

# Classification of Mining Equipment Used in India According to their Vibration Hazard Potential

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## ABSTRACT

*Epidemiological studies conducted in India and abroad on the operators of heavy earth moving machineries (HEMM) show increased prevalence of musculoskeletal disorders (MSD) related to whole body vibration (WBV) exposure in the course of mining operations. WBV exposure in seven opencast mines in various parts of India was evaluated through measurement of the magnitude of vibration and corresponding daily exposure durations according to the guidelines in ISO 2631-1:1997 WBV standard. Total 117 HEMMs were studied including Dozers, Dumpers, Shovels, Backhoes, Loaders, etc. The dominant axis of vibration depended upon the type of equipment and also their working condition. The health risk to the operators due to daily exposure to vibration (1.4 to 7.5 hours) was predicted in conjunction with their respective vibration magnitudes (0.21 to 1.82 ms<sup>-2</sup>). It was observed that 35 (30%) of them showed minimal or no health risk whereas 57 (49%) equipment showed moderate health risk to their operators in the prevailing working conditions. 25 (21%) equipment showed high probability of adverse effect on the health of their operators. Health risks were re-evaluated using vibration dose value (VDV) as an additional tool for risk assessment where crest factor was more than 9. Considering the magnitude of the problem, it was concluded that measurement of the vibration magnitudes and exposure duration of each and every machine should be conducted to identify and classify the hazardous equipment with a view to develop a strategy for control of occupational exposure to vibration in mines.*

**Keywords:** Whole body vibration, Machine vibration, Mine hazards, Environmental health, Occupational health, Epidemiology

## INTRODUCTION

Vibration transmitted to the body through the supporting surfaces such as feet, buttocks or back is known as Whole body vibration (WBV). There are various sources of WBV exposure in mining machineries such as - 1) seat transmitted vibration from dumper, dozer, shovel, backhoes, Load-haul-dump vehicles (LHD) and road graders; 2) WBV transmitted through feet while operating certain types of loaders used in underground (e.g. EIMCO 824), or during movement on the supporting structures of vibrating machines like crushers and vibrating screens. Factors like rugged/uneven terrain, speed, condition of seat and suspension etc. are important factors responsible for vibration in HEMMs during operation. The parts of the body most likely to be affected by exposure to whole body vibration depend on the magnitude of vibration, distribution of the motion within the body, body postures, and the frequency of vibration, direction and duration.