



AzSPU Hand-Arm Vibration Programme

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1.0 Purpose/Scope

BP is committed to the HSE policy of “no harm to people” and so recognizes that hand arm vibration is an area where ill health can arise.

This document presents the AzSPU approach to the assessment and management of Hand Arm Vibration risks. It provides a control strategy to eliminate, or reduce to as low as is reasonably practicable, the effects of hazardous vibration on employees working at AzSPU locations, who are exposed to potentially harmful levels of vibration, as a result of working with hand held power tools.

The scope of this programme relates to all tools, equipment and processes that transmit harmful levels of vibration to the hands and arms of employees, including contractor employees within AzSPU locations.

This programme is aimed to supervise hand arm vibration management programmes of contractor companies using power tools and to ensure their compliance with BP requirements and UK HSE regulations.

2.0 Definitions

AzSPU	Azerbaijan Strategic Performance Unit
Health Team	BP Azerbaijan SPU HSE and Engineering Department, Health Team.
ALARP	As Low As Reasonably Practicable
HAV	Hand Arm Vibration
EAV	Exposure Action Value
ELV	Exposure Limit Value

3.0 General Requirements

The Control of Vibration at Work Regulations 2005, UK.

4.0 General Information

4.1 What is HAV?

Hand Arm Vibration is vibration transmitted from work processes into workers' hands and arms. It can be caused by operating hand held power tools such as grinders, drills, needle guns, cengar saws, electrical and pneumatic hammers and drills, both percussive and rotary grinders, or by holding materials being processed by machines such as pedestal grinders.

4.2 When it is hazardous?

Regular exposure to HAV can cause a range of permanent injuries to hands and arms, collectively known as hand-arm vibration syndrome (HAVS).

4.3. Exposure Limit Value

The daily exposure limit value is the maximum amount of vibration an employee may be Exposed to on any single day.

For hand-arm vibration the daily exposure limit value, standardized to an eight-hour reference period, shall be 5 m/s^2 . Exposure shall be assessed by measuring vibration acceleration.

4.4. Exposure Action Value

The daily exposure action value is the level of daily exposure to vibration above Which you are required to take certain actions to reduce exposure.

For hand-arm vibration the daily exposure action (acceleration) value, standardized to an eight hour reference period, shall be 2.5 m/s^2 . Recommended daily action levels are reflected in the Table 1.

For the average overall vibration levels over the working day that cause an A(8) of 2.5 m/s^2 refer to Table 2.

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

Length of working day (hours)	16	12	8	4	2	1	$\frac{1}{2}$
Average overall vibration level over working day to give A(8) of 2.5 m/s^2	1.8	2.0	2.5	3.5	5	7.1	10

5.0 Key roles and responsibilities

5.1 Site Manager is responsible for health and safety of all personnel at the site, but shall assign specific responsibilities to the following personnel:

5.1.1 Site HSE Advisor

Acts as a focal point for all HAV issues, including:

- Ensuring that the use of power tools has been assessed in accordance with this programme
- Ensuring all personnel using hand tools are trained in HAV and that training logs are maintained.
- Monitoring HAV assessment and record sheet (see Appendix 3).
- Ensuring that personnel' exposure to HAV is not exceeding action value of 2.5 m/s^2 A(8).
- Regularly communicating to employing company on any personnel exposed to excessive HAV (A(8) over 2.5 m/s^2)
- Conducting internal audits to determine contractor compliance with this programme
- Liaise with Industrial Hygienist on any support in hand arm vibration programme, including measurements
- Ensure that suitable PPE is available

5.1.2 Responsible Site Personnel for Issuing Tools (Site to identify)

Those responsible for all power tools under their control shall:

- Ensure that each tool has been supplied with Tool Identification Number; Test Date; Vibration Level and Maximum Hourly Use per Day.
- Ensure that, prior to issue, each tool is fitted with a MicroTag detailing Tool Identification Number; Test Date; Vibration Level and Maximum Hourly Use Per Day. Micro-tags may be colour coded as follows:
 - ✓ **Red Tag** -For tools above 5.0 m/s². Indicates high risk therefore Bi-monthly assessment is required.
 - ✓ **Amber** – between 2.5 and 5m/s². Assessment shall be carried out annually.
 - ✓ **Green Tag**-For tools below 2.5 m/s². Indicates low risk, 2-yearly assessment is required.
- Ensure HAV Assessment and Record Sheets are issued with power tools.

5.1.3 Supervisors of personnel using power tools shall:

- Identify and implement methods or work practices to reduce workers' exposure to HAV.
- Collect all HAV Assessment and Record Sheets from individuals using power tools and filing of completed sheets for future analysis by site medic/H&S Advisor and BP Industrial Hygienist.
- Ensure that site medics are aware and involved on any health issues related to exposure to HAV

5.1.4 Users of Power Tools are responsible for:

- Regular visual inspection of tools to identify any defects prior to use.
- Completion of HAV Assessment and Record Sheet for tools above 2.5 m/s²
- Reporting symptoms of HAV to supervisor and/or site Medic.
- Getting adequate training in HAV and proper use of tools

5.2 Contractors shall:

- Comply with all requirements of this programme and ensure that all necessary actions are taken to reduce exposure of their employees to hand arm vibration
- Contractors' companies using power tools should carry out regular audits to ensure compliance with BP requirements and regulations .

5.3 Health Manager shall:

- Appoint a person for periodic review and update of this document.
- Support Assets in the implementation and monitoring of Hand Arm Vibration programme

5.4 Industrial Hygienist shall:

- Be responsible for provision of technical support, guidance and advice on all aspects of hand arm vibration management
- Carry out HAV assessment wherever required

- Support site HSE Advisors in conducting periodic audits at different locations to ensure contractors' compliance with this programme.

5.5 PU Health Advisor shall:

- Set up and implement hand arm vibration surveillance programme if necessary
- Coordinate medical provider in implementation of Hand arm vibration surveillance programme

6.0 CONTROL MEASURES

6.1 Overview

The control measures, which are to be considered to eliminate or reduce the effects of hazardous vibration, are as follows:

- Elimination or Substitution
- Engineering Controls
- Procedural Controls
- Personal Protective Equipment

7.2 Elimination or Substitution

Elimination of exposure to HAV is the best control measure, therefore the question "Is it absolutely necessary to carry out this work?" should always be asked. In a practical working environment the more realistic outcome is for exposure to be "As Low As Reasonably Practicable" and this can be achieved by substitution, modification or management controls. In addition to the assessment of specific working practices reference should be made to manufacturers' data on the probable magnitudes of vibration corresponding to the types of equipment and particular conditions of use. Alternative designs or models of equipment should be selected if this will achieve a quantifiable reduction of risk from HAV.

7.3 Engineering Controls

Where elimination or substitution is not feasible, then consideration must be given to the design of the product or process. The desired effect would be to design out hazardous operations that involve power tools and equipment. Existing tools and equipment can be modified to reduce the risk of HAVS to the worker. Manufacturer should be involved into decision on the correct and applicable modification. If existing tools and equipment are modified then site assessments should be conducted and recorded to take account of the modifications. Provision of auxiliary equipment, such as handles which reduce the vibration transmitted to the hand arm

7.4 Procedural Controls

Where workers' exposure regularly exceeds an **A(8) of 2.5 m/s²** programmes of preventative measures are recommended. This programme will include:

- Selection of tools and machinery
- Appropriate maintenance programmes for work equipment, the workplace and workplace systems
- Selection of consumables such as abrasives, cutting-bits etc
- Collation and assessment of vibration data

- Assessment of workplace design, layout and environment -
- Medical examination and health surveillance
- Provision of information, instruction, training and supervision
- Audit and review
- Management of subcontractors
- Inspection
- Job rotation

Where people have to work in cold areas further specific measures may include:

- Wearing warm gloves, and waterproof clothing for work in cold or wet areas
- Avoid pneumatic exhausts which discharge towards the workers hands (a flexible hose to lead the exhaust away might help)
- Arrangements to allow workers to warm up before starting work
- Massaging and exercising fingers during regular breaks to help blood circulation.

This guidance, together with Section 6.0 of this programme, details implementation of the above procedural controls.

7.5 Personal Protective Equipment

Keeping the hands and body warm helps to maintain good blood flow to the fingers and reduces the risk of injury from HAVS. Various gloves, with special soft linings intended to provide vibration isolation, are commercially available, but tests have shown that they are not usually effective in reducing the amount of vibration reaching the workers hands. They will usually provide little or no protection against vibration at the most damaging frequencies, and poorly selected gloves might even increase the vibration transmitted to the wearer's hands.

As a result of the poor performance of anti-vibration gloves, it is recommended that gloves should be selected on their ability to keep hands warm.

7.6 Maintenance Strategy

Vibratory equipment shall have routine maintenance carried out:

- ✓ **Red Tag** -For tools above 5.0 m/s². Indicates high risk therefore Bi-monthly assessment is required.
- ✓ **Amber** – between 2.5 and 5m/s². Assessment shall be carried out annually.
- ✓ **Green Tag**-For tools below 2.5 m/s². Indicates low risk, 2-yearly assessment is required.

The assessment should consist of maintenance checks, electrical integrity (i.e. PAT Testing) etc, which should be in accordance with the manufacturer's advice.

8.0 Implementation of HAVS Control Strategy:

8.1 Identification and assessment of hazardous tools and operations

Every site should create equipment inventory.

Every employer, who uses equipment, must ensure measures are taken to reduce the risk and to conform to the AzSPU HAV Management Programme.

Suppliers and vendors sending tools to BP sites are responsible for supplying the following information with each tool:

- Tool Identification Number
- Vibration Magnitude in m/s^2
- Test Date
- Maximum Hourly use per day (in order for the user not to exceed an $A(8)$ of 2.5 m/s^2)

This information must accompany each tool sent to the site and will be included within the site inventory of power tools. Prior to purchasing tools for use on BP/AzSPU sites, information must be obtained from suppliers about the vibration magnitudes their products are likely to create in normal use (frequency weighted acceleration in m/s^2). Data Sheets should also be obtained for existing tools and equipment from suppliers or manufacturers. It must be borne in mind that these figures have been derived from test lab conditions and not workforce conditions.

Vibration level should be verified at the earliest opportunity and at least during the first service period by measuring the vibration magnitude when the tool is operating, utilizing relevant consumables against a suitable surface by site H&S Advisor

This information should then be used to update exposure limits/recommended working time for that tool as identified above. The following question list provides useful guidance for tool selection:

Purchasing New Tools and Equipment

- (1) Is the vibration of any handle or other surface to be held by the user likely to exceed an acceleration of 2.0 m/s^2 , in normal use?
If the answer to this question is YES,
- (2) What is the overall frequency-weighted acceleration:
 - a) Under operating conditions producing the highest vibration?
 - b) Under typical operating conditions?
 - c) Under other standard conditions?
- (3) Under what operating conditions were the measurements made?
- (4) If the tests were in accordance with a published standard, provide details and indicate the extent to which the vibration may differ from the quoted values under normal conditions of use.
- (5) What measures have been taken to minimise vibration?
- (6) Are additional vibration reduction measures practicable? Give details of any design changes, the additional cost and any production penalties.
- (7) What is the maximum frequency-weighted acceleration that the tool or equipment can be guaranteed not to exceed?
- (8) What tests would be carried out to confirm any claims made in answer to question 7?
- (9) What other measures are required to minimise the vibration hazard to which employees are exposed when using the tool or equipment in question?
Give details of any special maintenance requirements.

8.2 REGISTRATION OF TOOLS

All tools with the potential to cause exposure to vibration must be registered and supplied by companies sending tools to site with information as detailed above. This information will be included within the site inventory of power tools and should be added to the site's HAVS monitoring spreadsheet.

To aid identification each tool must be fitted with a Micro-tag, by the person responsible for issuing the tools, identifying Tool Identification Number; Test Date; Vibration Level and Maximum Hourly Use Per Day (Appendix 1). A colour coding system may be used if desired. These will be colour coded as follows –

Red Label – For tools above 2.0 m/s^2 .

Green Label – For tools below 2.0 m/s^2 .

The user of any tool having a vibration magnitude greater than 2.0 m/s^2 will be required to complete a HAV Assessment and Record Sheet (See Appendices) in order to ensure that daily exposure does not exceed an A(8) of 2.5 m/s^2 .

Assessments must be maintained on site for at least three months for inspection by the site HSE personnel.

Examples of the Assessment and Record Sheet together with tool colour label sheets are included as appendices.

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8.3 AWARENESS, INFORMATION, INSTRUCTION AND TRAINING

Training is recognised as being an essential tool to raise awareness and help reduce the risk of employee's health being affected by vibration. The level of training and awareness will be as follows:

- All personnel working in AzSPU locations can receive a awareness session to provide background knowledge and information Reference to VTA number
- All personnel performing, or supervising, work involving power tools, must be trained in the requirements of this programme. – Reference to VTA number

This will include:

- Awareness on exposure limit and action values
- Potential sources of HAV
- The health effects of HAV, including circumstances which provide entitlement to health surveillance
- Risk factors (e.g. high levels of vibration, daily length/regularity of exposure)
- Results of any applicable assessment and/or measurements
- How to recognize and report signs of injury
- Ways to minimize risk, including:
 - ✓ Changes to working practices to reduce vibration exposure
 - ✓ Correct selection, use and maintenance of equipment
 - ✓ Maintenance of good blood circulation at work, e.g. by keeping warm and exercising fingers
- Maintenance personnel must be given instruction and training on the repair of equipment to ensure good maintenance practice to reduce vibration. –
- Purchasers/subcontractors to be given instruction and information regarding AzSPU HAV management programme and its requirements.

8.4 Assessment and Reporting of use of vibration equipment

Each tool must be marked with maximum hourly use per day. In any 12-hour shift it is expected that, with breaks etc., no person is likely to achieve a total usage of a power tool in excess of 8 hours. Therefore, using the action level given above, tools with a vibration magnitude equal to, or less than, 2.5 m/s^2 should not, under normal circumstances, cause the user to exceed an $A(8)$ of 2.5 m/s^2 if used for 8 hours or less in a 24 hour period.

To ensure satisfactory control, when using tools with a vibration magnitude above 2.0 m/s^2 , the risk of using that tool must be assessed. Each employee must record usage of power tools on a HAV Assessment and Record Sheet to determine if exposure limits have been breached (Appendix 3). Use of a power tool will have been identified during the pre-job risk identification process and, on withdrawing a power tool with a vibration level above 2.0 m/s^2 from the tool store, a HAV Assessment and Record Sheet will be issued with the tool.

Where the same worker, in the completion of a task, uses more than one vibratory tool, the maximum exposure time for each tool is reduced. The spreadsheet, which accompanies this programme, allows the calculation of $A(8)$ values when using a combination of tools. By entering identified vibration levels and usage times for each tool it calculates the overall $A(8)$ value, which would occur if using those tools. If overall $A(8)$ values are over 2.5 m/s^2 then it will be necessary to reduce the usage until satisfactory levels are achieved.

It shall be the responsibility of both the user and his employer/supervisor to ensure that both the maximum permitted time and the daily cumulative time for the tool(s) are not exceeded.

At the end of the day the user shall present the HAV Assessment and Record Sheet to his supervisor who shall sign the sheet as verified and retain it on file. At regular intervals, of not less than three months, the MEDIC or other person on site responsible for health issues will review returned record sheets.

It is important to note that the use of the HAV Control Strategy is additional to any controls specified in the Permit to Work system. The normal operations of AzSPU BP will still apply in that the use of power tools will still be subject to the controls and authorisations required by the Permit to Work System

8.5 HEALTH SURVEILLANCE

Employers of personnel carrying out work giving rise to significant risk of HAVS, i.e. workers likely to be exposed above **an A(8) of 2.0 m/s²**, must ensure that their employees are annually monitored for the development of HAVS.

Such a health surveillance system will include:

- New and existing employees, identified as having significant exposure to HAVS risk will undergo a medical assessment, including completion of a Health Surveillance Questionnaire such as that detailed in AzSPU Health Surveillance Programme.
- Employees are encouraged to recognize and report symptoms as soon as possible to their own Doctor, Supervisor, site Medic or other person responsible for health issues on site, in order that controls can be introduced or reviewed to prevent symptoms developing further.

For more detailed information on health surveillance please refer to AzSPU Health Surveillance Programme

8.6 Analysis and Audit

At regular intervals, of not less than three months, the site medic or other responsible for site health issues person (e.g. H&S Advisor) will review returned HAV Assessment and Record Sheets in order to ensure that HAV controls are being complied with, including, in particular, that exposure of any individual has not exceeded recommended levels. In addition the site tools inventory, color code tags; tool and task risk assessment should be reviewed. This will help to identify any improvements to the system, and ensure that requirements are being met.

The review should include a check on which tools are being used most frequently and to cross check this to the HAV risk associated with those tools. In this way it may be possible to identify and investigate the potential for high-risk tools to be changed out or replaced, or for different method to be used to eliminate HAV risk completely

It is expected that all employers of personnel who use vibration tools at AzSPU BP locations will have a demonstrated system to ensure controls are adequate to reduce vibration exposure to their employees to as low as reasonably practicable.

Using this approach it will be possible to drive a continuous improvement process with respect to HAV risk minimisation at the site.

8.7 Records

8.7.1 Health Records

The employing company should retain relevant health records, including:

- Pre-employment Health Surveillance Questionnaire
- Hand assessments – Health Surveillance Questionnaire
- Individual health surveillance records

8.7.2 Equipment Records

Equipment Records must be available on each installation and consist of:

- Equipment inventory
- Test certificate and Test Date
- Tool Identification Number
- Vibration Level in m/s^2
- Maximum Daily Usage

8.7.3 Training Records

Training Records must be maintained by each site and copied, where applicable, to parent companies. These will consist of:

- Course name and contents
- Attendees name and date of course

8.7.4 Exposure Records: HAV Assessment and record sheet

Exposure Records should be held for those personnel with exposure above an $A(8)$ of 2.5 m/s^2 or who, after risk assessment, perform tasks, which cannot be executed within the equipment safe working times. These records should be held on the site for at least three years for review by the medic, H&S Advisor, Industrial Hygienist. Records should include:

- A risk assessment of the work
- Exposure times of employees who executed work out with the equipment safe working times

Revision/Review Log

Revision Date	Authority	Custodian	Revision Details
12/12/2008	Almaz Aghazada	Hijran Jafarova	Initial Issue
14/12/2009	Almaz Aghazada	Hijran Jafarova	<ul style="list-style-type: none"> • Section 4.3 /4.4 Exposure limit and action values established as per the UK HSE HAV regulations • Section 5.0 Roles and responsibilities have been revised • Section 7.6 Maintenance strategy: Color coded information added
15/07/2010	Almaz Aghazada	Hijran Jafarova	<ul style="list-style-type: none"> • Periodic review

Appendix1

VIBRATION MEASUREMENTS AND VIBRATION EXPOSURE

Vibration is measured using a meter with a 'hand arm weighting' that filters the signal from accelerometers to give a hand arm acceleration value in m/s^2 . The method of measurement involves determining the frequency weighted acceleration values for three orthogonal axes, $a_{\text{hw}x}$, $a_{\text{hw}y}$ and $a_{\text{hw}z}$. The overall vibration a_{hv} is then calculated as follows:

$$a_{\text{hv}} = \sqrt{a_{\text{hw}x}^2 + a_{\text{hw}y}^2 + a_{\text{hw}z}^2}$$

The measurements should be made on the vibrating surface as close as possible to the centre of the gripping zone of the machine, tool or workpiece. A mounting force should be used which is representative of the coupling of the hand to the vibrating power tool, handle or workpiece. The vibration dose received by the worker over a typical working day depends on the duration of exposure as well as the level of vibration. The duration of exposure is the time actually working with the tool on i.e. the "Trigger Time" the tool is used.

To allow different exposure patterns to be compared, they are adjusted or 'normalised' to a standard reference period of 8 hours.

This equivalent value over 8 hours is called the $A(8)$ value and is determined as follows:

$$A(8) = a_{\text{hv}} \sqrt{\frac{T}{T_0}}$$

Where

T is the total daily duration of exposure to the vibration a_{hv} ,

T_0 is the reference duration of 8 hours.

If the work is such that the total daily vibration exposure consists of several operations, with different vibration magnitudes, then the daily vibration exposure $A(8)$ is determined by:

$$A(8) = \sqrt{\frac{1}{T_0} \sum_{i=1}^n a_{\text{hvi}}^2 T_i}$$

where: a_{hvi} is the vibration total value for the i th operation
 n is the number of individual vibration exposures
 T_i is the duration of the i th operation

The permissible maximum exposure time to a measured level of overall hand arm vibration can be calculated as follows:

$$t = \left(\frac{2.5}{a_{hv}} \right)^2 \times 8$$

where: t = time in hours
 a_{hv} = overall hand arm acceleration value in m/s^2

The overall hand arm vibration dose to which workers are exposed should not exceed the equivalent value of $2.5 m/s^2$ for a period of 8 hours ($2.5 m/s^2 A(8)$). For example if you had a tool with a vibration level of $2.0 m/s^2$ then the permitted usage time without exceeding the recommended daily exposure i.e. an $A(8)$ of $2.5 m/s^2$ would be calculated as follows:

$$t = \left(\frac{2.5}{2.0} \right)^2 \times 8$$

Hence the tool can be used safely for $t = 12$ Hours

Where the same worker, in the completion of a task, uses more than one vibratory tool, the maximum exposure time for each tool is reduced. Hand arm vibration calculator (Appendix 4), allows the calculation of $A(8)$ values when using a combination of tools. By entering identified vibration levels and usage times for each tool, it calculates the overall $A(8)$ value, which would occur if using those tools. If $A(8)$ values are over $2.5 m/s^2$ then it would be necessary to reduce the usage until satisfactory levels are achieved.

Appendix 2**Tool Identification Tag**

TOOL ID NUMBER	
<input type="text"/>	
TEST DATE	
<input type="text"/>	
VIBRATION LEVEL	
<input type="text"/> m.s ⁻²	
MAXIMUM USE PER DAY	
<input type="text"/> Hours	<input type="text"/> Minutes

Appendix 3

HAV assessment and record sheet

NAME (Print)	DATE
Signature	JOB TITLE

	Tool Type	Tool I.D. no.	Vibration Level (m/s ²)	Maximum Daily Use (hours)
1				
2				
3				
4				

Tool 1			Tool 2			Tool 3			Tool 4		
Start	Stop	Usage (hrs)	Start	Stop	Usage (hrs)	Start	Stop	Usage (hrs)	Start	Stop	Usage (hrs)
Total time used			Total time used			Total time used			Total time used		

Precautions taken

Comments (any defects with tool, experienced tingling of fingers, improvements etc.)	
Supervisor (sign)	Date

Appendix 4

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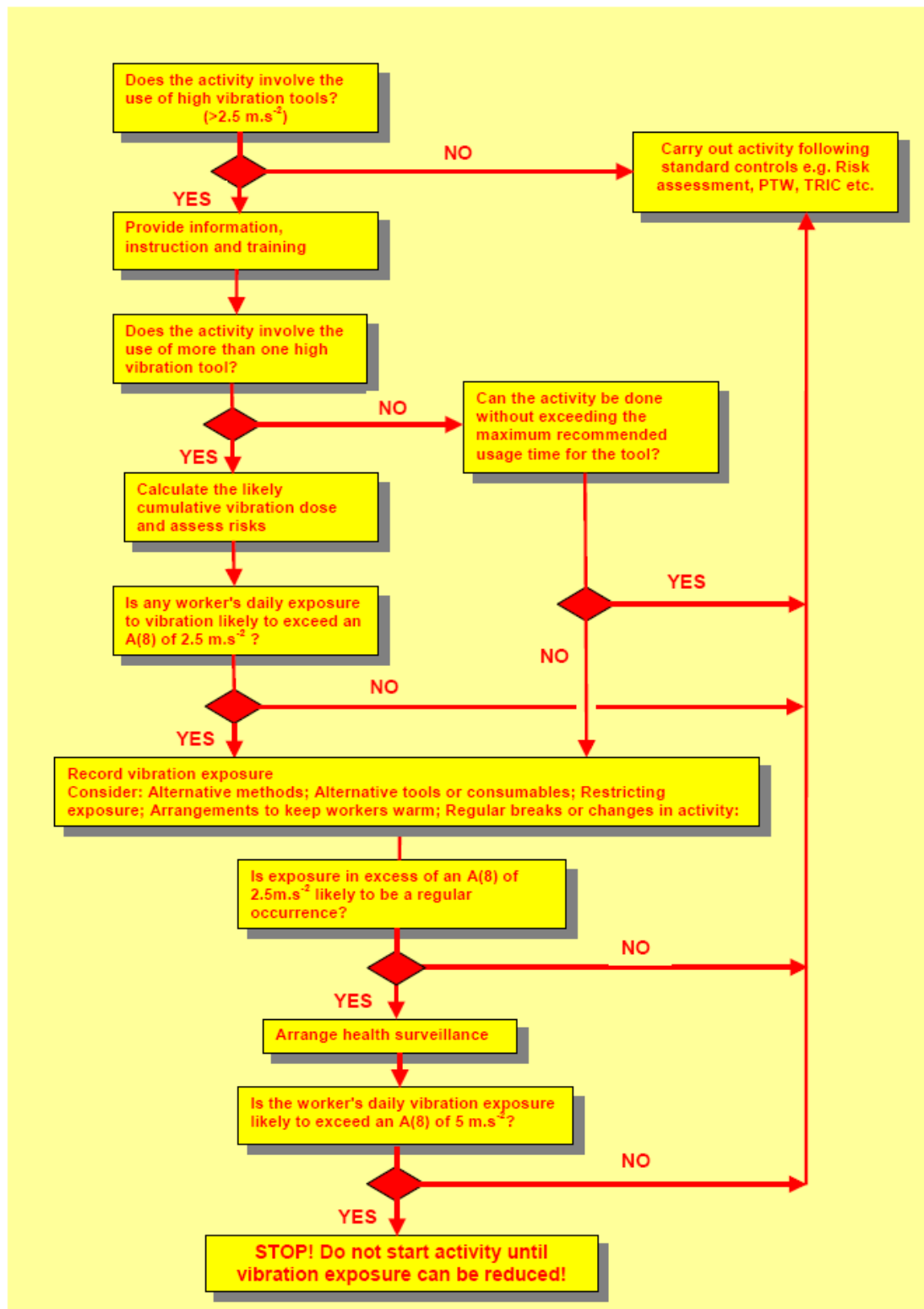
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CONTROL AND HAND ARM VIBRATION



Appendix 5



HAVS
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