Whole-body vibration in quarries

HSE information sheet

Introduction

This information sheet outlines the risk of developing back pain from whole-body vibration (WBV) in quarrying and explains what you can do to reduce exposure to it. It should be read in conjunction with INDG242(rev1) *Control back-pain risks from whole-body vibration*.[1]

What is whole-body vibration (WBV)?

Whole-body vibration is the vibration and shock you feel when you sit or stand on a vehicle or machine travelling over rough ground or along a track, or the vibration when you work near powerful machinery such as a rock crusher. Shocks can occur, for example, when driving over bumps or potholes. Exposure to WBV at low levels is unlikely on its own to cause back injury, but it can aggravate existing back injuries which may cause pain.

There are many causes of back pain other than WBV, which must be adequately controlled. The most likely cause of back pain should be tackled first.

See leaflet INDG242 for more information, and leaflets INDG143[2] and INDG383[3] for guidance on assessing and managing the risks from manual handling (see 'Further reading').

The law

The Control of Vibration at Work Regulations 2005 (the Vibration Regulations)[4] require you to control the risks from WBV and shock by a combination of:

- identifying sources of exposure and possible exposure controls;
- minimising exposure by maintaining or modifying machinery and following good practice measures to control exposure; and
- training operators to ensure controls are effective.

HSE also recommends health monitoring to identify and minimise the risk of back pain from all sources, not just from WBV. Include operators of mobile plant in health monitoring schemes to check for excessive back pain from any possible cause.

What are the action and limit values?

The Vibration Regulations require risks from vibration to be minimised. They set an exposure action value (EAV) which is the amount of daily exposure to WBV above which you are required to take specific actions to reduce risk. They also set an exposure limit value (ELV) that should not be exceeded.

Exposures for those using quarrying machinery are likely to be above the EAV and in some cases need careful management to remain below the ELV (see Table 1). You should not usually need to measure WBV exposures to know where and how the Regulations apply. However, action to reduce workplace exposure to WBV is required for most use of mobile quarrying machinery by most operators on at least some days.

What action should I take?

The kind of action you need to take varies with the degree of risk. Table 1 allocates common machinery and tasks to exposure groups requiring different levels of exposure and risk management. Actual exposures vary by quarry type and by implementing good practice you may be able to reduce exposures still further.

If you operate machinery or perform tasks not listed in Table 1 you may find information from manufacturers, your trade association, or elsewhere to identify what level of control action is required. Exposures should be reduced so far as is reasonably practicable. You may wish to get advice from a person who has the qualifications, knowledge and expertise to help you decide what you need to do.

Table 1 Quarry machinery grouped according to likely exposure

Group 1: WBV unlikely to be a risk	Group 2: You must manage exposure to WBV	Group 3: WBV is a likely cause of back pain	Group 4: You must restrict exposure to WBV*
■ Workstations on rock crushers ■ Drilling rig operations	■ Excavators more than about 25 t ■ Road haulage vehicles such as 8-wheeled tipper trucks ■ Mobile crushers (subject to further evaluation)	■ Excavators less than about 25 t ■ Rigid dumpers ■ Wheeled loading shovels used in stock areas ■ Telescopic handlers ■ Wheeled loading shovels used at the face ■ Articulated dumpers working on roadways with substantially flat surfaces ■ Graders	■ Dozers – especially ripping ■ Articulated dumpers working on surfaces causing body roll and creating high roll in the cab ■ Scrapers

Group 1: WBV unlikely to be a risk

- Exposure is likely to be below the EAV (0.5 m/s^2 $A(8)$) with no significant shocks.
- Low-cost vibration-reduction measures and management of WBV will reduce maintenance and the likelihood of back pain.

Group 2: You must manage exposure to WBV

- Exposures are likely to exceed the EAV (0.5 m/s^2 $A(8)$) on at least some days, but shocks are expected to be small.
- The risk of back pain from WBV is likely to be low and back pain is more likely to be caused by other factors.
- You must have low-cost vibration-reduction and management controls in place, but costly or difficult measures are unlikely to be reasonably practicable.

Group 3: WBV is a likely cause of back pain

- Exposures are likely to be much higher than the EAV and/or contain large shocks.
- You must have effective engineering and management controls.
- Health monitoring is recommended to confirm that the risk from WBV is under control.

Group 4: You must restrict exposure to WBV

- To comply with the ELV (1.15 m/s^2 $A(8)$) you must restrict how long people are exposed to WBV.

* A transitional period permits machinery to continue in use until July 2010 with operators exposed in excess of the ELV, so long as exposure is reduced so far as is reasonably practicable.

Controls to reduce the risk of WBV

Precautionary measures

- Establish who is responsible for managing the control of risk from exposure to WBV or shock.
- Find out what can reduce shock, such as adequate maintenance of tracks.
- Find out what can reduce vibration, such as limiting speed or good maintenance of machinery suspensions.
- Find out vibration information when purchasing or hiring machinery.
- Provide information and training for operators on how to minimise exposure to WBV and shock and how to recognise and report symptoms.

Selecting suitable machinery

Quarry managers should ensure that machinery:

- is suitable for the intended task;
- is properly maintained in accordance with the manufacturer's recommendations; and
- will not cause unnecessary vibration exposure.

Using under-sized or under-powered machines is likely to increase exposure to WBV and shock. It may be possible to reorganise the extraction process to minimise the use of mobile plant.

Since 1996 manufacturers/suppliers have had to:

- supply machinery with low vibration emissions;
- inform buyers of the WBV emission level; and
- provide additional information about WBV, as necessary, for the machinery to be used safely.

There is usually little difference in the vibration of directly competing machines but, where there is a difference, choose the alternative with lower WBV emission levels. However, comparing levels is only meaningful if the measurements have been made using the same method. Ask suppliers for likely vibration emissions for the work the vehicle is most likely to do and what methods of operation are likely to achieve lower vibration exposures.

Some manufacturers provide product literature that summarises the ranges in whole-body vibration likely for earth-moving machinery for various operations and provide guidance on how to operate the machinery for low vibration exposure.

Using articulated dumpers as part of a plan to reduce time and effort on roadway maintenance is **not acceptable** because it increases the vibration exposures of the dumper drivers compared with using rigid dumpers (or articulated dumpers on maintained surfaces).

Also remember:

- Installing conveyors can help minimise the need to use dumpers for hauling.
- Machinery should be fitted with vision aids such as convex mirrors and CCTV to minimise the need for the operator to twist or stretch.
- Road vehicles should not be used for haulage within quarries.

Construction and maintenance of haul roads

- Construct and maintain roadways, stock areas and other vehicle manoeuvring areas to a high standard, according to the machinery that will use them.
- Where there are permanent roadways in the quarry, consider constructing these roads to highways standard. Repair potholes to avoid shocks.
- Design and maintain roads to be even to avoid poor posture, high vibration and shock, particularly in articulated dumpers.
- Design road cambers to avoid or minimise poor posture.
- Construct roadways with good drainage to help reduce deterioration.

Grading of roadways has sometimes been reported to be a cause of high exposure to WBV. The schedule for road maintenance should balance the exposures of haul truck operators with those of grader operators.

Maintenance and adjustment of seats

- Machine manufacturers/suppliers must ensure that the seat adjustment controls are readily accessible and easy to use. The same applies to the retrofitting of replacement seats.
- Train operators to set seats correctly. Incorrect seat adjustment is frequently the source of poor posture and unnecessary vibration or shock.
- Check, lubricate and maintain seat, cab and chassis suspensions as recommended by the manufacturer.

Seat suspension components (especially the damper) will probably need replacing several times during the life of the seat. The seat will probably need replacing several times during the life of the machine. Fitting a heavier damper will often reduce exposure to shock and extend damper life, but modifications of the seat damper assembly should be discussed with the manufacturers of both the seat and the machine.

The seat assembly should be assessed regularly as part of the inspection regime for quarry vehicles.

Management controls and monitoring

All quarry mobile plant can cause exposure in excess of the ELV if management controls are not implemented and followed. Actual exposures are usually between the EAV and ELV, so controls are necessary and must be monitored and maintained.

Management controls restricting route or speed may help reduce exposure to a minimum and may be essential if, for example, there are large shocks or the ELV is exceeded. Management controls restricting how long machines are used for is a last resort to comply with the ELV.

You should only use job rotation to comply with the ELV after exposure to shocks has been minimised and preferably eliminated. Job rotation may increase the number of operators at risk if large shocks are present.

Include these measures in the quarry's vehicle rules.

High-risk tasks

Dozing, scraping, hauling in articulated dumpers on rough tracks, and possibly grading, are activities producing the highest vibration exposures and the causes of vibration and shock need careful control. Exposure durations must be controlled to ensure that exposures remain below the ELV.

Inform and train operators and drivers

A competent and skilled machine operator who drives in a smooth and controlled manner will often generate lower exposure to vibration than a less skilled operator or someone working under pressure. Train machine operators and give them information about:

- the risks of lower back pain in their jobs;
- the factors that are within their control (such as choice of speed and route) and where experience has shown these to be important;
- how to set the seat for good posture and to set the suspension correctly to minimise vibration;
- how to locate and adjust convex mirrors and CCTV so that they can use them without twisting and stretching; and
- how to identify and report faults.

Health monitoring

Operators of mobile plant should be included in health monitoring schemes used to check for excess of back pain from any possible cause. For more information, look at HSE's guidance booklet L141.

Further reading

1 *Control back-pain risks from whole-body vibration: Advice for employers on the Control of Vibration at Work Regulations 2005* Leaflet INDG242(rev1) HSE Books 2005 (single copy free or priced packs of 10 ISBN 978 0 7176 6119 0) www.hse.gov.uk/pubns/indg242.pdf

2 *Getting to grips with manual handling: A short guide* Leaflet INDG143(rev2) HSE Books 2004 (single copy free or priced packs of 10 ISBN 978 0 7176 2828 5) www.hse.gov.uk/pubns/indg143.pdf

3 *Manual handling assessment charts* Leaflet INDG383 HSE Books 2003 (single copy free or priced packs of 10 ISBN 978 0 7176 2741 7) www.hse.gov.uk/pubns/indg383.pdf

4 *Whole-body vibration. The Control of Vibration at Work Regulations 2005. Guidance on Regulations* L141 HSE Books 2005 ISBN 978 0 7176 6126 8

5 *Non-binding guide to good practice for implementing Directive 2002/44/EC (Vibrations at work)* European Commission ISBN 978 92 79 07533 9. Order or download free at www.bookshop.europa.eu

Further information

HSE priced and free publications can be viewed online or ordered from www.hse.gov.uk or contact HSE Books, PO Box 1999, Sudbury, Suffolk CO10 2WA Tel: 01787 881165 Fax: 01787 313995. HSE priced publications are also available from bookshops.

For information about health and safety ring HSE's Infoline Tel: 0845 345 0055 Fax: 0845 408 9566 Textphone: 0845 408 9577 e-mail: hse.infoline@natbrit.com or write to HSE Information Services, Caerphilly Business Park, Caerphilly CF83 3GG.

This document contains notes on good practice which are not compulsory but which you may find helpful in considering what you need to do.

This document is available web-only at: www.hse.gov.uk/vibration/wbv/quarries.pdf.