Erratum Notice
Date: 6th December 2024

Title: A Study Book for the NEBOSH National General Certificate (11th Edition)
Publisher: RMS Publishing
ISBN: 978-1-906674-93-9

It has come to our attention that an error appears in Element 5 of this publication, on page 179 of the August 2024 print run. Figure 5-20, 'Triaxial measurements' mistakenly shows a photograph of a radio mast. The correct image should be a diagram of a figure sat in a seat, with three arrows to indicate directions to measure vibration on the whole body.
This will be corrected for future printings.

We apologise for any inconvenience caused and appreciate your understanding.
We are happy to supply replacement pdfs where required, please contact us at support@rmspublishing.co.uk for further assistance or clarification.

Ways to contact us

- +44 (0) 1384 447927
- sales@rmspublishing.co.uk
- www.rmspublishing.co.uk

Suite 3, Victoria House
32 Lower High Street
Stourbridge
DY8 1TA

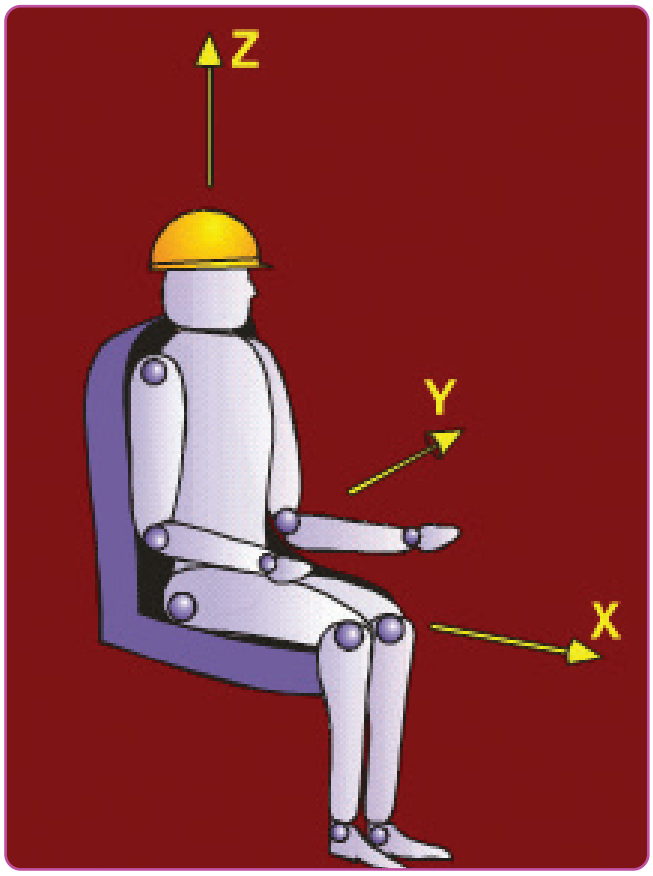

Figure 5-20: Triaxial measurements.
Source: HSE.

A typical vibration measurement system includes a device to sense the vibration (accelerometer), and an instrument to measure the level of vibration. The accelerometer produces an electrical signal and the size of this signal is proportional to the acceleration applied to it. A weighting system provides a single number as a measure of vibration exposure which is expressed as the frequency-weighted vibration exposure in metres per second squared (m/s^2), units of acceleration.

The exposure values are expressed in terms of m/s^2 A(8), which expresses a person's exposure as an average over an eight-hour period.

It does not fully represent the risks which are generated by vibration when it includes severe shocks and jolts (for instance, when driving over potholes or large rocks), which are considered to be an important risk factor in back pain. It is possible to make a basic assessment of the severity and frequency of shocks and jolts by observing the working vehicle and the movement of the driver in the seat, or by asking the driver about them.

Hand-arm vibration

The European Physical Agents (Vibration) Directive (2002/44/EC) deals with risks from vibration at work and distinguishes between vibration affecting the hand-arm system and the whole body. ***See Figure 5-21*** for the Directive's definition of the term 'hand-arm vibration'.

This led to the introduction of the CVWR 2005, which sets exposure action and limit values for vibration.

> "'Hand-arm vibration': the mechanical vibration that, when transmitted to the human hand-arm system, entails risks to the health and safety of workers, in particular vascular, bone or joint, neurological or muscular disorders."

Figure 5-21: Definition of hand-arm vibration.
Source: EU, Directive 2002/44/EC - on physical agents - vibration.

Effects on the body

Prolonged intense vibration transmitted to the hands and arms by vibrating tools and equipment can lead to a condition known as ***hand-arm vibration syndrome (HAVs)***. These are a range of conditions relating to long term damage to the circulatory system, nerves, soft tissues, bones and joints. The medical effects of sustained exposure to hand-arm vibration can be serious and permanent and are summarised in the following points:

- Vascular changes in the blood vessels of the fingers.
- Neurological changes in the peripheral nerves.
- Muscle and tendon damage in the fingers, hands, wrists and forearms.
- Suspected bone and joint changes.

Vibration generated by tools and equipment held in the hand can result in a significant reduction in blood flow to the hand. Prolonged exposure can cause the fingers go white and numb.

Leading to probably the best known of the conditions arising from the medical effects of exposure to vibration - vibration white finger (VWF).

This condition is also known as ***Raynaud's phenomenon*** (it has other causes in addition to exposure to vibration). Other symptoms of the condition are sharp tingling pains in the affected area and possible change in skin colour as blood vessels dilate when exposure to the vibration stops.

Figure 5-22: Use of circular saw - vibration.
Source: Wikimedia Commons.