Alcumus SafeContractor

Vibration

Guidance Note 31
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Vibration

Introduction

This Guidance Note gives practical information about managing exposure to vibration.

Appendices 1-3 provide further information to supplement that found in the body of this Guidance Note. Appendices 4 & 5 provide sample checklist templates. If you wish to use the templates in Appendix 4 & 5 to construct your own documents, you must ensure that all references to **Alcumus SafeContractor Certification** have been removed and the final documents are clearly incorporated into your existing safety management system.

What is vibration?

Vibration exposure at work is split into two areas, hand-arm and whole body vibration.

Hand Arm Vibration (HAV)

It is estimated that around five million workers are exposed to hand-arm vibration in the workplace. Two million of these workers are exposed to levels of vibration where there are clear risks of developing disease. Hand-arm vibration is vibration transmitted into your hands and arms when you use hand-held powered work equipment.

Regular exposure to HAV can give rise to permanent injuries such as:

- damage to the blood circulation in the fingers (vibration white finger)
- pain in the wrists (carpal tunnel syndrome)
- pain or loss of sensation in the hands or fingers
- loss of grip strength
- tingling sensations (pins and needles)
- loss of manual dexterity
- loss of sense of temperature in the fingers.

Whole Body Vibration (WBV)

Whole-body vibration is shaking or jolting of the human body through a supporting surface (usually a seat or the floor), for example when driving or riding on a vehicle along an unmade road, operating earthmoving machines or standing on a structure attached to a large, powerful, fixed machine which is impacting or vibrating.

Regular long term exposure to WBV is associated with back pain alongside other factors such as poor posture and heavy lifting. Employers should look out for WBV risks where any commercial/industrial/construction vehicles are driven regularly for most of the day.

Drivers of some mobile machines, including certain tractors, fork lift trucks and quarrying or earth-moving machinery, may be exposed to WBV and shocks, which are associated with back pain. If employers comply with appropriate legislation and follow guidance, it may be possible to reduce excesses of back pain from whole-body vibration. There are simple, non-technical and common sense measures which can be introduced to reduce exposure to vibration. The regulations introduce action and limit values for hand-arm and whole-body vibration.

What must I do?

An employer who carries out work which is liable to expose any of his employees to risk from vibrations, shall make a suitable and sufficient assessment of the risk created by that work to the health and safety of those employees and the risk assessment shall identify the measures that need to be taken to meet the requirements of the Regulations.

Please refer to separate Guidance Note on risk assessment in the document library.

An assessment of the vibration risk ensures that a valid decision accounting for the actual encountered levels of exposure is made. This determines what actions need to be taken to adequately control the exposure. Please refer to the relevant checklists at the end of this Guidance Note.

To carry out a suitable and sufficient risk assessment, you need to know what the exposure limit values and exposure action values are;

> *The Exposure Limit Value (ELV) is the maximum amount of vibration an employee may be exposed to in a single day*
>
> *The Exposure Action Value (EAV) is a daily amount of exposure above which employers must take action to control exposure*

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 m/s^2 A (8).

There is also a level of vibration exposure that must not be exceeded. This is called 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 m/s^2 A (8). It represents a high risk above which employees should not be exposed.

(Exposure Values are expressed in m/s^2 A (8). See appendix 3 for a full explanation of this term)

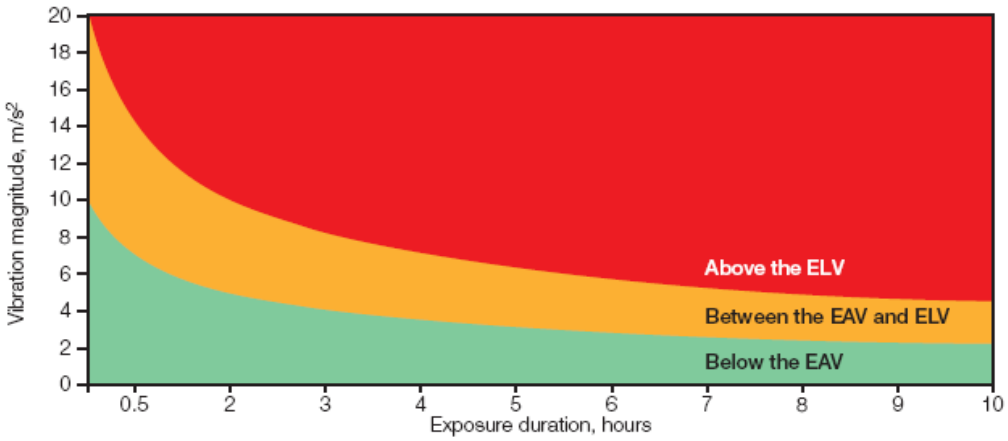

Figure 1 How vibration level and duration affect exposure

With these levels in mind:

a. Make a list of the processes and tools used within your organisation, which may involve regular exposure to vibration (See Appendix 1 for a list of commonly used tools with a known risk from hand arm vibration).

b. Check equipment/vehicle handbooks (for each item identified) for any warnings or information regarding vibration. Check that the information is representative of the way in which your company uses the equipment. You must contact the manufacturer if you require further information.

c. Make a list of all employees who use the relevant pieces of equipment, which jobs they do and note as accurately as possible how long their hands are in contact with the vibration source. *Ask employees whether they have felt tingling in their fingers or suffered from pins and needles after using power tools or suffer from a bad back after driving off road vehicles. If yes then it is necessary to reduce their exposure*, even if the measured/estimated exposure value is less than the daily exposure value.

d. Ask employees if they have developed any symptoms relating to Vibration. If symptoms are identified, then health surveillance must be put into place for the affected operatives.

e. Ask employees who work with equipment/vehicles that have high vibration values whether there are any other problems regarding its usage, e.g. weight, awkward posture, difficulty when holding equipment.

f. From the information received, estimate the levels of exposure and group the activities by level of risk:

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 four 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.

To help in the estimation of exposure the Health and Safety Executive have Vibration Calculators on their website:

http://www.hse.gov.uk/vibration/hav/hav.xls for hand arm vibration
and
http://www.hse.gov.uk/vibration/wbv/wbv.xls for whole body vibration.

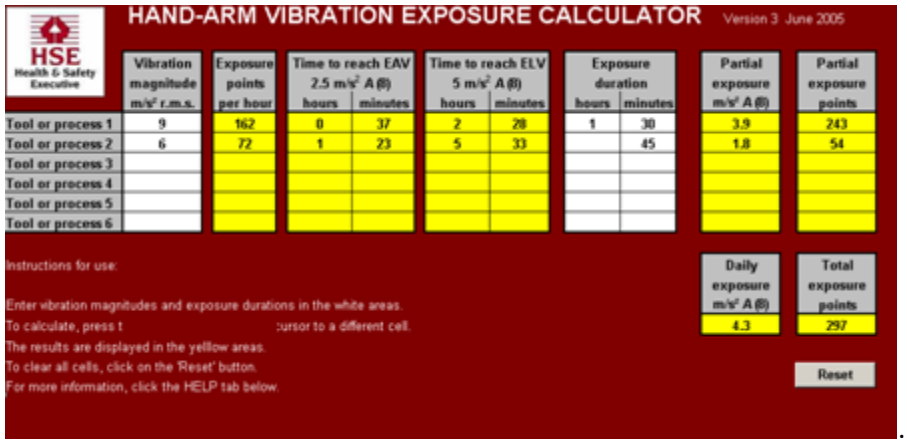

Figure 2 Screen Shot of Hand Arm Vibration Calculator

The above example shows the results for an operative using a hammer drill with a vibration level of 9m/s^2 for a trigger time (actual time in contact with the vibration source) of 1Hr 30 minutes and an angle grinder with a vibration level of 6m/s^2 for a trigger time of 45 minutes during the same day. This gives a total daily exposure level of 4.3m/s2 A (8) which is above the Exposure Action Value of 2.5 m/s^2 A (8), but not the Exposure Limit Value of 5m/s^2 A (8). If this is the regular level of work, action is required to reduce the exposure to vibration.

If you do not have access to the internet, you can use the simple 'exposure points' system below to estimate the daily exposure.

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 limited value (ELV) points.

100 points per day = exposure action value (EAV)
400 points per day = exposure limit value (ELV)

It is necessary to be aware of the available and appropriate measures for controlling the risk.

Control measures that may be adopted to reduce or control exposure include:

Hand Arm Vibration

- Alternative methods of working
- Mechanisation or automation of work
- Ensure equipment used is suitable for purpose (equipment which is too small or not powerful enough may require longer trigger time)
- Source tools with lower vibration levels
- Ensure equipment is adequately maintained following manufacturers recommendations
- Ensure cutting, grinding and chipping attachments are in good condition, sharpen or replace as necessary
- Plan work to avoid exposure for lengthy periods – several shorter periods are preferable to a continuous period
- Job rotation where tools require continual or frequent use
- Issue protective clothing to employees with a view to keeping them warm and dry to encourage good circulation, this will help to prevent Vibration White Finger
- Gloves may be issued to keep hands warm and dry but should not be relied upon as a means of providing protection from vibration as they cannot do this
- Introduce health surveillance procedures for persons showing symptoms
- Check that managers and employees are using the relevant control measures adopted
- Communicate with managers, supervisors, employees and trade union safety representative to see if there are any vibration problems with equipment or the way it is used.

Whole Body Vibration

- Select vehicles of suitable size, capacity and power to cope with work load and ground conditions
- Adjust driver weight setting on suspension seats, to help avoid the seat bottoming out (where the springs compress to their limit causing jarring to the operator), obtain advice from seating manufacturer and or vibration specialists
- Where possible ensure seat and controls are adjusted correctly
- Drive at a speed suitable for ground conditions to prevent excessive bumping and jolting
- Operate driving controls and controls for attached equipment smoothly
- Follow worksite routes
- Ensure vehicles/machinery are correctly maintained
- Ensure that paved surfaces and site roadways are adequately maintained in a smooth condition
- Ensure tyre pressures are correct and solid tyres are replaced before reaching wear limits
- Introduce work schedules to avoid long periods of exposure
- Ensure that people with back problems, young people and pregnant women are not exposed to high levels of vibration or prolonged exposure.

(Please note these lists are not exhaustive)

Where required, ensure that:

- Control measures to reduce vibration are properly applied; and
- You provide information, training and health surveillance.
- Review what you are doing if anything changes that may affect exposures to vibration where you work.

Overview

- Assess the vibration risk to 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; and 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 trade union safety representatives or employee representatives on proposals to control risk and to provide health surveillance
- Keep a record of the risk assessment and control actions
- Keep health records for employees under health surveillance
- Review and update the risk assessment regularly.

Further Guidance

- Hand-arm vibration - Control of Vibration at Work Regulations 2005 - Guidance on Regulations
  L140
  ISBN: 9780717661251
  Available at: http://www.hse.gov.uk/pubns/books/l140.htm

- Whole-body vibration - Control of Vibration at Work Regulations 2005 - Guidance on Regulations
  L141
  ISBN: 9780717661268
  Available at: http://www.hse.gov.uk/pubns/books/l141.htm

- Vibration solutions - Practical ways to reduce the risk of hand-arm vibration injury
  HSG170
  ISBN: 9780717609543
  Available at: http://www.hse.gov.uk/pubns/books/hsg170.htm

- Hand-arm vibration at work: A brief guide
  INDG175 (rev3)
  Available at: http://www.hse.gov.uk/pubns/indg175.pdf

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

- Hand-arm vibration - Advice for employees (Pocket card)
  INDG296 (rev1)
  Available at: http://www.hse.gov.uk/vibration/hav/indg296.htm

- Drive away bad backs - Advice for mobile machine operators and drivers (Pocket card)
  INDG404
  Available at: http://www.hse.gov.uk/pubns/indg404.pdf

Appendix 1

List of commonly used tools which can cause ill health from vibration

- Chainsaws
- Concrete Breakers
- Cut-off-saws (for stone etc.)
- Hammer drills
- Hand-held grinders
- Impact wrenches
- Jigsaws
- Needle scalers
- Pedestal grinders
- Polishers
- Power hammer and chisels
- Powered lawn mowers
- Powered sanders
- Scabblers
- Strimmers/brush cutters

Estimating Exposure

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

Information adapted from HSE publication INDG175 - Control the risks from hand-arm vibration.

Appendix 2

Examples of Jobs and Industries where there is a known risk from vibration

- Building and maintenance of roads and railways
- Construction
- Estate management (e.g. maintenance of grounds, parks, watercourses, road and rail-side verges)
- Forestry
- Foundries
- Heavy engineering
- Manufacturing concrete products
- Mines and quarries
- Motor vehicle maintenance and repair
- Public utilities (e.g. water, gas, electricity, telecommunications)
- Shipbuilding and repair

Information adapted from HSE publication INDG175 - Control the risks from hand-arm vibration.

Processes with a High Risk of Exposure to Vibration

- Drilling and breaking rock, concrete and other materials
- Consolidating or compacting sand, concrete or aggregate
- Riveting, caulking, hammering, clinching, flanging, and hammer swaging
- Preparing and dressing welds
- Surface preparation, including scabbling, de-scaling and paint removal
- Grinding, sanding or polishing wood, metal stone, rubber, plastics and ceramics
- Cutting metal, wood, grass, stone, bone etc.
- Holding or supporting objects being worked upon by machine
- Component or product assembly.

Appendix 3

Explanation of the expression of m/s2 A(8)

Hazards to health from vibration are usually assessed using the average (root-mean-square) acceleration level. This is expressed in m/s^2.

The vibration dose received by a worker depends on the duration of exposure. Because the exposure patterns may vary, they are normalised to a standard reference period. The British Standard refers to an eight hour day and is expressed as A(8). Other reference periods are used, i.e. International Standard ISO 5349:1989 refers to a 4 hour period and is expressed as A(4).

Average vibration levels over the working day which cause an A(8) of $2.5m/s^2$

Working day (Hrs)	8	4	2	1	½
rms giving 2.5m/s2 A(8)	2.5	3.5	5	7	10

Figures confirmed using HSE Vibration calculator.

Appendix 4

Initial HAV Checklist Prior to Risk Assessment

A "Yes" answer means that the risk may be high – more detail is required in the action box

Work Location Assessed	
Completed by	
Date	
Review Date	

		Yes	No	Action
1.	Is there any history of reported numbness or tingling fingers? (check accident book, speak to employees)			
2.	Are tools or handles vibrating at rates in excess of 2.5 ms^{-2}? (check manufacturer's data – does it relate to operating / working measurements or laboratory conditions?)			
3.	Are staff using hammering equipment in excess of 30 minutes?			
4.	Are staff using rotating equipment in excess of 2 hours/day?			
5.	Do employees hold vibrating equipment in cold conditions? (are gloves provided or other measures taken to keep warm?)			
6.	Are staff required to grip tightly any vibrating equipment?			
7.	Are staff required to apply undue force (push or pull) any vibrating equipment?			

Appendix 5

Initial WBV Checklist Prior to Risk Assessment

A "Yes" answer means that the risk may be high – more detail is required in the action box

Work Location Assessed				
Completed by				
Date				
Review Date				
		Yes	**No**	**Action**
1.	**Do you drive off-road?** High levels of whole-body vibration are most likely for people who drive vehicles over rough surfaces as part of their job, for example off-road vehicles such as tractors, quad bikes and dumper trucks.			
2.	**Do you drive or operate vibrating machinery for a long time every day?** The factors that govern a person's daily vibration exposure are the magnitude (level) of vibration and the length of time the person is exposed to it. The longer the duration of exposure, the greater will be the risk from vibration exposure.			
3.	**Do you drive vehicles that are not designed for the roadway conditions?** Some industrial vehicles, such as forklift trucks, do not have wheel suspension and are fitted with solid tyres, to provide them with the necessary stability to work safely. Provided they are driven on smooth surfaces whole-body vibration levels should not be high. However, if they are driven on unsuitable surfaces (e.g. a fork-lift truck designed for warehouse use being operated in an external loading yard), they can generate high levels of whole-body vibration.			

4.	**Do you drive over poorly maintained road surfaces?** Most road vehicles will generate fairly low levels of whole-body vibration provided the road surface is well maintained. Cars, vans and modern designs of suspended-cab lorries are generally unlikely to present a risk from whole-body vibration when used on well-maintained roads. However, vehicles with less effective suspension such as rigid body lorries may cause high levels of whole-body vibration, particularly when they are driven over poor surfaces, or when they are unladen.			
5.	**Are you exposed to shock (or jolts)?** The greatest risk from vibration exposure is believed to come from exposure to shock vibration. Shock vibration may arise from poor road surfaces, driving too fast for the terrain, or incorrect set-up of the seat suspension. Scrapers may generate high levels of shock vibration when driving over difficult ground. Some heavily laden vehicles may transmit shocks and jolts to the driver with hard use of the brakes.			
6.	**Do you need to adopt poor postures or perform manual handling tasks?** Poor cab layout or poor visibility can result in stretching and twisting, or may confine the driver to a fixed position for long periods. These poor ergonomic environments, either alone or combined with whole-body vibration exposures, can result in back and other musculoskeletal injuries.			
7.	**Do the manufacturers of the machinery warn of risk from whole-body vibration?** If you are using a machine that may put the users at risk of vibration injury, the manufacturer should warn you about it in the handbook.			
8.	**Do workers report back disorders?** Evidence of back injury means that ergonomic risks and vibration exposures need to be managed.			