ST081



# NIOSH Comments to DOL

**POST-HEARING COMMENTS OF THE
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
ON
THE MINE SAFETY AND HEALTH ADMINISTRATION PROPOSED RULE ON
AUTOMATIC EMERGENCY-PARKING BRAKES FOR RUBBER-TIRED
SELF-PROPELLED ELECTRIC FACE EQUIPMENT**

BY R.A. LEMEN

**30 CFR Part 75**

**U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Centers for Disease Control
National Institute for Occupational Safety and Health**

**August 29, 1988**

In our testimony of July 12, 1988, the National Institute for Occupational Safety and Health (NIOSH) was asked by the Mine Safety and Health Administration (MSHA) to expand on the NIOSH statement that ". . . most decelerations would be much less than 10g." We offer the following calculation to indicate what we consider to be a "worst-case" determination of deceleration forces for rubber-tired underground mining vehicles [Sears et al. 1955]:

$$F = \mu_s W = \mu_s (mg)$$

where: F = braking (deceleration) force
$\mu_s$* = coefficient of static friction
W = vehicle weight
m = vehicle mass
g = acceleration due to gravity

Furthermore, $F = ma$
and, from above, $F = m\mu_s g$
$\therefore$, $a = \mu_s g$
where: a = "forces" of deceleration

For dry surfaces (dry surfaces produce greater deceleration forces than wet surfaces), values of $\mu_s$ from the literature are on the order of 0.6 to 0.8 for slow-moving, rubber-tired vehicles [Bolz et al. 1970]. Therefore, in the "worst-case" we would expect deceleration forces to be no greater than 0.6 to 0.8g's. These theoretical calculations are supported by empirical data from Lee Brakes, Inc. [Attachments 1 and 2] that show forces of deceleration for an array of slow-moving underground mining vehicles to be less than 0.4g's.

In our testimony, NIOSH indicated that if the vehicle occupants are properly restrained, then all decelerations due to normal braking operations would not result in injuries. Therefore, NIOSH reiterates its recommendation from the testimony that ". . . operators and passengers [of self-propelled, underground mining equipment] should be required to use full-body safety restraints and ergonomically designed seats compatible with the deceleration."

NIOSH has contacted the Department of Transportation for information regarding minimum cut-off values for deceleration forces that would require seat-belt usage. NIOSH will forward these values to MSHA as soon as they are received.

---

*A coefficient of static friction will provide a greater force of deceleration than a coefficient of kinetic friction.

50272-101

| REPORT DOCUMENTATION PAGE | 1. REPORT NO. | 2. | 3. Recipient's Accession No. PB90 132630/AS |
|---|---|---|---|
| 4. Title and Subtitle NIOSH Testimony on the Mine Safety and Health Administration Proposed Rule on Automatic Emergency-Parking Brakes for Rubber-Tired Self-Propelled Electric Face Equipment by R. A. Lemen, August 29, 1988 | | | 5. Report Date 88/08/29 |
| | | | 6. |
| 7. Author(s) NIOSH | | | 8. Performing Organization Rept. No. |
| 9. Performing Organization Name and Address NIOSH | | | 10. Project/Task/Work Unit No. |
| | | | 11. Contract (C) or Grant(G) No. (C) (G) |
| 12. Sponsoring Organization Name and Address | | | 13. Type of Report & Period Covered |
| | | | 14. |

15. Supplementary Notes

16. Abstract (Limit: 200 words) This testimony expanded on an earlier testimony which stated that most decelerations of mine vehicles would be much less than 10 gravities (g). Calculations were offered which indicated what was considered to be a worst case determination of deceleration forces for rubber tired underground mining vehicles. The calculation took into account the braking force, coefficient of static friction, vehicle weight, vehicle mass, and acceleration due to gravity. For dry surfaces the values of the coefficient of static friction from the literature were between 0.6 to 0.8 for slow moving, rubber tired vehicles. In this worst case scenario, therefore, it was expected that deceleration forces would be no greater than 0.6 to 0.8g. If the vehicle occupants were properly restrained, then all decelerations due to normal braking operations would not result in injuries. NIOSH reiterated the recommendation that operators and passengers be required to use full body safety restraints and ergonomically designed seats compatible with the deceleration.

17. Document Analysis a. Descriptors

b. Identifiers/Open-Ended Terms NIOSH-Publication, NIOSH-Author, NIOSH-Testimony, Lemen-R-A, Mining-equipment, Equipment-operators, Mine-workers, Motor-vehicles, Safety-equipment

c. COSATI Field/Group

| 18. Availability Statement | 19. Security Class (This Report) | 21. No. of Pages 5 |
|---|---|---|
| | 22. Security Class (This Page) | 22. Price |

(See ANSI-Z39.18) *See Instructions on Reverse* **OPTIONAL FORM 272(4-77)** (Formerly NTIS-35) Department of Commerce

## REFERENCES

Bolz RE, Tuve GL (eds) (1970). CRC handbook of tables for applied engineering science. Cleveland, OH: CRC Press Inc., p. 615.

Sears FW, Zemansky MW, (eds) (1955). University Physics. Reading, MA: Addison-Wesley Inc.

## ATTACHMENTS

Lee Brakes Inc. Brakes for Shuttle Cars, Scoops, Tractors, Other Equipment-OEM and Retrofit. Columbus, OH.

Lee Brakes Inc. Park brake controls. Columbus, OH.

B486
10