

# Exposure to Whole-Body Vibration for Drivers and Passengers in Underground Mining Vehicles.

## Researchers

The three principal researchers were:

Barbara McPhee – Project Manager  
OH&S Services Network

Gary Foster – Project Hygienist  
Gary Foster & Associates

Airdrie Long – Biomedical Engineer  
Considered Solutions

## Aims

The main aims were to:

1. develop a suitable measurement system;
2. measure and analyse WBV exposure levels in a sample of workers, in a range of coal mine vehicles, using the Australian, British and new International Standards;
3. record individual's ratings of rides;
4. record musculoskeletal symptoms of operators;
5. develop guidelines on reducing harmful WBV in mining.

## Background

In NSW a significant number of Workers' Compensation claims are for back and neck injuries believed to arise directly or indirectly from exposure to what are commonly referred to as 'rough rides'. These rides include jolts and jars as well as 'steady state' vibration and are measured in terms of whole-body vibration (WBV). There has been surprisingly little research into the long-term effects on humans of exposure to WBV. Similarly there is very limited information on the extent and nature of WBV exposure in mining personnel in Australia.

The study was conducted in NSW open-cut and underground mines and a coal loading facility and began in 1996.

## Project Outcomes

- The Australian Standard may underestimate the effects of whole-body vibration in mining vehicles where jolts and jars are frequent
- Most underground vehicles, except some free steered & load haul dump vehicles were assessed by the Australian Standard as being acceptable for an 8-hour exposure

(continued on next page)

## REDUCING WHOLE-BODY VIBRATION EXPOSURE

### **Road maintenance programs**

- road maintenance programs that are planned & systematic and not regarded as secondary to production demands,
- dedicated vehicles & drivers for road maintenance,
- effective communication of information on road conditions eg use of caution markers for pot holes & poor conditions,
- immediate rectification of poor road conditions.

### **Design of vehicles and seats**

- vehicle suspension must be appropriate for loads & must not be allowed to bottom out,
- good seat design & improved seat suspension,
- improved visibility from cab (headlights, line-of-sight),
- forward facing seating for passengers,
- sufficient head & leg space for driver,
- fully adjustable seating & properly located controls.

### **Operator training**

- raise awareness of harmful effects & what constitutes harmful vibration,
- driver competency training.

### **Restricting speed**

- enforce speed limits,
- appoint competent & safe drivers,
- speed limited vehicles in specific situations.

### **Vehicle maintenance**

- planned maintenance for vehicle & seat suspensions,
- specialist maintenance for vehicle & seating suspension systems.

## Project Outcomes (continued)

- In underground mines, 89% of study participants reported some musculoskeletal disorders in the previous 12 months. Low back pain (75%) and/or neck pain (50%) were the most commonly reported disorders
- The International Standard, which incorporates methods to assess jolts and jars, is more stringent than the Australian Standard
- Under the International Standard acceptable exposure times are drastically reduced in many vehicles. This has wide implications for the industry which will need to use a variety of control methods (see box - Reducing WBV Exposures)
- The Vibration Dose Value (VDV) used in the International Standard was found to be a sensitive indicator of ride roughness and a good indicator of the condition of vehicle suspension
- Most vehicle operators underrated the roughness of their rides
- A range of factors is likely to contribute to rough rides, these are: type, age, design and make of vehicle; vehicle suspension, seat suspension and maintenance; road and work surfaces; vehicle activity; speed of operation and driver skills
- There was evidence that poor cab design increased operator's complaints of discomfort and reduced the benefits of good seating
- Exposure Standards using time limits will not protect against the one-off severe jolt e.g. resulting when a speeding vehicle hits a pothole

### Booklet on reducing whole-body vibration exposures in mining

A booklet is available through the Joint Coal Board Health and Safety Trust that explains the possible effects and assessment of whole-body vibration and the ways it can be reduced.

### Further Information

Barbara McPhee Ph 02 9808 2556  
Email [bmcphee@ozemail.com.au](mailto:bmcphee@ozemail.com.au)

Gary Foster Ph 02 9427 5246  
Email [gfoster@telpacific.com.au](mailto:gfoster@telpacific.com.au)

COMPARISON OF AUSTRALIAN & INTERNATIONAL STANDARDS				
Vehicle Type (median sample run)	Australian Standard		International Standard Time to reach -	
	Fatigue limit	Health limit	Caution zone	Likely health risk zone
FSV without suspension – driver	1 hour	4 hours	1 minute	6 minutes
FSV 4WD personnel troop carrier – passenger	4 hours	16 hours	1.5 hours	6 hours
Load haul dump vehicle	4 hours	8 hours	18 minutes	4.5 hours
Personnel rail carrier – passenger	4 hours	16 hours	2 hours	7 hours

March 2001

