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From: Crow, Matt <matt.crow@joyglobal.com>
Sent: Monday, December 14, 2015 8:24 AM
To: zzMSHA-Standards - Comments to Fed Reg Group
Subject: RIN 1219-AB78
Attachments: RIN 1219-AB78 Proximity Comments.pdf

See attached comments on behalf of Joy Global Underground Mining LLC.

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December 1, 2015

Mine Safety and Health Administration
Office of Standards, Regulations, and Variances
201 12th Street South, Suite 4E401
Arlington, Virginia 22209-3939

Re: RIN 1219-AB78 MSHA's Proposed Ruling on Proximity Detection for Underground Mobile Equipment

To whom it may concern,

Joy Global Underground Mining LLC is submitting the following comments in response to the Request for Information as documented in the Federal Register, Volume 80, No. 170 dated September 2, 2015/Proposed Rules

General Comments

1. Electromagnetic-based proximity detection systems that are commercially available today will not prevent all collisions between mining personnel and underground mining machines. Instead, today's commercially available proximity detection systems serve as training aids, that together with appropriate mine-provided safety training, help teach mine personnel to avoid certain hazardous areas around underground mining machines. Today's commercially available proximity detection systems may also be fairly viewed as "safety assist" devices, similar to the forward collision avoidance systems and rear collision avoidance systems found on many automobiles. However, just as an automobile collision avoidance system cannot prevent all collisions with other vehicles or pedestrians, today's commercially available proximity detection systems cannot prevent all collisions between mine personnel and underground mining machines. Therefore, proximity detection systems should never be relied on as the sole method of preventing collisions between mine personnel and underground mining machines. The driver of an automobile with a collision avoidance system remains responsible for being aware of, and taking appropriate action to avoid, potential collisions with other vehicles or pedestrians. Similarly, the operator of an underground mine who has had proximity detection systems installed on the mobile mining equipment used in the mine, remains responsible for providing its personnel with appropriate safety training, and individual mine employees remain responsible for being aware of, and taking appropriate action to avoid, collisions between mining personnel and underground mobile mining equipment.

2. Joy Global Underground Mining is unaware of any existing proximity detection technologies or systems that have, through testing on underground mobile equipment (including continuous miners), been verified and proven to stop in all instances in which personnel are located within the path of moving machinery. As discussed in Item 1 above, currently available proximity detection systems, like currently available automobile collision avoidance

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systems, cannot prevent all collisions. Just as certain circumstances, including road conditions, can interfere with the proper functioning of an automobile collision avoidance system, certain conditions within an underground mine, primarily electromagnetic interference, can interfere with the proper functioning of a proximity detection system.

3. Operating conditions in typical mines in South Africa tend to be much more forgiving than the operating conditions in most US mines. Personnel working in South African mines typically have increased visibility (due to the height of the mine) and significantly more space in which to stand (due to the larger entry width of the mine). South African mining personnel can typically remain much farther away from all equipment during production. Therefore, while the proximity detection system observed by MSHA in a South African mine may have performed well during such observation, such performance should not be interpreted to mean that the proximity detection system observed by MSHA (or any other proximity detection system) will prevent a collision in a production environment 100% of the time. The speed at which mobile equipment is traveling, as well as mine conditions, including electromagnetic interference and downward slopes, may prevent the proximity detection system from stopping the mobile equipment before a collision occurs.

4. Today's commercially available proximity detection systems have not been designed for use on continuous haulage applications. Adapting such proximity detection systems to continuous haulage applications would likely require the use of several proximity detection systems linked together along the length of the continuous haulage system. The cost of equipping a continuous haulage system with several linked proximity detection systems would likely constitute a significant portion of the cost of the continuous haulage system, significantly diminishing the economic feasibility of operating continuous haulage systems.

Responses to Specific Requests for Comments within the Preamble to the Proposed Ruling

5. Joy Global appreciates MSHA's willingness to consider alternative technologies that might provide protection from pinning, crushing, or striking hazards at least equivalent to that provided by proximity detection systems. Joy Global anticipates that advancements in the automation of the underground mining process will, over time, enable personnel to be located much farther away from underground mining equipment in a production setting. In addition, when developing regulations governing proximity detection, MSHA should consider other proximity-based solutions that may be developed in the future in which personnel will not need to wear a device that communicates with machine-mounted components. Examples of such a system include a proximity system utilizing passive detection, and a proximity system that utilizes data from a mine's tracking network to determine information about the proximity of mine personnel to underground mobile equipment.

6. In response to MSHA's request for comments on the types of mobile equipment that should be fitted with proximity detection, Joy Global requests that MSHA reconsider including continuous haulage equipment in the regulation. Flexible Conveyor Trains (FCTs) are quite

long and have virtually no lateral movement. The entire assembly follows the same path set by the inby end, in forward or reverse. The outby end is captive on or beside the Dynamic Move-up Unit (DMU). As such, it would not be necessary to have proximity detection systems that are intended to prevent the FCT from moving sideways into personnel. If such a proximity system were required for the FCT, significant development effort would be required, as today's proximity systems have not been designed for long pieces of equipment that do not move laterally.

For the reasons set forth above, Joy Global also recommends that MSHA consider removing chain haulage systems from the proposed mobile equipment proximity detection regulation, as the proximity systems that are available today were not designed to be placed on such types of equipment.

Finally, the development of proximity detection systems for continuous haulage equipment would likely take more time than the proposed regulation allots for both OE and rebuilt equipment.

7. In response to MSHA's request for comments on the proposed phase-in schedules for proximity detection systems on mobile machines, Joy Global recommends that MSHA wait to begin any phase-in period at least until the conclusion of the phase-in period for the continuous miner proximity detection regulation. This will allow the industry the ability to focus on each of these issues with the required amount of attention.

   Joy Global underground mobile equipment currently in service is not "proximity-ready"; as such, extensive fabrication, wiring work, and control system upgrades are necessary in order to properly install a proximity detection system on existing underground mobile equipment. Joy Global recommends that all installations of proximity detection systems on Joy Global underground mobile equipment occur during the original manufacture of the machine or in a planned rebuild within a Joy Global manufacturing/rebuild facility. Adding proximity detection systems to a machine underground typically is not feasible and can lead to compromised system reliability.

8. In response to MSHA's request for comments regarding the implementation of a potential requirement to slow equipment before stopping it, Joy Global recommends that MSHA allow proximity detection system developers, equipment manufacturers, and mines to work together to establish appropriate performance measures for each mine site. The specific operating nature of a proximity detection system on specific equipment may need to vary depending upon local conditions. Maintaining regulatory flexibility will allow the best opportunity for maximum system performance. By continuing to utilize a performance-based approach to the implementation of proximity systems, each mine would be able to adjust proximity detection system parameters for their own local conditions.

   There are control system limitations on certain mobile machines that would prevent a proximity detection system from being able to cause the equipment to slow down prior to

initiating a stop. Such equipment limitations must be considered by MSHA when determining the feasibility of requiring equipment to slow down before stopping.

9. During trials of proximity detection systems on continuous miners and battery haulers, Joy Global observed instances in which personnel (primarily continuous miner operators could not properly perform necessary tasks without getting closer to the continuous miner than the proximity detection system would allow. Without the capability to temporarily bypass proximity detection, these personnel would either be forced to operate equipment without a clear line of sight or they would need to stand in conditions that pose different hazards, such as roof or rib control hazards, or in locations that are not permitted per other regulations.

   Therefore, the proximity detection system regulation for mobile equipment should allow for personnel to temporarily bypass proximity detection when such conditions are encountered. In addition, the regulation should allow for a means to temporarily bypass a proximity detection system in the event that such proximity detection system fails to properly detect a personal wearable device and a person becomes pinned.

10. Personnel within an onboard operator's cab should be excluded from all proximity detection systems nearby. Given technology limitations, the cab-zone that is established on certain pieces of equipment may extend somewhat beyond the boundary of the cab.

11. In response to MSHA's requests for comments on the different warning signals provided by proximity detection systems, Joy Global's experience with proximity systems in underground haulage equipment trials indicates that the inclusion of a visual warning and shutdown signal on the machine for the machine operator's awareness is critical. In addition, it is helpful to have other indicators around the machine for other personnel, but not nearly as beneficial as the utilization of an audible signal on each of the personal wearable devices.

12. In response to MSHA's requests for comments regarding a visual signal to indicate that the machine-mounted proximity components are functioning properly, Joy Global agrees that such a signal provides some benefit to users. However, Joy Global's experience to date with proximity detection systems is that such signals cannot be relied upon. Most of today's commercially available proximity detection systems do not have the capability to detect all possible failure modes of each of the machine-mounted components. Instead, it is possible for a machine-mounted component to fail in such a way that the performance of the proximity detection system could be compromised without any indication of such compromised performance. In such a scenario, an operator could continue to think that the proximity detection system is fully functional due to the presence of the visual indicator. Such visual signals should never be relied upon to determine if a proximity system is functioning properly – only proper testing can determine the functionality of a proximity system.

13. Related to the above response, a regulatory requirement that a proximity detection system cause the machine to stop when a proximity component is not functioning properly may lead

to a false sense of security for machine operators. If the fault is never detected, the machine will never be stopped. And even when the proximity failure is detected, Joy Global also has concerns about preventing operation of equipment functions that are not normally interlocked with proximity stop functions.

Joy Global recommends that mine personnel perform proper pre-shift testing. If any failures are noted during these tests, the machine should be stood-down until the proper repairs can be made.

14. In response to MSHA's request for comments on the installation of a proximity detection system in a manner that prevents interference that adversely affects the performance of any electrical system; such conditions can never be assured. All electromagnetic-based proximity systems have EMI signatures. If a new electrical or communication system is introduced that is susceptible to this EMI, it is not the fault of the proximity system or the manner in which the proximity system was installed.

    It is extremely likely that an electromagnetic-based proximity system used in an underground mine will encounter electromagnetic interference from a variety of sources and that such electromagnetic interference will adversely affect the performance of the proximity system, with the result that in certain situations and under certain conditions, the machine will not stop when the shutdown zone is breached.

    While it is always advisable to install systems in a manner that minimizes the impact of adverse interference, it is not possible to eliminate electromagnetic interference completely.

15. Due to variations in technology among the various commercially available proximity detection systems, Joy Global does not recommend the development of a personal wearable device that could operate with different proximity systems. Each currently available proximity system utilizes proprietary protocols, some of which in turn rely on very specialized components. A universal personal wearable device would require the inclusion of these specialized components for each proximity system and could end up becoming so large that personnel could not feasibly wear it.

Joy Global's field testing experience with coal customers within the United States demonstrates measurable section production tonnage drops, typically within 5% to 10% of normal production levels, when proximity detection is active on haulage equipment. Such a production impact must be factored into the total cost of implementation of the regulation and should be considered in MSHA's economic analysis.

Thank you for giving us this opportunity to address the subject of Proximity Detection. If further information is needed or clarification of the information presented in this correspondence, please contact me at matt.crow@joyglobal.com or telephone at (814) 432-1573.

Sincerely,

Matt Crow

Matt Crow

cc: Philip Rosenstern