The University of Reading Health and Safety Services - Safety Note 23

Health & Safety Guidance on Hand-Arm Vibration (HAV)

1. What is it?

HAV is vibration which can reach your hands when you are working with hand held power tools, such as chainsaws, or hand-guided machinery such as buffing machines, or when holding materials which are being processed by machinery.

2. What are the effects?

HAV can cause damage to:-

- Blood circulatory system, vibration white finger (VWF) often occurs when fingers or the body are cold or wet, initially finger tips become white. They may become numb and you may get 'pins and needles'.
- Damage to nerves, causing reduction in sense of touch and temperature, and possibly permanent numbness or tingling in your fingers
- Damage to muscles, bones and joints
- You may notice loss of strength in you hands and pain in your wrists and arms. You may have difficulty in picking up small objects such as screws or nails.

The symptoms can limit what you do at work and leisure.

3. What are the causes of HAV?

The high levels of vibration emitted when using common tools can cause permanent damage to your hands and arms. The risk depends on:-

- How high the vibration levels are
- How long you use the equipment for
- How awkward it is for you to use the equipment
- How tightly you have to grip the equipment
- How cold and wet you get when using the equipment

Be aware of any tingling or numbness in fingers during or immediately after use of a vibrating tool or machine.

The problems can appear after months or years of use and depend on what levels have been experienced and for how long.

4. Who is most at risk?

Staff and students who regularly use vibrating tools and equipment in areas such as Grounds, Maintenance, Agriculture, Farms, workshops and engineering processes and those involved in cleaning activities. In particular, individuals using tools with a hammer action for more than half an hour each day or using rotary or similar action equipment for more than 2 hours a day.

5. What sort of equipment can cause HAV?

Examples include chainsaws, circular saws, hand-held grinders, hand-held sanders, nut runners, powered lawnmowers, strimmers/brush cutters and buffing machines.

6. How can the risk be reduced?

Departments and Schools must ensure that HAV risk tools and processes are identified, and carry out a risk assessment on their use.

The following measures should be considered:-

i. Avoid the need to use vibrating tools in the first place. For example, by reviewing cleaning effects on floors, to avoid the need to use buffing machines. Remember to consider ergonomic factors such as tool weight, handle design comfort, grip force needed, ease of handling and other risks such as noise and dust.

ii. Reduce the vibration generated by carefully selecting tools with lower vibration levels. Ask suppliers to provide information about vibration magnitudes that the products are likely to create in normal use. Consider purchasing the low-vibration designed equipment that is on the market.

iii. Using anti-vibration dampers and mountings or vibration isolating handles may help reduce HAV.

iv. Instigate a proper maintenance programme for tools according to manufacturer's instructions. Replace vibration mounts before they wear out, keep tools sharp, ensure rotating parts are checked for balance and replace them if necessary. For example, sharpening chainsaw teeth and keeping the correct chain tension are important when using chainsaws. It may be possible to fit anti-vibration handles to tools retrospectively as long as the handle is matched to the vibration characteristics of the tool.

v. Reducing the period of exposure - consider job rotation and establishing safe work procedures by ensuring workers work for limited periods and then have a change in activity.

vi. Remember staff and students must receive information and on-the-job training and supervision to ensure they understand the risks and how to avoid or reduce them and to report signs of injury. They must be shown how to use tools to reduce excessive grip pressures, push and guiding forces. Equipment users must also be advised to use the lightest tool for the job and to rest the tool as much as possible on the material being worked or support provided, and to hold the tool with a light but safe grip. Provide information on maintenance of good blood circulation by keeping warm, warming up, exercising fingers and not smoking, as this adversely affects blood circulation.

vii. Ensure a list of all staff at risk is sent to the Occupational Health Service and request in writing that a health surveillance programme is carried out for HAV.

7. Understanding vibration data

<u>Vibration magnitude</u>

Exposure to HAV is measured in terms of acceleration of the surface in contact with the hand as it moves one way and back again. This is normally expressed in m/s^2. Particular frequencies, 5-20 Hertz (Hz, cycles per second of energy), cause most damage. Owing to the

frequency dependence, a frequency weighting is applied to measurements. Hazard to health is usually assessed from the average (root mean square or rms) acceleration level where:-

$$\mathbf{a_{hw}} \quad \textbf{in m/s}^2$$

(h means hand transmitted and w means weighted)
Information from suppliers is often presented as vibration magnitude data. However, much of that data is derived from laboratory type conditions that may not be indicative of typical work conditions. Ask suppliers for data and information available for the types of work carried out in your area. They are obliged by law to help with such advice.

Daily vibration exposure

The vibration exposure or dose of a worker depends on the duration they are exposed and it is standardised to a reference period of 8 hours, thereby allowing different exposures to be compared. It is currently recommended that preventative measures and health surveillance are provided when workers' daily vibration exposure regularly exceeds 2.8 m/s^2 A(8).

It is possible to work out the daily exposure when the vibration magnitude of a tool is known. For example, information from a supplier of a chainsaw states that vibration magnitude is 9.7m/s^2. The equipment is worked on for 2 hours per day.

Using $\mathbf{A(8)= a_{hw}\sqrt{t/8}}$ *where* **t** *is the daily exposure time in hours.*

$\mathbf{A(8) = 9.7\sqrt{2/8}}$ $= 4.8 m/s^2$ A(8)

Where there are a number of different exposures you can use the formula:-

$$\mathbf{A(8) = \sqrt{(A_1(8)^2 + A_2(8)^2 + A_3(8)^2)}}$$

Where data is not available from suppliers, or there is concern that the data is insufficient, it is possible to measure individual exposures, but, this should be carried out by an expert. Please seek advice from Safety Services or the Occupational Health Service before embarking on this course of action.

8 Anti- vibration gloves

Gloves can be helpful in reducing risks from HAV. In cold conditions gloves will keep the hands warm, aiding circulation. Gloves are often necessary to protect against other risks. Any gloves supplied must be able to be used with the tool and task. Ensure that the wearer finds them comfortable and is able to manipulate the tools properly without increasing grip or force. Various gloves with special soft linings intended to reduce vibration risks, are available commercially. These usually provide little attenuation at the most hazardous frequencies and in some cases may increase the vibration reaching the hand. Therefore, unless test data is available for both the glove and the tool, it is best to assume they will not reduce the exposure to HAV.

References

1. Hand Arm vibration CD ROM, available from loan from Health & Safety Services
2. *Hand Arm vibration* HSG88, HSE 0-7176-0743-7
3. *Vibration solutions, practical ways to reduce the risk of hand arm vibration injury*, HSE ISBN 0-7176-0954-5

4. Good leaflets for Departments/Schools are: *Health risks from Hand-arm vibration, for employers* and *advice for employees* and *Power Tools: how to reduce vibration health risks* ISBN 0-7176-1553-7, 0-7176-1554-5 and 0-7176-2008-5 respectively. These are available from Health & Safety Services.

Debbie Sullivan, August 2003