

TOPIC INSPECTION PACK

HAND-ARM VIBRATION

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1 INTRODUCTION

This document provides guidance for inspectors on the inspection of work activities involving risks from hand-arm vibration (HAV), and on enforcement of the Control of Vibration at Work Regulations 2005. It is supplemented by supporting information in a series of appendices.

1.1 Hand-arm vibration syndrome

Hand-arm vibration (HAV) is a widespread hazard in many industries and occupations involving the use of hand-held power tools (such as grinders or hammer drills), hand-guided machinery (such as lawnmowers and plate compactors) or hand-fed machines (such as pedestal grinders). Prolonged and regular exposure to this vibration can affect the operator's health, resulting in painful and disabling disorders of the nerves, blood supply, joints and muscles of the hands and arms. These disorders are collectively known as hand-arm vibration syndrome (HAVS). The symptoms affecting blood supply to the fingers are also known as vibration-induced white finger (VWF). The risk of onset or worsening of HAVS increases with daily exposure and varies widely between individuals.

1.2 The scale of the problem

HSE research during the 1990s estimated that around five million British workers were exposed to hand-arm vibration in the workplace. Approximately 1.7 million were believed to be exposed at levels above the exposure action value (see below) with around 900,000 of these exposed above the current exposure limit value. About 288,000 people were estimated to have VWF.

2 THE CONTROL OF VIBRATION AT WORK REGULATIONS 2005

2.1 Exposure action and limit values

The Vibration Regulations introduced for the first time a statutory daily Exposure Action Value and Exposure Limit Value for HAV. The daily vibration exposure depends on the level of the vibration and the exposure time (i.e. total 'finger-on-trigger time'). It can be expressed as a value in $m/s^2 A(8)$ units or in exposure points. See [Appendix B](#) for more information on daily exposure and exposure assessment.

Table 1: Exposure action and limit values (Vibration Regulations 2005)

Exposure Action Value	2.5 $m/s^2 A(8)$ or 100 exposure points
Exposure Limit Value	5 $m/s^2 A(8)$ or 400 exposure points

2.2 Duties of employers

HSE guidance on the Regulations can be found in Part 1 of publication L140.

Table 2: Summary of duties of employers (Vibration Regulations 2005)

Requirement	Circumstances	Regulation
Conduct vibration risk assessment and assess likely exposure	Where the work is liable to expose employees to risk from HAV	Reg 5(1) Reg 5(2) Reg 5(3)
Review risk assessments	Regularly and when circumstances change	Reg 5(4)
Record significant findings and produce action plan for compliance with Regs 6, 7 and 10	As indicated by the risk assessment	Reg 5(5)
Eliminate risk from HAV exposure at source or reduce it ALARP	Any level of exposure (but subject to reasonable practicability)	Reg 6(1) Reg 6(3)
Reduce HAV exposure ALARP (programme of organisational/technical measures)	Action Value likely to be exceeded	Reg 6(2) Reg 6(3)
Do not exceed Limit Value ; if exceeded, take immediate action	Limit Value exceeded	Reg 6(4)
Provide suitable health surveillance and take appropriate action on the results	There is a risk to health from HAV or the Action Value is likely to be exceeded	Reg 7
Provide information, instruction and training for employees	There is a risk to health from HAV or the Action Value is likely to be exceeded	Reg 8

3 WHEN TO FOCUS ON HAND-ARM VIBRATION

If it is likely that the Action Value is frequently and regularly exceeded, there is a clear duty to reduce the exposure ALARP (Reg 6(2)), provide health surveillance (Reg. 7) and provide information, instruction and training (Reg 8). Hand-arm vibration should be considered to be a matter of evident concern where:

- one or more of the known high-risk processes listed in [Appendix F](#) is encountered;
- use of power tools or other vibrating equipment is of sufficient duration to be of concern (see the 'rough guide' below);
- there is evidence of vibration-related ill health (e.g. a RIDDOR report of HAVS); or
- employees report tingling when using tools which persists for 10 minutes or more afterwards.

Rough guide:

It is likely that the Action Value will be exceeded if:

- state-of-the-art rotary action power tools or machines (e.g. grinders, polishers, chainsaws) are used for more than about an hour per day; or
- state-of-the-art hammer action tools (e.g. breakers, scabblers, chipping hammers) are used for more than about 15 minutes per day.

For some tools or processes, the Action Value will be exceeded in a much shorter time.

Where you find employees apparently using power tools or other vibrating equipment for long periods, it can be helpful to keep in mind the following questions:

- What are you doing?
- Why are you doing it at all?
- Why are you doing it that way?
- How long does it take?

4 RISK AND EXPOSURE ASSESSMENT

The employer's risk assessment should establish whether the Action Value or Limit Value is likely to be exceeded and, if this is the case, should result in an action plan for control of risk and compliance with the Vibration Regulations.

Daily vibration exposure is dependent on the vibration level and total 'finger-on-trigger' time and should be assessed by the employer using vibration data representative of the working conditions, preferably corroborated using data from a second source. However, for the work activities listed in [Appendix F](#), it will usually be possible for employers and inspectors to establish whether the Action Value is *likely* to be exceeded by using the information on typical tool vibration levels from the relevant table and knowledge of daily tool use times. This should be sufficient to establish where the relevant duties in Reg. 6 (elimination/control of exposure), Reg. 7 (health surveillance) and Reg. 8 (information, instruction and training) apply.

The vibration risk assessment required by Reg. 5 is not an end in itself, but should result (where appropriate) in an action plan to achieve compliance with Regs 6 to 8. Where there is evidence of failure to comply with Regs 6(1), 6(2), 7 and 8, enforcement of Reg. 5 alone will not usually be the appropriate action.

5 CONTROL AND MANAGEMENT OF RISK

5.1 Alternative work methods

The work activities listed in column 5, of the relevant Table 1 in [Appendix F](#) have been established as good practice in the industries concerned and will often be reasonably practicable, depending on local circumstances (the list is not exhaustive). Inspectors should seek to secure compliance with Regs 6(1) and 6(2) through interventions to ensure that, where reasonably practicable, the employer adopts suitable alternative work methods; thereby ensuring vibration exposure is eliminated or reduced to as low as reasonably practicable (ALARP).

5.2 Management of residual exposure

If exposure is still likely to exceed the Action Value (after all reasonably practicable actions have been taken to eliminate/minimise the use of hand-operated vibrating machinery, or where changes of process have not yet been implemented) employers must manage the residual vibration risks, ensuring that exposure is ALARP and risk is controlled. This will require an appropriate combination of measures such as selection of suitable work equipment, maintenance of equipment, providing employees with information, instruction and training, limiting exposure time and health surveillance (see below). Regs 6, 7 and 8 apply. The relevant Table 2 in [Appendix F](#) contains further information.

5.3 Health surveillance

A suitable health surveillance programme must be in place for employees whose HAV exposures are likely to exceed the Action Value on a regular basis. This should enable new cases of HAVS to be detected and diagnosed, existing cases to be monitored, recommendations to be made on individual employees' fitness for work and provision of grouped results (i.e. not identifying individual employees) to help the employer monitor the effectiveness of the controls. Regulation 7 applies. The employer should also have a clear policy for the future management of affected employees. Inspectors can refer to an Occupational Health Inspector any concerns over:

- the service provided by an occupational health provider;
- an employer's failure to take account of recommendations and/or information supplied by the health surveillance provider; or
- inadequate health records

5.4 Compliance with the Exposure Limit Value

The Vibration Regulations deferred the full application of the Exposure Limit Value in Reg. 6(4) for five years, until 6th July 2010. The existence of this transitional period, and the need for employers to use this period to plan ways to avoid exposure above the Limit Value has been publicised through guidance and other channels since 2005. It is considered that employers have had a reasonable period of time since the introduction of the Vibration

Regulations to introduce new working methods, designs of equipment, etc. The availability of equipment with reduced vibration emissions continues to improve. Inspectors should therefore expect dutyholders to have taken action to ensure that workers are not exposed to vibration above the Limit Value.

Inspectors should note that Regulation 6(5) disapplies Regulation 6(4) in cases where exposure on most days is below the Action Value, and only occasionally exceeds the Limit Value, such that exposure averaged over a week is less than the Limit Value.¹ Weekly averaging is most likely to apply in cases of emergency work. Employers should put in place increased health surveillance for the employees concerned in such cases.

Inspectors should also note that exposure that is below the Limit Value is not necessarily ALARP.

6 RISK CONTROL INDICATOR

Table 3: Risk control indicator

Hand-arm vibration	Has exposure to vibration been reduced to ALARP by adoption of alternative working methods (or is a viable plan in place to achieve this); is any continuing and residual risk managed, e.g. by equipment selection & maintenance, operator training, management of exposure duration; is exposure below the legal limit (where reasonably practicable); and is a suitable health surveillance programme in place?
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The risk control indicator should be assessed against the scale shown in Table 4.

¹ Examples: (1) A daily vibration exposure of above 11 m/s² on a single day would result in a weekly exposure ($A(8)_{week}$) above the Limit Value, if there was no exposure to vibration on other days in the week. (2) A daily exposure of just below 2.5 m/s², i.e. the Action Value, on 4 days in a week would allow a daily exposure on a fifth day of up to 10 m/s² before the weekly exposure exceeded the Limit Value.

Table 4: Risk control indicator scale

Risk Control Indicators – Assessment Scale: each risk control indicator should be assessed against the following 1-6 scale.					
1	2	3	4	5	6
High standards with some aspects meeting best practice.	Good standards meeting minimum legal requirements.	One or more minor shortcomings are present. As these shortcomings are not serious, they can be dealt with informally with oral advice.	Standards are patchy. It is necessary to address one or more shortcomings by giving formal instructions for remedial action to be taken. Formal instructions may be implemented by, e.g., obtaining a verbal undertaking from the company to take specific action, sending a letter, or physical removal/ disposal of items.	Standards generally unsatisfactory. Typically, at least one contravention that gives rise to a discernible risk gap.	Standards unacceptable. Unless application of the EMM identifies duty holder factors that provide strong mitigation, the issuing of a notice and/or prosecution is likely to be appropriate.

7 INSPECTION AIDE MEMOIRE

Table 5: topics to consider during HAV inspections, and applicable legislation

<p>Risk assessment and action plan</p> <p>Has the employer made a suitable and sufficient risk assessment, i.e.:</p> <ul style="list-style-type: none"> • identified employees at risk from HAV; • made a valid estimate of their exposures, compared with the Action Value and Limit Value; • identified the need for immediate action if the Limit Value is exceeded • considered the available and appropriate options for controlling risk; • produced an action plan for control and arrangements to monitor progress against the action plan (to comply with Regs 6, 7 & 8); • made arrangements for periodic review of the assessment and for ongoing action as new options for risk control become available? 	<p>HSWA s2</p> <p>Vibration Regs. r5</p>
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<p>Adoption of alternative working methods</p> <p>Where exposure is likely to exceed the Action Value, has the employer:</p> <ul style="list-style-type: none"> • identified and adopted, where reasonably practicable, established industry good practice for eliminating or reducing traditional high exposure operations, including full or partial automation (see Appendix F) or planned to do so, with an appropriate timescale; • demonstrated that HAV risks are considered at the design and specification stage for new processes and projects? <p>Where exposure is identified as exceeding the Limit Value, a process change is likely to be necessary for work to continue. Daily personal exposure must not exceed the Limit Value.</p>	<p>HSWA s2</p> <p>Vibration Regs. r6(2), 6(3)</p> <p>Vibration Regs. r6(4)</p>
<p>Management of residual HAV risk</p> <p>Where risk remains after introduction of reasonably practicable alternative working methods, or where they have not yet been introduced, has the employer reduced exposure and risk ALARP, using, as appropriate:</p> <ul style="list-style-type: none"> • an appropriate procurement policy, selecting suitable work equipment for the job (note, efficiency is important - a machine with low vibration emission could result in a higher vibration exposure than a faster, more efficient machine with a greater vibration emission); • good ergonomic design in the workplace, allowing reduced grip and push forces; • maintenance and replacement of tools and consumables as required, to prevent unnecessary increases in vibration exposure; • limits on individual daily exposure (to bring exposure at least below the Limit Value); • operator training (see below); • gloves* and clothing to keep workers warm and dry? <p>See Table 2 in the appropriate part of Appendix F for industry-specific good practice.</p> <p>*Anti-vibration gloves should not be accepted as a means of reducing exposure to ALARP. (See L140, paragraph 184 for more information.)</p>	<p>HSWA s2</p> <p>Vibration Regs. r6</p>

<p>Health surveillance</p> <p>Where exposure is likely to exceed the Action Value (on a frequent and regular basis), or where employees are at risk (e.g. existing HAVS, Carpal Tunnel Syndrome or other relevant condition), has the employer put in place a suitable health surveillance scheme? The employer should:</p> <ul style="list-style-type: none"> • arrange for initial screening of employees, including those who will be exposed for the first time, typically using a suitable questionnaire, e.g. L140, page 108; • arrange for regular (e.g. annual) health surveillance for employees, typically using a suitable questionnaire, e.g. L140, page 110; • refer employees with a positive questionnaire response to an occupational health provider with expertise in HAVS clinical assessment and diagnosis; • obtain medical advice, following clinical assessment, on fitness for work with HAV (the employee's consent is not required for this); • encourage employees to cooperate and to consent to the release of clinical information, so that diagnosed cases of HAVS or CTS can be reported under RIDDOR; • keep health records containing the fitness advice and a record of health surveillance provision; • use feedback from the occupational health provider (individual fitness-for-work, and grouped information not identifying individual employees) to review the risk assessment and controls; • if an employee is not fit to work with HAV, remove them from exposure to HAV. 	<p>HSWA s2</p> <p>Vibration Regs. r7(1), 7(5)</p>
<p>The occupational health provider should:</p> <ul style="list-style-type: none"> • have access to the employer's HAV risk assessment and action plan and familiarise themselves with the nature of the work, ideally by visiting the workplace; • provide clinical assessment and diagnosis using competent and qualified* occupational health professionals; • provide adequate information and advice, including fitness for work with HAV advice, to individual employees on an annual basis; • provide the employer with recommendation on each individual's fitness for work with HAV; • provide the employer with grouped information (not identifying individual employees) derived from health surveillance; • advise the employer, subject to employee consent, to report HAVS or Carpal Tunnel Syndrome under RIDDOR. 	<p>HSWA s2</p> <p>HSWA s36</p>
<p>*Ideally the provider's staff will have attended a HAVS training course approved by the Faculty of Occupational Medicine.</p>	

<p>Information, instruction and training</p> <p>Employees at risk from vibration should have received information on:</p> <ul style="list-style-type: none"> • the risks from HAV and how to help reduce them (see above); • the importance of correct operation and maintenance of equipment; • arrangements for health surveillance and their duty to cooperate. <p>Look for evidence that tools are being used correctly, as recommended by the manufacturer. This may require operators to receive specified training: are the operators and their supervisors aware of the need? For example, breakers with suspended (sprung) handles must be used correctly, and with appropriate downward force, or the potential reduction in vibration will not be achieved.</p>	<p>HSWA s2</p> <p>Vibration Regs. r6(3)(f), r8</p> <p>HSWA s7</p>
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8 ENFORCEMENT GUIDANCE

When applying the Enforcement Management Model (EMM) to HAV, the benchmark is set at ‘Nil/Negligible risk of serious health effect’². [Appendix C](#) describes the application of the EMM to hand-arm vibration, and shows that the Initial Enforcement Expectation will usually be an Improvement Notice where exposure exceeds the Action Value (or where existing ill health shows that people are at risk).

Although the Vibration Regulations were introduced in 2005, HSE has been actively working to minimise HAV risks since guidance (HSG88, now withdrawn) was first published in 1994. Formal enforcement actions should therefore be taken where non-compliance is encountered, unless there are strategic or dutyholder factors indicating that this would not be appropriate.

The emphasis for HSE enforcement of the Vibration Regulations should be to secure elimination or reduction to ALARP of vibration exposure and risk, where the exposures are likely to exceed the Action Value and reasonably practicable solutions exist. Enforcement of Reg 6(2) will usually be appropriate, together with enforcement of Reg. 7 and Reg. 8 as required. The higher the exposure is above the Action Value, the greater the risk and hence the greater the risk gap. Where exposure is likely to be close to the Limit Value, formal enforcement action is expected (if exposure and risk are not ALARP).

Formal enforcement action will usually be appropriate only where the Action Value is likely to be exceeded. However, the duties under Regs 6(1), 7 and 8 are not dependent on the level of exposure, and enforcement should be considered at exposures below the Action Value where people’s health is at particular risk (for example if they have existing HAVS, carpal tunnel syndrome or other diseases of the hand, nerve disorders or circulatory

² Prior to the introduction of the Vibration Regulations the benchmark was set at ‘Remote risk of serious health effect’; the change reflects the requirements of the Regulations, which represent a Europe-wide consensus on acceptable vibration risk. The revised benchmark is also in line with the HSE’s objective for the elimination of disabling HAVS.

disorders). Information on a particular individual's health may be available from health surveillance records.

If the Limit Value is exceeded, Reg. 6(4) applies and a Prohibition Notice should be considered in order to deal with the risk of serious personal injury presented by this level of exposure (see [Appendix C](#)). In considering serving a PN, inspectors should take in to account the factors covered in Table 7. Inspectors are advised to consult a Noise & Vibration Specialist Inspector in cases where a PN is being considered (see Section 9). **In all cases where a PN is being considered it is likely that other enforcement action will be required in order to secure sustained compliance with aspects of the Vibration Regulations.**

In many cases inspectors will find [Appendix F](#) helpful, both for establishing whether exposure is likely to exceed the Action or Limit Value and for identifying risk control measures appropriate to the work activity. Inspectors should look out for updates in the guidance in [Appendix F](#), and new industry-specific guidance, or obtain advice from Noise and Vibration Specialist Inspectors.

Prosecution should be considered where the extent of risk, and strategic and duty holder factors, indicate such action would meet the principles and expectations of the HSE enforcement policy statement (OC 130/6). A Noise and Vibration Specialist Inspector should be consulted if prosecution is proposed.

8.1 Initial Enforcement Expectation:

The following enforcement guidance has been prepared applying the EMM framework to health risks from HAV. The initial enforcement expectations have been derived from the risk gap relevant to the situation described, and the authority of the relevant standard. Initial enforcement expectations needs to be considered in light of dutyholder and strategic factors. See [Appendix C](#) for further information.

Table 6: Initial enforcement expectation – Improvement Notices

	Situation	Initial Enforcement Expectation
1 (Control)	Exposure is likely to exceed the Action Value of $2.5 \text{ m/s}^2 A(8)$, and it is reasonably practicable to reduce the exposure or to eliminate the risk by changing the work process.	Require change of process (and other measures to manage residual risk where required) Improvement Notice HSWA s2(1) Vibration Regs reg. 6(2)

2 (Control)	Exposure is likely to exceed the Action Value of $2.5 \text{ m/s}^2 A(8)$, is not ALARP and reasonably practicable alternative processes are not readily identified.	Require control through equipment selection, training, maintenance, work planning, etc. Improvement Notice HSWA s2(1) Vibration Regs reg. 6(2)
3 (Control)	Exposure is above the Limit Value of $5 \text{ m/s}^2 A(8)$.	As 1 or 2 above, additionally see Table 7 on Prohibition Notices
4 (Health surveillance)	Exposure is likely to exceed the Action Value of $2.5 \text{ m/s}^2 A(8)$, or employees are otherwise at risk, and there is no health surveillance, or health surveillance is not suitable.	Improvement Notice Vibration Regs reg. 7(1), 7(5)
5 (Information, instruction & training)	Employees at risk from HAV have not been provided with suitable and sufficient information, instruction and training.	Improvement Notice HSWA s2 Vibration Regs reg 8(1)
6 (Risk assessment)	Exposure appears significant (e.g. rotary tool* with contact time > 1 hour, percussive tool* with contact time > 15 min), novel tool or process for which no information is available. No risk assessment and insufficient information to determine whether the Action Value is likely to be exceeded. *For state-of-the-art tools. Shorter times are appropriate for older tool types.	Improvement Notice HSWA s2 Vibration Regs reg 5

Table 7: Initial enforcement expectation – Prohibition Notices

	Situation	Initial Enforcement Expectation
1	<p>Exposure is above the Limit Value of 5 m/s² A(8), reg 6(4) applies (see Section 5.4).</p> <p>Factors to consider:</p> <ul style="list-style-type: none"> • Is there clear evidence to show that the Limit Value is being exceeded, in particular evidence of the likely duration of exposure and the likely vibration emissions of the tool(s) being used. In the absence of other information, refer to the example vibration emissions in Appendix A. • Would it be reasonably practicable to reduce exposure to at least below the Limit Value by technical or organisational measures, and could this be achieved within the minimum period for compliance with an Improvement Notice. If this is the case then serving of an IN with the minimum period would have the effect of dealing with the risk of serious personal injury and securing compliance with Reg. 6(4) in a short time-period. 	<p>Prohibition Notice served to halt process until arrangements made to ensure that individual employee exposure is below Limit Value</p> <p>HSWA s2</p> <p>Vibration Regs reg 6(4)</p> <p>Also consider what is necessary to secure compliance in accordance with Table 6.</p>
2	<p>Exposure is likely to exceed the Action Value of 2.5 m/s² A(8) (demonstrating risk) and is not ALARP. HSE sector has agreed with the industry that the method is no longer acceptable and will be prohibited where seen. (Examples: in shipyards, use of old-design chipping or scaling tools for more than 1 hour per day. In construction, extensive use of breakers for pile cap removal.)</p> <p>Note: if exposure is also likely to exceed the Limit Value, consider row 1 above.</p>	<p>Prohibition Notice</p> <p>HSWA s2</p> <p>Vibration Regs reg 6(2)</p> <p>Also consider what is necessary to secure compliance in accordance with Table 6.</p>

9 SPECIALIST SUPPORT

Specialist advice and support for inspectors is available and you should always ask for advice if in doubt. Lists of people providing specialist support to inspectors can be found via the “Access to HSE Specialists” link on the HSE Intranet home page.

Noise and Vibration Specialist Inspectors can:

- advise on reasonably practicable control measures in complex or novel situations;

- provide evidence (for example, where needed for enforcement of the Limit Value) of daily exposure, using information on patterns of hand-tool usage and direct measurement of the vibration (in some situations this will be provided by HSL staff³); and
- advise on compliance with the Vibration Regulations.

Occupational Health Inspectors, Medical Inspectors and Scientists in Central Medical Unit can:

- advice on the quality and suitability of health surveillance services;
- provide clarification on the requirements of the Vibration Regulations relating to health surveillance; and
- advice on appropriate management of employees diagnosed with HAVS or otherwise at particular risk from vibration.

Noise and Vibration Specialist Inspectors, Occupational Health Inspectors and Medical Inspectors can also provide expert evidence for prosecution.

³ Inspectors wishing to call on support from HSL on matters relating to hand-arm vibration should in the first instance contact a Noise & Vibration Specialist Inspector, who will act as Technical Customer for any such work, see Science and Innovation Programme - Guide to Procedures - Chapter 4 - Procedures for commissioning support (http://intranet/science/mainstream_st_proc/chapter4.htm).

APPENDIX A

Example Vibration Emission Values

1. The information in Figure A1 and Table A1 below is taken from the HSL database for HAV. Figure A1 illustrates the likely range in vibration magnitudes to be found during normal use of tools across different sectors and workplaces. Some of this range is due to a mix of tools (i.e. some tools are more often found in the lower part of the range than others) but some of it is due to differences between operator, operation, etc. The guidance in Section 3 above remains a good guide as to when to intervene – expect the action value to be exceeded if the ‘trigger time’ is more than 15 minutes for hammer action tools or more than 1 hour for rotary action tools.

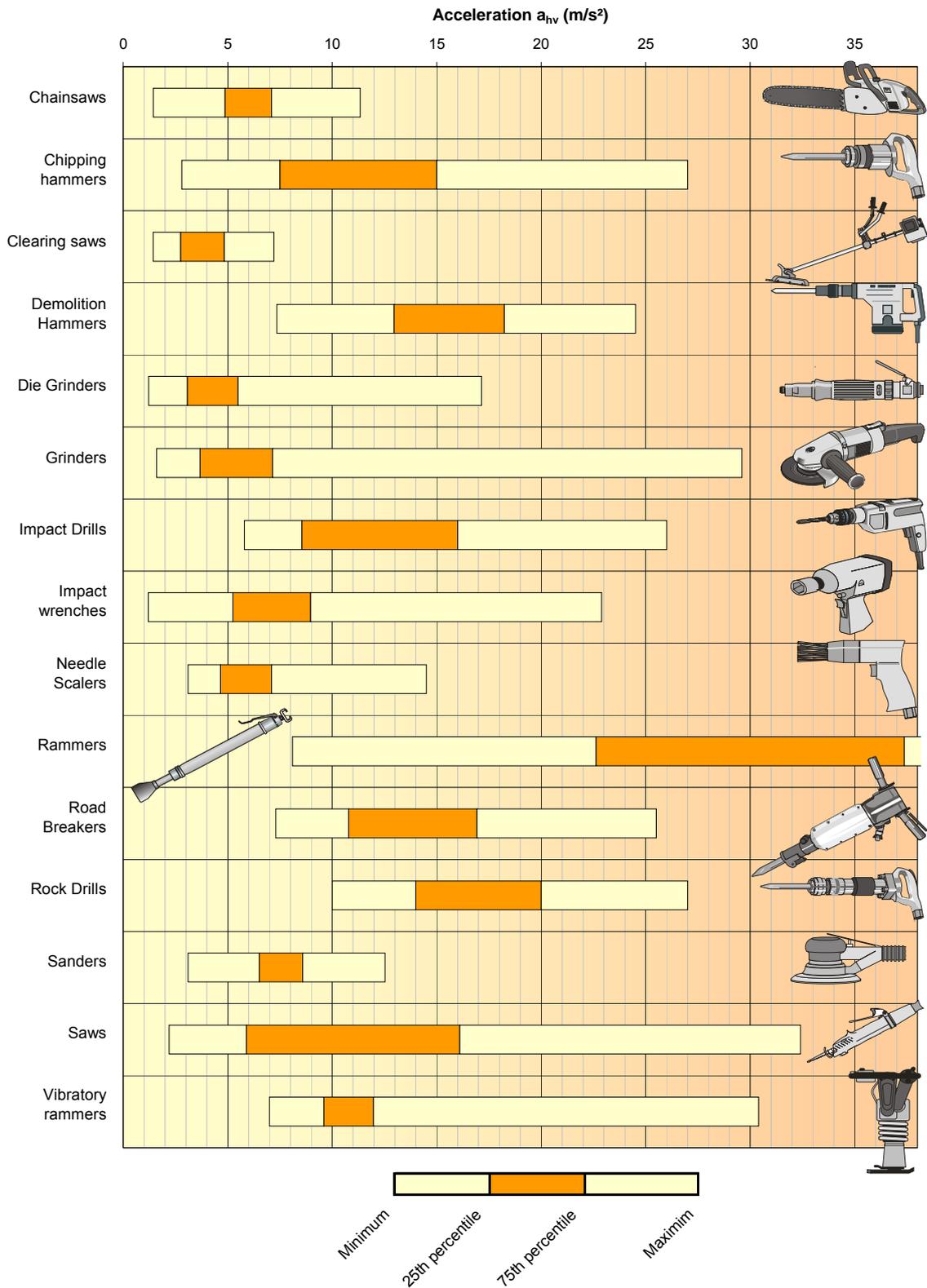
2. Table A1 summarises the upper quartile of vibration magnitudes illustrated in Figure A1 (the right hand bound of the darkly shaded range). You are justified in using the upper quartile value because this is likely if no effort has been expended on controlling vibration exposures – but do not be surprised if some employers can show emissions in the lower part of the range. The ‘trigger time’ to the Action Value is given corresponding to the upper quartile emission value.

3. You may find the detail provided here helpful in considering the validity of an employer’s vibration risk assessments. Contact your Noise and Vibration Specialist if you are unsure.

Table A1

Tool Type	Upper quartile vibration magnitude (m/s ²)	‘Trigger time’ to reach Action Value
Chainsaws	7	1 h
Chipping hammers (metal-working, foundries)	15	< 15 min
Clearing saws	5	2 h
Demolition hammers	18	< 10 min
Die grinders	6	1 h 20 min
Angle grinders	7	1 h
Hammer drills/combi hammers	16	< 15 min
Impact wrenches	9	40 min
Needle scalars	7	1 h
Rammers	38	< 3 min
Road breakers	17	10 min
Rock drills	20	< 10 min
Sanders (random orbital)	9	40 min
Saws	16	< 15 min
Vibratory rammers	12	20 min

Figure A1



4. The information in Table A2 covers a small number of tools for which less information is available than those in Figure A1 and Table A1. It is taken from the HAV guidance L140 and INDG175(rev2). These values are examples of vibration magnitudes measured by HSE on equipment in use at work. The table also shows the associated daily tool operating times ('trigger times') required to reach the Exposure Action Value.

Table A2

Tool Type	Condition	Vibration magnitude	'Trigger time' to reach Action Value
Scabblers (hammer type)	Typical	20 – 40 m/s ²	< 10 m
Clay spades/jigger picks	Typical	16 m/s ²	12 m
Pneumatic stone-working hammers	Vibration-reduced hammers and sleeved chisels	10 m/s ²	30 m
	Older tools, conventional chisels	30 m/s ²	< 5 m

5. The 'trigger time' to reach the Exposure Limit Value is four times greater than that to reach the Action Value.

6. The information here will often be sufficient to allow dutyholders or inspectors to form the opinion (along with evidence of duration of daily use and pattern of weekly use) that the exposure is likely to exceed the Action Value or Limit Value. This should give inspectors confidence that, for example, Reg 6(2) applies. Employers may use other data, provided it is representative of their use of the equipment, or their own measurements, to demonstrate, for example, that the Action Value is unlikely to be exceeded.

APPENDIX B

Assessing Vibration Exposures

General

1. The Regulations require an assessment of exposure. The main purpose is to determine whether the Exposure Action Value or Exposure Limit Value are likely to be exceeded, so that the employer's duties are clear. HSE does not expect employers to make a precise or detailed assessment of exposure beyond what is required to identify the need for action; resources should then be directed towards implementing the action plan and controlling the risk. Similarly, inspectors just need sufficient information on exposure levels to decide whether Regs 6(2), 7(1), 8 and 6(4) apply.

Daily exposure

2. Daily exposure (the A(8) value) depends on the magnitude (level) of the vibration and the total exposure time during the day. The vibration exposure could arise from a single source or multiple sources; the pattern of exposure could be, for example, intermittent throughout the working day, or periods of continuous exposure.

3. The vibration magnitude used for an exposure assessment should be a triaxial value (obtained from measurement in three directions at the worst hand position) and should have been measured on a similar tool, machine or workpiece in working conditions representative of those being assessed. This may be available from databases, tool manufacturers (see below), trade associations, etc. In some cases employers may need to make measurements.

4. The exposure time is the time spent with the hands in contact with the vibrating tool, handle, workpiece, etc. and is usually considerably shorter than the 'time on the job'. It is often referred to as 'trigger time' and is usually evaluated by observation of a sample of the work and taking account of the work done by an individual in a day.

5. Guidance on estimating vibration exposure, is given in the employers' leaflet on HAV (INDG175(rev2)) and in greater detail in the guidance book L140. Any measurement of vibration should be done in accordance with BS EN ISO 5349-1:2001 and BS EN ISO 5349-2:2002.

Uncertainty

6. Any assessment of daily exposure to HAV is subject to a very high level of uncertainty. An assessment carried out using best practice will have an uncertainty of $\pm 20\%$ and it is not unusual for the uncertainty to be much greater. This may affect enforcement decisions, particularly regarding the exposure limit value.

Ready reckoner and exposure points system

7. A ready reckoner for vibration exposure is available on the HSE website at :

www.hse.gov.uk/vibration/hav/readyreckoner.htm

8. This allows a daily exposure to be obtained from any combination of vibration magnitude and exposure time, for single sources of exposure or multiple sources. The exposure is expressed in points – where 100 points is equivalent to the Action Value and

400 points is equivalent to the Limit Value. Exposure points can be added where an employee uses more than one vibrating tool or process in a day, and are a convenient way to assess daily exposure. The use of a 'points per hour' value for a tool can be useful when planning work to minimise exposure.

Exposure calculator

9. A spreadsheet to calculate vibration exposures, is available at:

www.hse.gov.uk/vibration/hav/vibrationcalc.htm

10. This will calculate exposure in A(8) values and exposure points, times to reach the Action Value and Limit Value, and points per hour.

Vibration information from tool manufacturers

11. When employers request vibration emission data from suppliers, manufacturers etc., the data provided may not be suitable for assessment of exposure. The declared emission value should be measured in accordance with the appropriate harmonised standard. However, some harmonised test methods:

- specify unrealistic, artificial operating conditions;
- specify measurement of vibration in an inappropriate hand position; and/or
- specify measurement of vibration in a single direction.

12. The harmonised standards for electric and pneumatic machines are currently under revision, and it is hoped that declared emission values, and supplementary information from manufacturers on vibration risks, will be improved in future. If in doubt, you should consult a Noise and Vibration Specialist Inspector.

APPENDIX C

ENFORCEMENT MANAGEMENT MODEL (EMM)

APPLICATION TO HAND-ARM VIBRATION

Introduction

1. This Appendix to the HAV Topic Pack gives guidance to inspectors on applying the EMM to health risks from hand-arm vibration. It supersedes and replaces OC 246/32. General guidance on applying the EMM principles to health risks, including occupational health descriptors, is in OC 130/5.

2. Hand-arm vibration syndrome (HAVS) is a disease listed in RIDDOR 1995, Schedule 3, Column 1. When advanced beyond the initial stages it is an irreversible and disabling condition, i.e. a **serious health effect**.

3. The Control of Vibration at Work Regulations 2005 require that risks from vibration are eliminated or reduced to as low a level as is reasonably practicable (ALARP), whatever the initial exposure level. Where the daily Exposure Action Value is likely to be exceeded, the employer must reduce the exposure ALARP through a programme of appropriate technical and organisational measures, ensure that exposed employees have suitable health surveillance and provide information, instruction and training. In any case, the daily Exposure Limit Value must not be exceeded.

Benchmark

5. The benchmark for HAV is set at a '**nil/negligible**' risk of a **serious health effect**. The serious health effect, in this case, is HAVS that reaches a disabling severity before retirement age. This benchmark standard is met if there is full compliance with the Vibration Regulations **and** (if the exposure, although ALARP, continues to exceed the Action Value) the employer acts on the results of health surveillance to prevent progression of any HAVS cases to an advanced stage. In summary, compliance with the benchmark standard requires that:

(i) exposure is likely to be below the Action Value and there is no evidence of disease and no reported tingling during/after tool use; OR

(ii) if exposure is likely to be above the Action Value, the risk/exposure is ALARP, and there is adequate health surveillance with procedures in place to prevent anyone from advancing to a disabling stage of HAVS (i.e. stage 2 on the Stockholm Scale, see L140).

Risk matrix

4. It is widely agreed that the risk of HAVS (new cases or worsening of an existing condition) increases with increased daily vibration exposure, and with the number of years of exposure. BS EN ISO 5349-1:2001 includes a tentative dose-response relationship, restricted to the vascular component of HAVS (i.e. vibration white finger). This suggests that 10% of individuals will have finger blanching symptoms after 12 years if exposed at the Action Value of $2.5 \text{ m/s}^2 A(8)$ and after 6 years if exposed at the Limit Value of $5 \text{ m/s}^2 A(8)$. Exposure below the Action Value cannot be considered safe, although the risk will be

relatively low. No dose-response relationship is available for the sensorineural component of HAVS, which is considered to be the more disabling condition, or for the musculoskeletal component.

5. The risk matrix below is HSE’s interpretation of the tentative guidance on risk in BS EN ISO 5349-1:2001. It is therefore an Interpretive Standard. It assumes the exposure will continue throughout the employee’s working life (up to 40 years). The limited information on the dose-response relationship for HAVS is not sufficient to establish numerical levels of exposure that reflect ‘possible’ and ‘probable’ risks of serious health effect in the risk matrix below.

DESCRIPTOR	APPLICATION/ INTERPRETATION	LIKELIHOOD			
		PROBABLE	POSSIBLE	REMOTE	NIL/ NEGLIGIBLE
SERIOUS HEALTH EFFECT	Disabling HAVS before retirement age	Much greater than the Action Value of 2.5m/s ² A(8)	Greater than the Action Value of 2.5m/s ² A(8)	Less than the Action Value of 2.5m/s ² A(8)	Less than 1m/s ² A(8)

Risk gap

6. The risk matrix, when used with Table 2.1 in the EMM, will indicate an **extreme** risk gap for any exposure above the Action Value (2.5 m/s² A(8)). An Improvement Notice is therefore the Initial Enforcement Expectation where exposure is likely to exceed the Action Value **and** there is a breach of the Regulations (e.g. risk/exposure has not been reduced to ALARP, health surveillance is not in place, etc.). For enforcement guidance, see part 8 of the main part of this Topic Inspection Pack.

7. The EMM gives a **substantial** risk gap where exposures are below the Action Value but exceed 1 m/s² A(8). This suggests an initial enforcement expectation of a letter/inspection form, where the Regulations have not been complied with (e.g. it is reasonably practicable to reduce risk further by straightforward and low cost actions).

8. Assessing HAV risk can sometimes appear difficult and complex and the level of exposure will rarely be known precisely. However, the primary question is whether the exposure and risk are ALARP. When making decisions about the risk gap, inspectors should consider enforcement action where information on likely exposures and established industry good practice for HAV risk control (see [Appendix F](#)) suggests that the exposure is likely to be above the Action Value (indicating risk) and is not ALARP.

Relevant standards

9. The principal standards are:

Title	Authority
Risk matrix in HSE’s HAV Topic Pack, Appendix C	Interpretive

Guidelines for the measurement and evaluation of human exposure to hand-transmitted vibration. Part 1: General requirements. BS EN ISO 5349-1:2001	Established
L140 'Hand-arm vibration', Health & Safety Executive 2005	Established
Health and Safety at Work, etc. Act 1974, Section 2(1)	Defined
The Control of Vibration at Work Regulations 2005	Defined

APPENDIX E

Further sources of guidance

HSE guidance on hand-arm vibration

Hand-arm vibration. The Control of Vibration at Work Regulations 2005.

L140. HSE Books. ISBN 0-7176-6125-3

HSE leaflet for employers

Control the risks from hand-arm vibration. Advice for employers on the of Vibration at Work Regulations 2005.

INDG175(rev2). Pack of 10: ISBN 7176-6117-2

www.hse.gov.uk/pubns/indg175.pdf

HSE pocket card for employees

Hand-arm vibration . Advice for employees.

INDG296(rev1)

Pack of 25: ISBN 7176-6118-0

www.hse.gov.uk/pubns/indg296.pdf

HSE website

www.hse.gov.uk/vibration/hav

Other guidance, which pre-dates the vibration regulations but still contains useful information.

Hard to Handle Hand-arm vibration – manage the risk

Video.

Vibration Solutions Practical ways to reduce the risk of hand-arm vibration injury

HSG170. HSE Books. ISBN 0-7176-0954-5

Hand-arm vibration in the cast stone industry: reducing the risk

(Information sheet MISC493)

Hazards associated with Foundry processes - Hand Arm Vibration: The current picture (Foundries Information Sheet No. 8)

Hazards associated with Foundry processes - Hand Arm Vibration: Symptoms and solutions (Foundries Information Sheet No. 9)

Hand-arm vibration in foundries: furnace and ladle relining operations (Foundries Information Sheet No. 11)

A purchasing policy for vibration reduced tools in foundries (Foundries Information Sheet No. 12)

Hand-arm vibration in Foundries FIAC, 2001. HSE Books. ISBN 0-7176-1798-X