



Centers for Disease Control and Prevention
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November 8, 2011

MSHA
Office of Standards, Regulations, and Variances
1100 Wilson Boulevard
Room 2350
Arlington, Virginia 22209-3939

RIN 1219-AB65

Dear Sir/Madam:

The National Institute for Occupational Safety and Health (NIOSH) has reviewed the Mine Safety and Health Administration proposed rule on *Proximity Detection Systems for Continuous Mining Machines in Underground Coal Mines* published in the *Federal Register* on August 31, 2011 [76 FR 54163]. Our comments are enclosed with references.

Please do not hesitate to contact me at 513/533-8302 if I can be of further assistance.

Sincerely yours,

Paul A. Schulte, Ph.D.
Director
Education and Information Division

Enclosures

AB65-2COMM-17



Comments to MSHA

**Comments of the National Institute for Occupational Safety and
Health on the Mine Safety and Health Administration
Proposed Rule on Proximity Detection Systems
for Continuous Mining Machines in Underground Coal Mines**

RIN 1219—AB65

**Department of Health and Human Services
Centers for Disease Control and Prevention
National Institute for Occupational Safety and Health
Cincinnati, Ohio**

11/08/2011

AB65-2 COMM-17

NIOSH has reviewed the Mine Safety and Health Administration (MSHA) proposed rule *Proximity Detection Systems for Continuous Mining Machines in Underground Coal Mines* published in the *Federal Register* [76 FR 54163] on August 31, 2011 and offers two comments regarding points under (b) *Requirements for proximity detection systems*. The NIOSH comments are intended to assist MSHA.

Comment 1

Page 54179. (b)(1) *Cause a machine to stop no closer than 3 ft from a miner...*

NIOSH recommends flexibility in a performance-based requirement for stopping machine motion. The requirement to “stop the machine no closer than 3 ft from a miner” will limit future technological innovations that could improve miner safety. This would require a change in phrases such as “Cause the machine to stop all motions that may cause pinning or striking hazards...” This change would address two main concerns with the current language (summarized in items 1A and 1B):

1A. The current language may preclude the introduction of intelligent proximity detection systems such as the system now under development by NIOSH:

- The requirement for the machine to stop will establish the minimum baseline performance for future approaches to be considered “as safe as” those defined by the initial regulation. When dealing with statistically low probability events, there are generally limited, if any, ways to replicate the hazard to unambiguously determine that one approach is “as safe as” another. Therefore, comparisons for determining compliance with the “as safe as” requirement focus on the level of protection of the new approach compared to an existing approach [DOL 2003; Boring et al. 2005].

In the proposed rule, the requirement is for the machine to stop. An intelligent system does not require the entire machine to stop; rather it restricts certain motions of the machine so that the operator and miners around the machine cannot be injured. There are several advantages to this as described in the NIOSH response to the MSHA Request for Information (RFI). These include:

- Decreased nuisance shut-downs
- Flexibility in operator position when close proximity to the machine is needed to perform a task
- Flexibility in operator position to avoid other hazards such as unsupported roof or ribs and other pieces of equipment, and
- Safety and productivity increases.

For the “as safe as” comparison that uses a level of protection methodology, there would be a comparison of A) an approach that causes the machine to completely stop, versus B) one that allows certain parts of the machine to remain running. It is reasonable to conclude that “A” provides a level of protection higher than “B”. Therefore, the “stop” requirement must be modified to allow intelligent proximity detection to be considered. Our proposed wording

clarifies that MSHA intends to accept the level of protection offered by the NIOSH or any other Intelligent Proximity Detection System while still permitting the immediate introduction of currently available proximity detection systems.

1B. NIOSH recommends verification of the 3-ft stopping distance requirement as a safe automatic stopping distance:

- The rationale for adopting a 3-ft stopping distance in this proposed rule is based on NIOSH research on a person's ability to escape the path of a moving continuous mining machine (CMM). NIOSH research concluded that if a miner was aware he was about to be struck by a CMM, then he would have a higher probability of getting out of the way and avoid being struck if he was at least 3 ft away when the machine started moving toward him [DuCarme et al. 2010; Bartels et al. 2007]. This finding is insufficient to conclude that 3 ft is a safe automatic stopping distance between the miner and the machine. NIOSH has not conducted research to verify this distance requirement.
- NIOSH recommends MSHA consider system specific factors in determining a sufficient margin of safety. In the development of an intelligent proximity detection system, NIOSH evaluated the position accuracy of commercially available proximity detection hardware. Under laboratory conditions, position errors of 20 centimeters (cm) (8 inches) were observed [Carr et al. 2010] for a particular system. These results represent tests conducted under specific laboratory conditions and higher errors may occur under different conditions and for different systems.
- NIOSH recommends MSHA consider the positioning errors introduced by the location of the wearable component on the miner. The 95th percentile back width for male miners in the United States is 57 cm (22 inches) [Ayoub et al. 1982]. Considering the cumulative error due to the size of the wearer's torso and variability of position accuracy, one side of a miner's torso may be 77 cm (30 inches) closer to the machine than what is reported by the proximity detection system. This analysis only takes into account these two sources of error. Other error sources may significantly increase position errors and therefore, the required safety margin.

Comment 2

Regarding page 54179, (b)(1)(ii) *Remotely operating a continuous mining machine while cutting coal or rock, in which case, the proximity detection system must cause the machine to stop before contacting the machine operator.*

NIOSH recommends rewording (b)(1) as suggested in Comment 1, and eliminating (b)(1)(ii) due to the following concerns:

- 2A. The requirement that the machine must stop before contacting the machine operator while cutting coal or rock is written in terms of a performance-based requirement. This is a deviation from the prescriptive 3-ft stopping distance requirement for all other machine

activities. NIOSH does not recommend requiring a performance-based specification for one set of conditions and a prescriptive basis for another in existing systems.

- 2B. There is no means currently available in the MSHA-approved proximity detection systems for determining whether the CMM is cutting coal/rock or only running the cutter drum.
- 2C. Other activities may require an operator or miner to be closer than 3 ft to the CMM, such as positioning the conveyor over the shuttle car, or activating certain machine functions during maintenance.

References

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- Boring R, Beasley W, Bedway B, Murtaugh S, Warnock W [2005]. Part 6: Equivalency Review and Comparison: MSHA and IEC Explosion-proof Enclosure Standards. Report of Investigation. Triadelphia, WV: Department of Labor –Mine Safety and Health Administration.
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- DuCarme J, Kwitowski A, Bartels J [2010]. Operating speed assessments of underground mining equipment. Mining Eng 62(3):39–45.