**QUEEN’S UNIVERSITY BELFAST**

Health & Safety Compliance Committee

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#### Control of Vibration Hazards at Work

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1. Summary

The Control of Vibration at Work Regulations (CVWR) place specific duties on employers such as the University to manage risks from vibration.

The CVWR’s require the University to assess the risks from vibrating equipment, machinery and vehicles provided at work and eliminate or reduce these risks to as low a level as is reasonably practicable. The primary aim is to protect staff and others such as students who may be put at risk from the ill health effects of vibration.

2.0Introduction

This guidance outlines measures to protect employees and others from the risks of Hand Arm Vibration Syndrome (HAVS) and an increased risk of back pain which can be caused by exposure to whole-body vibration (WBV).

These measures include assessing the risks from exposure to vibration, taking steps to reduce exposure to vibration and provision of training and information for employees/students on the risks from vibration and the control measures in place

 This guidance applies to all work within the University where there is a risk of elevated levels of exposure to hand-arm vibration or whole body vibration. Exposure to vibrating machinery is most likely to be applicable to the University Maintenance and Grounds staff, but wider consideration should be made within the University.

Generally, it is anticipated that the level of risk is not high because of the nature of the work taking place, i.e. vibration exposure is not prolonged, is frequently interrupted, and occasional exposure is unlikely to cause ill health.

2.1 Hand arm vibration

Hand-arm vibration (HAV) is vibration transmitted from work processes into operators’ hands and arms. HAV is a potential hazard for persons who work with hand held tools, hand guided machinery or feed work by hand to a machine where this exposes their hands and arms to high levels of vibration. Prolonged and regular exposure to excessive levels of HAV can affect the operator’s hands and arm, resulting in impaired blood circulation and damage to the nerves and muscles. This can be felt as tingling or numbness in the fingers and finger blanching. The effects are cumulative and may involve pain, loss of manual dexterity and reduced grip strength. In severe cases blood circulation may be permanently impaired leading to Hand Arm Vibration Syndrome, of which the best known condition is ‘Vibration White Finger’.

2.2 Whole Body Vibration

Whole body vibration (WBV) is mainly concerned with large shocks or jolts (when there is a risk of injury to the back) and usually applies to persons in the sitting or standing position when travelling in mobile machinery (e.g. tractors) for extended periods.

Although exposure to whole-body vibration alone is unlikely to cause back pain pre-existing back conditions may be aggravated by this exposure.

2.3 Potential sources of high vibration

Sources of hand-arm vibration include work with powered hand-held tools, hand guided machinery and hand fed machines.

Sources of whole-body vibration are found in work activities where the body is exposed to high levels of shock or vibration especially where persons drive vehicles off-road or across rough surfaces e.g. ride-on mowers, tractors, off-road vehicles etc.

The following is an indicative list of the types of equipment used in the University that may present a vibration hazard:

* Grounds work, e.g. chainsaws, strimmers, leaf blowers, powered hedge trimmers, push mowers, etc;
* Maintenance equipment, e.g. angle grinders, rotary burring tools, sanders, drills etc;
* Workshop equipment, e.g. hand guided wood machining tools, pedestal grinders, percussive metal or stone working tools, concrete saw etc.

2.4 Vibration Exposure Limits

The Regulations make provision for the control of vibration, setting daily exposure limits and action values for hand arm and whole body vibration (refer appendix 2). Exposure action values indicate levels of daily exposure which if exceeded must be reduced to control the risk to operatives.

3.0 Responsibilities

3.1 Head of School/Directorate

Heads of School/Directors of Academic Support Units are responsible for ensuring that appropriate arrangements are in place in the areas under their control to ensure compliance with the provisions of this policy/guidance and that these arrangements are communicated to relevant staff.

3.2 Line Manager/Supervisor

1. Line managers have a responsibility to ensure that:
	* + - Vibration risks are assessed and that staff are not exposed to vibration above the Exposure Limit Value;
			- If the daily Exposure Action Values are likely to be exceeded action is taken to ensure that:
* Controls are in place to eliminate the risk or to reduce the exposure to as low a level as is reasonably practicable, and
* Staff requiring health surveillance are identified and referred to the Occupational Health Service.
* Vibration levels are taken into account when purchasing or hiring new equipment and that data on vibration magnitude is obtained for all new equipment purchased or hired;
* Staff are provided with information on the associated health risks and the control measures to be followed;
* Maintenance regimes for tools and equipment are followed and that aspects which reduce vibration are regularly checked as necessary.

3.3 Employee/Student Responsibility:

Staff and students have a responsibility to ensure that they make full and proper use of all measures put in place by the School/Directorate to control and minimise the risk of exposure to vibration. They should, in particular:

* Use equipment in the appropriate manner and in accordance with instruction;
* Follow any restrictions on duration of use or other safety precautions that may apply to use of equipment with a vibration risk;
* Report promptly to their line manager any defect or difficulty with the equipment that could affect its vibration characteristics which produces higher than normal vibration levels;
* Report to their line manager immediately any symptoms associated with hand-arm vibration or whole body vibration.

3.4 Occupational Health Service

The Occupational Health Service is responsible for:

* Organising and carrying out appropriate health surveillance programmes and associated training and education as required;
* Ensuring that health surveillance records are confidentially maintained;
* Notifying the Line Manager of health surveillance results and any resulting recommendations.

4.0 Policy Provisions

4.1 Risk Assessment

No work, which is liable to expose any employee and/or student to HAV or WBV at or above the relevant Exposure Limit Values, as outlined in Appendix 2 should be carried out until a risk assessment has been made.

The person(s) directly involved in the work and where practicable, employee safety representatives should participate in the risk assessment process.

The purpose of the risk assessment is to identify the likely levels of exposure to vibration. This will include observing the work and obtaining relevant information and data on the magnitude of the vibration under the work methods used and the duration of use within any working day. In addition, it is necessary to identify any staff whose health is at particular risk from vibration.

If exposure is likely to reach the Exposure Action Value, measures must be implemented which prevent or adequately control exposure to vibration and reduce the daily vibration exposure to as low a level as is reasonably practicable.

Guidance on the risk assessment of vibration is provided in Appendix 1.

4.2 Control Methodology

4.2.1 Purchasing new equipment

Whenever new equipment is to be purchased, the supplier’s information should be checked in advance and every effort made to ensure that equipment with the lowest vibration levels and best protection is obtained. Any second hand equipment should be assessed before being put into use.

4.2.2 Reducing vibration risk

Where an Exposure Action Value is likely to be reached or exceeded, then exposure should be reduced to as low a level as is reasonably practicable by establishing and implementing control measures appropriate to the activity. Typical control measures include:

* using other work methods which eliminate or reduce exposure to vibration;
* choosing work equipment of appropriate ergonomic design which produces the least possible vibration;
* the provision of auxiliary equipment which reduces the risk of injuries caused by vibration;
* the introduction of appropriate maintenance programmes for the work equipment, the workplace and workplace systems;
* the provision of information, instruction and training such that work equipment may be used correctly and safely, in order to minimise exposure to vibration;
* the limitation of the duration and magnitude of exposure to vibration by introducing work schedules with adequate rest periods;
* the provision of clothing to protect employees from cold and damp, if applicable.

4.2.3 Maintenance of Work Equipment

All power tools and ride-on equipment such as tractors and off-road vehicles must be inspected regularly for damage and serviced/maintained in accordance with the manufacturers’/suppliers’ advice. This is to ensure that the equipment is maintained in its most efficient state and the best vibration performance is sustained during its operational lifetime.

Individual users must be made aware that if at any point they consider a machines performance has deteriorated in terms of vibration, they must report it promptly to line management so that further investigation can be made.

4.2.4. Health Surveillance

It is the responsibility of Line Managers/Supervisors to identify staff and students requiring health surveillance for vibration risks through risk assessment and ensure that they are referred to the University Occupational Health Service.

The aim of any health surveillance is to identify at an early stage any member of staff who may be showing signs of HAVS.

Health Surveillance is required if the risk assessment indicates there are individuals who are at particular risk to health from vibration or employees who are, or are liable to be, exposed to vibration at or above the EAV.

Individuals who may be considered to be particularly sensitive to vibration include those with existing HAVS or other conditions of the hands, arms, wrists or shoulders or with conditions affecting the circulation such as diabetes or nerve disorders affecting the hands or arms such as carpal tunnel syndrome.

4.2.5. Information, Instruction and Training

 If there is considered to be a risk to the health of staff from exposure to vibration at work or the exposure is likely to be at or above the EAV then suitable information, instruction and training should be provided for those staff.

The information, instruction and training should include consideration of:

* Provision of information on vibration levels relevant to the machinery used, in particular identifying equipment that is known to have high vibration levels;
* Symptoms staff should look for and action they should take if they believe they have those symptoms;
* The selection, use, and maintenance of equipment;
* The need for any restriction on the duration of use of vibrating machinery and dividing the work with other colleagues;
* The use of PPE where it is required by the risk assessment e.g. the need to keep hands warm;
* Any health surveillance required and why it is important;
* The importance of reporting any defects or problems with equipment, eg unusually high vibration levels.

5.0 Compliance Monitoring

The Safety Service will monitor compliance with the provisions of this policy and guidance during local audits and through the annual health and safety assurance reports.

6.0 Further Guidance

1. The Control of Vibration at Work Regulations 2005 (downloadable from the Safety Service web site).
2. ‘Hand Arm Vibration: The Control of Vibration at Work Regulations 2005’, Guidance on Regulations, L140, HSE ISBN 0-7176-6125-1 (downloadable from Safety Service website).
3. ‘Whole Body Vibration: The Control of Vibration at Work Regulations 2005’, Guidance on Regulations, L141, HSE ISBN 0-7176-6126-1 (downloadable from Safety Service website).
4. Vibration Solutions – Practical ways to reduce the risk of hand-arm vibration injury (HSG 170).
5. Hand-arm vibration – advice for employees, INDG 296 rev1, (downloadable from Safety Service web site).

Appendix 1

**Risk Assessment of Vibration**

In general at the University, the nature of the work lessens the risk. For example, work may be seasonal or related to particular projects and exposure to vibration is normally not prolonged on a regular basis. University equipment tends not to be operated in the same way as in industrial or construction environments, so individuals are not continuously carrying out repetitive high vibration tasks on a daily basis. There is nevertheless still a need to risk assess each situation.

The following outlines the five steps to complete an assessment of the risk to health created by vibration;

**Step 1 - Identify the hazards**.

To help identify if there is a vibration problem to manage, the following questions should be asked:

* Are rotary action power tools used for more than about an hour per day?
* Are hammer action tools used for more than about 15 minutes per day?
* Do any suppliers of equipment you use warn of a vibration risk,
* Do any staff have symptoms of HAVS?

If the answer to any of the above questions is ‘yes’ then it should considered there may be a vibration problem and the following steps should be taken:

* Identify all existing powered tools, equipment and ride-on machinery which involve regular exposure to vibration;
* Estimate the maximum duration of their use in any working day;
* Consult equipment handbooks which should give vibration emission values. This may be provided by the manufacturer: however, manufacturers’ data will often come from testing under specific controlled conditions which are very different from normal working practices and therefore may significantly underestimate exposures in practice;
* Alternate sources of data include websites which have measured vibration levels of equipment in real use, these include <http://www.operc.com/havtec/default.asp>;
* Ask members of staff if they have any symptoms associated with hand-arm vibration or with whole-body vibration;
* Observe specific working practices;
* If necessary (where it is not possible to obtain relevant data by other means) the Safety Service should be contacted to arrange measurement of the magnitude of vibration to which employees are liable to be exposed.

*Note: The ‘best case’ manufacturers’ data should not just be taken as representative of true real life exposure. If necessary, where it is considered the data obtained is not truly representative and may only be a best case, then a multiplier of x2 should be applied when assessing the likely estimate of real life worst case exposure. Additional information may be sought from equipment suppliers.*

**Step 2 - Identify all persons who may be at risk**

If there is likely to be a risk the next stage is to identify who may be at risk. This can be achieved by making a list of staff who use vibrating machinery or equipment and which jobs they do. Persons use equipment/tools/vehicles in different ways, their posture or technique may increase their vibration exposure from a particular activity by up to 50% compared to colleagues.

Some members of staff may be at particular risk. This would include staff with existing HAVS or other injuries to the hands, arms, wrists or shoulders. Also for WBV, those with existing back conditions.

**Step 3 - Assess whether current controls are adequate**

In order to assess whether control measures are adequate an indication on whether individuals are exceeding EAV’s and ELV’s is required. In order to do this the Health and Safety Executive (HSE) have produced a ‘calculator’ tool which calculates the daily vibration exposure that an employee is subjected to.

A separate HSE calculator is available for both hand-arm vibration and for whole-body vibration, these resources can be accessed via the Health and Safety Executive website at; <http://www.hse.gov.uk/vibration/wbv/index.htm>

Where there is a likelihood than an EAV for either HAV or WBV will be exceeded, a written risk assessment should be undertaken which identifies risk reduction measures to eliminate exposure at source or reduce exposure to as low a level as is reasonably practicable and ensures the ELV is not exceeded.

The risk assessment should take into account the:

* Magnitude, type and duration of exposure – the greater the magnitude the shorter the allowable duration may need to be;
* Effects of vibration on ‘at risk’ employees;
* Information provided by manufacturer;
* Availability of replacement equipment which poses lower risk from vibration;
* Specific working conditions such as temperature;
* Precautions to protect those who are at a particular elevated or high risk.

Action should be taken to reduce risks from vibration to as low as reasonably practicable, even if vibration levels are below the Exposure Action Level.

The hierarchy of control measures to eliminate or adequately control exposure to vibration are, in descending order:

* Consideration as to whether the work can be done another way which then eliminates or reduces exposure to vibration;
* Selecting or replacing work equipment of appropriate ergonomic design (newer, better designed machinery often emits significantly lower levels of vibration than traditional types);
* Ensuring appropriate maintenance programmes are in place for equipment and vehicles (worn parts or loose components can significantly increase vibration levels);
* Encouraging employees to report unusually high vibration levels;
* Providing information and training for operators and drivers;
* Providing suitable clothing to protect employees from cold and damp (keeping employees warm and dry, either by maintaining good working environment or by providing and using PPE will help maintain good blood circulation and reduce the likelihood of vascular symptoms such as finger blanching);
* Reducing the time exposed to vibration e.g. regular breaks, job rotation etc. (this is the final resort when other precautions to reduce exposure have been implemented).

Wherever vibration levels may exceed the EAV, advice should be sought from the Safety Service to assist with risk assessment and reduction of vibration exposure.

**Step 4 – Record the findings of the Risk Assessment**

The risk assessment should include an action plan which documents the measures already in place to reduce the risk from vibration exposure and any further measures planned. (refer Safety Service Guidance on task risk assessment at: <http://www.qub.ac.uk/directorates/HumanResources/OccupationalHealthandSafety/RiskManagement/>

The vibration risk assessment can be a stand-alone document, or can be incorporated into the overall risk assessment for the work activity within the School or Directorate.

**Step 5 – Monitor and Review the Risk Assessment**

It is the responsibility of the Line Manager to regularly check that controls introduced are effective. This will involve talking to and observing staff work practices.

It is recommended that the risk assessment should be reviewed if there is any change in vibration exposure and on an annual basis.

Appendix 2

**Vibration Exposure limit Values and Exposure Action Values**

The Control of Vibration at Work Regulations define two types of exposure limit.

The **Exposure Action Value** (EAV) is the level of daily exposure to vibration, which if exceeded requires action to reduce exposure.

The **Exposure Limit Value** (ELV) is the maximum vibration exposure permitted for any individual on a single day.

The vibration level produced by equipment is usually assessed by measuring the acceleration level in m/s2.

The exposure values for Hand-Arm Vibration are:

Exposure Action Value (EAV) – **2.5 m/s² A(8)** (exposure averaged over a day)

Exposure Limit Value (ELV) – **5 m/s² A(8)** (exposure averaged over a day)

 The exposure values for whole-body vibration are:

Exposure Action Value (EAV) – **0.5 m/s² A(8)** (exposure averaged over a day)

Exposure Limit Value (ELV) – **1.15 m/s² A(8)** (exposure averaged over a day)

The vibration dose received by the operator 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. The Control of Vibration at Work Regulations describes how an exposure normalised to 8 hours A(8), can be calculated. The table below gives the average vibration levels over a working day and the times to reach the exposure levels.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Vibration magnitude (m/s2) | 2.5 | 3.5 | 5 | 7 | 10 | 14 | 20 |
| Time to reach Exposure Action Value (hours) | 8 | 4 | 2 | 1 | ½ | ¼ | 8 mins |
| Time to reach Exposure Limit Value (hours) | >24 | 16 | 8 | 4 | 2 | 1 | ½ |

For example, a hand held power tool with a vibration level of 7 m/s2 would result in exposure of the operator to the equivalent of the EAV in just one hour, hence typical use greater than this would require reasonable practicable exposure reduction measures to be taken. If this tool was used for 4 hours a day the ELV would be exceeded and no further use would be permitted.

The diversity of work that an individual may be involved in can however cause difficulty in accurately assessing exposure because a number of different tools are being used in any one day for variable lengths of time. However, it should be possible to estimate a cumulative exposure by summing up the typical exposure pattern from the range of equipment used.