

VIBRATION HAZARDS

The information below is presented by the Federal Professional Association of Ancillary Construction Trades as part of the Austrian National Occupational Safety and Health Strategy

INTRODUCTION

In many fields of occupational activity employees are subject to vibration which is caused by hand-held tools (mechanical vibration) and transmitted to the body from the driver's seat or the ground. Exposure to vibration can severely affect workers' health. Thus, general efforts are required to prevent health hazards by taking technical, organisational or personal precautions.

The Ordinance governing the protection of workers from hazards caused by noise and vibration (Verordnung zum Schutz von ArbeitnehmerInnen vor einer Gefährdung durch Lärm und Vibrationen, VOLV) obliges employers to comply with the limit values specified in the Ordinance.

If exposure levels exceed a specific value (action value), the employees have to be informed and instructed about the hazards involved and appropriate protection measures.

WHAT IS VIBRATION?

Vibrations are mechanical oscillations transmitted to the human body via direct contact. Vibration is caused by work equipment performing continuous or repetitive movements, such as power-driven tools, mobile appliances or rotating machines.

The strain caused by vibration results from by vibration intensity and the duration of exposure.

Hand-arm vibration (HAV) is passing into the human body through the hand-arm system. Whole-body vibration (WBV) is transferred to the body through the legs when standing or through the buttocks when sitting.

LIMIT VALUES	HAV	WBV
Action value: If action values are exceeded, specific measures have to be taken.	2.5 m/s ²	0.5 m/s ²
Exposure limit value: Upper level which must not be exceeded	5.0 m/s ²	1.15 m/s ²

For establishing the exposure level that can be compared to a given limit value, the average vibration level that employees are subject to over an 8-hour period is taken.

For young persons the action values are the exposure limit values.

If the exposure to vibration cannot be assessed based on information provided by manufacturers in manuals,

reference data bases or based on calculations, vibration levels have to be measured.

EFFECTS OF VIBRATION ON HUMAN HEALTH

Excessive strain caused by strongly vibrating work equipment causes chronic hand and arm conditions known as Raynaud's phenomenon.

Studies show that workers whose whole body is exposed to vibration (mainly drivers of automotive work equipment) often suffer from back pain. Continuous strain caused by exposure to whole-body vibration over periods of several months or years may result in spine injuries.

EFFECTS OF WHOLE-BODY VIBRATION

- Fatigue, concentration disorders, sleep disorders
- Reduced dexterity, vestibular disorders
- Impaired vision as a result of fatigue
- Pain, restricted mobility of the cervical spine, the shoulder/arm region and/or the lumbar spine
- Gastrointestinal disorders
- Psychological troubles (such as unrest, stress)

EFFECTS OF HAND-ARM VIBRATION

- Stiff fingers
- Reduced dexterity
- Vascular and neuronal damage: Raynaud's phenomenon (numbness and/or tingling sensation in the fingers)
- Impaired tactile sense and reduced sensation of hot and cold
- Damage to bones and joints (shoulders, elbows, wrists) causing pain and reducing mobility

VIBRATION SOURCES

Hand-held tools

Grinders, powder-actuated fastening tools, drilling machines, etc.

Vehicles, machines

Forklift trucks, power shovels, agricultural machines, etc.

Rotating machines

Engines, lathes, conveyors

Machines delivering impacts

Demolition hammers, presses, swing frames, etc.

WHAT NEEDS TO BE DONE IN CASE AN ACTION VALUE IS EXCEEDED?

If an action value is exceeded, the following measures have to be taken to reduce vibration:

- Using other low-vibration processes
- Using low-vibration work equipment
- Regular maintenance of work equipment

In case of whole-body vibration

- Reducing unevenness of driveways (removing stones, grooves and holes)
- Adapting driving speed, type of wheels/tyres and tyre pressure to the ground surface conditions
- Using adapted vibration-reducing seats and cabins
- Installing machines in a way to cushion vibration
- Avoiding sudden movements, braking and acceleration

In case of hand-arm vibration

- Using vibration-reducing handles for hand-held tools

Organisational measures

- Reducing time of exposure by optimising work; minimising duration of vibration-intensive work processes to reduce time of exposure
- Preventing strain-intensifying factors
 - Avoiding heavy work, where possible
 - Facilitating ergonomic postures, avoiding forced postures
 - If workers are exposed to hand-arm vibration and cold (cool) or cold and damp surrounding conditions at the same time, heated handle systems should be used or workers should wear protective gloves.
- Avoiding great physical efforts for gripping, pressure and holding
- Identifying pre-existing muscular and skeletal injuries, including vascular damage in case of hand-arm vibration (health monitoring should start as soon as action values are reached)

Personal protective equipment

If personal protective equipment (such as anti-vibration gloves) which allows to lower the strain caused by vibration below exposure limit values is available, it has to be made available to and used by the employees. In addition, workers have to use protective gloves against cold and moisture.

HEALTH MONITORING

If vibration strains exceed action values, the employees concerned have to be offered a medical examination before commencement of the work and at an interval of 4 years.

The results of periodic health monitoring are to be taken into account when determining and assessing the hazards and strains involved.

MEASURED VIBRATION VALUES

Vibration intensities have been found to vary greatly. The Handbook on Hand-Arm Vibrations (Handbuch Hand-Arm-Schwingungen, in German) concerning the implementation of the respective EU Directive lists values measured for chain saws ranging from 1.4 m/s² to 11.3 m/s², for example. The series of measurements published by AUVA includes values ranging from 3.8 m/s² to 9.4 m/s².

In case of whole-body vibration, values measured for dump trucks published in the Handbook on Whole-Body Vibration (Handbuch Ganzkörper-Schwingungen, in German) range from 0.24 m/s² to 1.63 m/s², for example. The series of measurements published by AUVA includes values ranging from 0.7 m/s² to 2.1 m/s².

WORK EQUIPMENT	HIGHEST MEASURED VALUE [m/S ²]	LOWEST MEASURED VALUE [m/S ²]
Chain saw	11.3	1.4
Chisel hammer	27.0	2.8
Demolition hammer	24.5	7.4
Straight grinder	17.2	1.2
Angle grinder	29.6	1.6
Percussion drill	26.0	5.8
Impact driver	22.9	1.2
Needle gun	14.5	3.1
Rammer	47.6	8.1
Breakers	25.5	7.3
Hammer drill	27.0	10.0
Orbital sander	12.5	3.1
Jig saw	32.4	2.2
Vibratory compactor	30.4	7.0

SOURCES

- Website of the Labour Inspectorate "Vibration - comprehensive information" (in German)
- AUVA fact sheet E10 on "Vibration" (in German)
- AUVA vibration data base

In cooperation of:



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No claim is made to content being complete.

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