

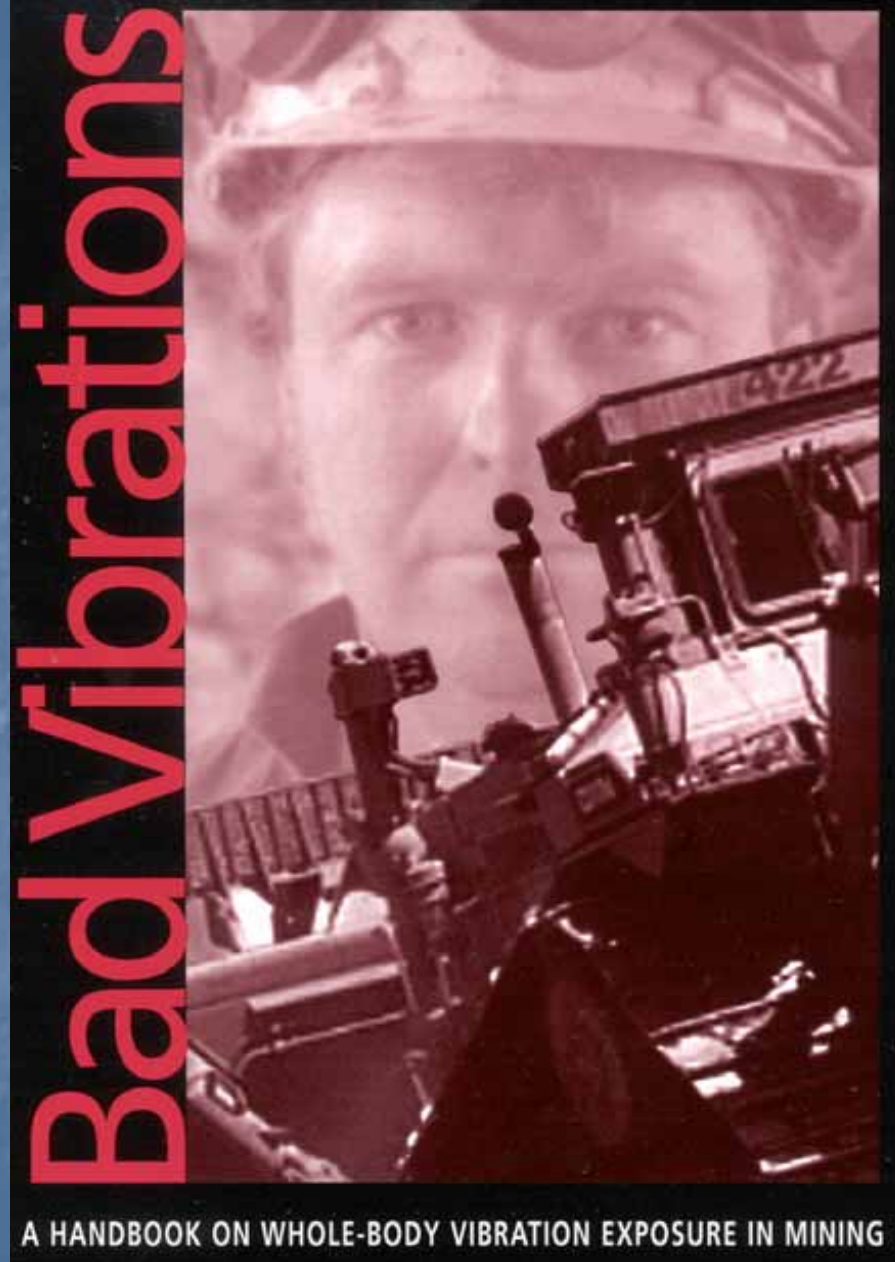


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Vibration Measurement.....(1994 to 2000)



Measurement now...



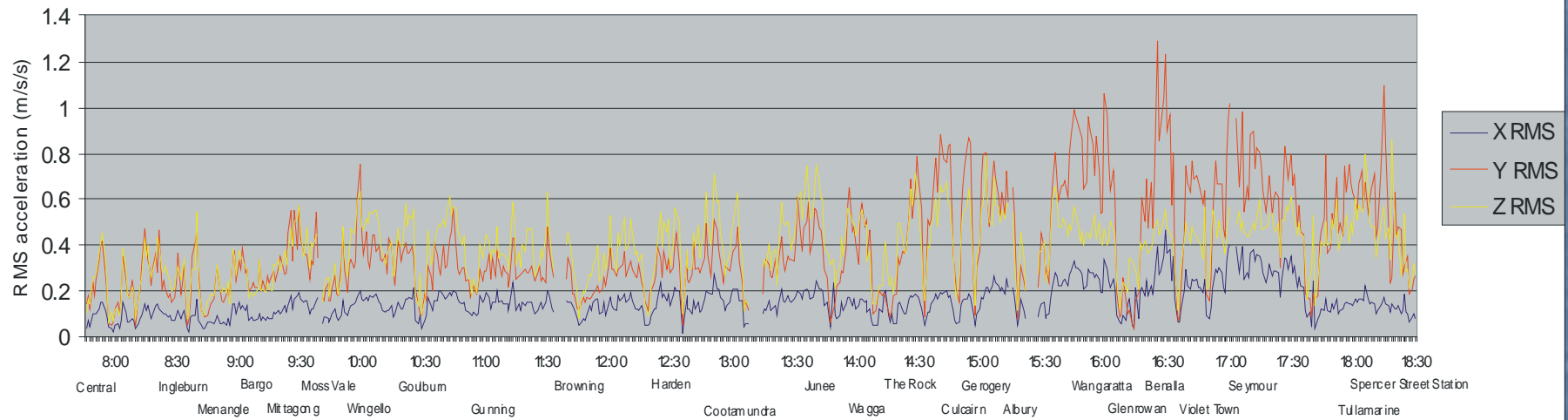
Sources of Whole-body vibration in mines



Interstate trains



Train vibration levels



Motor bike – whole body & hand arm vibration



Hand-arm vibration



Adverse effects of whole-body vibration

- Evidence is strongest for low back especially when associated with manual handling problems and poor posture
- Complicated by prolonged sitting, poor posture, manual handling and other causes of back pain and injury
- Jolts and jars thought to cause most problems with backs

Effects on the spine

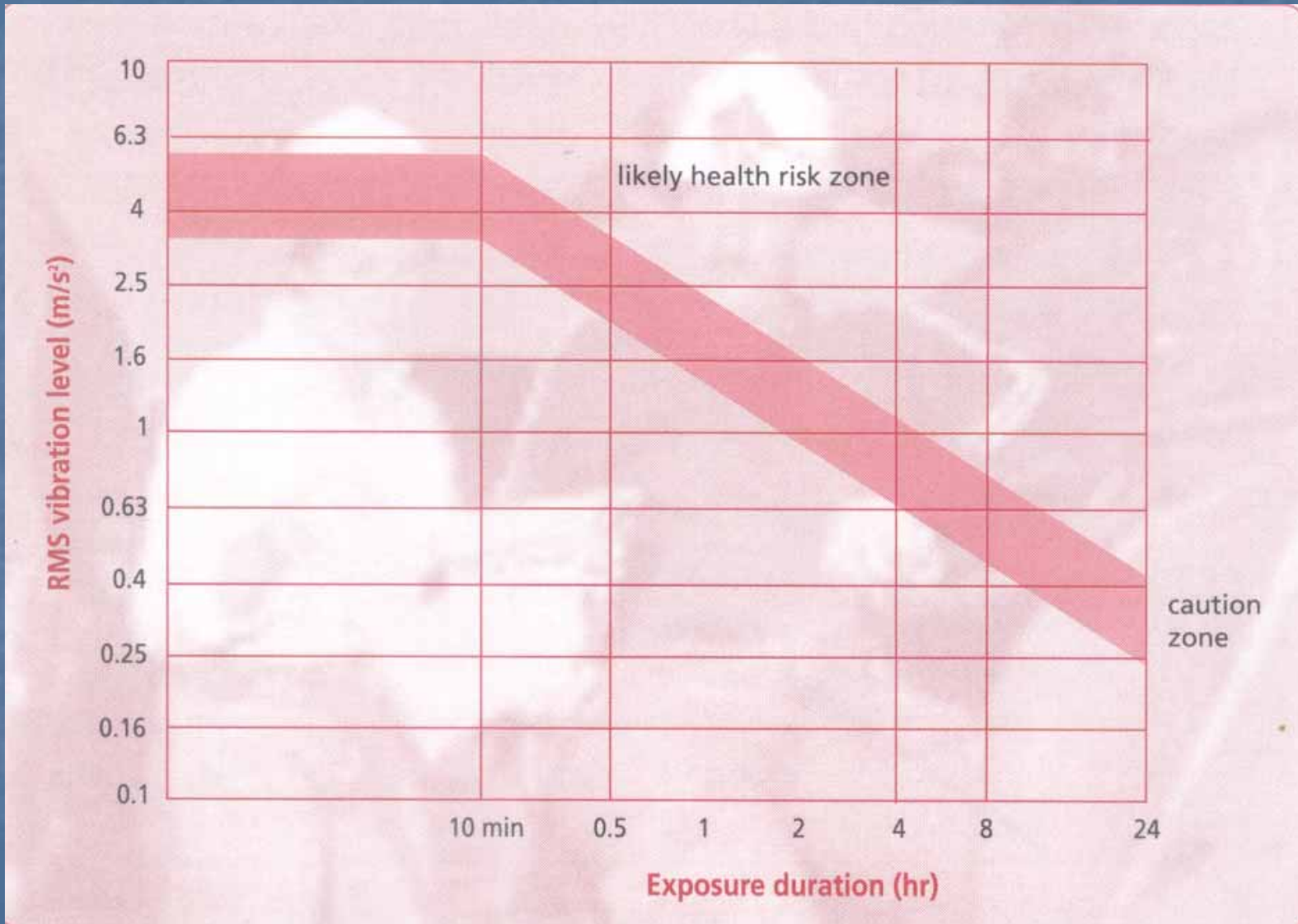
Possible causes of back pain from increased dynamic load on lower back vertebrae

- Reduced disc height
- Increase in radial disc bulge
- Micro fractures in the vertebrae endplates
- Fatigue of lower back muscles

Whole-body Vibration Exposure Standards

- Previous Australian Standard AS 2670 – 1990 did not adequately assess shock type vibration
- British Standard BS 6841-1987 adopted the Vibration Dose Value (VDV) that included assessment of shocks
- The International Standard ISO 2631-1.2 also adopted the VDV in 1997 in a completely new approach to vibration assessment
- Australia adopted the new International Standard ISO 2631 in 2001 (AS 2670-2001 – Evaluation of human exposure to whole-body vibration)
- European Directive – 2002
- International Standard ISO 2631.5 -2004 - Method for evaluation of vibration containing multiple shocks.

Australian Standard AS 2670-2001 Evaluation of human exposure to whole-body vibration – Health Criteria



Australian Standard **AS 2670-2001** (ISO Standard)

Basic Evaluation Method – r.m.s

Used when vibration exposure is steady state without jolts and jars

Examples:

- Drilling
- Most dump trucks
- Graders
- Coal prep plants

Australian Standard **AS 2670-2001** (ISO Standard)

Basic Evaluation Method – r.m.s

Used when vibration exposure is steady state without jolts and jars

Examples: Drilling
 Most dump trucks
 Graders
 Coal prep plants

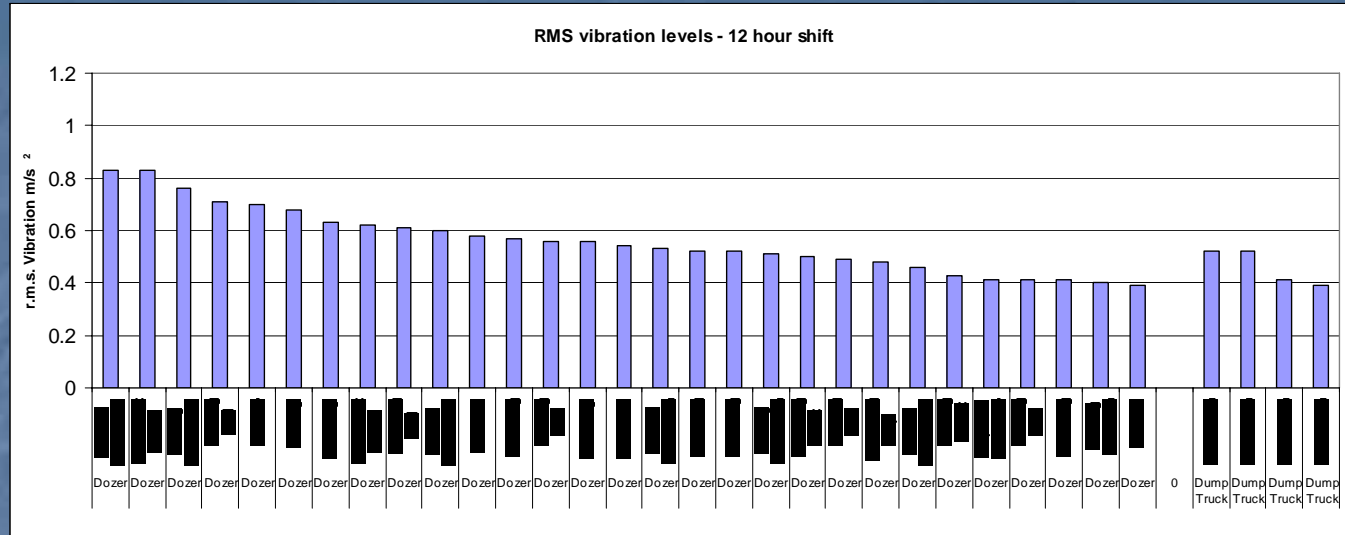
Additional Evaluation Methods - VDV

Used when vibration exposure contains high proportion of shocks or
“jolts and jars”

Examples: Dozers
 Scrapers
 Some light & heavy trucks
 Off road vehicles

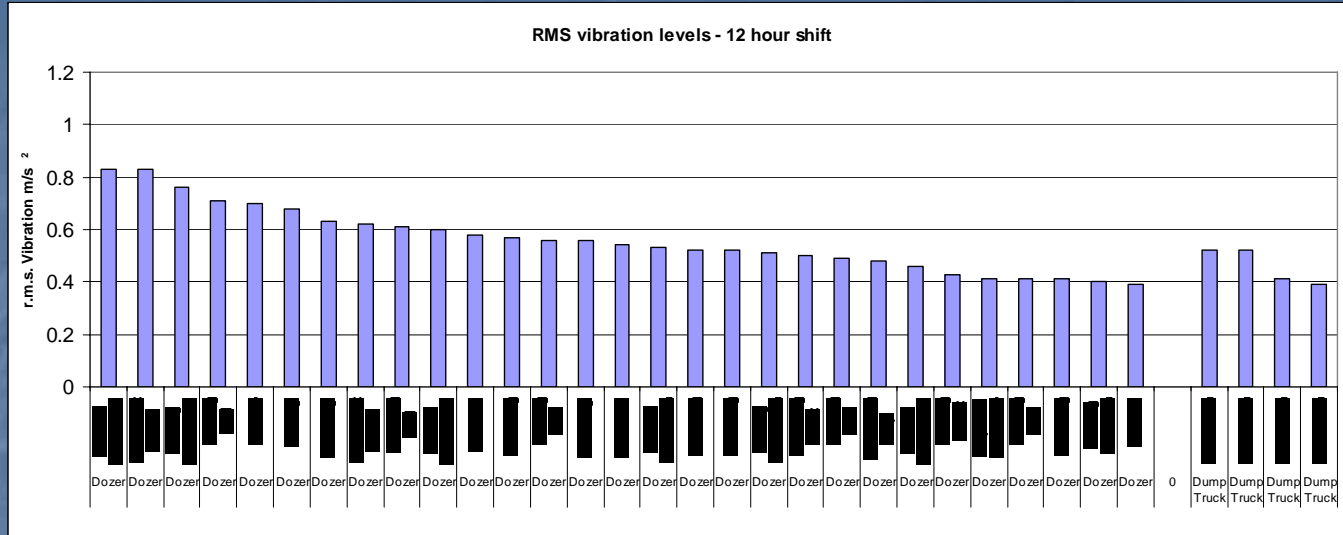
Vibration levels of dozers & dump trucks

Basic
r.m.s

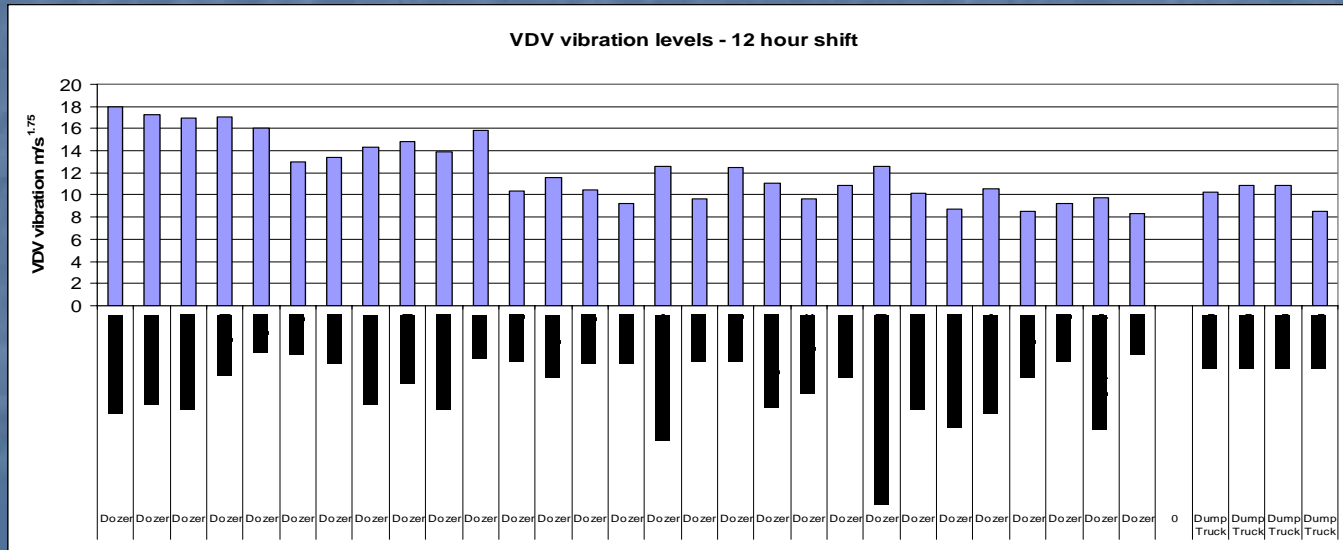


Vibration levels of dozers & dump trucks

Basic
r.m.s

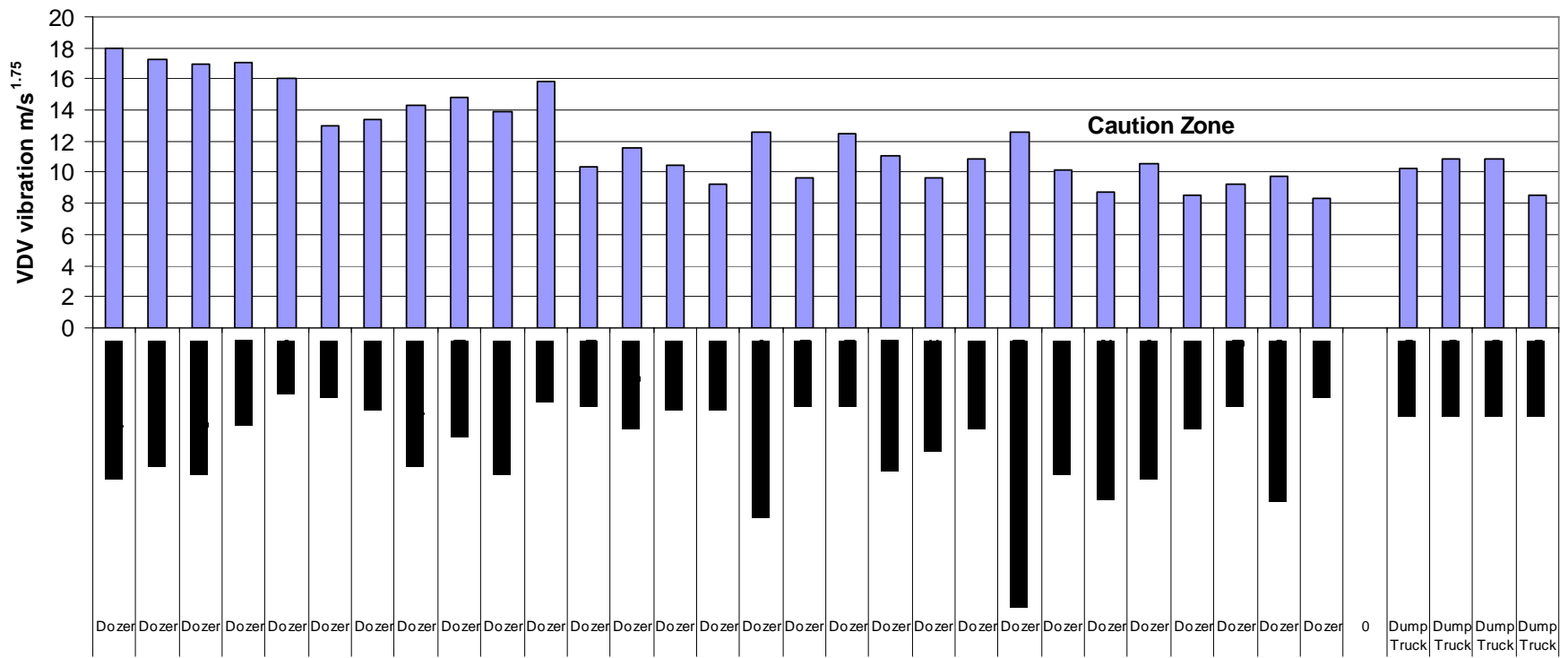


Additional
VDV



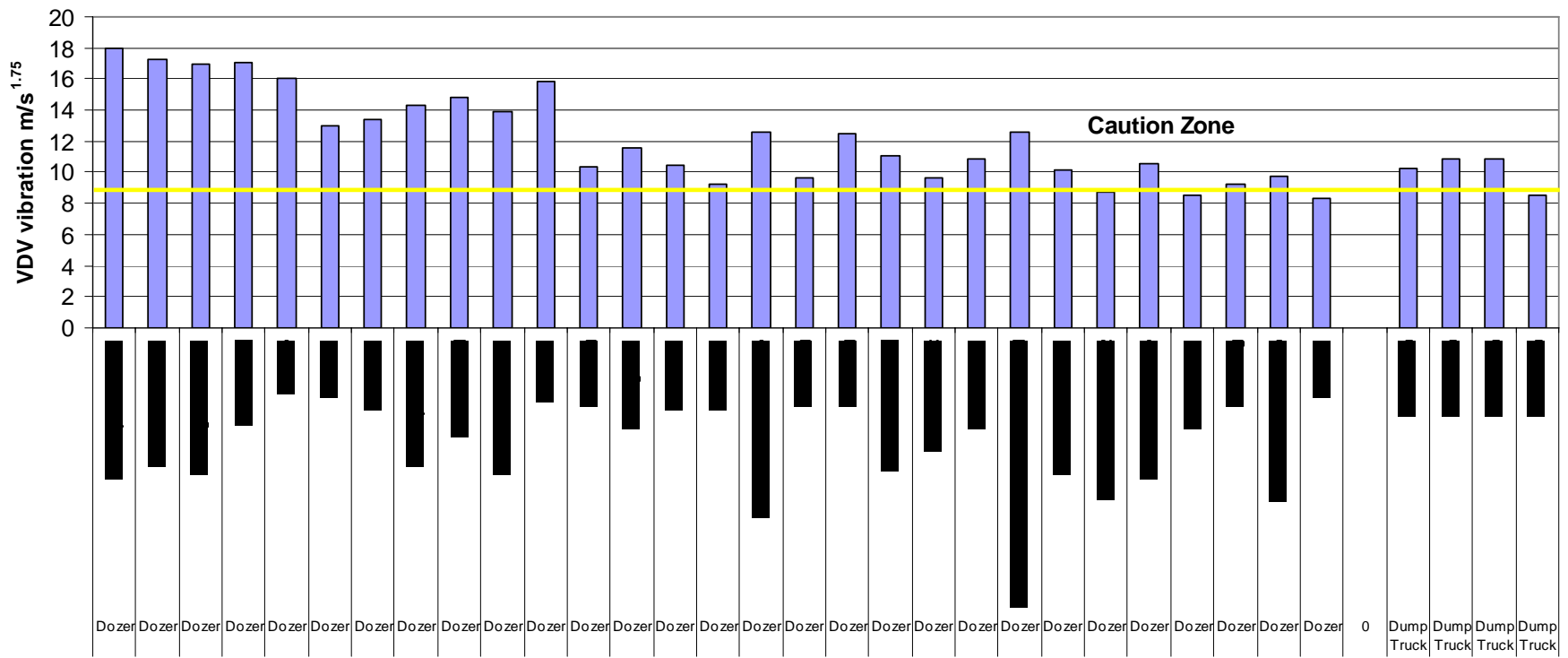
Australian Standard VDV limits

VDV vibration levels - 12 hour shift



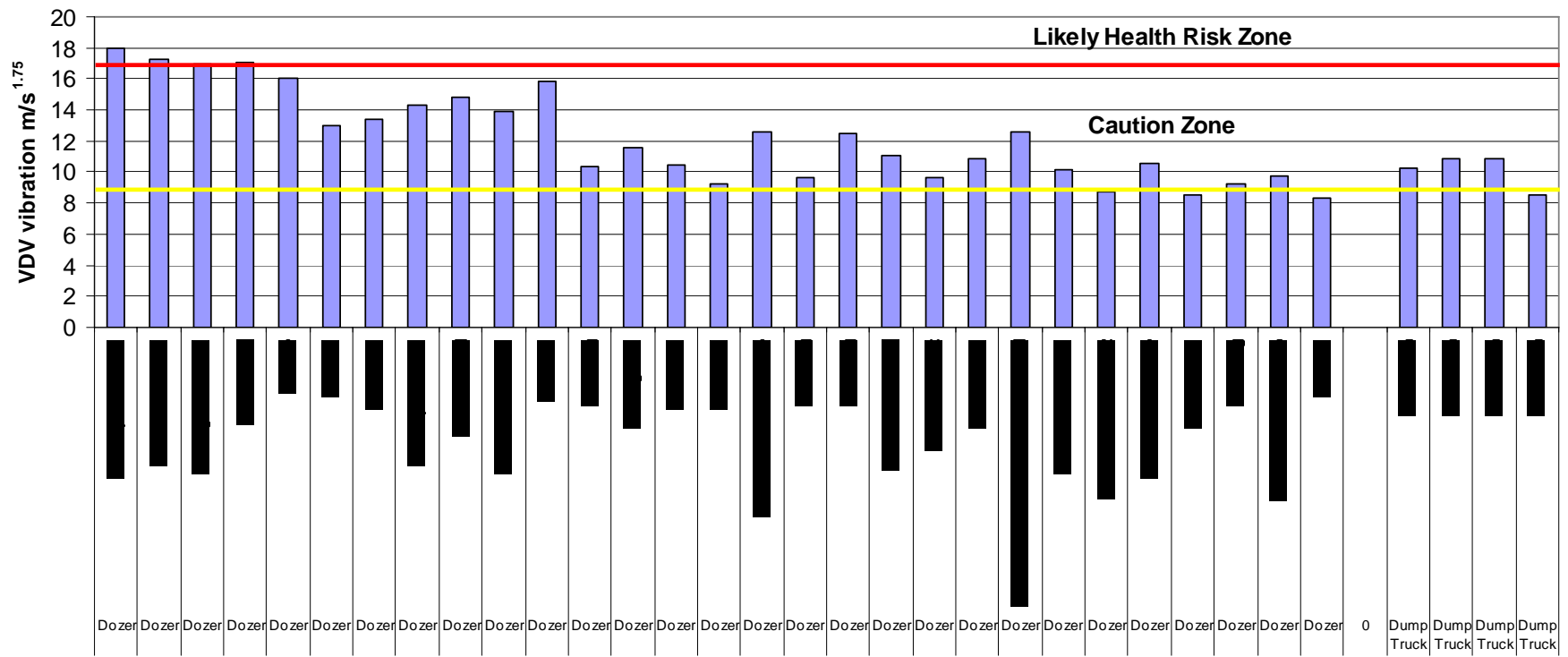
Australian Standard VDV limits

VDV vibration levels - 12 hour shift

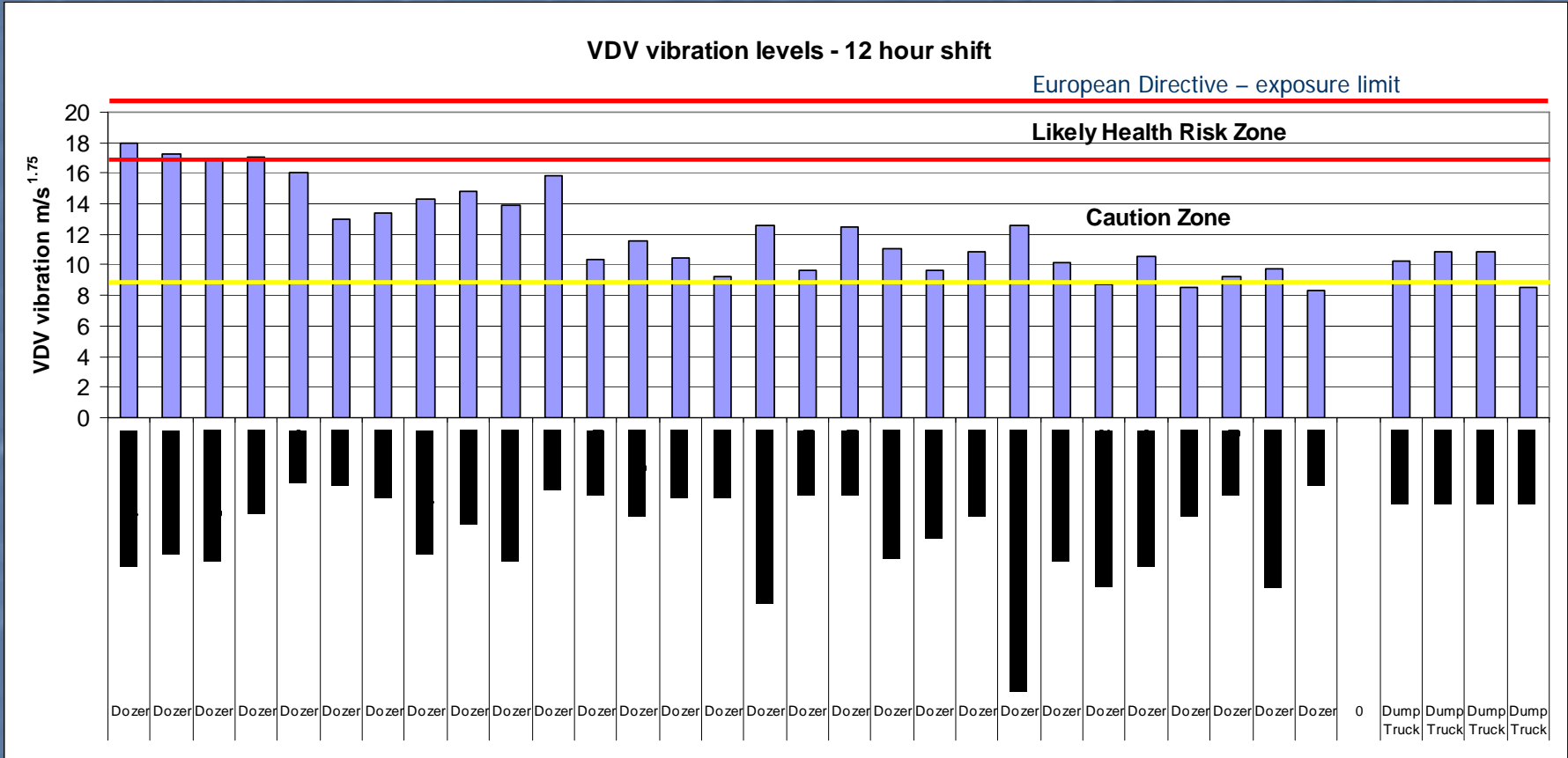


Australian Standard VDV limits

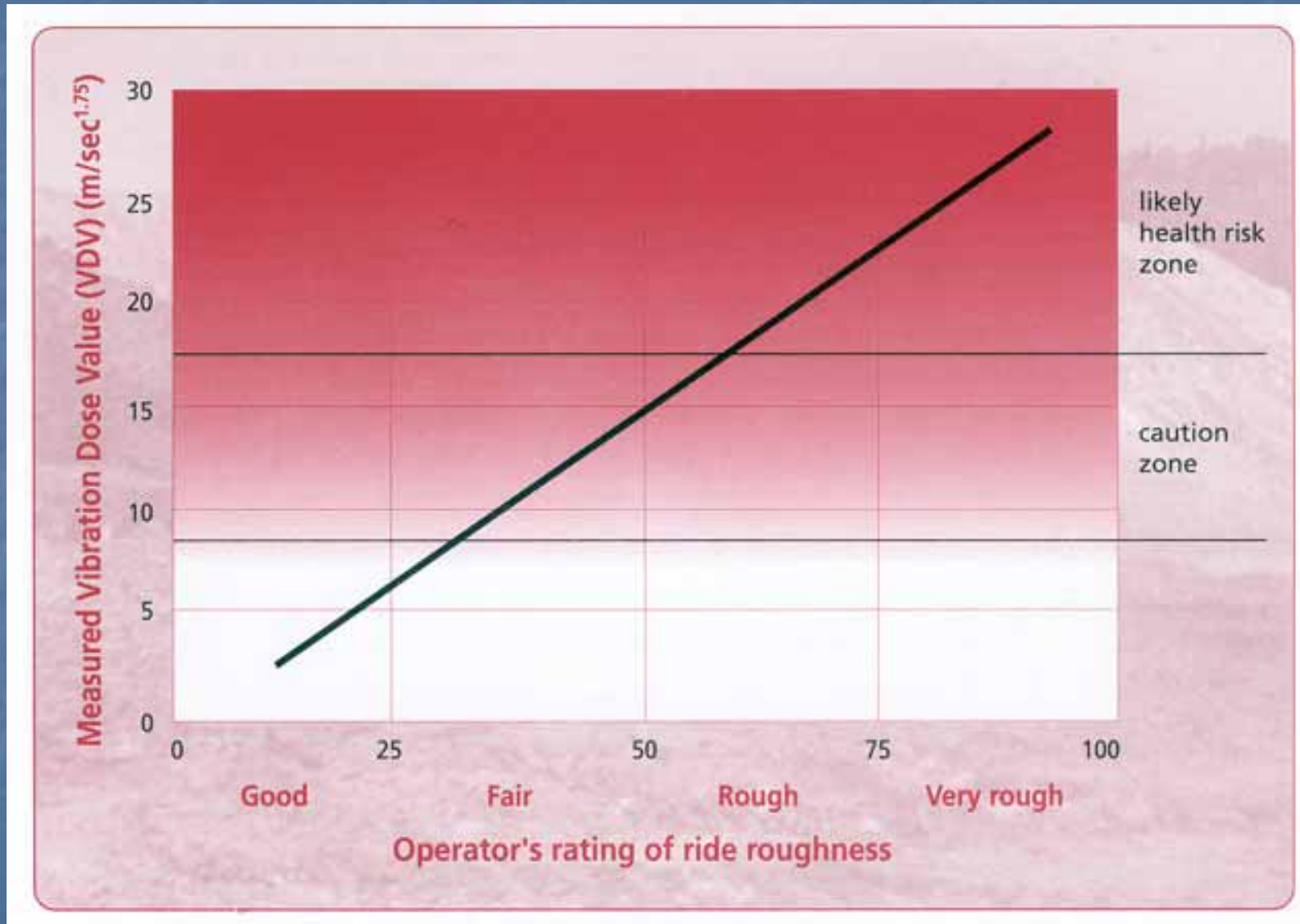
VDV vibration levels - 12 hour shift



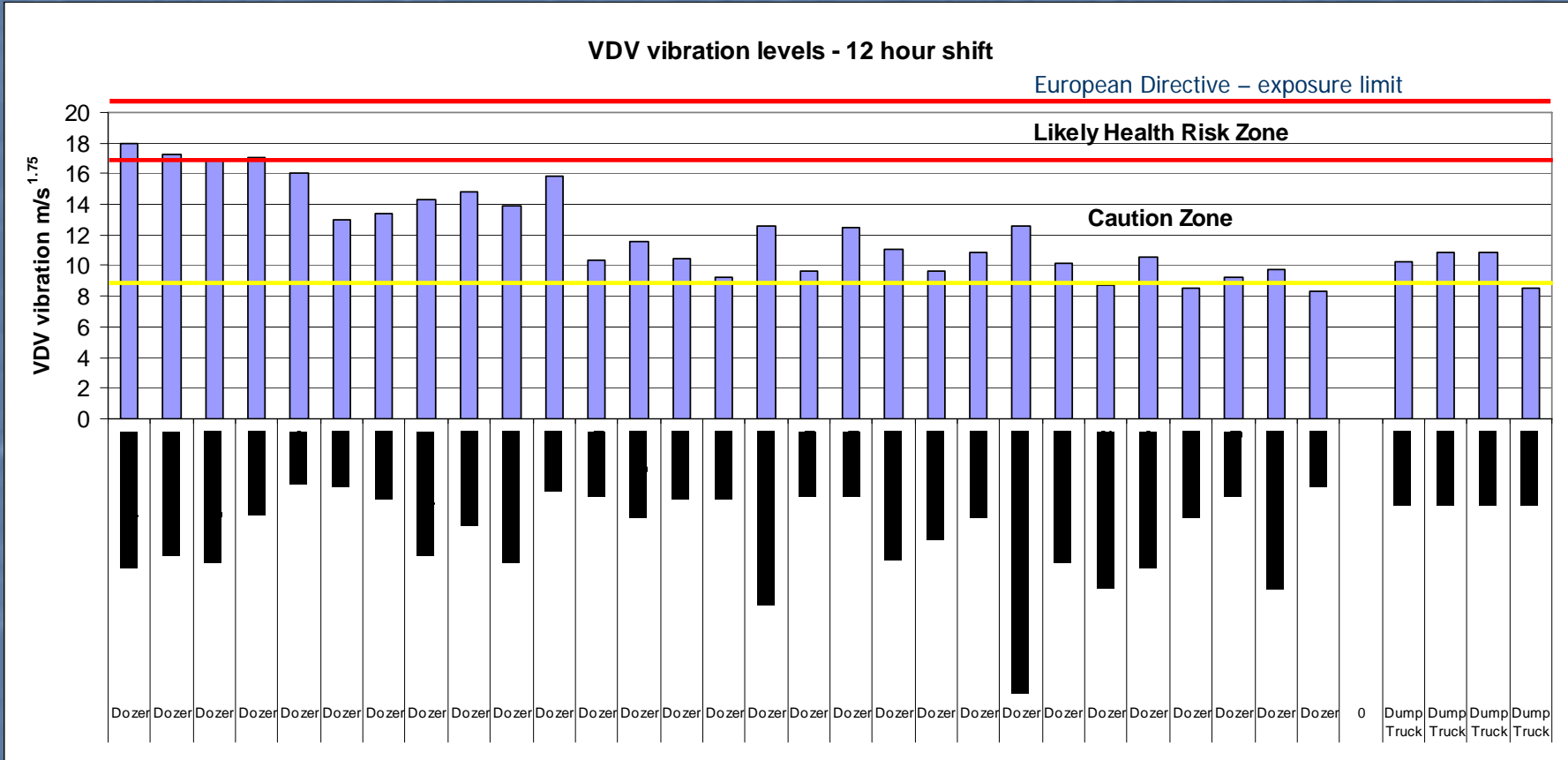
Australian Standard & European Directive VDV limits



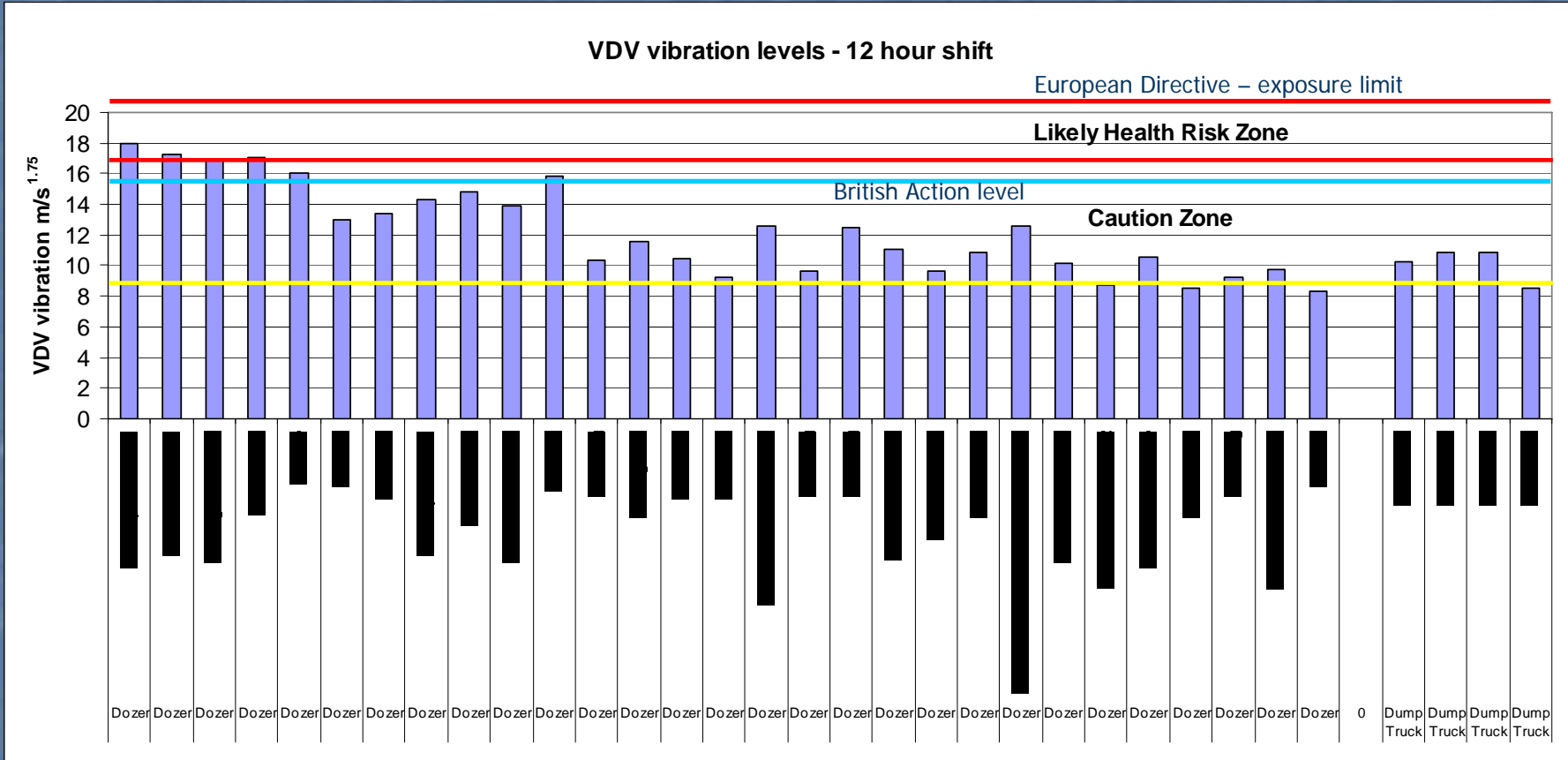
VDV & ride roughness



Australian Standard & European Directive VDV limits



Australian Standard & European Directive VDV limits



Case study: Lube truck



Overhanging cabin



Hard suspension



Suspension seat



- Often poorly adjusted
- Little understanding of seat function by some drivers

Some very rough sections of road

- Driving fast over short rough sections drastically increased shocks & consequently Vibration Dose Value (VDV)



Lifting heavy hoses



Comparison of Standards – 12 hour shift

Standard	Caution Zone or Action Level	Likely Health Risk Zone or Exposure Limit	Comment
British Standard BS 6840:1987	15 m/s ^{1.75} (VDV)	-	Only Action Level - no Exposure Limit set
International Standard ISO 2631-1:1997 & Australian Standard AS 2670-2001	0.35 m/s (r.m.s) 8.5 m/s ^{1.75} (VDV)	0.7 m/s (r.m.s) 17 m/s ^{1.75} (VDV)	VDV level remains the same for 12 hours
European Directive, 2002	0.41 m/s (r.m.s) 9.2 m/s ^{1.75} (VDV)	0.97 m/s (r.m.s) 21 m/s ^{1.75} (VDV)	VDV level remains the same for 12 hours

Management of vibration

Assess and rank exposures

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Compare with Standards & other mine data if available

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Establish goals that can be realistically achieved

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Implement various control options

Vibration Control options

Vibration exposure

Vibration sources:

- Rough roads
- Vehicle activity
- Engine vibration

Modifying factors:

- Condition of roads and work surfaces
- Vehicle activity
- Type and design of vehicle
- Vehicle age and condition, suspension and maintenance
- Seat design, suspension and maintenance
- Cab layout, design and orientation
- Vehicle/Machine speed, driver skills and awareness
- Lighting and visibility
- Task design and work organisation

Management of vibration

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Make someone responsible for program

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Health surveillance

Management of vibration

Assess and rank exposures

Compare with Standards & other mine data if available

Establish goals that can be realistically achieved

Implement various control options

Make someone responsible for program

Health surveillance

Monitor and evaluate

Management of vibration Training & fitness

Drive to conditions

Fitness - less injury & back pain

Thank you

Gary Foster

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