

Preventing Hand-Arm Vibration Syndrome

What is Hand-Arm Vibration?

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 road breakers, and hand-guided equipment, or by holding materials being processed by machines, such as pedestal grinders.

What are its effects?

Regular and frequent exposure to hand-arm vibration can lead to permanent health effects. This is most likely when contact with a vibrating tool or work process is a regular part of a person's job. Occasional exposure is unlikely to cause ill health. Hand-arm vibration can cause a range of conditions collectively known as hand-arm vibration syndrome (HAVS). It includes vibration white finger which can cause severe pain in the affected fingers.



Legal requirements

The Control of Vibration at Work Regulations 2005 aim to protect workers from risks to health from vibration. Employers should:

- assess and identify measures to eliminate or reduce risks from exposure to hand-arm vibration; and
- where required, ensure that:
 - Control measures to reduce vibration are properly applied; and
 - information, training and health surveillance is provided to employees.

Control measures for vibration

There is a hierarchy of control measures to prevent and reduce vibration:

1. Alternative working methods

- Look for alternative work methods which eliminate or reduce exposure to vibration, e.g. precast concrete with existing holes so no drilling necessary.
- Mechanise or automate the work.

2. Better equipment

- Make sure that equipment selected or allocated for tasks is suitable and can do the work efficiently.
- Select the lowest vibration tool that is suitable and can do the work efficiently.
- Limit the use of high-vibration tools wherever possible.

3. Purchasing equipment

- Discuss your requirements with a range of suppliers.
- Check with suppliers that their equipment is suitable and will be effective for the work, compare vibration emission information for different brands/models of equipment, ask for vibration information for the way you plan to use the equipment, and ask for information on any training requirements for safe operation.
- Get your employees to try the different models and brands of equipment and take account of their opinions before you decide which to buy.

4. Workstation design

- Improve the design of workstations to minimise loads on employees' hands, wrists and arms caused by poor posture.
- Use devices such as jigs and suspension systems to reduce the need to grip heavy tools tightly.

5. Work schedules

- Limit the time that your employees are exposed to vibration.
- Plan work to avoid individuals being exposed to vibration for long, continuous periods – several shorter periods are preferable.
- Where tools require continual or frequent use, introduce employee rotas to limit exposure times.

6. Clothing

- Provide your employees with protective clothing when necessary to keep them warm and dry. This will encourage good blood circulation which should help protect them from developing vibration white finger.
- Gloves can be used to keep hands warm, but should not be relied upon to provide protection from vibration.

Hand Arm Vibration in the railway industry

Hand-held power tools, such as concrete breakers, hammer drills and disc cutters are frequently used in the maintenance of the railways, putting maintenance workers at significant risk. London Underground has looked at its operations and its arrangements for monitoring, reducing and preventing hand arm vibration to its workers. It has been carrying out a series of trials and is moving towards a more general implementation of improvements as part of an ongoing HAVS initiative.

Ways you can prevent HAVS – Good practice

London Underground introduced measures in three areas: use of remote control breakers, to avoid the need for use of hand held breakers; trials of new lower vibration hand breakers; and monitoring and measuring vibration to prevent exposures to harmful levels.

Substitutes – Changing the process

A remote-controlled Brokk machine was hired in with an operator to carry out concrete breaking. London Underground has used it for work on weekend possessions before, but only recently started using it in engineering hours at night when trains do not run. They now have Brokks working in engineering hours, in three separate locations. London Underground has found that the use of the Brokk delivers a higher productivity than a work gang with manual breakers. A Brokk can work on six to seven pit blocks in a night with an operator and gang of 16 workers. A manual gang of 24 workers with four breakers will only manage four to five pit blocks in a night. Not only does this prevent hand-arm vibration, but manual handling is also reduced (as they don't need to carry breakers and the Brokk breaks and dislodges concrete ready for clean-up).

Brokk remotely controlled concrete breaker



The Brokk also ensures fewer people are likely to be exposed to significant levels of noise and dust; this is an area that London Underground intends to assess further. London Underground has compared the per night costs with those using normal manual concrete breakers and found that there was a cost saving of around £500 **per night** from using the Brokk.

Better equipment - trialling new breakers

London Underground has also looked at using concrete breakers that produce less vibration. They trialled six new breakers at sites, between 22 and 29 January, 2011 on the Piccadilly and Northern lines.

Three of these new models have considerably lower vibration ratings, which should ensure that daily limits are not exceeded in an engineering hours shift. This will allow longer breakout times with less exposure on possessions, increasing productivity and reducing costs. London Underground is looking at replacing its existing breakers in due course, but plans to do further tests on noise levels in different environments and reassess hearing protection levels following the tests. It will also test new power tools as they come onto the market.

Monitoring and measuring vibration

Vibration is monitored to ensure workers are not exposed to harmful effects above the exposure limit value (ELV). The ELV is measured on a points basis with the limit being 400 points per day. Each tool is allocated points per hour according to the amount of vibration. When multiplied by the number of hours it provides a daily 'trigger time' for the tool(s) eg a tool vibrating at 7m/s^2 equals 100 points so the trigger time would be four hours.

London Underground provided its workers with HAVmeters that measure the increasing amount of vibration from the tools they use and will alert the user when to stop using those types of tools. Tool tags were also used to gather some basic data on the machines' performance. HAVmeters:

- are specific to each individual;
- alert the user when approaching maximum exposure levels;
- maintain a consistent record of worker exposure; and
- help to support and measure the success of a reduction policy.

HAVmeter base station with a swipe card for individual users



It found that the meters enable better control of usage of the breakers than a time-based rotation of personnel (for example each operative nominally worked for a 15 minute session but that could vary and whilst reportedly it was only one 15 minute session in a shift, that required supervision and control).

Managing workers health – examples of good practice

Whilst there are other systems that alert users when Exposure Values are reached, the HAVMeters were chosen to provide data that can be used both to record exposure and to compare different people and equipment.

Further Information

Extensive advice on the symptoms of HAVS, employer's responsibilities and controls to protect workers can be found on [HSE's website](#).