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Vibracije dlan-roka - Smernice za zmanjšanje tveganja zaradi vibracij - 2. del: Organizacijski ukrepi na delovnem mestu

Hand-arm vibration - Guidelines for vibration hazards reduction - Part 2: Management measures at the workplace

Hand-Arm-Schwingungen - Leitfaden zur Verringerung der Gefährdung durch Schwingungen - Teil 2: Organisatorische Maßnahmen am Arbeitsplatz

Vibrations main-bras - Guide pour la réduction des risques de vibrations - Mesures de prévention sur le lieu de travail

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European foreword

This document (CEN/TR 1030-2:2016) has been prepared by Technical Committee CEN/TC 231 "Mechanical vibration and shock", the secretariat of which is held by DIN.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes CR 1030-2:1995.

The present series CR 1030 / CEN/TR 1030 is composed with the following parts:

— CR 1030-1, *Hand-arm vibration — Guidelines for vibration hazards reduction — Part 1: Engineering methods by design of machinery*;

— CEN/TR 1030-2, *Hand-arm vibration — Guidelines for vibration hazards reduction — Part 2: Management measures at the workplace*.

Introduction

The habitual and prolonged use of machinery which transmits vibration to the hand can cause disorders of the upper limbs. European legislation — especially the Physical Agents Directive 2002/44/EC (Vibrations at work) — requires that employers assess and take measures to prevent or reduce workplace risks to the health and safety of their employees. The basic strategy to be adopted is defined in the European legislation including the Directive 2002/44/EC and described in the "Non-binding guide to good practice for implementing Directive 2002/44/EC (Vibrations at work)", Part I "Guide to good practice on hand-arm vibration", which is addressed to the European Member States. It covers the following areas of measures:

a) assessment of risks;

b) identification of necessary preventative and/or protective measures;

c) organization for the effective implementation of preventative and protective measures;

d) implementation of an adequate programme of measures to prevent or reduce risks.

This revised Technical Report CEN/TR 1030-2 (first edition was published as CR 1030-2 in 1995) primarily provides additional information and examples to the European "Guide to good practice on hand-arm vibration" (Part I of the Non-binding guide to good practice for implementing Directive 2002/44/EC (Vibrations at work)).

This Technical Report CEN/TR 1030-2 provides additional information for Member States' health and safety authorities or labour authorities as well as managers, health and safety officers, engineers, planning and purchasing staff and others on further aspects of vibration effect reduction and control, which supports the practical implementation of the requirements of the Physical Agents Directive 2002/44/EC (Vibrations at work). Effective protection against vibration generally requires a combination of measures which can be categorized as technical measures and management measures; see Figure 1.

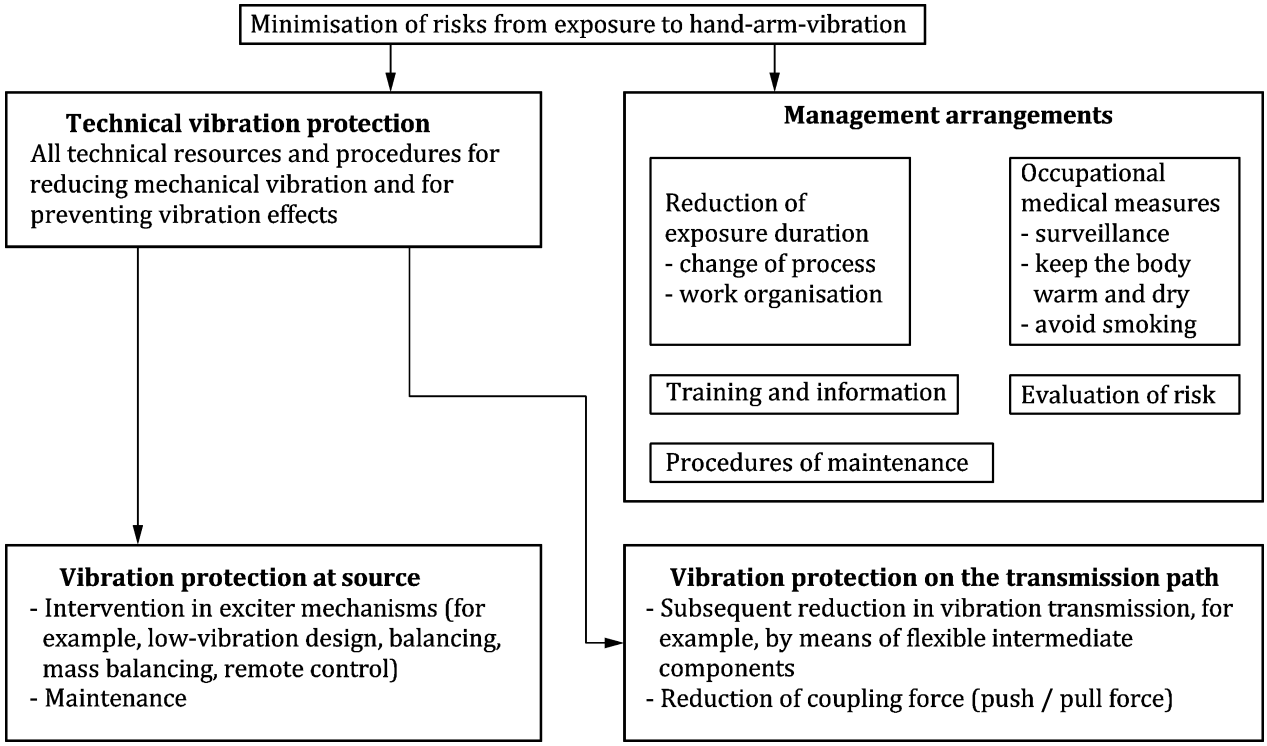


Figure 1 – Minimization of risks from exposure to hand-arm vibration

1 Scope

This Technical Report outlines practicable measures for the reduction and control of health hazards associated with exposure to hand-arm vibration at work. It supplements the European "Guide to good practice on hand-arm vibration" and provides a practical professional aid for Member States' health and safety authorities or labour authorities who write national guidance for managers, health and safety officers, engineers, planning and purchasing staff and others.

This Technical Report covers the following principal aspects:

a) identification of main sources of hand-arm vibration at work;

b) vibration reduction by re-considering task, product, process and design;

c) how to select low-vibration machinery, including vibration reducing features, auxiliary equipment for control of vibration;

d) other issues, e.g. personal protection and its limitation;

e) management measures for the control of hand-arm vibration exposure;

f) health surveillance.

2 Normative references

The following documents, in whole or in part, are referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

CR 1030-1, *Hand-arm vibration — Guidelines for vibration hazards reduction —Part 1: Engineering methods by design of machinery*

EN 12096, *Mechanical vibration - Declaration and verification of vibration emission values*

CEN/TR 15350:2013, *Mechanical vibration - Guideline for the assessment of exposure to hand-transmitted vibration using available information including that provided by manufacturers of machinery*

EN ISO 5349-1:2001, *Mechanical vibration - Measurement and evaluation of human exposure to hand-transmitted vibration - Part 1: General requirements (ISO 5349-1:2001)*

EN ISO 5349-2, *Mechanical vibration - Measurement and evaluation of human exposure to hand-transmitted vibration - Part 2: Practical guidance for measurement at the workplace (ISO 5349-2)*

ISO 2041, *Mechanical vibration, shock and condition monitoring — Vocabulary*

ISO 5805, *Mechanical vibration and shock — Human exposure — Vocabulary*

3 Terms and definitions

For the purpose of this document, the terms and definitions given in EN ISO 5349-2, ISO 2041 and ISO 5805 apply.

4 Identification of main sources of hand-arm vibration at work

A starting point is to consider the work being carried out, the processes involved and the tools and equipment used. Use of hand-held, hand-guided or hand-fed powered equipment should be managed.

The risk assessment should:

a) identify where there can be a risk from hand-arm vibration;

b) estimate workers' exposures using information on tool vibration and information gathered on patterns and durations of tool use and compare them with the exposure action value and exposure limit value as specified in the Physical Agents Directive 2002/44/EC (Vibrations at work);

c) identify the available risk controls;

d) identify people who can be at particular risk, e.g. young or pregnant workers, those who have had surgery on hands and arms or have known disorders similar to those that can be caused by vibration;

e) if it is likely to help plan and implement controls, make a more detailed assessment of exposure, e.g. including measurement;

f) identify the steps to control and monitor hand-arm vibration risks;

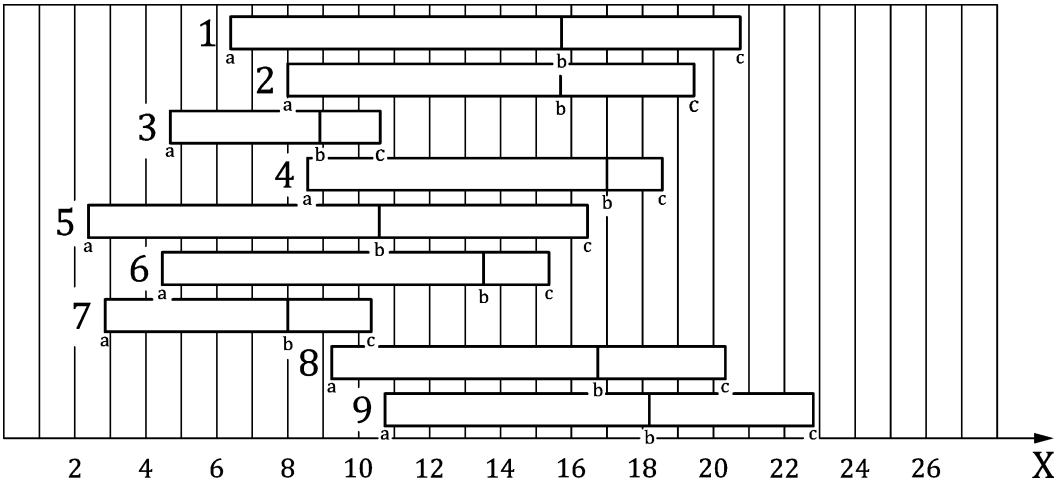
g) record the assessment, the steps that have been taken and their effectiveness;

h) be revised periodically, e.g. if there are changes in the work equipment or if workers report signs or symptoms that can be attributed to vibration injury.

Figure 2 shows sample ranges of vibration magnitudes of some of the most common tools and machines that create the risks. Annex A lists more examples of tools for which the management of vibration exposure is needed.

The values listed in Figure 2 are values from real-world/field measurements at working places with tool applications/conditions at companies according to EN ISO 5349-2 (the values of Figure 2 are not manufacturer data or manufacturer-declared values).

Annex I provides additional information about tool characteristics and work tasks for the tools, listed in Figure 2.

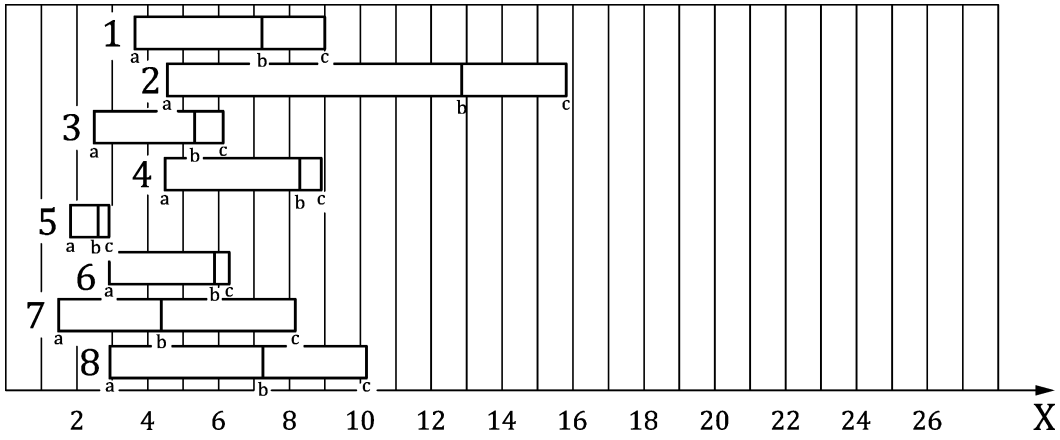


Key

X a_{hv} in m/s²

1 concrete breaker E and P (39)
2 impact drill E (10) - percussive mode
3 core drill E (28)
4 trench rammer C (12)
5 plate compactor C (31)
6 cut-off saw C (19)
7 angle grinder E (12)
8 perforator SDS plus E (32)
9 perforator SDS max E (40)
a 10th percentile
b 75th percentile
c 90th percentile

a) Machinery used in construction

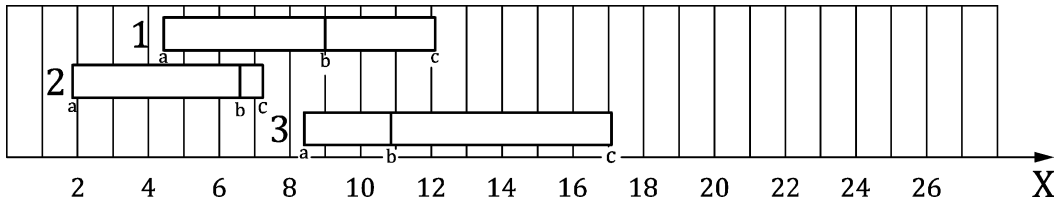


Key

X a_{hv} in m/s²

1 mower C (18)
2 brush cutter with disc C (12)
3 brush cutter with strimmer C (21)
4 chain saw C (17)
5 pole pruner B (11)
6 pole pruner P (22)
7 leaf blower C (12)
8 hedge cutter C (23)
a 10th percentile
b 75th percentile
c 90th percentile

b) Machinery used in landscaping and gardening

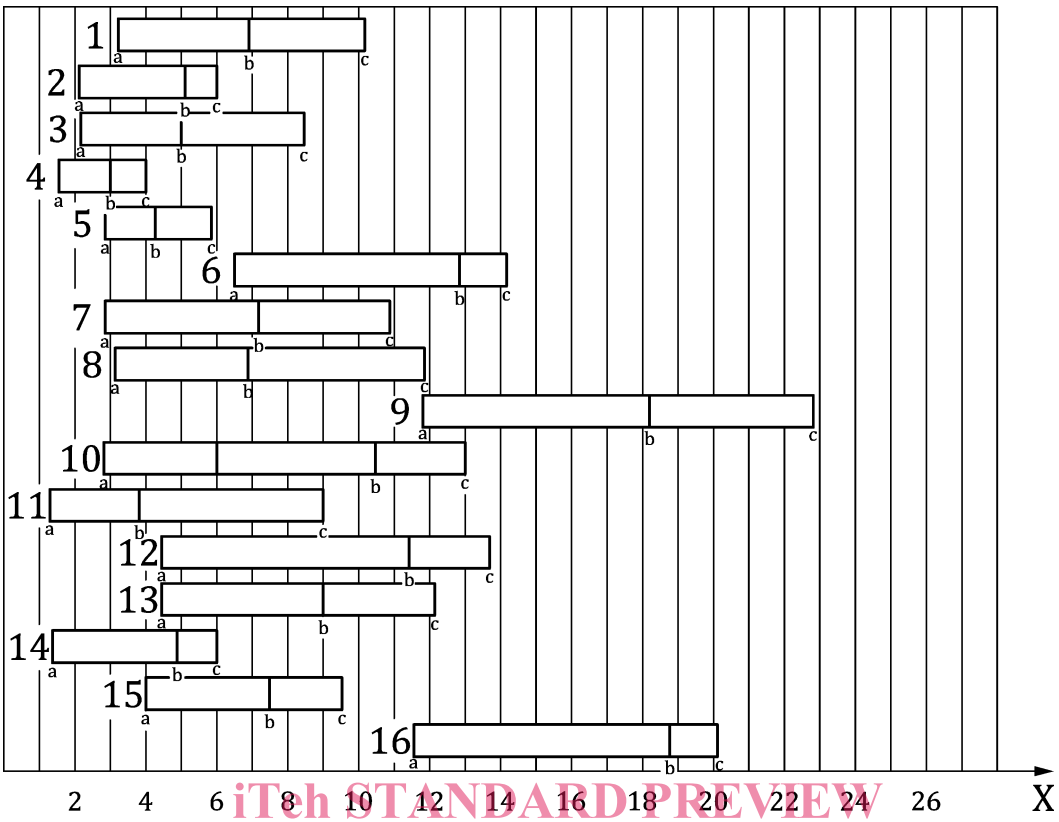


Key

X a_{hv} in m/s²

1 nail gun P (48)
2 tacker P (10)
3 jig saw E (9)
a 10th percentile
b 75th percentile
c 90th percentile

c) Machinery used in wood working



Key

X a_{hv} in m/s²
1 angle grinder E and P (106)
2 vertical grinder P (12)
3 straight grinder E and P (28)
4 screwdriver E and P (12)
5 impact wrench B (13)
6 impact wrench P (12)
7 impact wrench P (21)
8 ergo pulse/ratchet wrench E and P (11)
9 needle scalers P no susp. (12)
10 needle scalers P susp. (12)
11 angle sander E and P (12)
12 orbital sander P (73)
13 vibrating sander E and P (20)
14 drill E and P (16)
15 impact drill E (10) - rotatory mode only
16 reciprocating saw E and P (13)
a 10th percentile
b 75th percentile
c 90th percentile

d) Machinery used in metal working

NOTE For each tool family, the energy mode (B: Battery; C: Combustion; E: Electric; P: Pneumatic) and the number of measurements are given.

Figure 2 — Examples of vibration magnitudes for common tools, given as total acceleration values a_{hv} measured along the 3 axes under real conditions (2005 to 2014)

It is important to keep workers and their representatives involved and informed in the assessment of vibration risk. An effective partnership with workers helps to ensure that the information used for the risk assessment is based on realistic assessments of the work being carried out and the time taken to do that work.

The factors that govern a person's daily vibration exposure are:

— the frequency-weighted magnitude (level) of vibration and

— the length of time (duration) the person is exposed to it.

The greater the magnitude or the longer the duration of exposure, the greater is the person's vibration exposure.

It is essential that the various sources of vibration with risks for health and safety and their characteristics are known, exposed employees are identified and a reliable estimate is made of their exposures. In order to do this, it is necessary to know

— the machinery, processes, tools and tasks in use within the company, which are likely to expose employees to vibration;

— who is likely to be exposed sufficiently to vibration to be at risk.

An initial identification of sources of exposure to hand-arm vibration can be made by listing all the vibrating processes, machines and tools used at work which require employees to hold or guide a vibrating handle, control, work-piece or other vibrating surface. A list of the more common machines and processes which expose people at work to hand-arm vibration is given in Annex A.

Furthermore, it is necessary to know

1) the number and location of employees for each of the tasks which expose them to hand-arm vibration;

2) representative vibration values and the likely range in values for each machine, tool, etc. which create the hazard and the vibration exposure of persons at risk;

3) uses of the machines (if any) that are likely to cause increased vibration risk;

4) daily duration and pattern (e.g. tasks and tools) of vibration exposure.

If there is a range of well-maintained modern tools, exposure above the exposure action value is likely for 15 min use of hammer action tools or 1 h of other action tools. It is often possible to select equipment carefully for lower vibration so that it can be used for longer than these periods.

NOTE 1 The exposure action value standardized to an 8 h reference period is 2,5 m/s^2 as defined in Directive 2002/44/EC (Vibrations at work). Some people regularly exposed to this level of vibration will develop symptoms after some years of exposure.

Most older/traditional designs of tool will reach the exposure action value after much shorter durations. Also designs of tool without vibration minimization (state of the art of minimization measures as required by the EU Machinery Directive 2006/42/EC) will reach the exposure action value after much shorter durations.

The daily vibration exposure A(8) represents the contribution of all machines, processes or tools to the daily vibration exposure of the persons who operate or use it. The daily vibration exposure A(8) for a worker carrying out one process or operating one tool can be calculated from a magnitude and exposure time: