

# Hand-arm vibration: Inspection and Enforcement Guidance

## Open Government status

Fully Open

## Target audience

All HSE Inspectors and Visiting Officers

SG Specialist (Noise & Vibration, Occupational Hygiene, Occupational Health) Inspectors

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## ***Summary***

This guidance replaces the Topic Inspection Pack on Hand-arm Vibration (HAV). It is for Inspectors inspecting work activities involving risks from exposure to HAV and investigating hand-arm vibration syndrome (HAVS) and carpal tunnel syndrome (CTS) ill health cases reported through RIDDOR. It is also for visiting officers (VOs) assisting with HAVS RIDDOR investigations. It provides a consistent framework for assessing compliance and making enforcement decisions.

## ***Introduction***

HAV is a widespread hazard in many industries and occupations which use vibrating tools and work processes. Prolonged and regular exposure to this vibration can lead to progressive and permanent health effects resulting in a range of disease conditions, collectively known as HAVS. Vibration exposure is also associated with specific diseases such as CTS. The Control of Vibration at Work Regulations 2005 (Vibration Regulations) is the primary legislation dealing with HAV issues in the workplace.

This OG provides guidance for Inspectors on the factors they should consider and the actions they should take when investigating HAVS cases and enforcing the Vibration Regulations when they find high HAV exposures and inadequate measures to control and manage risks.

## ***HAV as a Matter of Evident Concern (MEC)***

HAV should be considered as a matter of evident concern (MEC) where:

- exposure is likely to be at or above the Exposure Action Value (EAV) (see the 'rough guide' in [Appendix 1](#)); or
- there is evidence of vibration-related ill health (eg HAVS, CTS) not being properly managed; or
- employees report tingling when using vibrating tools, which persists for 20 minutes or more afterwards.

## ***Action***

Inspectors should take action when HAV is identified as a MEC during inspections.

Inspectors should estimate the employees' exposures to HAV sufficient for reliable comparison with the EAV and the Exposure Limit Value (ELV) of the Vibration Regulations and then assess the adequacy of control measures and management arrangements in place to eliminate exposure at source or reduce it to ALARP.

When considering HAV issues during an inspection, the Inspector should focus on high-risk activities with the potential for high HAV exposures, i.e. exposures likely to be above the EAV where inadequate controls can result in an extreme risk gap under the Enforcement Management Model (EMM).

The steps Inspectors should take to assess exposure and take enforcement action, in accordance with the EMM and Enforcement Policy Statement (EPS), are described below. Advice is also provided on the initial enforcement expectation (IEE) in situations where inadequate controls and management are found.

### **Step 1: Determine exposure**

The level of the risk from HAV is determined by the daily vibration exposure. The information that needs to be considered to estimate exposure is set out in [Appendix 1](#).

Primary duties of control and management of risks from HAV under the Vibration Regulations are dependent upon the employees' likely daily vibration exposures and the frequency and regularity of that exposure. Gathering and recording exposure information is important to support any subsequent action.

### **Step 2: Assess adequacy of control and management of risk**

The principles of control and management measures and the factors that should be considered are listed in [Appendix 2](#).

Inspectors should give priority to preventing the risk (i.e. elimination and control). Inspectors will find the [industry-specific good practice guidance](#) for foundries, construction and heavy fabrication helpful for identifying risk control measures appropriate to the work activity.

Inspectors should check that measures are adapted to prevent risk to workers susceptible to HAV injury, for example, to prevent the progression of symptoms in workers with diagnosed HAVS/CTS.

### **Step 3: Enforcement action**

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 reach or exceed the EAV regularly and frequently, and reasonably practicable solutions exist. Enforcement of Reg 6(2) (control) will usually be appropriate, together with enforcement of Reg 7 (health surveillance (HS)) and Reg 8 (information, instruction and training (IIT)) as required. Where an Inspector is of the opinion that exposures are likely to be at or above the EAV but this is disputed by the dutyholder and there is insufficient information available to support the dutyholder's view, enforcement of Reg 5(1) (risk assessment) may be appropriate to establish the risk and the measures that need to be taken.

Where inadequate control is found, Inspectors should determine the risk gap and IEE using the EMM. [Appendix 3](#) helps apply the EMM to health risks from HAV and considers IEEs where exposures and risks are not adequately controlled and/or managed.

### ***Investigating RIDDOR reports of HAVS and CTS***

HSE's Incident Selection Criteria requires mandatory investigation of all cases of work-related ill-health reported through RIDDOR – including HAVS and vibration related CTS. Inspectors can use Appendix 4 to this OG to guide their investigation. Advice is given in other appendices on the evidence required to assess dutyholders' compliance with the Vibration Regulations and actions supported by the EMM and EPS.

### ***Background***

HSE research during the 1990s estimated that around five million British workers were exposed to HAV in the workplace. Approximately 1.7 million were believed to be exposed at levels above the Exposure Action Value (EAV), with around 900,000 of these exposed above the Exposure Limit Value (ELV). About 288,000 people were estimated to have vibration white finger (VWF), which is a form of HAVS affecting blood supplies to fingers.

### ***Organisation***

There are no special organisational requirements.

### ***Further References***

Inspectors should pay particular attention to:

**HSE guidance on hand-arm vibration**

Hand-arm vibration. The Control of Vibration at Work Regulations 2005.  
L140. HSE Books.  
<http://www.hse.gov.uk/pubns/books/l140.htm>

### **HSE leaflet for employers**

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

### **HSE pocket card for employees**

Hand-arm vibration. Advice for employees.  
INDG296(rev2)  
[www.hse.gov.uk/pubns/indg296.pdf](http://www.hse.gov.uk/pubns/indg296.pdf)

### **HSE website**

[www.hse.gov.uk/vibration/hav](http://www.hse.gov.uk/vibration/hav)

## **Contacts**

Advice and support for Inspectors is available from Noise and Vibration Specialists and Occupational Health Inspectors. You should always ask for advice if in doubt.

Noise and Vibration Specialist Inspectors can:

- advise you on reasonably practicable control measures for hand-arm vibration including in complex or novel situations;
- advise you on suitability of risk assessment and information, instruction and training (IIT) provided by the employer;
- help you with evidence of daily personal vibration exposures, especially when circumstances are complex or unusual, including measurement, or call upon HSE SD scientists<sup>1</sup> if highly specialist instrumentation is needed;
- advise you on compliance with the Vibration Regulations.

Occupational Health Inspectors can:

- advise on the quality and suitability of health surveillance services;
- provide clarification on the health surveillance requirements of the Vibration Regulations; and
- advise on the appropriate management of employees diagnosed with vibration injury or who are otherwise at particular risk from vibration, eg diseases of the hands, arms, wrists or shoulders or diseases affecting blood circulation;
- advise on suitability of IIT provided by the employer.

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

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<sup>1</sup> Inspectors wishing to call on reactive support from HSE SD on matters relating to hand-arm vibration should in the first instance contact a Noise and Vibration Specialist Inspector, who will act as the Technical Customer for any such work. See FOD Info System Homepage (FISH) / Specialist Assistance and particularly <http://intranet/fish/specialist.htm>

## Appendix 1: Determining exposure

As part of the assessment of the risk from vibration and the control measures required, the Vibration Regulations require an estimation of exposure sufficient to determine whether the Exposure Action Value (EAV) or Exposure Limit Value (ELV) are likely to be exceeded, so that the exposure based measures required for the employer to meet their 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 identified and controlling the risk. Similarly, inspectors just need sufficient information on exposure levels to decide whether Regs 6(2) (control), 7(1)(b) (health surveillance), 8(1)(b) (information, instruction and training) and 6(4) (application of ELV) apply. You should establish that exposure is regular and frequent, i.e. it will be repeated several days each week over months and years.

Situations where exposures are likely to exceed EAV are outlined in the Rough guide below.

### *Rough guide:*

It is likely that the EAV will be exceeded if:

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

Note: The times to reach EAV in this guide are for modern well-designed and well-maintained tools or machines. Older, poorly designed or poorly maintained machines may reach the EAV much sooner.

Many of the high-risk processes listed in the [Industry-specific good practice guidance](#) will result in daily exposures above the EAV unless exposure times are very short.

### **Daily exposure**

A person's daily exposure (the A(8) value) depends on:

- the vibration magnitude (level) to which they are exposed when using a machine;
- the duration of exposure (the time for which a worker's hand is actually in contact with that vibration, that is, trigger time).

If more than one machine is used during a day, the contribution from each machine should be estimated and then combined to obtain an overall daily exposure.

The vibration magnitude used for an exposure assessment 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, for example, when representative data is not readily available or a tool is used in an unconventional way.

### **Example vibration magnitudes**

Table 1.1 contains example vibration magnitudes for some common machines, which were measured by HSE and published in guidance book L140. Inspectors should use current information published on HSE's website <https://www.hse.gov.uk/vibration/hav/source-vibration-magnitude-app3.pdf>. Inspectors can use the 'recommended initial value' vibration magnitudes embedded in the HSE HAV exposure calculator, in combination with

observations of duration of exposure (trigger times), to make an initial estimate of daily vibration exposures and, say, assess the suitability of employers' exposure estimates. The 'Tool type', 'Tool characteristic, inserted tool, size, process' and 'Notes' should be used to check that there is a close match between the machine being assessed and the machine for which vibration data is provided. In many cases, this will be sufficient to compare with the EAV and ELV and to determine what duties under the Vibration Regulations apply. Inspectors should challenge employers' use of vibration magnitudes lower than the 'recommended initial value' and seek evidence that the lower values are valid, for example, in-use data from tool manufactures or on-site measurement information. Employers' legitimate use of values in the lower part of the range established by HSE is expected to become more common as employers identify the lower vibration models of a tool type. Inspectors should contact a Noise and Vibration Specialist Inspector if they are unsure.

### **Exposure points system**

HSE advocates a points system in L140 to help dutyholders in estimating their worker's daily exposure. The exposure is expressed in points – where 100 points is equivalent to the EAV and 400 points is equivalent to the ELV. Exposure points can be added where an employee uses more than one vibrating tool or process in a day. The use of 'points per hour' or 'points per 5 minutes' values etc. for a tool can be useful when planning work to minimise exposure.

### **Tools to calculate daily exposure**

A ready reckoner is available on the HSE website at:

[www.hse.gov.uk/vibration/hav/readyreckoner.htm](http://www.hse.gov.uk/vibration/hav/readyreckoner.htm)

An exposure calculator (spreadsheet) is available at:

[www.hse.gov.uk/vibration/hav/vibrationcalc.htm](http://www.hse.gov.uk/vibration/hav/vibrationcalc.htm)

Both can be used to estimate daily vibration exposures (in A(8) values and exposure points) using vibration magnitudes and exposure times, for single or multiple sources of exposure.

The exposure calculator has 'recommended initial value' vibration magnitudes for commonly used tools embedded for use in initial exposure assessment.

### **Vibration information from tool manufacturers**

Machinery manufacturers are required to provide information on vibration under the Supply of Machinery (Safety) Regulations 2008 so that the employer can plan use of the machine without risk from vibration. The tool manufacturers' declared vibration emission values ( $a$  and uncertainty  $K$ ) should represent the highest vibration in typical use of the machine and is likely to have been measured in accordance with a harmonised standard designed to eliminate much of the variability that occurs during real use. A sum of ' $a+K$ ' should provide a value that will not be exceeded if the standard test is repeated. Many standards underestimate workplace vibration magnitudes for some models of a tool type.

Before using vibration information supplied with a tool to assess the risk of using a machine in the workplace, the employer should check (for example with the manufacturer and/or supplier) how the declared vibration emission levels represent workplace vibration.

Table 1.1 Example vibration magnitudes of some common machines

Industry	Tool type	Tool characteristic, inserted tool, size, process	Range (m/s <sup>2</sup> )	Recommended Initial value (m/s <sup>2</sup> )
<b>General</b>				
	Drills	Standard drill bit	2 - 5	5
	Drills	Hole saw	4 - 12	10
	Drills - Core	78 - 107 mm	6 - 8	8
	Drills - Impact	5 and 8 mm masonry bit	7 - 13	11
	Grinders - Angle	100 - 180 mm	3 - 10	7
	Grinders - Angle	125 and 100 mm Flapper discs	2 - 5	4
	Grinders - Angle	220 - 300 mm	4 - 11	9
	Grinders - Die		5 - 10	8
	Grinders - Straight		4 - 9	8
	Nail guns		3 - 13	9
	Needle scalers	Non-vibration reduced	12 - 26	19
	Needle scalers	Vibration reduced	3 - 8	7
	Nibblers		7 - 12	12
	Reciprocating saws		7 - 27	18
	Sanders - Random-orbital		6 - 14	12
	Sanders Orbital		4 - 12	9
<b>Construction</b>				
	Breakers		7 - 18	14
	Demolition or rotary hammers		10 - 21	18
	Plate compactors	Non-vibration reduced	9 - 22	18
	Plate compactors	Vibration reduced	2 - 7	4
	Pneumatic hammers		10 - 29	25
	Saws - Cut-off	Masonry cutting	5 - 14	13
	Scabblers		4 - 14	12
	Trench Rammers		13 - 13	13
	Water jetting guns		1 - 5	4
<b>Forestry / Horticulture</b>				
	Brushcutters	Saw head	3 - 5	5
	Brushcutter & Strimmers	Strimmer head	2 - 7	7
	Chainsaws		5 - 7	7
	Hedge trimmers		3 - 7	6
	Mowers - Hand-guided		4 - 8	7
	Mowers - ride on		3 - 7	6
<b>Engineering</b>				
	Chipping hammers	Chipping weld	20 - 32	31
	Impact wrenches	Drive size: 3/8, 1/2 & 3/4"	3 - 6	5
	Impact wrenches	Drive size: 1"	7 - 11	10
	Pedestal grinders		2 - 11	8
	Polishers - angle (hand-held)	Mop head or soft-backed pad	1 - 3	3
<b>Stone working / mining / quarrying</b>				
	Chipping hammers	Chipping stone, concrete, rust	11 - 22	20
	Rock drills		10 - 28	26
	Stone hammers		7 - 22	18
<b>Woodworking</b>				
	Jigsaws		9 - 17	11
	Routers		2 - 3	3
	Staplers		2 - 6	4



## ***Appendix 2: Control and Management of risks from exposure to hand-arm vibration (HAV)***

Table 2.1 contains factors that should be considered when assessing the adequacy of control and management of exposures to HAV. The table is arranged according to the principles of controlling and managing the risks from HAV. It can be used during HAV interventions to ensure that the necessary information is gathered to assess the compliance levels and support subsequent enforcement actions.

Table 2.1 Factors to consider during HAV inspections and applicable legislation

<b>Factors</b>	<b>Legislation</b>
<p><b>Risk assessment</b></p> <p>Has the employer made a suitable and sufficient risk assessment, that is:</p> <ul style="list-style-type: none"><li>• identified employees at risk from HAV?</li><li>• made a valid estimate of their exposures and compared these with the EAV and ELV?</li><li>• identified the need for immediate action if the ELV is exceeded?</li><li>• considered the available and appropriate options for controlling risk?</li><li>• considered information obtained from health surveillance?</li><li>• recorded the steps planned or taken to control risks and to inform employees of the risks and their controls (to comply with Regs 6 &amp; 8)?</li><li>• made arrangements for periodic review of the assessment and for ongoing action as new options for risk control become available?</li></ul>	<p>HSWA s2</p> <p>Vibration Regs reg 5</p>
<p><b>Adoption of alternative working methods – elimination and control</b></p> <p>Where exposure is likely to reach or exceed the EAV, has the employer:</p> <ul style="list-style-type: none"><li>• identified and adopted, where reasonably practicable, established industry good practice for eliminating or reducing traditional high exposure operations, including full or partial automation (see <a href="#">Appendix 6</a>) or planned to do so, with an appropriate timescale?</li><li>• demonstrated that HAV risks are considered at the design and specification stage for new processes and projects?</li></ul> <p>Where exposure is shown to exceed the ELV, a process change is likely to be necessary for work to continue. Daily exposure to vibration must not exceed the ELV.</p>	<p>HSWA s2</p> <p>Vibration Regs reg 6(2), reg 6(3)</p> <p>Vibration Regs reg 6(4)</p>



<p><b>Management of residual HAV risk - control</b></p> <p>Where risk remains after introducing reasonably practicable alternative working methods, or where they have not yet been introduced, has the employer reduced exposure and risk to ALARP, using, as appropriate:</p> <ul style="list-style-type: none"> <li>• a procurement policy, selecting suitable work equipment for the job (NOTE: using machines efficient at the job is important - a machine with low vibration magnitude could result in a higher vibration exposure than a faster, more efficient machine that has higher vibration magnitude)?</li> <li>• good ergonomic design in the workplace, allowing reduced grip and push forces?</li> <li>• maintenance and replacement of tools and consumables as required, to prevent unnecessary increases in vibration exposure?</li> <li>• limits on individual daily exposure (to bring exposure at least below the ELV)?</li> <li>• operator training (see below)?</li> <li>• gloves* and clothing to keep workers warm and dry?</li> </ul> <p>General guidance on managing HAV risks is provided where use of vibrating equipment is unavoidable in Table 2 in <a href="#">Appendix 6</a>.</p> <p>*Anti-vibration gloves should not be accepted as a means of reducing vibration exposure to ALARP (see L140, Appendix 4 for more information).</p>	<p>HSWA s2</p> <p>Vibration Regs reg 6</p>
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## Health surveillance

Where vibration exposure is likely to exceed the EAV (on a frequent and regular basis), or where employees are at particular risk (eg existing HAVS, Carpal Tunnel Syndrome (CTS) or other relevant conditions), has the employer put in place a suitable health surveillance scheme? Has the employer:

- arranged for initial screening of employees by an occupational health provider, including those who will be exposed to HAV for the first time, typically using a suitable questionnaire, e.g. L140, Appendix 9?
- arranged for regular (e.g. annual) health surveillance for employees by a competent responsible person or an occupational health provider, typically using a suitable questionnaire, e.g. L140, Appendix 9?
- arranged a referral system to a competent occupational health provider should symptoms be indicated?
- if the assessment by the competent occupational health provider demonstrates HAVS, referred the employee for a formal diagnosis by an occupational health physician, who will also advise on fitness to work?
- followed the occupational health physician's advice to manage exposure to vibration (the employee's consent is not required for this)?
- referred employees with possible HAVS symptoms developing between planned health surveillance assessments to a competent occupational health provider with expertise in HAVS clinical assessment and diagnosis?
- encouraged employees to cooperate and consent to the release of their clinical information, so that diagnosed cases of CTS and diagnosed new and worsening cases of HAVS can be reported under RIDDOR??
- kept health records containing the fitness for work advice and a record of health surveillance provision?
- used feedback from the occupational health provider (individual fitness for work and grouped anonymised health surveillance results (for more than 5 employees)) to review the vibration risk assessment and controls for other workers similarly exposed?
- removed employees not fit to work because of HAVS, from work that exposed them to HAV?

Has the occupational health provider:

- given access to the employer's HAV risk assessment and action plan and familiarised themselves with the nature of the work, ideally by visiting the workplace?
- provided clinical assessment and diagnosis using competent and qualified\* occupational health professionals?
- provided adequate information and advice, including on fitness for work with HAV, to individual employees on an annual basis?
- provided the employer with recommendations on each individual's fitness for work with HAV?
- provided the employer with grouped anonymised health surveillance results (for more than 5 employees)?
- advised the employer, subject to employee consent, to report cases of CTS and new and worsening cases of HAVS under RIDDOR?

\*Occupational health staff undertaking HAV health surveillance assessments should have successfully completed an Faculty of Occupational Medicine (FOM) approved HAV training course and have the appropriate clinical skills to assess possible HAVS cases.

HSWA s2

Vibration Regs  
reg 7(1),  
reg 7(5)

HSWA s2

HSWA s36

<p><b>Information, instruction and training</b></p> <p>Have employees at risk from exposure to vibration or whose exposures are likely to be at or above the EAV, received information on:</p> <ul style="list-style-type: none"> <li>• how their individual personal daily exposures compare with the EAV and ELV?</li> <li>• the risks from HAV and how to help reduce them?</li> <li>• the importance of correct operation and maintenance of tools and machines?</li> <li>• signs and symptoms of HAVS and how to report them?</li> <li>• arrangements for health surveillance and their duty to cooperate?</li> </ul> <p>Look for evidence that tools are being used correctly, as recommended by the manufacturer. This may require operators to receive specific training: are the operators and their supervisors aware of this requirement? 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 reg 6(3)(f), reg 8</p> <p>HSWA s7</p>
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### ***Appendix 3: Applying the Enforcement Management Model (EMM) to health risks from hand-arm vibration and enforcement guidance***

This Appendix sets the health risks from hand-arm vibration (HAV) in context with the EMM and provides enforcement guidance including initial enforcement expectations (IEEs) for inspections and investigations. General guidance on applying the EMM principles to health risks, including occupational health descriptors, is in OG EMM: [Application to Health Risks](#).

#### **Application of EMM to risks from HAV**

##### **Consequence/ health outcomes**

Hand-arm vibration syndrome (HAVS) is a permanent and progressive occupational disease listed in RIDDOR 2013, Regulation 8. When advanced beyond the initial stages (Stages 1 and 2 early), it is a more disabling condition, i.e. a **serious health effect**.

##### **Benchmark**

The benchmark 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 (i.e. stage 2 late or stage 3) whilst in work. This benchmark standard is met if there is full compliance with the Vibration Regulations **and** the employer acts on the results of health surveillance (including for employees exposed to HAV below the EAV who are particularly at risk) to prevent progression of any cases of HAVS, in particular to an advanced stage. In summary, compliance with the benchmark standard requires that:

- (i) exposure is likely to be below the EAV and there is no evidence of HAVS or where HAVS is present, health surveillance shows it is not progressive; OR
- (ii) the risk/exposure is ALARP (but above the EAV) and there is adequate health surveillance, with procedures in place to prevent any cases of HAVS from advancing, particularly to more disabling severity (e.g. stage 2 late or stage 3 on the Stockholm Scale, see L140).

##### **Likelihood/Risk matrix**

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 (VWF). This suggests that 10% of individuals will have finger blanching symptoms after 12 years if exposed at the EAV of  $2.5 \text{ m/s}^2 \text{ A}(8)$  and after 6 years if exposed at the Exposure Limit Value (ELV) of  $5 \text{ m/s}^2 \text{ A}(8)$ . There is a high likelihood of harm when exposure is much greater than the EAV on most working days. Exposure below the EAV 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.

The risk matrix below is HSE's interpretation of the tentative guidance on risk in BS EN ISO 5349-1:2001. It assumes that the exposure to vibration will continue throughout the employee's working life (through to retirement). 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 a serious health effect.

Table 3.1: Risk matrix for HAVS

DESCRIPTOR	APPLICATION/ INTERPRETATION	LIKELIHOOD	
		PROBABLE/ POSSIBLE	REMOTE
SERIOUS HEALTH EFFECT	Disabling HAVS before retirement	Greater than the Action Value of $2.5\text{m/s}^2 A(8)$	Less than the Action Value of $2.5\text{m/s}^2 A(8)$ but greater than $1\text{m/s}^2 A(8)$

### Risk Gap

The risk matrix in Table 3.1, when used with Table 2.1 in the EMM, will indicate an **extreme** risk gap for any exposure above the EAV ( $2.5\text{m/s}^2 A(8)$ ). Actions required by the Vibration Regulations reduce the likelihood of harm and the risk gap and this is reflected in the IEEs recommended in Table 3.3.

The EMM gives a **substantial** risk gap where exposures are below the EAV but exceed  $1\text{m/s}^2 A(8)$ .

### Standards

The principal standards are:

Table 3.2: Standards

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

### Enforcement Guidance

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 EAV and reasonably practicable control solutions exist. Enforcement of Reg 6(2) (Control) will usually be appropriate, together with enforcement of Reg 7 (Health surveillance) and Reg 8 (IIT) as required.

Issuing of enforcement Notices will usually be appropriate where:

- the EAV is likely to be exceeded regularly and frequently; and
- exposure is not ALARP; and/or
- the remaining risk is not appropriately managed

see Tables 3.3 and 3.4.

The duties under Regs 6(1), 7(1)(a) and 8(1)(a) are not dependent on the level of exposure. Enforcement should be considered at exposures below the EAV where people whose health

is at particular risk (for example if they have existing HAVS, carpal tunnel syndrome (CTS) or other diseases of the hand, nerve disorders or circulatory disorders) and the risk is not appropriately managed to prevent potential progression of HAVS or CTS. Relevant health information may be available for individuals from their health records.

If the ELV is exceeded, a Prohibition Notice (PN) under Reg 6(4) should be considered in order to deal with the risk of a serious health effect presented by this level of exposure. In considering serving a PN, inspectors should take into account the factors covered in Table 3.4. Inspectors are advised to consult a Noise & Vibration Specialist Inspector in cases where a PN is being considered. 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 the Vibration Regulations.

Prosecution should be proposed where serious breaches of the Vibration Regulations are found, and strategic and dutyholder factors indicate such action would meet the principles and expectations of the HSE enforcement policy statement. It is advised that a Noise and Vibration Specialist Inspector should be consulted if prosecution is proposed and an Occupational Health Inspector should be consulted if the case concerns arrangements for occupational health provision or health surveillance.

### **Initial Enforcement Expectation**

Tables 3.3 contain common situations that inspectors are likely to encounter where the IEE is Improvement Notice (IN).

Please Note, for exposures between the  $1 \text{ m/s}^2 \text{ A}(8)$  and the EAV, the EMM may indicate an IN for Control where straightforward and low-cost actions are available and the exposure is not ALARP but verbal or written advice may be proportionate and appropriate. An IN served below the EAV will require a proof of risk from HAV. As shown in Table 3.1, this level of exposure is not safe, but the risk is relatively low.

Table 3.3: Initial enforcement expectation – IN

Risk/Exposure	Situation	Initial Enforcement Expectation
likely to exceed the EAV of 2.5 m/s <sup>2</sup> A(8)	<b>Control –</b> Exposure is not ALARP; 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) IN HSWA s2(1) Vibration Regs reg 6(2)
	<b>Control –</b> Exposure is not ALARP and reasonably practicable alternative processes are not readily identified.	Require control through equipment selection, training, maintenance, work planning, etc. IN HSWA s2(1) Vibration Regs reg 6(2)
likely to exceed the EAV of 2.5 m/s <sup>2</sup> A(8) or any employees at particular risk	<b>Health surveillance –</b> There is no health surveillance, or health surveillance is not suitable, or actions taken as a result of finding ill-health effects are inadequate.	IN Vibration Regs reg 7(1), 7(5)
	<b>Information, instruction, training –</b> Employees have not been provided with suitable and sufficient information, instruction and training.	IN HSWA s2 Vibration Regs reg 8
above the ELV of 5 m/s <sup>2</sup> A(8)	<b>Control –</b> Exposure should not exceed ELV.	Require change of process or limitation of exposure duration and other measures to manage residual risk where required; IN additionally, see Table 3.4 on PN
appears significant (e.g. rotary tool with trigger time > 1 hour, percussive tool with trigger time > 15 min); use of novel tool or process for which no information is available.	<b>Risk Assessment –</b> No risk assessment and insufficient information to determine whether the EAV is likely to be exceeded.  Note: If there is clear evidence to show that the EAV is likely to be exceeded and the exposure is not ALARP, action should be taken according to control situations above for exposure likely to exceed the EAV of 2.5 m/s <sup>2</sup> A(8).	IN HSWA s2 Vibration Regs reg 5 but it is good practice to issue IN on measures to control the risk and include requirements concerning risk assessment in written advice.



Table 3.4 addresses situations where the IEE is PN under regulation 6(4) and the factors that inspectors should consider for risk of a serious health effect when making the decision to halt process until arrangements made to ensure that individual employee's exposure is below the ELV. Inspectors should also consider what is necessary to secure sustained compliance with the Vibration Regulations in accordance with Table 3.3.

Table 3.4: Initial enforcement expectation – PN

Situation	Factors to consider
Exposure from an activity is frequently above the ELV of 5 m/s <sup>2</sup> A(8) on at least one day per week and exposure is usually above the EAV of 2.5 m/s <sup>2</sup> A(8) (otherwise R6(5) exempts).	<ul style="list-style-type: none"> <li>Is there clear evidence to show that the ELV is being exceeded and the EAV is habitually exceeded; in particular, evidence of the likely duration of exposure and the likely vibration magnitudes of the tool(s) being used? In the absence of other information, refer to the example vibration magnitudes of some common machines in <a href="#">Appendix 1</a>;</li> </ul>
Exposure is above the ELV of 5 m/s <sup>2</sup> A(8) for a period of at least 5 days (otherwise 6(5) exempts) and exposure is usually above 1 m/s <sup>2</sup> A(8)	<ul style="list-style-type: none"> <li>Is there clear evidence to show that the ELV is being exceeded on at least 5 days in any 7-day period; in particular, evidence of the likely duration of exposure and the likely vibration magnitudes of the tool(s) being used? In the absence of other information, refer to the example vibration magnitudes of some common machines in <a href="#">Appendix 1</a>;</li> <li>Is there clear evidence to show that exposure is usually above 1 m/s<sup>2</sup> A(8)? In particular, evidence of the likely duration of exposure and the likely vibration magnitudes of the tool(s) being used.</li> </ul>
Exposure is above 11 m/s <sup>2</sup> A(8) (i.e. well above the ELV of 5 m/s <sup>2</sup> A(8)) for any one day in a week, although the exposures for the remaining days of the week are below the EAV of 2.5 m/s <sup>2</sup> A(8) <i>but</i> above 1 m/s <sup>2</sup> A(8)	<ul style="list-style-type: none"> <li>Is there clear evidence to show that the exposure is likely to be above 11 m/s<sup>2</sup> A(8) in particular, evidence of the likely duration of exposure and the likely vibration magnitudes of the tool(s) being used? In the absence of other information, refer to the example vibration magnitudes of some common machines in <a href="#">Appendix 1</a>;</li> <li>Is there clear evidence to show that exposure is usually above 1 m/s<sup>2</sup> A(8)? In particular, evidence of the likely duration of exposure and the likely vibration magnitudes of the tool(s) being used.</li> </ul>
Exposure is likely to exceed the EAV of 2.5 m/s <sup>2</sup> A(8) and is not ALARP. There is agreement between the appropriate HSE industry sector and industry that use of the tool/process is no longer acceptable and will be prohibited where seen.	<p>Examples include: use of old-design chipping or scaling tools for more than 1 hour per day in shipyards; extensive use of breakers for pile cap removal in construction.</p> <p>Note: If exposure is also likely to exceed the ELV, consider the situations described above.</p>

## ***Appendix 4: Guidance on HAVS/CTS RIDDOR investigation***

### **Background**

HSE's Incident Selection Criteria requires mandatory investigation of all work-related cases of Hand-Arm Vibration Syndrome (HAVS) and Carpal Tunnel Syndrome (CTS) reported through RIDDOR. This guidance provides a framework for consistent HSE investigation. It follows the principles set out in the Enforcement Policy Statement (EPS) and the Enforcement Management Model (EMM) and focuses effort towards potential serious breaches of the Vibration Regulations. An approach to HAVS/CTS RIDDOR investigations is recommended which helps Visiting Officers (VOs) gather pertinent information from which managers, and Inspectors can make prompt and positive decisions. Following this guidance is recommended, but discretion should be used according to circumstances.

### **Informing decisions**

Questions or selected questions from the questionnaire at [Appendix 5](#) can be used to gather relevant information during initial investigation of HAVS/CTS RIDDOR case(s). The information might be gathered by a VO or Inspector to help the Principal Inspector (PI) or lead Inspector to –

- establish that HAVS or CTS was diagnosed by an occupational physician and involved RIDDOR defined activities so was, in fact, reportable;
- review previous interactions with the company on HAV, HAVS or CTS at this or other sites across Great Britain to establish what previous advice HSE has given and what enforcement has been taken;
- review control and management of HAV risk against compliance standards set out in [Appendix 2](#);
- decide what further investigation is appropriate as set out below and in the flow chart in this appendix.

### **Factors to consider**

Full compliance with the Vibration Regulations can see reports of HAVS Stage 1 or CTS cases, but subsequent management of cases and their co-workers should: halt or slow progression of observed HAVS cases and halt or slow new incidence of HAVS Stage 1 and CTS; and prevent HAVS reaching Stage 2 late in all cases. See 'Benchmark' in [Appendix 3](#).

RIDDOR reporting of HAVS at any Stage should be investigated. PIs and Inspectors should use the flow chart below to assist them in triaging the investigation.

Where high risks from exposure to HAV are present and not controlled and managed adequately, take immediate enforcement action to secure compliance; that is to prevent new cases and prevent the progression of existing cases. See Appendix 3 for more enforcement guidance.

Prosecution should be proposed when:

- there is a single case of HAVS stage 2 late or stage 3; or
  - multiple cases of HAVS stage 1 and stage 2 early or late;
- and
- there are/were exposures regularly at or above the EAV that are/were not controlled and managed SFAIRP to prevent harm.

Dutyholder factors and strategic factors in the EMM should then be considered.

CTS is a 'significant health effect' in the EMM (not a 'serious health effect'). RIDDOR reports of CTS alone should not normally result in prosecution. However, all cases of CTS should be investigated and enforcement action, if required, should be based on the risk from HAV and control of the risk of HAVS, see [Appendix 3](#).

### **Tips for investigating RIDDOR reports of HAVS and CTS**

Focus on the duty holder's control and management systems of the HAV risks rather than individual worker(s) who have been diagnosed with HAVS/CTS.

Use information on the levels of risks faced by the affected person (AP) or selected APs as indicators to assess duty holder's control and management of HAV risks.

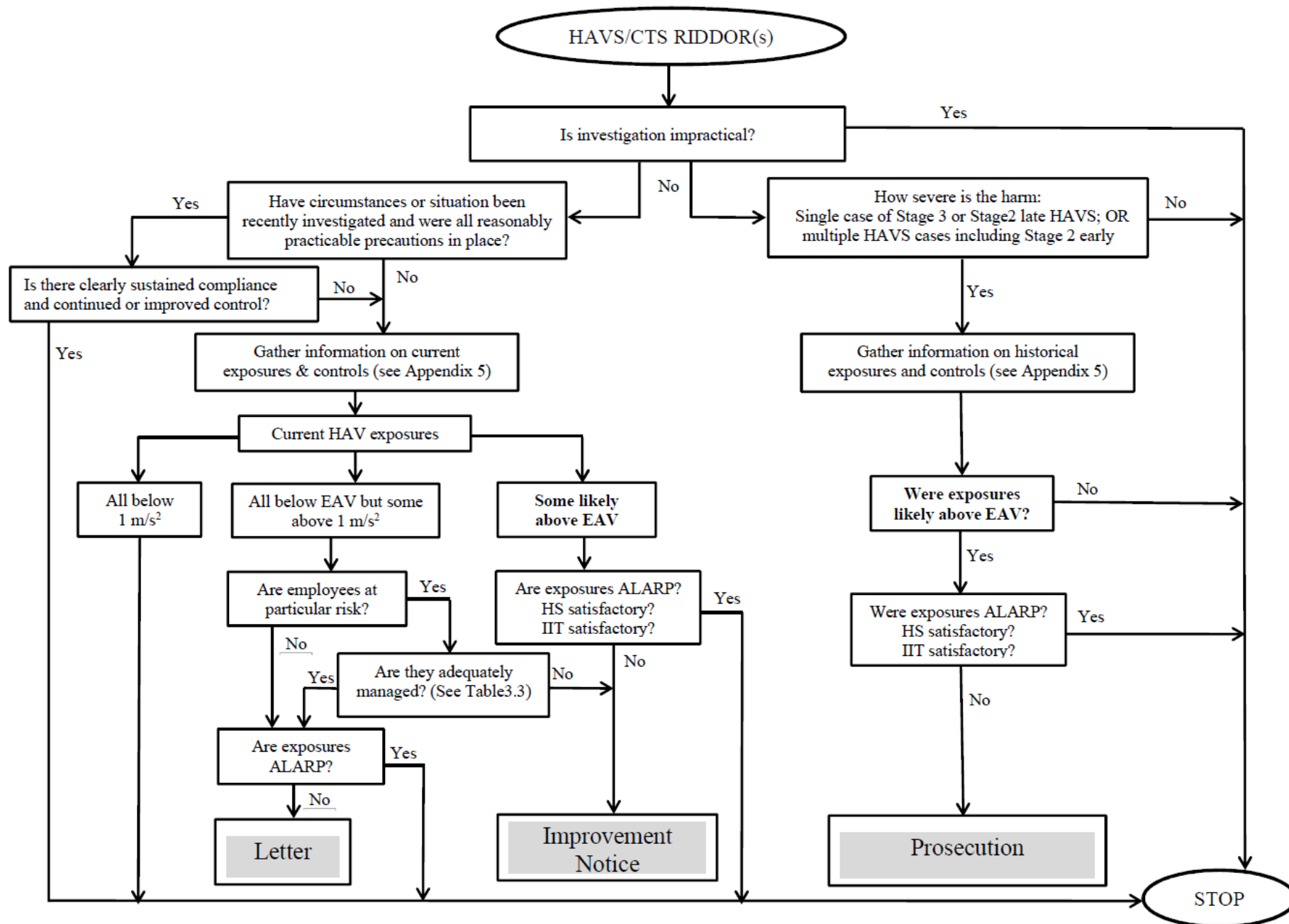
Decide if there are workshops or processes other than those where the AP(s) work that expose workers to high risks of developing HAVS.

Consider HQ intervention to assess the adequacy of the management system across a company reporting HAVS/CTS RIDDORs for multiple sites. Visit a selected site(s) to assess the implementation at the local level.

When RIDDOR report(s) of new or worsening HAVS/CTS are received from a duty holder following a recent intervention covering HAV, HSE should establish if these cases present new evidence of non-compliance (either prior to HSE's intervention or due to new activities since HSE's intervention) or if they are due to deterioration of control and management. Positive responses will normally require further intervention. The Principal Inspector should consider whether the conditions are met to initiate a prosecution.

All new or worsening cases of HAVS reaching stage 2 late or stage 3 will require investigation of failure of the company's procedures to prevent progression of the disease and, potentially, a visit to secure compliance with the Vibration Regulations. The Principal Inspector should consider whether the conditions are met to initiate a prosecution.

A process for HAVS/CTS RIDDOR investigations is shown in the flow chart below. Principal Inspectors and Inspectors should use the flow chart to guide the investigation and/or enforcement in conjunction with the guidance in this Appendix.



## ***Appendix 5: Initial information required for HAVS/CTS RIDDOR investigations***

The advice and questionnaire below can be used for initial enquiries to gather relevant information. Questions can be tailored to individual cases so that only necessary information is requested. The information might be gathered by a VO or Inspector to help the PI or lead Inspector to decide the further direction of the investigation.

### **Desk based review of the case and the dutyholder**

1. Review RIDDOR to check the case is reportable against the following criteria:
  - Diagnosed CTS is reportable when work involves regular use of percussive or vibrating tools;
  - Diagnosed new or worsening case of HAVS is reportable when work involves regular use of percussive or vibrating tools, or the holding of materials which are subject to percussive processes, or processes causing vibration.
2. Obtain a site overview and company 360° COIN, and check:
  - previous history of HAVS/CTS RIDDOR reporting;
  - previous HSE advice, enforcement or investigations concerning HAV.
3. Check Companies House information to get company status.

### **Questionnaire for dutyholder information on control and management of HAV**

4. Ask the dutyholder for the following information about the control and management of vibration exposure:
  - What are your policies and procedures for management of HAV risks?
  - How many shop floor workers are there?
  - What does your HAV risk assessment find? Including:
    - How many workers are exposed to HAV and how many have exposures at or above the EAV?
    - What tools or process are used, their associated vibration magnitudes and the source of that information, their associated exposure times (trigger times), and workers' estimated daily exposures?
  - What measures are in place to minimise HAV exposures and prevent exposures above the ELV?
  - What are your arrangements for health surveillance for HAVS/CTS? Including:
    - when health surveillance for HAVS started, how often is it performed and have there been any breaks?
    - how many workers have HAVS/CTS?
    - how do you manage workers with HAVS or CTS?
    - what are the arrangements for retention of health records?
    - what procedures and equipment have been changed for all workers since (the latest cases of) HAVS/CTS were found?
  - What information, instruction and training on HAV have you provided for workers and their supervisors and how often is it delivered?
  - Information required for the affected person(s) (AP), including:
    - Do you have the health records for the AP?
    - What is the HAVS staging on the Stockholm Scale?

- What are the AP's work histories with the company, particularly the roles with use of vibrating tools? And what is the likely exposure for each role?
- Is the AP subject to health surveillance? If yes, when did it start? How often is it performed? Have there been any breaks?
- What HAV related training do the APs receive?
- Have any HAV exposure/risk controls been modified since diagnosis?
- What other action has been taken since diagnosis?
- Did the AP have any pre-existing conditions relevant to the diagnosis?
- Are you aware of any out of work activities or previous work that may have exposed the AP to vibration?

#### **Review response**

5. PI or the lead inspector to review the response from the dutyholder and make decisions on further investigation, such as site visit to ensure current risks from exposure to HAV are adequately controlled and/or consider prosecution; or no further action. The flow chart in Appendix 4 should be helpful in making such decisions.

## ***Appendix 6 – Industry-specific good practice guidance***

Industry-specific good practice is provided for the following sectors:

- Foundries (Table 1A);
- Heavy Fabrication (Table 1B);
- Construction (Table 1C); and
- General management of HAV risks (Table 2)

Established alternative working methods to avoid/reduce the use of vibrating equipment appear in Table 1 and expectations on the general management of HAV risks where use of vibrating equipment is unavoidable appear in Table 2.

Vibration guidance applicable to all industry including Foundries, Heavy Fabrication and Construction is available from the HSE vibration webpages including L140 Hand-arm Vibration and leaflet 'Hand-arm vibration at work: A brief guide'.



## Foundries

Table 1A: Established alternative processes to avoid/reduce the use of vibrating equipment

Activity or process	Recommended initial value (m/s <sup>2</sup> )	Corresponding time to reach		Alternative methods	Further information (links on HSE website)
		Action value	Limit value		
Knock-off, cut-off and fettling castings using:				Eliminate or reduce the need for manual knock-off/cut-off or fettling using, where appropriate: <ul style="list-style-type: none"> <li>good foundry practice and investment on casting (lost wax or lost foam casting) techniques to improve casting precision</li> <li>design castings to minimise fettling (number of joint lines, etc.)</li> <li>decrease ingate/feeder size and reduce cut-off time</li> <li>design castings suitable for direct machining</li> <li>challenge inappropriate customer specifications for high standards of finish</li> </ul> Substitute alternatives to manual fettling using, for example: <ul style="list-style-type: none"> <li>robot fettling machines</li> <li>automated grinding and manipulators</li> <li>semi-automatic cut off</li> <li>cropping machines</li> <li>jig-mounting for grinder or castings</li> </ul> Design casting and runner systems to allow for use of these alternative methods.  Note: These methods for elimination and substitution will usually be reasonably practicable for large production runs; some may also be appropriate in jobbing foundries.	Example: <a href="#">eliminate fettling by improving casting quality</a> Example: <a href="#">machining as a substitute for fettling</a> Example: <a href="#">automatic fettling</a> Example: <a href="#">jigs for hands free grinding</a> Example: <a href="#">semi-automatic cut-off</a> Example: <a href="#">isolated cut-off machine</a> Example: <a href="#">hydraulic cropping</a>
Large angle grinders	9	37mins	2 hrs 28mins		
Large straight grinders	8	47mins	3hrs 8mins		
Chipping hammers	22 <sup>1</sup>	6mins	25mins		
Pedestal grinders	8	47mins	3hrs 8mins		
Knocking- off ceramic mould shells with chipping hammer	No data available			Hands-free alternative process: <ul style="list-style-type: none"> <li>Frame-mounted breaker</li> </ul>	Example: <a href="#">shell knockout 1</a> Example: <a href="#">shell knockout 2</a>

<sup>1</sup> Values differ from 'Sources of vibration magnitude data' published on HSE's vibration website, because some applications are different and data here may be subsets of the overall data.

Activity or process	Recommended initial value (m/s <sup>2</sup> )	Corresponding time to reach		Alternative methods	Further information (links on HSE website)
		Action value	Limit value		
Furnace/cupola descaling/lining removal with:  Breaker, or  chipping hammer	14  20	15mins  8mins	1hr 1min  30mins	Eliminate the use of hand-operated tools: <ul style="list-style-type: none"> <li>• water-cooled cupola without lining (for capacity &gt;9 tonnes/hr)</li> <li>• hydraulic lining “push-out” for furnace lining</li> <li>• hydraulic machine-mounted breaker</li> </ul> Reduce the frequency of lining renewal or slag chipping by: <ul style="list-style-type: none"> <li>• maximising life of lining through good cupola operating practice</li> <li>• reducing the build-up of slag by control of impurities</li> </ul>	Example: <a href="#">hydraulic push-out</a> Example: <a href="#">ladle slag chipping</a>
Ramming moulds with: sand rammers  electric demolition hammers	27 <sup>2</sup>  13 <sup>2</sup>	4mins  18mins	16mins  1hr 11mins	In jobbing foundries, where hand-ramming of moulds cannot be eliminated, the risk can be controlled by; <ul style="list-style-type: none"> <li>• mounting an electric hammer in a frame on a balancing rig</li> <li>• mounting a pneumatic rammer in a semi-rigid balancing arm</li> </ul>	

Note: Changes of process to eliminate or reduce vibration may introduce other hazards to safety or health (e.g. chemical, fume, spatter, noise, dust) that must be addressed and managed.

<sup>2</sup> There are currently no data available in ‘Sources of vibration magnitude data’ published on HSE’s vibration website for this activity or process. The value given here is a provisional value, pending collection of more data to ensure statistical validity.

## Steel fabrication/shipyards

Table 1B: Established alternative processes to avoid/reduce the use of vibrating equipment

Activity or process	Recommended initial value (m/s <sup>2</sup> )	Corresponding time to reach (hr:min)		Alternative methods	Further information (links on HSE website)
		Action value	Limit value		
<p>Manual cutting of steel plate and re-working to correct component profile using:</p> <p>angle grinders</p> <ul style="list-style-type: none"> <li>• small</li> <li>• large</li> </ul> <p>straight grinders</p> <p>chipping hammers (rarely)</p> <p>Nibbling machine (hand-fed type)</p>	<p>7</p> <p>9</p> <p>8</p> <p>27<sup>3</sup></p> <p>12</p>	<p>1hr 1min</p> <p>37mins</p> <p>47mins</p> <p>4mins</p> <p>21mins</p>	<p>4hrs 5mins</p> <p>2hrs 28mins</p> <p>3hrs 8mins</p> <p>16mins</p> <p>1hr 23mins</p>	<p>Expect to see accurate pre-prep: cutting components to correct size – “<i>Measure twice, cut once</i>”, with a minimum of “green”. Significant exposures from re-work using grinders etc. should be challenged.</p> <p>Select suitable modern precision processes for cutting out, as appropriate:</p> <ul style="list-style-type: none"> <li>• CNC oxy-fuel flame cutting</li> <li>• CNC machining</li> <li>• laser profiling (up to approx 5 mm plate thickness)</li> <li>• abrasive water jet cutting (up to 150 mm thickness) – cold process with no heat distortion</li> <li>• submerged plasma cutting</li> <li>• submerged spark erosion (electrical discharge machining)</li> </ul> <p>Note: Improving accuracy and minimising manual re-working is also usually cost-effective.</p>	<p>Example: <a href="#">machining</a></p> <p>Example: <a href="#">laser cutting</a></p> <p>Example: <a href="#">plasma cutting</a></p>
Weld preparation and finishing, using tools as above	As above	As above	As above	<p>Apply bevelled edges for welding while cutting out to avoid unnecessary grinding</p> <p>Use single sided welding (with a suitable backing material) to avoid routine back gouging associated with double sided welding (resulting distortion can be managed with “strongbacks”, heat line straightening, etc.)</p>	

<sup>3</sup> Values differ from ‘Sources of vibration magnitude data’ published on HSE’s vibration website, because some applications are different and data here may be subsets of the overall data. In addition, values given here are provisional, pending collection of more data to ensure statistical validity.

Activity or process	Recommended initial value (m/s <sup>2</sup> )	Corresponding time to reach (hr:min)		Alternative methods	Further information (links on HSE website)
		Action value	Limit value		
Removing fairing aids, lifting lugs, etc. using grinders (see above)	As above	As above	As above	<p>Design fairing and lifting processes to avoid the need for temporary welded aids, which must be removed by grinding:</p> <ul style="list-style-type: none"> <li>• Use magnetic, vacuum or screw clamps and anchors instead of welded fairing aids</li> <li>• Bolt fairing aids to welded studs that require less grinding to remove</li> <li>• Design welded lifting lugs that can be left in place</li> <li>• Use lifting clamps instead of welded lifting lugs</li> <li>• Use bolted lugs or shackles instead of welded lifting lugs</li> </ul>	
<p>Surface preparation using:</p> <p>needle scalers</p> <ul style="list-style-type: none"> <li>• non-vibration reduced</li> <li>• vibration reduced</li> </ul> <p>scaling hammers/scabblers (piston type)</p>	<p>19</p> <p>7</p> <p>12</p>	<p>8mins</p> <p>1hr 1mins</p> <p>21mins</p>	<p>33mins</p> <p>4hrs 5mins</p> <p>1hr 23mins</p>	<p>Cleaning steel surfaces and preparing them for painting. Use of scaling tools should be minimised (to small and awkward areas only) and modern vibration-reduced tools should be used.</p> <p>Where reasonably practicable, an appropriate alternative process should be used, for example:</p> <ul style="list-style-type: none"> <li>• shot blasting</li> <li>• abrasive vacuum blasting</li> <li>• ultra-high-pressure (UHP) water jetting</li> <li>• dry ice pellet blasting (non-abrasive “clean” method)</li> <li>• ice blasting (wet)</li> </ul>	<p>Example: <a href="#">abrasive blasters</a></p>

Note: Changes of process to eliminate or reduce vibration may introduce other hazards to safety or health (e.g. chemical, fume, spatter, noise, dust) that must be addressed and managed.

Note: Since 1998, HSE policy in shipyards has been to serve IN for control where no progress has been made and PN where old design chipping or scaling tools are being used for more than 1 hour per day.

## Construction

Table 1C: Established alternative processes to avoid/reduce the use of vibrating equipment

Activity or process	Recommended initial value (m/s <sup>2</sup> )	Corresponding time to reach		Alternative methods	Further information (links on HSE website)
		Action value	Limit value		
<b>Tunnelling</b> by hand with clay spade or jigger pick	16 <sup>4</sup>	12mins	47mins	Use mechanised tunnelling methods to eliminate hand digging. This is expected for all but the smallest tunnelling jobs.	<a href="#">British Tunnelling Society code of practice on hand-arm vibration</a>  <a href="#">Tunnelling and Pipe Jacking: Guidance for Designers</a>
<b>Breaking</b> concrete, asphalt, etc. with hand-operated breakers in groundwork, road maintenance, etc.	14	15mins	1hr 1min	Plan construction work (e.g. casting-in ducts, detail box-outs) to minimise breaking through new concrete/masonry. Use alternative method/equipment as appropriate: <ul style="list-style-type: none"> <li>• machine-mounted hydraulic breakers</li> <li>• floor saws</li> <li>• directional drilling/pipe jacking to avoid trenching</li> <li>• hydraulic crushers</li> <li>• hydraulic bursters</li> <li>• diamond core drilling</li> <li>• diamond wire cutting</li> <li>• hydro-demolition (UHP water jetting)</li> </ul>	<a href="#">Construction Industry Council guidance</a> Example: <a href="#">mounted breaker</a> Example: <a href="#">directional drilling</a> Example: <a href="#">crushing concrete</a> Example: <a href="#">bursting concrete</a> Example: <a href="#">diamond wire cutting</a> Example: <a href="#">water jetting</a> <a href="#">Codes of Practice from the Water Jetting Association</a>
<b>Demolition</b> of concrete/masonry using: hand-held hammers: <ul style="list-style-type: none"> <li>• demolition or rotary hammers</li> <li>• pneumatic hammers</li> </ul> or breakers	18	9mins	37mins		
	25	5mins	19mins		
	14	15mins	1hr 1min		

<sup>4</sup> There are currently no data available in 'Sources of vibration magnitude data' published on HSE's vibration website for this activity or process. The value given here is a provisional value, pending collection of more data to ensure statistical validity.

Activity or process	Recommended initial value (m/s <sup>2</sup> )	Corresponding time to reach		Alternative methods	Further information (links on HSE website)
		Action value	Limit value		
<b>Pile cropping</b> using hand-held hammers/breakers	See data for hand-held hammers/breakers	See data for hand-held hammers/breakers	See data for hand-held hammers/breakers	<p>Pile cap removal using hand-operated breakers is <b>not acceptable</b>. Use alternative method as appropriate:</p> <ul style="list-style-type: none"> <li>• Elliott method</li> <li>• Recipieux method</li> <li>• suspended hydraulic pile cropper</li> <li>• the alternative methods already described for hand-operated breakers, especially machine-mounted breakers</li> <li>• design pile spacing and pile re-bar for mechanised cropping</li> </ul> <p>Note: some dressing using hand-operated tools may still be required.</p>	<a href="https://www.effc.org/content/uploads/2015/12/Breaking_Down_of_Piles_May2015.pdf">https://www.effc.org/content/uploads/2015/12/Breaking_Down_of_Piles_May2015.pdf</a>
<b>Scabbling</b> using: scabblers	12	21mins	1hr 23mins	<p>Scabbling purely for architectural aesthetic effect is <b>not acceptable</b>. Specify finishes that do not require scabbling. (Some finishes can be designed into shuttering, using special moulds or chemical retardants and water jetting.)</p> <p>Surface preparation to ensure a good concrete bond. Use of alternative methods where technically appropriate:</p> <ul style="list-style-type: none"> <li>• grit blasting (wet or dry)</li> <li>• use of chemical retarders and pressure washing</li> <li>• cast in proprietary joint formers e.g. mesh formwork</li> <li>• UHP water blasting (refer to Code of Practice from the Water Jetting Association for safety guidance)</li> </ul>	<p><u>Example: grit blasting</u></p> <p><u>Example: paint-on retarder</u></p> <p><u>Example: special formwork</u></p> <p><u>Codes of Practice from the Water jetting Association</u></p>
<b>Wall chasing</b> using hand-held breakers	See data for hand-held breakers	See data for hand-held breakers	See data for hand-held breakers	<p>In new buildings, specify built-in ducting</p> <p>In existing buildings, consider over-coating existing plaster and building in the ducts</p>	<a href="#">Construction Industry Council guidance</a>

Activity or process	Recommended initial value (m/s <sup>2</sup> )	Corresponding time to reach		Alternative methods	Further information (links on HSE website)
		Action value	Limit value		
<b>Drilling</b> masonry/concrete using: electric hammer drills or “combihammers”	18	8mins	33mins	Design and plan to avoid unnecessary drilling. Use, where appropriate: <ul style="list-style-type: none"> <li>• jig-mounted drilling</li> <li>• diamond core drilling (clamped in rig)</li> <li>• cast-in anchors and channels for wall fixings instead of drill-and-fix types</li> <li>• direct fastening tools</li> </ul>	

Note: Changes of process to eliminate or reduce vibration may introduce other hazards to health (e.g. noise, dust) or to safety (e.g. hazards associated with lifting operations in some mechanised methods for pile cap removal), which must be addressed and managed.



Table 2: General management of HAV risks where the use of vibrating equipment is unavoidable

Issue	<i>Expectation</i>
<b>Selection of work equipment</b>	<p>Tool selection can make a substantial difference to the vibration magnitude, but the tool must be suitable for the task and used correctly.</p> <p>Employers should demonstrate a sound procurement policy for power tools and hand-guided machines, showing that they have considered the following:</p> <ul style="list-style-type: none"> <li>• There is no reasonably practicable alternative method with no (or less) vibration magnitudes (see Table 1 for specific sectors)</li> <li>• Equipment is generally suitable for the job (safety, size, power, efficiency, ergonomics, cost, user acceptability, etc.)</li> <li>• Reduced vibration designs are selected assuming the tools are otherwise suitable (e.g. grinders with automatic spindle balancing, breakers with handle suspension, etc)</li> <li>• Information (e.g. from manufacturers, hire company, databases, trade associations etc.) on likely in use vibration magnitudes shows that they are lower, or at least not higher, than those for competing machines also suitable for the job</li> <li>• For hand-fed machines, for example pedestal grinders, ensure the work rest is isolated from machine vibration – if necessary, use floor standing rests</li> <li>• Available information from the manufacturer, or elsewhere, on control of vibration risks through: <ul style="list-style-type: none"> <li>○ maintenance of tools and accessories (e.g. servicing grinders, sharpening drills and chisels)</li> <li>○ selection of appropriate consumables (e.g. suitable grit size and hardness of abrasive wheels, pitch of teeth on rotary files/burrs, chisels, drills, etc) with lower vibration design</li> <li>○ correct operation and operator training (see below)</li> <li>○ maximum daily ‘trigger times’ or maximum daily work done with the tool etc.</li> </ul> </li> </ul>
<b>Limiting daily exposure time</b>	<p>Restricting exposure time (“finger-on-trigger” time) may be required to bring exposures below the Exposure Limit Value (ELV), even after all reasonably practicable measures to reduce vibration magnitudes are in place.</p> <p>Maximum times can be determined using the exposure points system or supplier’s “traffic lights” tool categories, but these should be based on “real use” vibration magnitudes from a reliable source.</p> <p>Note: Employers tend to ask “How long can we use this tool?” The exposure must be reduced to the <u>lowest level that is reasonably practicable</u> (Reg 6(2)); the ELV should not be used as a target, if a lower exposure is reasonably practicable.</p>
<b>Other risk controls</b>	<p>Control of HAV risk by means other than reducing vibration exposure:</p> <ul style="list-style-type: none"> <li>• ergonomic aids, for example: <ul style="list-style-type: none"> <li>○ use tensioners or balancers to support the weight of the tool and reduce the grip and other forces applied by operator</li> <li>○ provide work rests to take the weight of heavy workpieces hand-fed to machines (but avoid transmission of machine vibration to the workpiece via the rest)</li> </ul> </li> <li>• suitable workplace temperature or provision of warm clothing and gloves</li> <li>• regular breaks from work involving vibration and encourage operators to exercise fingers</li> </ul>

Issue	<i>Expectation</i>
<b>Information, instruction and training</b>	<p>Employees at risk from vibration should have received information on:</p> <ul style="list-style-type: none"> <li>• the risks from HAV and how to help reduce them</li> <li>• the importance of correct operation and maintenance of equipment</li> <li>• arrangements for health surveillance and their duty to cooperate</li> <li>• Tools must be used correctly, as recommended by the manufacturer. This may require operators to receive specific training. Are operators and their supervisors aware of such needs? For example, <ul style="list-style-type: none"> <li>○ if an unsuitable abrasive is used, operators may resort to “bumping” the grinder against the casting; this can result in distortion of the wheel and increased vibration, and there is also a risk of wheel breakage;</li> <li>○ percussive tools with suspension systems designed to absorb vibration must be used correctly and with appropriate force, or the potential reduction in vibration will not be achieved</li> </ul> </li> </ul>
<b>Health surveillance</b>	<p>Required where the Exposure Action Value (EAV) is likely to be exceeded or employees are otherwise at risk. Expect to see, as a minimum:</p> <ul style="list-style-type: none"> <li>• use of a periodic health screening questionnaire – ideally annually and for new employees</li> <li>• arrangements for referral of relevant cases to an occupational health provider with HAVS expertise, for diagnosis and on-going monitoring</li> <li>• arrangements to receive medical advice on management of affected employees</li> <li>• arrangements for RIDDOR reporting of CTS cases and new or worsening of HAVS cases</li> <li>• arrangements to receive grouped information on employees' health, to demonstrate effectiveness of vibration controls</li> </ul> <p>Note: In construction, short-term employment presents difficulties for managing health surveillance; cooperation between different employers should be encouraged.</p>