

**Hand Arm Vibration Syndrome**  
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## **Bad Vibrations**

The effects of vibration causing ill health and injury in the workplace are clearly understood. So much so that Hand Arm Vibration Syndrome (HAVS) has been listed as a prescribed disease in the UK since 1985 and is listed in RIDDOR2013(8) as being an occupational disease.

Its occurrence must be recorded by the person designated responsible for managing health and safety in the workplace and reported to the HSE using this form

<https://extranet.hse.gov.uk/lfserver/external/F2508AE>

## **What is HAVS**

HAVS is caused by the continuous use of vibrating machinery, it affects nerves, muscles, joints and blood vessels. Symptoms appear in the vascular system which involves the tips of fingers going white (blanching), or the neurological system, which includes numbness and tingling of the fingers and a reduced sense of temperature or touch. Attacks in the early stages of the condition are not continuous

You do not have to be using vibrating equipment for the symptoms to appear despite the fact they have been caused by that equipment, simply working in cold conditions is enough to trigger the symptoms.

When this occurs and the cold body subsequently warms back up an exaggerated return blood flow can occur that will lead to a throbbing of the fingers, the fingers going red and feeling extremely painful. HAVS will be triggered by conditions that

have resulted in reduced blood circulation – and this includes smoking which causes small blood vessels to narrow and can exacerbate the symptoms and cold weather which reduces blood flow to fingers

If exposure to vibration continues then the symptoms will spread further up the hand and can even affect the thumb, sufferers will experience joint pain (Carpal Tunnel Syndrome) reduced muscle strength and permanent nerve damage. HAVS does not appear overnight, it is a chronic condition that studies have suggested may take up to ten years to develop. Once it has developed it cannot currently be cured.

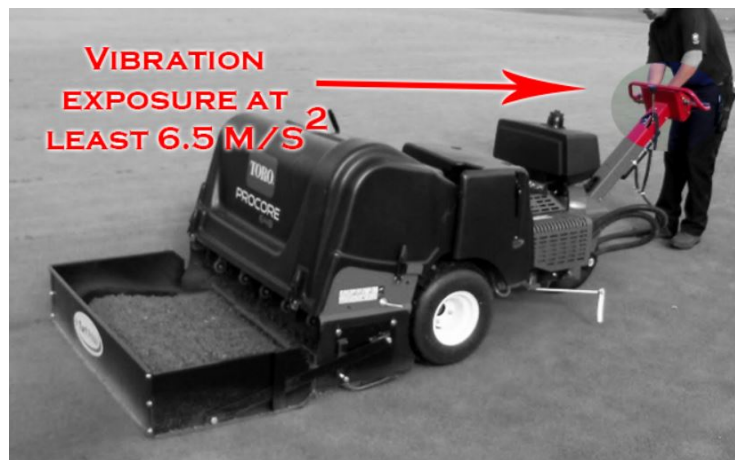


## Managing HAVS

Exposure to vibration in the UK and EU is regulated, those regulations place a duty on the employer to either eliminate vibration at source or to lower exposure to as low as is reasonably practicable.

Eliminate at source means taking physical contact with the vibrating equipment out of the task (using a remote control) or do not undertake the task (does that bank really need strimming?).

Where it cannot be eliminated (yes that bank does need strimming!). Lower to as low as is reasonably practicable by introducing organisational and technical procedures appropriate to the activity.



As vibration is a workplace hazard, any employer exposing their staff to vibration must conduct a vibration risk assessment. Like any risk assessment, it is a tool that enables the manager to record the controls in place, whether they are sufficient or not, and if any improvements are needed. The risk assessment should determine who is exposed, the magnitude of exposure and the duration of exposure for all equipment. It should identify vulnerable workers (those with early symptoms of HAVS) and young workers with developing bodies who are more susceptible to Musculoskeletal Disorder.

‘You cannot manage what you cannot measure’ is a well-known adage. Vibration can be measured, like noise it is measured in amplitude (the extent of oscillation) and frequency (how often it occurs).

In physical terms, the measurement is expressed in meters per second sq (M/S<sup>2</sup>). Knowing the vibrating levels of machinery is the starting point to implementing procedures, the next is the extent to which you can be exposed to vibration.

The Control of Vibration at Work Regulations introduce the concept of an Exposure Action Level (ELV) and Exposure Limit Value (ELV) CVWR2005(4).

Put simply the EAV is the exposure to vibration levels at which the employer has to take action. The ELV is the maximum amount of vibration an employee can be exposed to in a 24-hour period.

Unlike the noise regulations where exposure can be controlled by the appropriate use of PPE, the exposure to vibration is controlled by time, there is no provision in the regulations for the use of anti-vibration gloves.

Exposure limit values and action values / For hand-arm vibration		
Definition	Value	Employers duties
Exposure Action Value (EAV)	2.5 m/s <sup>2</sup> A (8)	Take certain actions to reduce exposure, provide staff with training and information on HAVS and the procedures you are putting in place to reduce exposure to as low as is reasonably practicable
Exposure Limit Value (ELV)	5 m/s <sup>2</sup> A (8)	Ensure this level is not exceeded in a 24-hour period

The data for these levels are provided by the manufacturers of the equipment and is published within the operators' manual. We must bear in mind that this is a measurement taken as factory new, that equipment deteriorates, gets damaged, and is not always maintained as it should be. The measurement provided by the manufacturer does not consider wear and tear, service requirements, damaged parts, or blunt blades – all of which add to the vibration exposure. This means that

any employer exposing employees to vibration also has a duty to measure to determine actual vibration levels by measuring at suitable intervals.

Once vibration levels are established it is easy to put in place procedures that keep exposure levels below the ELV, the easiest way of doing this using a points system introduced by the HSE. Points are awarded to a vibration magnitude per hour if the points tally for the day reaches 100 you have reached EAV and must take action if the point tally reaches 400 you have hit ELV and exposure must cease for 24 hours

Using the HSE Vibration Exposure Points Calculator we can see that equipment with a vibration magnitude of 5 M/S<sup>2</sup> can be used for eight hours before the ELV is reached  $5 \times 8 = 400$  exposure points.

Vibration Magnitude	HSE Vibration Exposure Points									
43	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
Vibration Magnitude	15m	30m	1h	2h	3h	4h	5h	6h	8h	10h
Exposure time										
Chart Legend										
Above the ELV										
Likely to be above the ELV										
Above the ALV										
Likely to be above ALV										
Below ALV (no action needed)										

The same vibration dose is achieved by a vibration magnitude of

- 10 M/S<sup>2</sup> for 2 hours
- 20 M/S<sup>2</sup> for 30 mins

I know from experience working with golf clubs that most handheld equipment greenkeepers and groundsmen use reaches the EAV, and much exceeds ELV.

Managing vibration is relatively easy once Vibration Magnitude has been established, it is best done as follows;

- Mark equipment with its ELV using data tags
- Ensure that points exposure on the HSE calculator remains below 400 for the day.
- Allow for breaks and rest periods
- Rotate tasks amongst the team to spread exposure
- Consider Vibration magnitude as part of your purchasing policy and buy the most suitable piece of equipment for the task but with the lowest exposure levels.
- Inform your staff about HAVS and the early symptoms
- Instruct your staff to report immediately if any symptoms are experienced
- Maintain equipment in line with OEM recommendations
- Do not use defective equipment
- Ensure equipment is set up correctly.

Remember vibration magnitude can be attained from the operator's manual, but the data is unlikely to be relevant after a period of use. In that instance, a Vibration meter has to be used. To comply with the regulations measuring equipment must satisfy; ISO 8041: 2005, IEC 60942: 2003 Class 1/C, IEC 61672-1 2002 Class 1.

## Examples of measurements taken and diversity amongst the same equipment

Location	Kit	Vib Magnitude	ELV / h.m	HSE points (a1)
Golf Course 1	Toro Pro core 648	10.4	1.51	216
Golf Course 2	Toro Pro core 648	5.74	6.42	66
Golf Course 3	Toro Pro core 648	11.38	1.33	259
Golf Course 3	Turfcutter	33.71	0.3	2273
Golf Course 1	Turfcutter	26.66	0.4	1422
Golf Course 2	Strimmer Stihl FS130	6.71	1.72	90
Golf Course 2	Strimmer Stihl FS130	14.12	0.15	399
Golf Course 3	Chainsaw Stihl KM130	24.41	0.5	1192
Golf Course 3	Chainsaw Stihl KM130	8.34	0.43	139
Points expressed as all for 1 hour exposure (a1)				
ELV is total vibration exposure in an 24 hour period				
If ELV is reached no more exposure to vibrating equipment over ALV is allowed in 24 hour period				

The measurements above are all actual measurements taken using a pre-calibrated vibration meter, the diversity in Vibration Magnitude is symptomatic of equipment age (old v new), how it is maintained, stored and set up.

The Pro Core (Golf Course 2) with a Vib magnitude of 5.74 M/S<sup>2</sup> had an engine defect so was running poorly