



Safety & Wellbeing Policy Arrangement

Section 26 – Vibration at Work

E-mail healthandsafety@northlan.gov.uk

Arrangement Section 26 – Vibration at Work

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Further guidance on this matter can also be obtained from the Safety team at healthandsafety@northlan.gov.uk

1. Introduction

There are two main health issues related to vibration, hand arm vibration which can occur in operators who regularly work with hand-held vibrating equipment and whole body vibration which can occur in operators who regularly work with off road machinery eg. tractors, earth moving machines etc.

Hand Arm Vibration Syndrome

Operators can suffer various types of injury to the hands and forearms, including damage to the nerves and muscles, and impaired circulation. Collectively these injuries are known as 'hand-arm vibration syndrome' (HAVS) and can be triggered by cold temperatures. HAVS is a general term covering a range of conditions, including:

- Vascular disorders which cause impaired blood circulation and blanching of the affected fingers and parts of the hand. These are generally known as vibration-induced white finger.
- Numbness and tingling in the fingers and hands, reduced grip strength and dexterity and reduced sensitivity of touch and temperature, as a result of neurological and muscular damage.
- Other possible types of damage which lead to pain and stiffness in the hands and joints of the wrists, elbows and shoulders related to vibration is carpal tunnel syndrome.
- Chilblains at the end of an attack, which are caused by circulation returning (red flush), and can be very painful.

Advance Symptoms due to continued exposure can lead to some or all of the following:

- Extensive blanching of most fingers even in summer.
- Increased finger pain, swelling and ulceration.
- Continuous numbness - continuous aching up to the elbow.
- Severely reduced sense of touch.
- Seriously reduced manual dexterity and grip strength to the extent that sufferers can't dress themselves easily, carry out car maintenance, gardening etc, and some may have distorted finger joints.

HAVS is the generally accepted term to describe the diverse symptoms resulting from prolonged exposure to hand-transmitted vibration. The most commonly recognised symptom is that of the blanching of the fingers (i.e. reduction in blood supply resulting in white fingers), usually triggered by exposure to cold. This feature of altered circulation is sometimes referred to as Vibration White Finger, Vibration-Induced White Finger or just White Finger.

Vibration-Induced White Finger is an example of Reynaud's Phenomenon, which can have a number of other causes including the condition of Primary Reynaud's Disease. Prevalence of Primary Reynaud's Disease has been reported at between 3% and 20% of the population with 75% of sufferers being female, and its onset commonly occurs at about 40 years of age. Therefore, it is important to take advice from a consultant occupational physician to confirm the diagnosis of hand-arm vibration syndrome and the absence of other causes.

An attack can last several minutes and may be associated with pain when the circulation returns accompanied by blue and then red discoloration. The area affected usually increases with continued long-term exposure, typically starting at the fingertips and progressing upwards into the knuckles. Attacks are more likely in cold weather but more severe cases report symptoms associated with a fall in temperature in summer months or whilst swimming. Attacks lasting up to an hour have been reported. During an attack the individual often notices difficulty with manipulative dexterity and sometimes can experience problems with gripping the pneumatic tool or work piece. This can only put the employee's health and safety further at risk.

Whole Body Vibration

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

Associated health risks with whole body vibration can be individuals suffering headaches through to musculoskeletal disorders.

Those thought to be most likely to experience high vibration exposures are regular operators and drivers of off-road machinery such as:

- construction, mining and quarrying machines and vehicles, particularly earthmoving machines such as scrapers, bulldozers and building site dumpers;
- tractors and other agricultural and forestry machinery, particularly when used in transportation, tedding (turning hay), primary cultivation and mowing.

2. Statement

It is the intention of North Lanarkshire Council to reduce, so far as is reasonably practicable, the risks to employees' health and safety from the use of hand-held vibrating tools and equipment. Where appropriate, Assistant Chief Executives will ensure that a vibration management programme is in place in the Service and that Service Health and Safety Policies include arrangements on the following:

- Assessment of Risk from the use of hand-held vibrating tools and equipment by undertaking a programme of Vibration Assessments;
- Provision and Maintenance of Measures to Control Risks;
- Implementation of a 'Buy/Hire Smooth Policy for Machinery';
- Pre-employment Screening;
- Health Surveillance;
- Prevention or Control of Exposure to Vibration;
- Information, Instruction and Training;
- Supervision.

3. Legislative Expectations

The Control of Vibration at Work Regulations requires employers to assess the vibration risk to your employees then:

Decide if they are likely to be exposed above the daily exposure action value (EAV) and if they are:

- introduce a programme of controls to eliminate risk, or reduce exposure to as low a level as is reasonably practicable;
- provide health surveillance (regular health checks) to those employees who continue to be regularly exposed above the action value or otherwise continue to be at risk;

Decide if they are likely to be exposed above the daily exposure limit value (ELV) and if they are:

- take immediate action to reduce their exposure below the limit value;
- provide information and training to employees on health risks and the actions you are taking to control those risks.
- Consult your trade union safety representative or employee representative on your proposals to control risk and to provide health surveillance;
- Keep a record of your risk assessment and control actions;
- Keep health records for employees under health surveillance;
- Review and update your risk assessment regularly.

4. Vibration Management

A vibration risk management programme should be implemented. The objective of the programme is to meet the requirements of the legislation, principally the Control of Vibration at Work Regulations 2005 and other relevant regulations and standards by implementing a package of measures that will be effective within the organisation. The vibration management programme will contain the following elements:

- Identification and assessment of hazardous operations through expert measurement of tools, processes etc. to calculate risks and maximum permissible exposure values.
- Control of exposure through training of operators and modifying operations to minimise risks; reducing vibration through engineering modifications. It should be noted that there are no effective PPE options available at this time.
- A Buy/Hire Smooth procurement policy.
- Health surveillance programme.
- Maintenance of up to date assessments, which are suitable and sufficient, of each element of the programme through effective monitoring. This will then be extended outwards to cover operational activities, and relevant equipment. Any equipment that does not meet an acceptable standard, particularly the requirements of the Provision and Use of Work Equipment

Regulations 1998, will be repaired, modified or replaced as appropriate, according to a prioritised plan.

5. Identification and Assessment

Identification of the hazards and assessment of risks should be carried out where it is considered that employees may be exposed to vibration hazards while using any equipment relating to common industrial tools and processes which are listed in **Appendix 2**. This will be achieved through comprehensive risk assessments following the Council assessment system that is attached in **Appendix 1**.

Assessments must be undertaken by persons having the experience and training to do so, the more complicated an assessment, then the more training and/or experience the assessor will require. A competent assessor should be aware of his/her limitations and the system should provide for an assessor to request assistance, in undertaking assessment, from persons with the requisite training and experience.

Where any of the tools or processes listed in **Appendix 2** are used, Assistant Chief Executives should appoint a competent person(s) to undertake the required assessments using the Council assessment system or equivalent system approved by the Council Health and Safety Officer. Advice on this matter can be obtained from the Health and Safety Unit, who have Officers trained at an appropriate level. Assessment must be undertaken on all new activities before the activity commences.

An assessment will require to be undertaken for all processes or activities involving equipment or processes that could expose employees of the council to a level of vibration which could exceed the recommended levels. This will be in writing and a detailed study of the process/activity will be required. The assessment process should make use of the Equipment Safety Data Sheets provided by the manufacturer or supplier.

Machinery suppliers' information data sheets should be requested prior to purchase to allow comparison of assessment. The interpretation of suppliers' data has to be made with caution. Areas quoted are often emission values either when the tool is idling and not in contact with the work piece.

Assessments undertaken by the competent person experienced in the measurement of hand-transmitted vibration should take into account the following risk factors:

Grip force	Length and frequency of work	Workplace temperature
Push force	Rest causes	Individual's susceptibility

When an assessment is being undertaken the following steps should be followed:

1. Identify hand-transmitted vibration tasks and hazards;
2. Decide who and what is to be assessed and where assessments are to be carried out, including specifying the number of employees engaged in each work activity;
3. Investigate and document the task where hand-transmitted vibration is occurring;

4. Identify components of work pieces used;
5. Detail equipment, including the manufacturer, model, plant and equipment identity, tool speed, tool type and type of tool bit or accessory;
6. Note whether the equipment incorporates any anti-vibration feature, e.g. side handles or vibration damp;
7. Measure the exposure times, and the frequency and duration of rest periods from use of the equipment; (see appendix 4)
8. Document any differences of exposure between hands and record the leading hand (hand nearest the work piece) used;
9. Identify whether employees are left or right handed and those who may be more vulnerable, (e.g. those with general circulatory conditions and those who smoke);
10. Note if gloves are worn;
11. Record vibration magnitude; (see appendix 4)
12. Review past accident history and sickness/absence records of those using the equipment identified.

If a manager or competent person receives a request from an employee who feels that a risk assessment should be carried out, then they should act upon this, provided the request is reasonable.

If an incident is reported to a manager or competent person that someone has suffered hand arm vibration symptoms, they should immediately contact the Health and Safety Section for advice.

The assessments should be recorded where significant risks are encountered and must be reviewed periodically to ensure that they remain valid. Factors that may instigate a re-assessment include:

- a change in legislation
- a change in control measures
- any significant change in the work carried out
- introduction of new equipment or processes
- items discovered through the monitoring process which would indicate that the assessment could be improved
- Changes to the capabilities of employees

6. Control Measures

Taking into consideration the results of the risk assessment, it is the responsibility of the manager or competent person to implement suitable control measures to allow the working process to be completed safely. The measures for reducing occupational exposure to vibration will include:

- To eliminate the hazard, e.g. by automation or robotisation;
- To substitute the hazard by using lower vibration processes and tools/equipment/vehicles
- To instigate a regular maintenance programme
- To reduce employees exposure time
- To provide instruction/training on the correct operating procedures

In addition, a review of all best available technical information should be carried out regularly. However, all potential solutions should be viewed in terms of risk practicability and cost.

The main aim of these Guidelines is to protect the employee and to reduce the vibration transmission as far as is reasonably practicable. The risk assessment should have identified the various sources and characteristics of the vibration hazard, including the number of employees at risk, allowing for an overall risk evaluation. Those tools/equipment or processes of greater risk should be addressed first using the following hierarchy of controls.

(i) Elimination

Is the task or process required?

(ii) Substitution

Always consider alternative methods rather than using vibrating tools/equipment/vehicles.

(iii) Minimising Vibration Transmission to the Hands

Some tasks and processes make the use of hand-held power tools unavoidable. A number of tools have been marketed as low vibration tools, however, care should be taken not to substitute one hazard for another. The provision of lower vibration tools may increase the grip force and push force required by the operator to complete the task, increasing the physical strain, either in the upper limb or spine. Management will carefully assess lower vibration tools, however if they are less efficient their use may be longer, therefore increasing overall exposure time. Certain ergonomic factors will be considered at the purchase stage, in addition to any potential reduction in vibration. These are:

- Reduce the weight of the tool where practicable;
- Optimise grip size;
- Use soft, hand-profiled grips;
- Optimise grip angles at 70°;
- Use thermal insulation with the pneumatic tools;
- Direct exhaust air away from the operator's hands with the use of the hoses.

The transmission of vibration between the work surface/hand interface should always be considered.

If gloves are worn they should be provided for warmth rather than for anti-vibration.

If fitting tools with anti-vibration handles is considered, it is of particular importance that there is no trade-off for the control of safety of the tool while in operation for the benefit in reducing vibration transmission.

(iv) Minimising Vibration Transmission to the Body

Where tasks and processes require the use of vehicles employers will look at introducing working methods which eliminate or reduce exposure, e.g. minimising the transport of goods or materials or to replace manned with unmanned machines such as remotely controlled conveyors. An important aspect of minimising vibration is through choosing work equipment of appropriate ergonomic design, i.e. the choice of vehicle can be an important means of reducing exposure to vibration. Certain ergonomic factors will be considered at the purchase stage, in addition to any potential reduction in vibration. These are:

- visibility should be such that the machine can be operated without stretching and twisting;
- it should be easy to get in and out of the machine by using handholds and footholds so that the temptation to climb or jump is minimised;

Additionally, if the machine cab is the sole workplace of the machine operator, including break time, it should have sufficient space and facilities for rest periods.

(v) Maintenance

Regular maintenance schedules must be followed. It is particularly important that the maintenance schedule ensures continued performance and the lowest possible vibration levels. All maintenance should be recorded.

(vi) Exposure Time Reduction

Where it is reasonable and practicable to do so, job rotation and suitably timed rest breaks will help to reduce vibration exposure. However, it should be remembered that the initial vibration exposure should be prevented wherever possible by elimination or substitution.

(vii) Information, Instruction and Training

Information will be provided to employees on the risks associated with vibration, as well as information on the associated health conditions and why they should be reported to their line manager.

Employees should be instructed on the actions required to minimise the risk and ways in which they can contribute to risk reduction and control. For hand arm vibration this would be by maintaining good blood circulation, warming both hands and body prior to starting work in cool conditions, keeping warm while working, ensuring their tools are properly maintained and reporting defects. For whole body vibration this would be adjusting seat/controls etc; driving

'smoothly'; follow worksite routes to avoid travelling over rough terrain; adjust the vehicle speed to suit the ground conditions and report any defects.

Employees should be supplied with the following information:

- Jobs usually associated with Hand-Arm Vibration Syndrome;
- Jobs usually associated with Whole Body Vibration Syndrome;
- Ways of minimising the risks, including good work practices;
- Guidance on gripping tools properly;
- Guidance on adjusting and driving vehicles;
- Encouragement to report signs and symptoms;
- Attendance at health surveillance as required (see 8 below);
- General advice on keeping hands and body warm, both at and away from work;
- General advice on adjusting seating, controls etc in vehicles';
- Encouragement to report any tool/equipment/vehicle believed to have a fault.

New employees will be adequately trained on the correct use of tools, equipment and vehicles, including the effects of vibration transmission. (See also Appendix 5.)

7. Buy/Hire Smooth Policy for Machinery and Equipment

The Supply of Machinery (Safety) Regulations 1992 (as amended) requires equipment to be designed to reduce vibration risks to as low a level as possible. The equipment will then bear the CE mark to indicate it complies with these requirements.

Where any item of equipment, machinery or vehicle of the type listed in **Appendix 2** is to be purchased or hired an assessment will be carried out prior to purchase or hire. Information on the level of vibration must be obtained from the manufacturer or supplier and an assessment of the equipment and the work activity in which it is to be used undertaken in accordance with the system set out in **Appendix 1**.

Where equipment is replacing an existing piece of equipment the assessment must be reviewed.

The level of vibration emitted from such equipment/vehicles will be considered during any tendering process for the purchase of new equipment/vehicles and this will play a significant part in the decision making process.

Exposure Action Value (EAV) and Exposure Limit Value (ELV)

The following levels are set within the Control of Vibration at Work Regulations and should be considered at all times when assessing and purchasing equipment.

Hand Arm Vibration

A(8) RMS Value	Action Required
Less than A(8) 1.0 m/s ²	Monitor and review if it is believed that this level could be increased
	<i>What is the Exposure Action Value?</i>
	The exposure action value (EAV) is a daily amount of vibration exposure above which employers are required to take action to control exposure. The greater the exposure level, the greater the risk and the more action employers will need to take to reduce the risk. For hand-arm vibration the EAV is a daily exposure of 2.5 m/s ² A(8).
	<i>What is the Exposure Limit Value?</i>
	The exposure limit value (ELV) is the maximum amount of vibration an employee may be exposed to on any single day. For hand-arm vibration the ELV is a daily exposure of 5 m/s ² A(8). It represents a high risk above which employees should not be exposed.

Whole Body Vibration

A(8) RMS Value	Action Required
	<i>What is the Exposure Action Value?</i>
	The exposure action value (EAV) is the amount of daily exposure to whole-body vibration above which you are required to take action to reduce risk. It is set at a daily exposure of 0.5 m/s ² A(8). Whole-body vibration risks are low for exposures around the action value and only simple control measures are usually necessary in these circumstances.
	<i>What is the Exposure Limit Value?</i>
	The exposure limit value (ELV) is the maximum amount of vibration an employee may be exposed to on any single day. It is set at a daily exposure of 1.15 m/s ² A (8). Operators of some off-road machines and vehicles may exceed the limit value but this will depend on the task, vehicle speed, ground conditions, driver skill and duration of the operation.

8 Health Surveillance Programme

The Management of Health and Safety at Work Regulations 1999, Regulation 6, requires employers to provide appropriate health surveillance for employees where the risk assessment shows it to be necessary. The Council has arranged a comprehensive health surveillance programme (to be provided by the Council's Occupational Health Provider) for all employees in jobs identified as giving rise to

significant risk from vibration. This surveillance programme should enable symptoms to be assessed and appropriate information to be given to individuals regarding further exposure to vibration.

The knowledge of the dose response relationship from exposure to vibration is inconclusive and therefore guidelines on exposure levels cannot, in themselves, be relied on to prevent symptoms in all employees. The aim of health surveillance is to stop work related ill health by providing both **pre-employment** and **routine monitoring** of exposed employees.

If health surveillance is to be introduced in an already exposed workforce, employees should be consulted to ensure that they are aware of the purpose and methods of surveillance, and of action that may be required for the control of disease, such as redeployment or rehabilitation. Where redeployment is necessary as a result of health surveillance this will be done in accordance with the council policy on redeployment. Similarly, rehabilitation will be in accordance with the Council's Managing Attendance Policy. During health surveillance, employees should be informed of the results of each assessment and/or examination and of any implications of the findings, such as a requirement to modify or reduce vibration exposure. There should also be an opportunity to discuss such implications at the time when health assessments are made.

Pre-Employment Assessment

It is recommended that individuals who suffer from Reynaud's Disease or Reynaud's Phenomenon of non-occupational origin should not be exposed to hand-transmitted vibration at work. Reynaud's Phenomenon may occur in some individuals as a side effect of medication such as Beta-blockers. Consideration must also be given to those more at risk from whole body vibration such as those with previous back or neck problems.

Pre-employment assessment by questionnaire and clinical examination will establish a baseline from which to judge the results of further routine medical examinations and also determine a person's suitability to work with the type of equipment listed in **Appendix 2**. It also provides an opportunity to educate employees about the health effects of vibration, and about measures which are under a worker's control and which will help to minimise the onset of symptoms.

Routine Medical Examinations

This should normally be performed annually, however, for newly exposed employees, a check after six months to identify any worker who may be particularly susceptible should be conducted. Assessment should be by means of questionnaire and clinical examination, however a shorter questionnaire may be used at this stage if applicable. If after the routine assessment there are no reported symptoms, there is no need for full quantitative assessment at this stage. Employees must be encouraged to report any symptoms to a designated person, at any time, and not wait until their next routine medical.

NOTE: More frequent examinations may be appropriate after the onset of symptoms in order to judge the rate of progression and the effect of any workplace intervention.

Display of Symptoms

If any symptoms are reported by an employee to the designated person, work conditions must be re-assessed to minimise vibration exposure. An appointment must be made with the Council's Occupational Health Provider who will conduct a full quantitative health surveillance medical and indicate any further period of review as necessary. This will allow the rate of progression of symptoms and any functional impairment to be monitored. **Measures to reduce the individual's vibration exposure to the lowest level reasonably practicable must be considered at this stage.**

9 Monitoring

Monitoring will be undertaken to ensure that assessments remain suitable and sufficient and that employee's health is not being adversely affected by their use of equipment/vehicles from which vibration is emitted. This will involve reviewing each element of the programme through effective auditing that will cover operational activities, and relevant equipment/vehicles.

Any equipment that does not meet an acceptable standard, particularly the requirements of the Provision and Use of Work Equipment Regulations 1998, will be repaired, modified or replaced as appropriate, according to a prioritised plan.

Employees and their representatives are encouraged to monitor the effectiveness of this policy. It is recognised by the organisation that the law requires effective monitoring by management, however, to encourage a proactive approach to health and safety within the workplace, the benefits of co-operation are recognised. There is a desire to promote this attitude within the organisation.

10 Advice and Guidance

Further advice on Safety & Wellbeing matters email healthandsafety@northlan.gov.uk

Any direct approach by the Health and Safety Executive must be immediately reported to the Council Health and Safety Officer, who must also be kept informed of any further discussions or communications.

North Lanarkshire Council's Vibration Assessment Methodology

Measurement Process HAV

- Identify tools being used, including any problems with existing tools, daily exposure times, and any early symptoms (e.g. tingling fingers) experienced by operators relating to HAVS.
- Contact manufacturers (e.g. Flymo etc.) ask them to supply all existing vibration/noise data for tools being used. Carry out desktop risk assessment based on that data and prioritise action plan.
- Prior to purchase/hire of any of new tools/equipment carry out assessment based on manufacturers information, existing information and possible measured assessment during trial, fully considering a number of factors e.g. balancing vibration/noise levels, ergonomics, weight and operator usability with the overall cost and performance of the equipment.
- Conduct field measurement study (under real working conditions).
- A high priority should be given to the assessment of the most frequently used machinery and heavier percussive action tools.
- Future assessments may be conducted using information included in a central database for vibration equipment. This database should also include information returned via a questionnaire completed by operators which is available via the line manager.
- A simple ready-reckoner based on operator(s) daily vibration 'dose' (DVD), achieved through work scheduling (based on the risk assessments) will be given to all people in control of work and an information card provided for operators safety & environmental hand-book.

Measurement Process WBV

- Identify vehicles being used, including any problems with existing vehicles, daily exposure times and any symptoms experienced by operators;
- Contact machine manufacturers for vibration emission information. Carry out desktop risk assessment based on that data and prioritise action plan.
- Prior to purchase/hire of any vehicle carry out an assessment based on machine manufacturers information and any measure information acquired through trial. Consider all factors eg. vibration levels; ergonomics; power and capacity and operator usability with the overall cost and performance of the equipment.
- Carry out a measurement study under real working conditions Measurement should be conducted in accordance with the guidelines in the ISO2631-1 standard. An accelerometer is placed between the individual and the vibration source at the point of contact.
- Give a higher priority to the assessment of vehicles which are used most frequently.

Equipment/Machinery/Vehicles

Services will only purchase/hire tools, equipment, machinery and vehicles from manufacturers and suppliers who comply with current relevant legislation, e.g:

Section 6 of the Health and Safety at Work etc. Act 1974, which requires,

- designers, manufacturers, importers and suppliers to supply machines and equipment which so far as reasonably practicable, are safe and without risks to health, and to supply information about the safe use;

The Supply of Machinery (Safety) Regulations 1992, which require that;

- Machines must be so designed and constructed that the risks resulting from vibration (and noise) are reduced to the lowest level taking account of technical progress and the availability and means to reduce vibration (and noise) particularly at source.
- Suppliers must not only give specific information regarding airborne noise and emissions but also in the case of hand held or hand guided machines, information regarding vibration. Technical documentation must include the weighted rms. acceleration to which the hand and arms are subjected, if this is likely to exceed 2.5m/s^2 . (Note: this is the vibration amplitude whilst the tool is operating in normal use, not the vibration dose averaged over an 8 hour day).
- No machinery may be sold in the European Union that does not legitimately bear a CE mark. In order to conform with the European Machinery Directive, and display the CE Mark, a technical construction file which includes vibration (and noise) information must be maintained and made available to HSE Inspectors or Trading Standards Officers at 48 hours notice. Failure to comply with EU law is a criminal offence on the part of the manufacturer or his representative in Europe and may also result in the prohibition of machinery sales in member states.

Typical tools/activities associated with a risk of vibration

The following list of tools and activities is not exhaustive

- (i) Percussive metalworking tools;
- (ii) Rotary tools and grinders;
- (iii) Percussive hammers and drills;
- (iv) Chainsaws;
- (v) Miscellaneous tools and processes.

(i) Percussive Metalwork Tools

Most of these tools are driven by compressed air which leads to a cooling of their tool handle. The hands can be directly cooled by the exhaust air if it is not directed away from the operator. It has been speculated that this may actually be associated with the cause of hand-arm vibration or may make an individual more susceptible to the effects of vibration.

These percussive metalworking tools produce high magnitudes of vibration with a high risk of causing symptoms. The leading hand, which is used to guide the piston end of the tool as opposed to the trigger hand, is often subject to higher levels of vibration.

(ii) Rotary Tools and Grinders

These tools can be hand-held, as in angle grinders, or mounted to the floor, as with pedestal grinders. Vibration transmitted depends on the type, size and hardness of the work piece including the pattern of the metal removal required. Grip and push force is of particular relevance in this type of activity. Pedestal grinders produce higher vibration magnitudes than the hand-held variety. Some wibbling tools (small pneumatic tools the size of a pencil), which are positioned like a hand-held pencil between the thumb and index and middle fingers, tend to produce higher frequency vibrations.

(iii) Percussive Hammers and Drills

There are now various types of drills and hammers that are used to break up or drill into rocks of various kinds, or on roads. High vibration levels have been recorded from road-breakers, although the prevalence of vibration white finger has not been as high as expected. This may reflect the pattern of work (e.g. the intermittent nature of road breaker use) or possibly the lower grip forces used, although there have been reports of higher incidence of bone and joint problems.

(iv) Chainsaws

Anti-vibration chainsaws with vibration isolation and heated handles, introduced in the 1970s, have since been shown to have reduced recurrence of Vibration White Finger in this occupational group, although there is still a need to review exposure times and work practices to totally eliminate the problem.

(v) Miscellaneous Tools and Processes

As well as chainsaws the following equipment/tools are likely to be used in landscaping and grounds maintenance

- Strimmers
- Grass cutting machinery
- Hedge trimmers
- Clearing saws

Vibration from the steering wheels of vehicles has also been reported to lead to Vibration White Finger although only in those with high usage. There have also been reports of circulatory disturbances in the feet in response to hand-transmitted vibration, possibly due to the sympathetic nervous system, although these reports have received less consensus. Some effect may be associated more directly when the foot is used to steady a tool, as in the case of a jackhammer.

Some activities where vibration may be found are listed below:

- Construction;
- Demolition;
- Engineering;
- Road/Pavement Working;
- Stone Working etc.;
- Landscaping (hard and soft)
- Grounds maintenance
- Wood working

Employers and Employees Duties

Duties of Employer

Under current health and safety legislation employers and equipment manufacturers must consider what action is necessary to reduce risks to health, so far as is reasonably practicable. The HSE has published authoritative guidance, Hand-Arm Vibration (HS(G)88), as a source of reference for those involved in identifying and controlling the risks of HAVS.

It contains extra technical details to compliment the case studies and includes sections on:

- hazard and controlling programmes;
- technical ways to reduce vibration; clinical effects and the health surveillance programme;
- Measuring hand-arm vibration.

Furthermore, legislation such as:

- The Health and Safety at Work etc. Act 1974 requires work to be "without risk to health so far as reasonably practicable".
- The Management of Health Safety at Work Regulations 1999 require employers to assess the risks caused by work, including the risks from working with hand-held vibrating equipment, and to take measures to control these as far as reasonable practicable.
- The Provision and Use of Work Equipment Regulation 1998 require that equipment is suitable for the job. Remembering that suitability is related to the appropriateness of the design for the risks involved and hence depends on the task for which the tool is used and the best available replacement. The equipment is also required to be maintained in an efficient state with maintenance records where appropriate.
- HSE Guidance on Hand-Arm Vibration HS(G)88 states that programmes of preventative measures and health surveillance are recommended where workers' exposure to vibration regularly exceeds a specified level. However this action level should not be considered a safe level.
- The Safety Representatives and Safety Committees Regulations 1977 require employers to consult with the trade unions on the introduction of any new measures into the workplace which may affect the health and safety of employees.
- The Reporting of Injuries Diseases and Dangerous Occurrences Regulations 1995 require that where there are cases of HAVS amongst the workforce then they are reported to the relevant enforcing authority.

Duties of Employees

It is the duty of every employee to co-operate with their employer in matters that relate to health and safety. If they feel any symptoms they consider are attributable to vibration e.g. numbness or tingling of the hands after operating a tool for ten minutes, they must report this to their manager immediately.

Measuring Hand/Arm Vibration

The British Standard for measurement of hand-arm vibration is BS6842:1987, using the frequency weightings set down. The measurement process is similar to that identified in HS(G)88. Exposure to hand transmitted vibration is quantified in terms of the acceleration of the surface of the equipment in contact with the hand. The acceleration of the surface is expressed in metres per second (m/s^2).

There are five main points to the measurement of HAVS:

The average magnitude of vibration is indicated by the root mean square (RMS)

- Frequency weighted acceleration;
- Vibration accelerometers (measuring devices) measure vibration along a single axis;
- The total vibration can be determined by measuring along three orthogonal axes, and combining the results to give a single overall acceleration level;
- Correct selection of the accelerometer is important.
- Exposure to vibration over a working day (A(8)) can be calculated from the vibration measurements and the duration of the exposure.

Vibration Assessments

All values are weighted by a low frequency band pass hand-arm vibration filter shaped between limits of 5Hz and 1250Hz, which allows for the fact that low frequency vibration is more damaging than high frequency vibration.

Weighted vibration levels are measured on the handle of the item of equipment in three mutual perpendicular axes, giving frequency weighted vibration acceleration values of A_x , A_y , and A_z (m/s^2).

Vibration Measurements and Vibration Exposure

Various methods have been developed to measure vibration, giving the results as the displacement, velocity or acceleration of vibrating surfaces. The majority of manufacturers concentrate on the root mean square (RMS) value which is measured in metres per second squared (m/s^2).

If the machine manufacturer can provide enough data on vibration levels under standard conditions it might be possible to calculate exposure from this data and from local information on how long employees will use the tools. This avoids the practical difficulties of measuring vibration, though care is needed to make sure that the vibration data is reasonably representative of what is likely when the tools are being used for the jobs being assessed.

The vibration 'dose' received by the worker over a typical working day depends on the duration of exposure as well as the vibration magnitude. To allow different exposure patterns to be compared, they are adjusted or '**normalised**' to a standard reference period of 8 hours, however long the actual exposure period.

Appendix 2 describes how an exposure normalised to 8 hours (A(8)). Total vibration dose calculated for a standard 8 hour day can be calculated and provides a detailed table/ready

reckoner that can be used when calculating exposure, or as a guide when purchasing equipment.

Exposure points system and ready-reckoner

The table below is a 'ready reckoner' for calculating daily vibration exposures. All you need is the vibration magnitude (level) and exposure time. The ready-reckoner covers a range of vibration magnitudes up to 40 m/s² and a range of exposure times up to 10 hours.

The exposures for different combinations of vibration magnitude and exposure time are given in exposure points instead of values in m/s² A(8). You may find the exposure points easier to work with than the A(8) values:

- exposure points change simply with time: twice the exposure time, twice the number of points;
- exposure points can be added together, for example where a worker is exposed to two or more different sources of vibration in a day;
- the exposure action value (2.5 m/s² A(8)) is equal to 100 points;
- the exposure limit value (5 m/s² A(8)) is equal to 400 points.

Vibration magnitude m/s ²	40	800																						
	30	450	900																					
	25	315	625	1250																				
	20	200	400	800																				
	19	180	360	720	1450																			
	18	160	325	650	1300																			
	17	145	290	580	1150																			
	16	130	255	510	1000																			
	15	115	225	450	900	1350																		
	14	98	195	390	785	1200																		
	13	85	170	340	675	1000	1350																	
	12	72	145	290	575	865	1150	1450																
	11	61	120	240	485	725	970	1200	1450															
	10	50	100	200	400	600	800	1000	1200															
	9	41	81	160	325	485	650	810	970	1300														
	8	32	64	130	255	385	510	640	770	1000	1200													
7	25	49	98	195	295	390	490	590	785	865														
6	18	36	72	145	215	290	360	430	575	720														
5.5	15	30	61	120	180	240	305	365	485	605														
5	13	25	50	100	150	200	250	300	400	500														
4.5	10	20	41	81	120	160	205	245	325	405														
4	8	16	32	64	96	130	160	190	255	320														
3.5	6	12	25	49	74	98	125	145	195	245														
3	5	9	18	36	54	72	90	110	145	180														
2.5	3	6	13	25	38	50	63	75	100	125														
2	2	4	8	16	24	32	40	48	64	80														
1.5	1	2	5	9	14	18	23	27	36	45														
1	1	1	2	4	6	8	10	12	16	20														
		15 m	30 m	1 h	2 h	3 h	4 h	5 h	6 h	8 h	10 h													
		Daily exposure time																						

Hand/Arm and Whole Body Vibration

The following information is of particular importance to those whose work involves regular and frequent use of: -

- Hand-held powered tools; hand-guided powered equipment; hand-fed powered equipment; other ride on plant/ equipment

This information sheet aims to give brief details of what:-

- Hand arm vibration (HAV) is
- Injuries it can cause
- Simple steps can be taken to control it and where to get further information.

What is HAV?

HAV is vibration, which is transmitted from work processes into hands arms, etc. It can be caused by operating hand-held power tools such as road breakers, hand-guided/ ride-on equipment such as lawn mowers, or from holding materials being processed by machines such as pedestal grinders. Another common term to describe this condition is Vibration White Finger (VWF).

When is it Hazardous?

Regular and frequent exposure to high levels of vibration can lead to permanent injury. This is most likely when contact with a vibrating tool or process is a regular part of a person's job. Occasional short-term exposure is unlikely to cause injury, although those with certain medical conditions (e.g. Raynaud's Disease) should avoid using such equipment for any length of time.

What type of Tools and Equipment can cause vibration injury?

There are hundreds of different types of tools and equipment which can expose operator to high levels of hand-arm vibration. Some of the more common ones include: - chainsaws, concrete breakers/ road drills; hammer drills; hand-held grinders/ sanders; pedestal grinders; riveting hammers; power hammers/ chisels; strimmers/ brush cutters; etc.



What injuries can HAV cause?

Regular exposure to HAV can cause a range of temporary and permanent injuries to the hands and arms. The injuries can include damage to the:-

- Blood circulatory system
- Sensory nerves
- Muscles
- Bones
- Points

These injuries can result in: -

- Severe pain and numbness
- Pins and needles
- Painful wrists (carpal tunnel syndrome)
- Loss of grip strength
- Loss of sense of touch.

How quickly will using these tools and machines start to cause health problems?

This will depend on a number of factors including the level of vibration which reaches the hands and how long they are exposed to it. The people most likely to be harmed by vibration are those who regularly use high-vibration tools and machines. For some people, symptoms may appear after only a few months of exposure, but for others it may take several years.

How can Tool and Machine Manufactures Help?

For most types of equipment, manufactures are required by law to:-

- Design and construct equipment which will cause the minimum risk of vibration injury;
- Provide you with warning of any residual risk from vibration, information on vibration levels and
- Instructions on how to use the equipment to avoid risk from vibration.

What does the Law require employers to do about these risks?

Health and Safety law requires employers to do a number of things to protect their employees. They should:

- Assess, control and manage all risks to health,
- Provide and maintain suitable equipment for use,
- Provide suitable information, instructions and training on health risks and safe use of equipment.
- Provide health surveillance for employees where the risks cannot be completely eliminated, etc.

How do I know if I am at risk?

- Check the guidance issued by the equipment manufacturer related to the risk from vibration.
- Are you using hammer action equipment for more than half an hour each day or rotary/ other action equipment for more than 2 hours each day?
- Have your fingers gone white on exposure to the cold?
- Have you had any tingling or numbness in your fingers after using vibrating equipment?
- Are you experiencing any problems with muscles or joints in your hands/ arms?
- Do you have any difficulty picking up small objects such as screws or nails?

If you answered "**yes**" to one or more of these questions, report them to your supervisor for further action. Seek medical advice, if condition is confirmed, refrain from using such tools in the future.

What can be done to control the risk?

- Look for alternative ways of working with vibration equipment altogether.
- Use the most appropriate equipment for the job, minimise exposure time (job rotation/ rest breaks), only use vibrating plant for short periods of time, long term use should be avoided where practicable.
- Ensure regular maintenance of equipment (replace worn parts as required, etc.) Report all defects in equipment as soon as possible to supervisor/ lines manager.
- Get further advice from manufacturers, etc.
- Attacks are often triggered by cold weather, keep hands warm- wear one if not two pairs of gloves when operating vibrating plant
- Avoid smoking during work with vibration plant/ equipment as smoking can increase the likelihood of attacks as it affects the blood circulation in the body.
- Exercise hands regularly - even if it is simple hand clenching and stretching exercises to help with blood flow / circulation- especially in the colder weather.

Where can I find out more?

HSE have published a number of leaflets, books and a video on hand-arm vibration. All are available via the HSE website with many of the leaflets freely available online. A number of Council Services now have specific information available on CONNECT. Check with your line manger/ supervisor for additional information as required.

Replicated from IS13 – Hand Arm Vibration

Impact Assessments

Document Title: Health and Safety Policy - Arrangement Section 26, Vibration at Work

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Environmental Impact Assessment: This document has been assessed for significant environmental impact; no detrimental impact has been identified

Equality Impact Assessment: This document has been assessed for significant equality implications; no significant issues have been identified.

General Comments: This document is the arrangement section, relating to the management of vibration risks. This is associated with the Council's health and safety policy as required by the Health and Safety at Work Act 1974. The general aim of the council is to ensure a healthy and safe working environment for all persons working for or make use of Council Services. Nothing in the document serves to have any negative impact on the above issues and indeed, in general, associated documents will encourage positive consideration of the factors to ensure all members of the workforce and community are afforded access to the same safe and healthy workplace.