greatest risk first. Your rough groupings could be based on the following:

High risk (above the ELV)

Employees who regularly operate:

- hammer action tools for more than about one hour per day; or
- some rotary and other action tools for more than about two hours per day.

Employees in this group are likely to be above the exposure limit value set out in the Regulations. The limit value could be exceeded in a much shorter time in some cases, especially where the tools are not the most suitable for the job.

Medium risk (above the EAV)

Employees who regularly operate:

- hammer action tools for more than about 15 minutes per day; or
- some rotary and other action tools for more than about one hour per day.

Employees in this group are likely to be exposed above the exposure action value set out in the Regulations.

Do I need to measure my employees' exposure to vibration?

The rough groupings described above should be enough for you to do a basic risk assessment which will enable you to decide whether exposures are likely to exceed the exposure action value and exposure limit value and to allow you to plan and prioritise your control actions effectively (see 'Control the risks').

Alternatively, you may choose either to use available vibration data or to have measurements made to estimate exposures if you want to be more certain of whether the risk is high, medium or low. A more detailed exposure assessment may help you:

- decide which control actions might be most effective and practicable in reducing vibration exposure;
- be more certain whether exposures are likely to exceed the action or limit values;
- check whether your controls are effective.

If you decide to do this, read 'Estimating exposure'.

Estimating exposure

You may be able to get suitable vibration data from the equipment handbook, or from the equipment supplier. See Table 1 for examples of vibration levels HSE has measured on equipment in use. There are also some databases on the internet which may have suitable vibration data.

If you plan to use the manufacturer's vibration data you should check that it represents the way you use the equipment (see 'Duties of manufacturers and suppliers') since some data may underestimate workplace vibration levels substantially. Ask the manufacturer for an indication of the likely vibration emission of the tool when your employees are using it. If you are able to get vibration data from the manufacturer which is reasonably representative of the way you use the equipment, it should be suitable

for you to use in estimating your employees' exposure. However, if the only information available to you is the vibration emission declared in the equipment's handbook, it may be safer to double this figure before using it for estimating daily exposures.

You also need to check, by observing them, how long employees are actually exposed to the vibration (ie the total daily 'trigger time' with the equipment operating and in contact with the employee's hand(s)). Employees are unlikely to be able to provide this information very accurately themselves. You could observe and measure the trigger time over, for example, half an hour and then use the result to estimate the trigger time for the full shift. Alternatively, where the work task is repetitive, eg drilling large numbers of holes in masonry, you could measure the

Tool type	Lowest	Typical	Highest
Road breakers	5 m/s ²	12 m/s ²	20 m/s ²
Demolition hammers	8 m/s ²	15 m/s ²	25 m/s ²
Hammer drills/combi hammers	6 m/s ²	9 m/s ²	25 m/s ²
Needle scalers	5 m/s ²	-	18 m/s ²
Scabblers (hammer type)	-	-	40 m/s ²
Angle grinders	4 m/s ²	-	8 m/s ²
Clay spades/jigger picks	-	16 m/s ²	-
Chipping hammers (metal)	-	18 m/s ²	-
Stone-working hammers	10 m/s ²	-	30 m/s ²
Chainsaws	-	6 m/s ²	-
Brushcutters	2 m/s ²	4 m/s ²	-
Sanders (random orbital)	-	7-10 m/s ²	-

Table 1 Some typical vibration levels for common tools

trigger time when drilling several holes and multiply the average by the number of holes typically drilled in a shift.

If the employee is exposed to vibration from more than one tool or work process during a typical day, you will need to collect information on likely vibration level and 'trigger time' for each one.

Once you have collected relevant vibration data and exposure times you will need to use an exposure calculator to assess each employee's daily exposure (see HSE's vibration web pages at www.hse.gov.uk/vibration).

Alternatively, you can use the simple 'exposure points' system in Table 2 to estimate the daily exposure.

Workplace vibration measurements

If you want to obtain vibration measurements for your own tools you will need to arrange for a competent person to carry out measurements for you using specialised equipment. Measurement results can be highly variable, depending on many factors, including the operator's technique, the condition of the work equipment, the material being processed and the measurement method. The competence and experience of the person who makes the measurements is important so that they can recognise and take account of these uncertainties in producing representative vibration data.

Tool vibration (m/s^2)	3	4	5	6	7	10	12	15
Points per hour (approximate)	20	30	50	70	100	200	300	450

Multiply the points assigned to the tool vibration by the number of hours of daily 'trigger time' for the tool(s) and then compare the total with the exposure action value (EAV) and exposure limit value (ELV) points.

100 points per day = exposure action value (EAV)

400 points per day = exposure limit value (ELV)

Table 2 Simple 'exposure points' system

Duties of manufacturers and suppliers

How can tool and machine manufacturers and suppliers help?

Tool and machine manufacturers and suppliers are obliged by the Supply of Machinery (Safety) Regulations 1992 (as amended) to design equipment which will reduce vibration risks to as low a level as possible, making use of the latest technology. The equipment should be CE-marked to show that it complies with these requirements, and health and safety information should be provided in an instruction book. This should include:

- warnings about any vibration-related risk from using the equipment;
- information on safe use and, where necessary, training requirements;
- information on how to maintain the equipment;
- a statement of the vibration emission (or a statement that the vibration test has produced a vibration emission of less than 2.5 m/s^2) together with information on the test method used (see 'Estimating exposure').

For most types of tool, manufacturers use internationally agreed test methods for vibration testing. These allow you to compare the vibration performance of different brands and models of the same type of tool. Unfortunately, many of these test methods do not represent the way tools perform at work and vibration levels in the workplace may be much higher than those in this type of 'laboratory' test.

In some industries, employers' organisations, equipment manufacturers and hire companies have adopted colour-coding systems to mark tools to show which are high, medium and low risk. These 'traffic light' systems are intended to help users manage the use of the tools to control risks from vibration.

Control the risks

How do I control the risks from hand-arm vibration?

When you have identified who is at risk, you need to decide how you can reduce the risks. You must do all that is reasonable to control the risk. First, prepare an action plan for and deal with the high-risk work tasks. Then address the medium- and lower-risk activities.

Risk controls include:

Alternative work methods

- Look for alternative work methods which eliminate or reduce exposure to vibration. Your trade association, other industry contacts, equipment suppliers and trade journals may help you identify good practice in your industry.
- Mechanise or automate the work.

Example: Use a breaker attachment on an excavating machine to break concrete rather than using a hand-held breaker.

Equipment selection

- Make sure that equipment selected or allocated for tasks is suitable and can do the work efficiently. Equipment that is unsuitable, too small or not powerful enough is likely to take much longer to complete the task and expose employees to vibration for longer than is necessary.

- Select the lowest vibration tool that is suitable and can do the work efficiently.
- Limit the use of high-vibration tools wherever possible.

Example: To cut large holes in brickwork, use a diamond-tipped hole-cutting drill bit with a rotary action rather than a tungsten-tipped hole bit which requires rotary and hammer action.

Purchasing policy for replacing old equipment and tools

Work equipment is likely to be replaced over time as it becomes worn out, and it is important that you choose replacements, so far as is reasonably practicable, which are suitable for the work, efficient and of lower vibration.

- Discuss your requirements with a range of suppliers.
- Check with suppliers that their equipment is suitable and will be effective for the work, compare vibration emission information for different brands/models of equipment, ask for vibration information for the way you plan to use the equipment, and ask for information on any training requirements for safe operation.
- Get your employees to try the different models and brands of equipment and take account of their opinions before you decide which to buy.
- Find out about the equipment's vibration-reduction features and how to use and maintain the equipment to make these features effective.

- Make sure your organisation has a policy on purchasing suitable equipment, taking account of vibration emission, efficiency and your specific requirements.
- Train purchasing staff on the issues relating to vibration so that they can deal effectively with equipment suppliers.

Example: If a breaker has vibration-isolating handles, check how the machine must be operated to ensure the reduced vibration levels are achieved in use and ensure your operators have the necessary training.

Workstation design

- Improve the design of workstations to minimise loads on employees' hands, wrists and arms caused by poor posture.
- Use devices such as jigs and suspension systems to reduce the need to grip heavy tools tightly.

Example: Where a heavy grinder is used at a permanent workstation to do repetitive work, suspend it from a counterbalance system to reduce the load on the operator's arms and the tightness of grip needed.

Maintenance

- Introduce appropriate maintenance programmes for your equipment to prevent avoidable

increases in vibration (following the manufacturer's recommendations where appropriate).

- Do not use blunt or damaged concrete breaker and chipping hammer chisels and replace consumable items such as grinding wheels, so that equipment is efficient and keeps employee exposure as short as possible.

Example: Check and sharpen chainsaw teeth regularly (following the manufacturer's recommendations) to maintain the chainsaw's efficiency and to reduce the time it takes to complete the work.

Work schedules

- Limit the time that your employees are exposed to vibration.
- Plan work to avoid individuals being exposed to vibration for long, continuous periods – several shorter periods are preferable.
- Where tools require continual or frequent use, introduce employee rotas to limit exposure times (you should avoid employees being exposed for periods which are long enough to put them in the high risk group (see 'High risk (above the ELV)').

Example: Organise employees to work in teams where they switch tasks within the team to avoid individuals having unnecessarily high exposure to vibration.

Clothing

- Provide your employees with protective clothing when necessary to keep them warm and dry. This will encourage good blood circulation which should help protect them from developing vibration white finger.
- Gloves can be used to keep hands warm, but should not be relied upon to provide protection from vibration.

How do I know if the steps I have taken to control risks are working?

- Check regularly that the programme of controls you have introduced is being carried out by your managers and employees.
- Talk regularly to your managers, supervisors, employees and trade union safety representative or employee representative about whether there are any vibration problems with the equipment or the way it is being used.
- Check the results of health surveillance and discuss with the health service provider whether the controls appear to be effective or need to be changed.



Health surveillance

Providing health surveillance

You must provide health surveillance for all your employees who, despite your action to control the risk, are likely to be regularly exposed above the exposure action value or are considered to be at risk for any other reason.

The purpose of health surveillance is to:

- identify anyone exposed or about to be exposed to hand-arm vibration who may be at particular risk, for example people with blood circulatory diseases such as Raynaud's Disease;
- identify any vibration-related disease at an early stage in employees regularly exposed to hand-arm vibration;
- help you prevent disease progression and eventual disability;
- help people stay in work;
- check the effectiveness of your vibration control measures.

You should consult with your trade union safety representative, or employee representative, and the employees concerned before introducing health surveillance. It is important that your employees understand that the aim of health surveillance is to protect them from developing advanced symptoms of ill health so that they can continue to work. You will need their understanding and co-operation if health surveillance is to be effective.

How can I arrange health surveillance?

Basic health surveillance consists of regularly seeking information about early symptoms of ill health by using a questionnaire. It may help you keep costs down if you carry out this function yourself, referring any positive responses to an occupational health service provider.

Alternatively, you could ask an occupational health service provider to provide a complete service on your behalf. You should be able to find details of occupational health service providers from your trade association, your local telephone directory, the internet or your nearest HSE office.

What should I expect from an occupational health service provider?

A suitable occupational health service provider will have training and experience in health surveillance for hand-arm vibration. They should be able to:

- advise you on a suitable health surveillance programme for your employees;
- set up the programme;
- provide the necessary training and supervision for your staff if they are going to help with the basic health surveillance;
- provide suitably qualified and experienced staff to carry out the higher level health surveillance;
- provide you with reports on your employees' fitness to continue work with vibration exposure.

What do I have to do with the results of health surveillance?

You will need to:

- keep records of the health surveillance and fitness for work advice provided for each employee (but not the confidential medical records which are kept by the doctor). Your health and safety inspector is entitled to ask to see the health records as part of their checks that you are complying with these Regulations;
- make employees' records available to them;
- act upon any recommendations made by the doctor about employees' continued exposure to vibration;
- use the results to review and, if necessary, revise your risk assessment, including your plans to control risks;
- discuss any changes to your risk assessment with your trade union safety representative or employee representative;
- notify the relevant enforcing authority when advised in writing by a doctor that an employee in listed occupations has HAVS or carpal tunnel syndrome, as required by the Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1995 (RIDDOR). For more information on RIDDOR see HSE's leaflet HSE31 or phone HSE's Infoline (see back cover for details).



Information and training

What information and training do I have to give to my employees?

You should provide your employees with information on:

- the health effects of hand-arm vibration;
- sources of hand-arm vibration;
- whether they are at risk, and if so whether the risk is high (above the ELV), medium (above the EAV) or low;
- the risk factors (eg the levels of vibration, daily exposure duration, regularity of exposure over weeks, months and years);
- how to recognise and report symptoms;
- the need for health surveillance, how it can help them remain fit for work, how you plan to provide it, how you plan to use the results and the confidentiality of the results;
- ways to minimise risk including:
 - changes to working practices to reduce vibration exposure;
 - correct selection, use and maintenance of equipment;
 - correct techniques for equipment use, how to reduce grip force etc;
 - maintenance of good blood circulation at work by keeping warm and massaging fingers and, if possible, cutting down on smoking.

You should consult your safety or employee representative on your proposals for training and information.

How can I find out more?

Hand-arm vibration: Control of Vibration at Work Regulations 2005. Guidance on Regulations L140 HSE Books 2005 ISBN 0 7176 6125 3 (due to be published autumn 2005)

Hand-arm vibration: Advice for employees Pocket card INDG296(rev1) HSE Books 2005 (single copy free or priced packs of 25 ISBN 0 7176 6118 0)

Control back-pain risks from whole-body vibration: Advice for employers on the Control of Vibration at Work Regulations 2005 Leaflet INDG242(rev1) (single copy free or priced packs of 10 ISBN 0 7176 6119 9)

RIDDOR explained: Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1995 Leaflet HSE31(rev1) HSE Books 1999 (single copy free or priced packs of 10 ISBN 0 7176 2441 2)

Hard to handle: Hand-arm vibration - managing the risk Video HSE Books 1998 ISBN 0 7176 1881 1

HSE's vibration web pages: www.hse.gov.uk/vibration

Further information

HSE priced and free publications are available by mail order from HSE Books, PO Box 1999, Sudbury, Suffolk CO10 2WA Tel: 01787 881165 Fax: 01787 313995 Website: www.hsebooks.co.uk (HSE priced publications are also available from bookshops and free leaflets can be downloaded from HSE's website: www.hse.gov.uk.)

For information about health and safety ring HSE's Infoline Tel: 0845 345 0055 Fax: 0845 408 9566 e-mail: hseinformationservices@natbrit.com or write to HSE Information Services, Caerphilly Business Park, Caerphilly CF83 3GG.

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

This leaflet is available in priced packs of 10 from HSE Books, ISBN 0 7176 6117 2. Single free copies are also available from HSE Books.

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