PUBLIC SUBMISSION

As of: 12/26/18 3:29 PM
Received: December 24, 2018
Status: Posted
Posted: December 26, 2018
Tracking No. 1k2-97aq-fnu7
Comments Due: December 24, 2018
Submission Type: Web

Docket: MSHA-2018-0016
Safety Improvement Technologies for Mobile Equipment at Surface Mines, and for Belt Conveyors at Surface and Underground Mines.

Comment On: MSHA-2018-0016-0001
Safety Improvement Technologies for Mobile Equipment at Surface Mines, and for Belt Conveyors at Surface and Underground Mines.

Document: MSHA-2018-0016-0105
Comment from Avi Meyerstein, The Mining Coalition

Submitter Information

Name: Avi Meyerstein
Organization: The Mining Coalition

General Comment

Please see attached comments of the Mining Coalition.

Attachments

2018-12-24 Mining Coalition Comments on MSHA Powered Haulage RFI

AB91-COMM-13

12/26/2018

HUSCH BLACKWELL

750 17th St. N.W., Suite 900
Washington, DC 20006-4675
Main: 202.378.2300
Fax: 202.378.2319

December 24, 2018

Sheila A. McConnell
Director
Office of Standards, Regulations, and Variances
Mine Safety and Health Administration
201 12th Street South, Suite 4E401
Arlington, Virginia 22202-5452

Re: RIN 1219-AB91

Dear Ms. McConnell:

On behalf of the Mining Coalition (the "Coalition"), we are pleased to submit the following comments in response to the Mine Safety and Health Administration's ("MSHA") Request for Information ("RFI") regarding the use of technology to improve mine safety involving powered haulage. 83 Fed. Reg. 29718 (Jun. 26, 2018).

The Mining Coalition is an informal group of metal and non-metal mining production and service companies, which support continuing safety improvements and sound regulations. Together, the Coalition members employ thousands of people and share MSHA's goals of advancing miner safety and health. We share the information below so that MSHA's RFI and future steps on the many issues contained in it can benefit from the Coalition's experiences.

Executive summary

- Though mining has achieved record levels of safety, MSHA is right to seek solutions for the remaining serious accidents. Because human factors are a major part in these cases, properly-enforced comprehensive safety programs are a significant solution, with or without new technology. MSHA can play a role in promoting these.
- Some new safety technologies are feasible and impactful. But, many promising tools still require further development and study. Some of the simplest solutions are also the best and quickest to make an impact.
- With diverse mines, equipment, and operations, solutions should be targeted.
- Improved accident data will aid in considering new safety solutions.
- Vehicle makers are best equipped to install new technologies in the factory.

- High-visibility seat belt materials could quickly help enforce safety rules. Unfortunately, committed seat belt violators will likely circumvent interlocks.
- MSHA should consider unintended consequences of crash avoidance systems. More mine testing, development, and information could advance this technology.
- For conveyors, MSHA should consider emphasizing emergency stop cords, improved lock-out/tag-out, and other simple, impactful solutions.

Comments

I. After mining has become safer than ever and safer than many other industries, the RFI focuses on the toughest accidents to eliminate.

Even as the mining industry – in partnership with MSHA – has achieved better safety outcomes than many other industries in recent decades, we applaud MSHA's continued focus on preventing the handful of serious accidents that continue to occur. Mining itself has improved dramatically. In 1978, mining had 242 fatalities, according to MSHA data.[1] By 2017, that number was down by 88% to 28. Everyone agrees that even one fatal accident is too many. Every miner should go home safely at the end of every shift. Members of the Mining Coalition spend millions of dollars and substantial energy to get to zero. Yet, when considering how to tackle the remaining accidents it is worth recognizing this accomplishment with credit to MSHA, miners, and mine operators alike. It is also worth recognizing that the remaining accidents remain because they are the toughest to prevent.

Mining today is also much safer than many other industries and represents a relatively small portion of U.S. workplace injuries. For instance, mining's 25 fatal incidents in 2016 are dwarfed in comparison with many other sectors, including construction contractors (631), administrative and building support services (372), food services and restaurants (165), and even the performing arts and sports (53).[2] Indeed, though mining has a safety enforcement agency all to itself, mining accounted for just 0.5% of all workplace fatalities in 2016.[3] The same is true for serious injuries. In 2017, mining had a recordable injury rate of 2.4, making it a much safer place to work than in a grocery store (4.6) and especially a nursing home (10.9).[4]

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[1] MSHA, MSHA at a Glance (CY 1978-2017), *available at* https://www.msha.gov/sites/default/files/Data_Reports/at-a-glance-legacy-2.12.2018.pdf.

[2] *See id. See also* Bureau of Labor Statistics, 2016 Census of Fatal Occupational Injuries, *available at* https://www.bls.gov/iif/oshwc/cfoi/cftb0304.xlsx.

[3] *See id.* (BLS data with 5,190 total workplace fatalities).

[4] BLS, 2017 Nonfatal Injury and Illness Rates by Industry, *available at* https://www.bls.gov/web/osh/summ1_00.htm.

Since MSHA's RFI focuses on tasks relating to mobile equipment, transportation, and conveyors, it is also notable that mining is far safer than other industries with similar workplace hazards. For instance, the truck transportation industry had 570 deaths in 2016 compared with 25 in mining (17 of which were in metal/non-metal). The warehousing and storage industry, where conveyors are prevalent, had a 2017 injury rate of 5.1 compared with mining's rate of 2.4.

These numbers provide helpful context for the RFI's important questions. Why do a handful of fatal accidents persist in mining after the vast majority have been eliminated? Based on the experiences of Coalition's members, in some cases, there may be opportunities to implement simple technological solutions that could prevent a few more accidents. However, the most significant "low-hanging fruit" engineering controls already are in place. What often remain are incidents caused by human factors. Sometimes, there is no technological answer, particularly in those handful of cases when someone is committed to unsafe conduct (such as using drugs or not buckling a seat belt).

II. While making appropriate use of new technology is important, behavior and culture are the final frontier in significant further safety advances.

Mining Coalition members believe, based on their experience, that mining's next major safety advances will come from consistently improving behavior and culture across the industry, as much as from technology. Over the last several decades, employers with the safest operations have learned that safety does best when companies create and implement comprehensive safety programs. Such programs have several key components: policies, equipment, training, maintenance, enforcement, and discipline. All together, these build a culture of safety.

This multi-layered approach weaves a strong protective fabric. There are no shortcuts. While equipment and technology are key components, leading safety programs long ago learned that technological safeguards alone are insufficient. The RFI's questions underscore that the key issue often is not the absence of sufficient rules or equipment; rather, it is all too often a breakdown in complying with existing rules and using existing safety equipment.

In some recent "powered haulage" accidents, new technologies likely would not have changed the outcome. For instance, where a vehicle's braking system fails, proximity detection or even automatic braking would not matter.[5] Whether the operator or the automatic system tries to apply the brakes, they would not work. What might help minimize such events is focusing on the human factor – aggressive maintenance regimes, mechanic and operator training, and pre-shift examinations. These human "systems" would be equally responsible for installing, maintaining, and overseeing any new safety technologies. If the mine system does not maintain the brakes, there is reason to worry that it will not maintain more complex technology, either.

[5] At least a couple accidents in recent years appear to fall into this category: *See* CAI-2015-05, *available at* https://www.msha.gov/sites/default/files/Data_Reports/Fatals/Coal/2015/final-c15-05.pdf, and MAI-2016-17, *available at* https://www.msha.gov/sites/default/files/Data_Reports/Fatals/Metal/2016/final-m16-17.pdf.

Precisely because it is the final frontier, behavior-based safety has developed over the last 20-30 years into a mature field. Companies with strong safety records address behavior both with positive and negative attention. Employees and teams receive recognition for consistently working safely while individuals receive discipline for failing to do so. As MSHA examines how to partner with industry to further reduce serious accidents, there are some tried-and-true tools that operators have found to work, and which MSHA could emphasize.

In the interest of reducing these remaining serious accidents, MSHA can reinforce such successful mine operator efforts in several significant ways:

Sharing experiences, training, and education regarding behavior-based safety and comprehensive training programs. MSHA can share success stories about comprehensive safety programs and "life-saving rules" (below) with mine operators across the industry and indicate its support for operators who seriously enforce seat belt and powered haulage safety rules. It can help equalize the playing field by helping operators of all sizes implement the kinds of sophisticated safety programs usually found only at the largest firms. MSHA can improve its guidance and resources to support effective disciplinary programs.

Focusing on distracted and impaired driving. On the highways, the National Highway Traffic Safety Administration ("NHTSA") has an entire category for deaths resulting from "human choices."[6] Out of 37,461 roadway deaths in 2016, this includes alcohol (28%), distracted driving (9%), and drowsy driving (2%). The numbers may well be different in mining since miners in drug-testing programs may be less likely to be drug-impaired on the job, and many mines prohibit the use of cell phones. However, the Coalition is aware of fatal accidents involving drugs and cell phone use where employees evaded their training and company policies. At the same time, drowsy operation may be higher in mining, given the nature of shift work.

This information leads to a number of questions. What do similar statistics look like for mining? How would the technologies in the RFI address these concerns? Are they the quickest, most reliable, and most efficient means of addressing the problems? Are there technologies missing from consideration, such as those addressing drowsiness? Finally, how can MSHA best support mine operators in reducing drug and alcohol use, cell phone use at work, and fatigue?[7]

Requiring additional emphasis on life-saving rules. Much as MSHA focuses extra attention on "rules to live by," some operators have succeeded by focusing on "life-saving rules" – those most critical to safety, such as seat belt use. With these rules, operators provide extra education, training, reminders, and compliance checks so everyone understands why these rules are so critical. Sadly, even then, some still do not comply – in some cases through error or omission and other times intentionally. As a result, operators with successful programs also

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[6] NHTSA, Traffic Safety Facts, *available at* https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/812446 (Oct. 2017).

[7] NIOSH may be a valuable resource, as it apparently is already investigating these human factors according to its latest strategic plan. Regarding reducing powered haulage accidents in mining, NIOSH notes, "Investigating the human system integration elements of capabilities/limitations and administrative/behavioral considerations associated with their implementation for automation remains a critical need of the mining industry." NIOSH Strategy Plan: FYs 2019-2023, *available at* https://www.cdc.gov/niosh/about/strategicplan/traumin.html.

increase disciplinary consequences for violating these core rules. Miners who don't wear seat belts may face particularly serious discipline to ensure their own protection.

Even without new rulemaking, MSHA could push down across the field greater emphasis on life-saving rules. This is not a suggestion for greater or lesser enforcement against operators. MSHA already has programs for that. Rather, we suggest a separate track of MSHA efforts to provide support and resources. This has worked at many mines. MSHA could spread the message and provide support materials. It could also encourage more detailed annual training on issues like wearing seat belts, collision avoidance, edge safety, and conveyor hazards.

Supporting appropriate discipline. Every system needs a check. It is not enough to require something. There must be a consequence for not doing it. Under the Mine Act, MSHA's enforcement tools are most directly aimed at mine operators. However, when MSHA only focuses accountability on operators, it misses an opportunity to fully provide a check against violations. MSHA's own accident reports often conclude that the cause of the accident the mine operator's failure to prevent it through supervision. If operators are to blame for insufficient supervision, they should also be positively supported to use all necessary tools to supervise appropriately and ensure that miners comply with rules. MSHA should develop and provide disciplinary resources to help mine operators realize this potential.

Section 2(e) of the Mine Act anticipates this role, declaring that mine operators, "*with the assistance of the miners* have the primary responsibility to prevent the existence of [hazardous] conditions and practices."[8] MSHA can help this miner-management partnership by supporting comprehensive safety programs with more education and training. It can talk about the importance of fairly administered discipline. It should continue to fairly evaluate Section 105(c) discrimination complaints to ensure that only meritorious complaints receive MSHA's backing. For too long, mine operators' experience was that too many miners – ironically, often those who failed to follow safety policies – used the complaint process to obtain leverage or revenge after receiving appropriate discipline. When it comes to safety, MSHA should not accept non-performance from either operators or individual miners.

III. While some simple engineering controls may yield benefits, MSHA needs the right data, target, and approach.

No doubt, there are some engineering controls that could add value to the issues in MSHA's RFI – either now or in the future. However, there are a few overarching challenges. Operators have already experimented with many of these technologies only to find that they are not quite ready for widespread use in the field. In addition, the issues MSHA raises apply very differently at different types of mines and with different types of equipment, making it critical that future work on these issues focus on where hazards justify new technologies. Finally, MSHA and the industry would benefit from improved MSHA accident investigation reports so that the data underlying any future rulemaking is reliable.

[8] 30 U.S.C. § 801(e).

A. Though some of the RFI's suggested engineering enhancements may be feasible and impactful, operators have had challenges with some of the technologies suggested by MSHA.

When it comes to implementing additional engineering controls, Mining Coalition members' experience is that not all safety mechanisms are created equal, and it is critical to bear in mind their limitations and unintended consequences.

Some engineering enhancements – often simple ones – make it easier to ensure compliance with safety rules. But, others make everything harder. For instance, Coalition members have seen success with increasing seat belt compliance rates through the use of high-visibility seat belt materials, which make it more obvious to supervisors when someone is complying or not. On the other hand, seat belt interlock systems require additional time to engage mobile equipment, including in an emergency, and lead some miners to attempt unsafe workarounds so they can circumvent the interlock, potentially causing a greater hazard.

As detailed below, some technologies demand careful placement and maintenance. Some have durability challenges in mining environments. Many can lead to unintended consequences. For example, research has shown that some of these new technologies may make operators complacent, overloaded by information, fatigued by alarms, and less safe.[9]

B. MSHA should take care to hit the right target. Its broad RFI, covering so many different kinds of mines and environments, suggests a need for greater specificity to solve the identified problems.

The RFI has extremely broad application. With respect to its seat belts, collision avoidance, and highwall/dump point provisions, the RFI impacts surface metal and non-metal mines, as well as surface coal mines and surface areas at underground coal mines. The belt conveyor provisions impact all mines at which such conveyors operate. MSHA is right to ask questions aimed at understanding the unique aspects and challenges of working with certain types of equipment. For instance, equipment operating in narrow spaces will likely have higher false alarm rates from collision avoidance systems, which can lead to alarm fatigue.

The Coalition's initial recommendation is that MSHA consider thoroughly not just which equipment and technologies exist, but also where the biggest risks exist, by type of mine, activity, and equipment. Then, MSHA can narrowly tailor any regulatory changes to obtain the largest safety benefits without imposing drastic costs with no attached benefits, *e.g.*, where meaningful safety risks do not exist.

This should include sorting accidents specifically by causation. A number of recent fatalities might have been better avoided through enhanced training, policies, and discipline. In many cases, sufficient regulations exist, and the real key is finding ways to incentivize miners to obey speed limits, implement grade and gear reductions, comply with policies against alcohol- and drug-impaired operation, and improve inspection and maintenance of equipment.

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[9] *See* below, at 16, n.28.

Because of wide variations, it is important to retain mine operator discretion in implementing safety mandates. Operators that make safety a priority will see better results than those who do not, regardless of technology. Overly specific regulations do not leave operators with enough authority to make changes when a specific, mandated piece of technology does not achieve its desired ends. Additionally, overly specific technology requirements can create a monopoly for one manufacturer, resulting in higher costs to operators, regardless of the effectiveness of the product.

C. A significant first step would be closely reviewing and improving the accident data MSHA has to consider these kinds of questions.

MSHA needs strong, specific data about past events in order to identify technologies that could have prevented them. MSHA accident investigation and fatality reports should strive to include full context and avoid speculation or assumptions, even when specifics of an accident cannot be determined. In the immediate term, MSHA can carefully review its "powered haulage" accident reports to determine which have sufficient and reliable detail such that they can shed light on changes for the future. In the longer term, MSHA could change its accident report guidance to collect more precise data.

The most significant challenge is that in focusing heavily (and understandably) on systems-based root causes, MSHA accident reports may not account fully for human factors. The MSHA investigation handbook requires that root causes be framed as management failures.[10] While this is not uncommon for a safety regulator, there should also be sufficient emphasis on human factors. We know from motor vehicle accident data that a large percentage of accidents result from human factors. Mobile equipment in mining is likely no different. Emphasizing human factors would help better account for accidents caused by from drugs, alcohol, or fatigue.

Perhaps, other investigative agencies can offer ideas. For instance, National Transportation Safety Board ("NTSB") investigations include a focus on "human performance," focusing on multiple human factors, including behavioral (24-72 hour history, operator behavior, life habits and events) and medical (health, drugs/alcohol, fatigue) factors.[11] In light of the opioid

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[10] *See* MSHA Handbook PH11-I-1, Accident/Illness Investigations Procedures, at 47-48, *available at* https://arlweb.msha.gov/READROOM/HANDBOOK/PH11-I-1.pdf (emphasis in original) (stating that while "human actions or inactions" causing the hazard are "indirect causes," a "root cause" focuses on management failures, *e.g.*, "the reason that the *mine operator's* rules, policies, procedures or programs failed to ensure that employees took appropriate actions."

[11] NTSB, Aviation Investigations Manual Appendices, at H-17-18, *available at* https://www.ntsb.gov/investigations/process/Documents/MajorInvestigationsManualApp.pdf. NTSB also has a 3-page checklist focused solely on exploring fatigue issues. *See* NTSB, NTSB Methodology for Investigating Operator Fatigue in a Transportation Accident, *available at* https://www.ntsb.gov/investigations/process/Documents/fatigue_checklist_V%202_0.pdf.

crisis, OSHA also recently clarified that drug testing of employees to evaluate the root cause of a workplace incident is permissible as a means to promote workplace safety and health.[12]

Looking simply at all prior "powered haulage" events may not be specific enough. For example, it is not helpful to simply note how many accidents involved a driver found not wearing a seat belt. In some or many of those cases, using a seat belt (or having a seat belt interlock) may not have mattered. Sometimes, the accident reflects such intentional misconduct that the driver was clearly committed to his actions and one would expect him to circumvent any interlock system. Other times, the nature of the accident meant that a seat belt would not have made a difference, such as with a vehicle falling hundreds of feet.

One example that seems to demonstrate both points is a 2014 accident in which a haul truck driver sat quietly in his truck, ignoring radio calls, before suddenly speeding around the property, breaking through multiple berms, and driving over the highwall to a 238-foot drop. Despite company training, policies, and drug testing, the driver was intoxicated.[13] He was sufficiently deliberate that he likely would have evaded any seat belt interlock, and in any event, it is unclear that a seat belt would matter when suffering a 238-foot drop in a large truck. It is not clear that this kind of accident should be a data point in support of interlocks.

In other cases, an accident report may be silent on whether the miner was wearing a seat belt at the time of the accident or removed it afterwards. In a 2015 accident in which a tanker truck overturned, the report could not determine whether the driver was wearing his seat belt or not, concluding that he "could have possibly unhooked his seat belt after the truck overturned," presumably in an attempt to escape.[14] In a 2016 accident, a truck driver broke through a berm and ended up submerged in 14 feet of water.[15] Though his seat belt ultimately was found unbuckled, it is unclear whether he removed it upon hitting the water in order to try to escape.

Similarly, in the case of whether current berm rules and regulations are sufficient, accident reports do not always appear to address the sufficiency of berms. The same 2016 accident report does not describe the conditions of the berm and whether it met existing standards. If the berm itself was non-compliant, perhaps the best and most immediate solution would be to help focus everyone's energies on compliance with the existing berm regulations.

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[12] Occupational Safety and Health Admin., Standard Interp. / Clarification of OSHA's Position on Workplace Safety Incentive Programs and Post-Incident Drug Testing Under 29 C.F.R. §1904.35(b)(1)(iv), Oct. 11, 2018, *available at* https://www.osha.gov/laws-regs/standardinterpretations/2018-10-11.

[13] CAI-2014-13, *available at* https://www.msha.gov/sites/default/files/Data_Reports/Fatals/Coal/2014/final-c14-13.pdf.

[14] *See* CAI-2015-07, *available at* https://www.msha.gov/sites/default/files/Data_Reports/Fatals/Coal/2015/final-c15-07.pdf.

[15] *See* MAI-2016-02, *available at* https://www.msha.gov/sites/default/files/Data_Reports/Fatals/Metal/2016/final-m16-02.pdf.

D. Vehicle safety technologies are best implemented by equipment manufacturers at the time of vehicle production.

Even if MSHA finds technologies that are effective, reliable, and provide a benefit that outweighs their costs, there remains a major question about how to implement them. For a number of reasons, rolling out new technologies will be far more effective if done by phasing in certain features on newly-manufactured equipment rather than retrofitting older equipment.

The history of bringing new safety technologies to passenger vehicles is a success story worth considering. Over the years, the National Highway Traffic Safety Administration ("NHTSA") has required certain new features, such as airbags, while guiding manufacturers toward developing others, like collision avoidance systems. Retrofitting the fleet would be cost prohibitive and technically infeasible. Instead, regulators focused on working with manufacturers to require or encourage features in new equipment. As the fleet turns over, the new technologies gain widespread adoption.

By contrast, retrofitting equipment would be complicated, unreliable, and far more costly. Mine operators are relatively poorly positioned to choose and implement new safety technologies compared with vehicle manufacturers. The manufacturers know their equipment best and what will be compatible. Full integration into the vehicle from the design stage also ensures a functioning, reliable system, especially where it requires integrating one or more sensors with the onboard computer(s) and/or the engine. Indeed, some Coalition members have installed aftermarket systems and found them to be unreliable.

Equipment that is "built on" a vehicle's outside or undercarriage rather than "built in" may also be subject to more physical damage in mining environments. Much of the equipment requires careful installation and placement (for cameras or radar sensors, for example). Mass production at the factory also reduces costs while retrofitting can be prohibitively expensive, especially with complex new systems installed on old machinery (which may affect small and medium-sized operators the most if their fleets tend to be older). Incorporating sensible new technologies at the factory also allows mine operators to roll their upgrades into the already-planned costs of natural equipment upgrades. The largest companies replace their equipment at a quick enough pace that new safety technologies would phase-in through the supply chain in relatively short order.

E. Some next-stage vehicle systems are not ready for prime time, as they are subject to installation, reliability, durability, and maintenance challenges.

Many of the systems in question – such as for collision or edge avoidance – have an array of sensors and parts, sometimes requiring external networks and communication, and sometimes depending on other objects and equipment also being properly equipped (such as systems based on transponders or tags). Installing such systems on the thousands of pieces of mobile equipment now deployed in the field is particularly complex.

With many of these systems are still developmental, the question becomes whether they deliver reliability that justifies such complex installations. Some Coalition members have had

experience with back-up cameras, for instance, that repeatedly fail, or proximity systems that issue frequent false positive alarms. Some of the new technologies do not appear to have been thoroughly developed yet or fully tested in challenging mining environments.

The result is not only functionality limitations but durability concerns. From a mobile equipment perspective, mining environments are often rocky, dusty, and dirty. They wear hard on vehicles and equipment, which may be operated 12 or 24 hours a day. Avoiding frequent breakdowns will require hiring, training, and supervising extensive additional maintenance staff. Expanded crews will be critical since once these technologies are installed, failure will require tagging out the entire machine, which has severe consequences for operations and production. MSHA should take these needs for more mining-specific performance data and testing, as well as additional personnel costs, into consideration.

F. MSHA should consider how much value experimental systems would add and at what cost.

The complexity of these systems – and their hidden maintenance costs – put additional burden on MSHA to analyze the costs and benefits of requiring new vehicle technologies. One Coalition member obtained quotes for equipping one of its mines with fatigue monitoring devices to intervene when drivers become tired (a much simpler system than many collision avoidance systems). The system would have cost an estimated $2 million to upgrade the fleet and $400,000 each year to maintain the upgrades. Especially if the systems do not fully function, the risk is diverting other safety resources, perhaps reducing attention to greater hazards or more effective safety initiatives.

Smaller and medium-sized operators could be hit hardest by these costs. The Coalition recommends that MSHA carefully consider ways to narrowly tailor any additional regulations in order to achieve the right safety results. This should include a comprehensive cost-benefit analysis that considers the relative costs of requiring retrofits versus phasing in factory-built solutions, as well as costs of training on new technology and ongoing maintenance.

IV. High-visibility seat belt materials, education, and discipline could help ensure seat belt usage, but complex interlocks may be thwarted easily.

Mine operators certainly agree that everyone must wear seat belts. Seat belts are emblematic of the challenge with the handful of remaining powered haulage accidents each year. There are safety equipment, policies, and ample training in place, but injuries occur when a few individuals fail to comply – either by losing control or by willfully ignoring the rules.

Coalition members have found that the simplest solutions are the best: high-visibility seat belt materials that make it easier to see when equipment operators are buckled up and strict enforcement of safety policies requiring seat belt usage. Interlocks, on the other hand, are likely as ineffective as they are complex: those committed to not wearing seat belts easily avoid them.

A. MSHA, state and federal law, and mine operator policies already demand seat belt use, but some individuals are committed to not complying.

It is worth remembering that just as on the highways, seat belts are already required in surface mining equipment, they must meet certain specifications, and equipment operators must wear them.[16] There are important lessons to learn from seat belt usage on public roads and highways:

Some people seem committed to not buckling up. The experience with public seat belt laws has been significant progress with most people, coupled with a handful of stubborn people who, it seems, are absolutely committed to not wearing their seat belts even though their own lives – and civil penalties – are at stake. On the one hand, state and federal laws requiring seat belt availability and use have led to 89.7% compliance nationwide in 2017.[17] On the other hand, though, there are still 10% who are remaining holdouts. They persistently refuse to buckle up. Among people who never use safety belts, the top reasons they cite are discomfort; the belief that it's not necessary, and a dislike of being told what to do. This reluctance to comply continues even despite the law and extra technology, such as 92% of new cars today being sold with enhanced seat belt reminder systems.[18]

Forcing personal responsibility has made a real difference. Seat belts usage has increased significantly as federal law first made them required equipment on passenger vehicles and state law then imposed individual penalties against unbuckled drivers (and often, passengers). Since the late 1960s, new vehicles have required seat belts under federal law. In addition, drivers must wear seat belts by law in 49 U.S. states under threat of individual penalty. Many states also impose higher penalties for repeat violators. As these laws took effect and prominence, usage increased from 70.7% in 2000 to 81.2% in 2006 to a high of 90.1% in 2016.[19]

The more discipline, the more compliance. States that have increased enforcement, have better seat belt usage rates. States with "primary enforcement," where police can pull over a driver for a seat belt violation alone, had 90.9% usage compared with states that had no enforcement or only "secondary" enforcement, which had 85.7%. According to the Insurance Institute for Highway Safety ("IIHS"),[20]

- The frequency of never using a safety belt was twice as high in states with secondary enforcement compared with states with primary enforcement.

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[16] *See* 30 C.F.R. §§ 56.14130, 56.14131, 77.403–1, and 77.1710(i).

[17] Hongying (Ruby) Li and Timothy M. Pickerell, Nat'l Highway Traffic and Safety Admin, Traffic Safety Facts Research Note, Seat Belt Use in 2017—Overall Results (April 2018).

[18] Kate Gibson, More New Vehicles Equipped with Crash Avoidance Technology, http://www.thedrive.com/sheetmetal/17145/more-new-vehicles-equipped-with-crash-avoidance-technology (Dec.21, 2017).

[19] NHTSA, Seat Belt in 2017, *available at* https://crashstats.nhtsa.dot.gov/Api/Public/Publication/812465.

[20] Ins. Inst. for Highway Safety, Highway Loss Data Institute, Safety Belts (May 2018), https://www.iihs.org/iihs/topics/t/safety-belts/qanda#safety-belts.

- States that went from secondary to primary enforcement laws saw a 14-percentage point median increase in observed belt use.
- Higher fines for safety belt violations lead to higher rates of seat belt use.
- Publicized enforcement campaigns are necessary to sustain compliance over time.

When MSHA considers improving seat belt usage, it should bear in mind these lessons.

Expect that the violators are dedicated. Even where individuals directly face direct financial and legal penalties (on the highways), a small minority of users still refuse to comply, and they will be committed to circumventing interlocks. MSHA should not give up striving for 100%, but it should be realistic about how hard it can be to move the needle. This is also relevant to a cost-benefit analysis. MSHA should carefully consider whether significant additional mandates are only likely to change a tiny fraction of behavior. If so, they may not be worth the diversion of critical safety resources. A starting point would be to have data on seat belt usage in mining. Is it also near 90% or much lower? Before MSHA can determine whether a regulation is worthwhile, it must know the scope of the problem.

Policies and education can work. If MSHA helps mine operators develop comprehensive safety programs and cultures, provides training and educational resources, and promotes seat belt usage, it can have an impact.

B. High-visibility seat belt materials, training, and support for discipline could help mine operators enforce seat belt rules.

High-visibility seat belts may help. The high visibility helps supervisors easily see and address violations. It supports accountability by increasing the risk of being caught. One Coalition member had success with installing high-visibility seat belts, which allow supervisors to shine light from the ground and easily see if a driver is buckled. Other Coalition members agree that such material is an effective, feasible tool that can be implemented quickly.

Of course, the entire purpose of the high-visibility belts is to help supervisors enforce the rules, so these belts really work best when combined with a strong, fair disciplinary system. At one member site, however, there were some challenges with compliance. They were able to eliminate these challenges through heavy enforcement and discipline (such as 30-day suspension for violations). MSHA should encourage mine operators to periodically audit seat belt usage. Just as state troopers set up checkpoints on holiday weekends to look for impaired or unbuckled drivers, mine operators could use special enforcement periods to educate and/or discipline.

Several Mining Coalition member companies have found success with auditing and discipline. For one Coalition member, at every project, every person on site is seen by management at least once and sometimes 3-4 times per day, and seat belts are always inspected. This operator has found that checking, enforcing, and applying discipline where necessary have created a culture of consistent seat belt compliance. A second company does area audits twice per month, in addition to specific training that emphasizes seat belts. Every facility is different, so programs should be tailored to each.

C. No matter how costly or sophisticated warning systems and seat belt interlocks may be, violators can defeat them.

Those not wearing seat belts are already violating their employer's policy, MSHA regulations, and the law. Despite training and repeated reminders, they flout these rules. They will be no less determined to ignore warning lights or circumvent seat belt interlocks. Additionally, some question whether in the event of an emergency, the time needed to engage a seat belt interlock and start a machine could create a hazard by delaying moving the equipment.

A warning and/or interlock system is technologically complex to install and maintain. At its heart are one or more sensors to detect if the seat belt is buckled and even if a person is in the seat. At a minimum, it requires wiring and sensors between the seat belt buckle and the equipment computer or engine. Retrofits would be challenging on older equipment. They may involve replacing a number of parts and removing seats and access panels. Existing on-board computer chips and PLCs on the equipment may not have the necessary software or inputs.

Were there a foolproof system, it might be worth considering, even despite the high costs to install and maintain for every seat belt in every mine truck. However, some mine operators have already installed these systems voluntarily. Unfortunately, they found that miners committed to undermining their own safety easily bypassed the sensors, alarms, and interlocks.

One Coalition member installed a sophisticated interlock system that both detected whether someone was sitting in the seat and detected whether the belt was buckled. To start the truck, the driver first had to sit down and buckle the belt. However, some employees figured out workarounds. In one case, a person found an old seat belt and cut off the clip so he would have an extra. He would then simply click that into the buckle to fool the interlock system. Others would buckle the seat belts behind them and sit on top of them.

Many years of trying to encourage seat belt use in passenger vehicles has taught that this problem never goes away completely. Some people are just determined to drive unbuckled. The best solution – which can be implemented immediately and with relatively little cost (rather than interlocks that will involve great expense over many years) – is to increase the cost and likelihood that they will be caught. Education, training, and pledge cards may all be effective. MSHA can help mine operators with these efforts. Finally, should interlocks be required, it should be in the most reliable and efficient manner – at the time of new vehicle manufacture.

V. With many high-tech solutions still experimental and unproven in many mining environments, MSHA should focus on simple, immediate tools to reduce collisions and highwall accidents.

Because collision and edge avoidance systems are still in development, particularly for challenging mining environments, the best way to mitigate these hazards and prevent the handful of serious accidents still occurring is to implement across the industry simple but impactful comprehensive safety policies and enforce compliance. While developing technology offers

great promise for the future, it remains unproven for mining. Even in passenger vehicles, many of these technologies are still a work in progress.

A. Many collision and object (or edge) detection technologies are still experimental, even in automobiles.

It seems that in part, MSHA's RFI is inspired by knowledge that some collision and edge detection, automatic braking, and similar technologies are available in some form in some cars. However, even in passenger vehicles, these new tools are very much still in development, with uncertain safety records, effectiveness, and reliability. For example, currently, only 19% of 2017 automobile models come with automatic emergency braking systems.[21]

In fact, for many of these technologies, NHTSA has not yet set performance specifications or recommended them. For instance, according to its web site, it has no recommendations or specifications for pedestrian automatic emergency braking (a "promising" technology for "the future" to brake when a pedestrian steps in front of a vehicle), lane keeping (an "emerging" technology), blind spot detection (a "promising" technology), and 911 automatic crash notification systems (which "may enhance" safety).[22] Other technologies are recommended but not required, such as automatic emergency braking systems (to detect and prevent front-end collision with preceding car), forward collision warning systems (to warn of front-end collisions), and lane departure warning systems.

Perhaps one way that MSHA can contribute to faster development and adoption of these technologies is to borrow from NHTSA's model and create resources for mine operators about what these various technologies are, what they can do, how reliable they are, and whether they are ready for recommended adoption. In addition, it can partner with equipment manufacturers to encourage faster adoption and standards. This is the long path of education, experimentation, and development that occurs before some of these technologies – such as back-up cameras – are eventually required by law.

B. Current generation systems sometimes fail to alarm and other times generate false alarms, creating user mistrust and "alarm fatigue."

Studies have shown that false alarms are a major concern with collision warning systems because the equipment operator may, understandably, start ignoring alarms."[23] Car owners with automatic braking systems have reported false alerts with those systems from 12-40% of the time

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[21] Kate Gibson, More New Vehicles Equipped with Crash Avoidance Technology (Dec. 21, 2017), *available at* http://www.thedrive.com/sheetmetal/17145/more-new-vehicles-equipped-with-crash-avoidance-technology.

[22] Nat'l Highway Traffic Safety Admin., Driver Assistance Technologies, https://www.nhtsa.gov/equipment/driver-assistance-technologies#topic-available-technologies; https://www.iihs.org/iihs/topics/t/automation-and-crash-avoidance/qanda#crash-avoidance-technologies.

[23] Todd M. Ruff, NIOSH, Test Results of Collision Warning Systems for Surface Mining Dump Trucks (2000), available at https://www.cdc.gov/niosh/mining/userfiles/works/pdfs/ri9652.pdf.

depending on the make and model of the vehicle.[24] In a mine, equipment can alarm based on environmental conditions, such as rocks, foliage, or uneven terrain. In some mines, there are also small spaces or narrow passes, where alarms could trigger frequently.

NIOSH echoed this concern in a 2007 study on the subject. In testing radar systems, one system alarmed 94% of the time when a truck was moved in reverse. 40% of the time the alarms were false. NIOSH concluded, "The high number of alarms that do not represent dangerous situations, including false and nuisance alarms, will be problematic if operators lose confidence in the system and start to ignore alarms altogether."[25]

Indeed, this was exactly the experience of one Coalition member. The company installed a collision warning system on its 100-ton haul trucks. The system was made by the truck's manufacturer, and although the trucks were no longer new, the manufacturer itself came to the mine to install, set up, and maintain the new systems. The trucks were equipped with cameras on all sides and radar. They were programmed to alarm and turn on the appropriate camera view upon detecting movement or objects. Unfortunately, they alarmed frequently with false positives. During a 12-hour shift, drivers were receiving over 100 false alarms per truck, which conditioned them to ignore the alarms. Although the manufacturer had its engineers and programmers troubleshoot the system extensively, eventually the system had to be removed.

This problem can be even worse when mine operators deploy multiple warning systems. Although many suggest that this is often the most effective way to ensure all possible hazards are detected, a NHTSA report has warned that this arrangement can create an atmosphere in which drivers are unsure about or misjudge the meaning of a particular warning.[26]

C. Even when successful, these systems create concern about unintended consequences.

Some experts warn that even the success of sophisticated warning and collision avoidance systems presents a challenge. When these systems work reliably, there is concern that they may lead to unintended consequences, shifting risk from one hazard to another.[27] Once they

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[24] Mike Monticello, Guide to Automatic Emergency Braking—How AEB can put the brakes on car collisions, Consumer Reports (June 29, 2017), https://www.consumerreports.org/car-safety/automatic-emergency-braking-guide/.

[25] NIOSH, RI 9672 Report of Investigations/2007, at 17, *available at* https://www.cdc.gov/niosh/mining/userfiles/works/pdfs/2007-146.pdf (2007) ("2007 NIOSH Study").

[26] John L. Campbell et al., Nat'l Highway Traffic Safety Admin Report No. HS 810 691, Crash Warning System Interfaces: Human Factors Insights and Lessons Learned, 2-7 (2007).

[27] CTV News, "How new safety technology might actually be making our driving worse," *available at* https://www.ctvnews.ca/features/how-new-safety-technology-might-actually-be-making-our-driving-worse-1.3823118 (Mar. 7, 2018) (noting complacency problems, rising lane-keeping accidents in cars with lane-keeping technology, drivers overly relying on back-up cameras, and drivers turning off advanced tech for too many alarms); NBC News, "Driver safety systems can avoid — and cause — crashes, study shows," *available at* https://www.nbcnews.com/business/autos/driver-safety-systems-can-avoid-cause-crashes-study-shows-n898371; IIHS, "IIHS-HLDI test drives uncover driver assistance system quirks," *available at* https://www.iihs.org/iihs/sr/statusreport/article/51/8/2 (noting mistrust of systems by drivers and that technology

trust that a system works reliably, drivers can become complacent, forgetting or relaxing their safe driving behaviors after coming to rely on the system to keep them safe. According to the Insurance Institute, "One concern is that drivers might rely on crash avoidance systems too much and feel freer to look away from the road or take other risks."

Alarm fatigue and information overload are also problems. In one tragic accident documented by MSHA, a 350-ton haul truck ran over a passenger van. The truck had no fewer than four cameras installed, feeding a split-screen display in the driver's cab. Yet, MSHA found that the passenger van may have been only partly visible in one camera view. In addition, the wide-angle image was not as clear at the edges, and the miner may have been overwhelmed by information: "[I]t would be unrealistic to expect a person getting information from so many sources – direct line of sight, two mirrors, and four camera images, to be able to detect subtle images in the periphery of one of the cameras."[28] Cameras have great potential, but this reinforces the value MSHA can add by working with manufacturers to ensure that system design takes account of real-world challenges.

Similarly, some crash avoidance technologies have been found to reduce the likelihood of one type of crash while increasing the risk of another. The IIHS' research on the effects of front crash prevention on police-reported crashes found that vehicles with forward collision warning and automatic braking had a 20 percent higher rate of being rear-ended than vehicles without the systems.[29] In a study that monitored teen driving behavior in cars with and without collision avoidance systems and lane departure warnings, teens in cars with the systems increased use of turn signals and decreased lane drifts, but they also followed other vehicles too closely.[30]

D. There are many unknowns and challenges in applying collision avoidance technologies to mining.

Much is unknown about how these systems perform in a mine. In the 2007 NIOSH study, the research agency concluded that there was still work to be done to determine whether these technologies would work to reduce accidents in mining and how.[31] NIOSH concluded that "tests did not determine the effectiveness of the devices in accident reduction." It also called for more research to find effective audible and visible alarms specifically for surface mining. Currently, NIOSH's web site states that "[v]ery little data are available that show the performance of PWSs

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was "immature") (Nov. 10, 2016); USA Today, "Testing finds flaws with electronic car safety systems, insurance group warns," *available at* https://www.usatoday.com/story/money/cars/2018/08/06/electronic-driver-assist-systems-safety-warning-insurance-groups/921376002/ (Aug. 7, 2018).

[28] *See* MAI-2017-11/12, *available at* https://www.msha.gov/data-reports/fatality-reports/2017/fatality-11-12-october-31-2017/final-report.

[29] Ins. Inst. for Highway Safety, Highway Loss Data Institute, Automation and crash avoidance (May 2018), https://www.iihs.org/iihs/topics/t/automation-and-crash-avoidance/qanda#crash-avoidance-technologies.

[30] *Id.*

[31] *See* 2007 NIOSH Study at 44.

[proximity warning systems] when mounted on actual mining equipment."[32] Information available suggests that substantial more research and data collection will be necessary before MSHA could reasonably consider specific options.

Environmental conditions. Mine operators and researchers already have discovered a number of challenges with many of these systems, however. Mining equipment and environments make installation and maintenance of these devices particularly technically challenging and expensive. Rocky and mountainous terrain, dusty conditions, debris, and bad weather can interfere with and/or damage the equipment. Because many mines are located in mountainous areas, systems based on GPS are not always effective. One Mining Coalition member installed a camera-based system for giving the driver added visibility but found that in the dirty mining environment, it was impossible to keep the cameras clean.

Installation and testing. Some mines also have a mix of equipment and legacy equipment that complicate installation and testing. To the extent that systems will not just warn drivers of potential hazards, but also lock the gears or shut down the vehicle, the systems will require interconnectivity with vehicle controls and on-board computers. When it comes to retrofitting existing equipment, all of this translates into tremendous costs across a mine's fleet.

Ongoing costs. As NIOSH notes, some of the costs are ongoing. "Maintenance repair and adjustments for a PWS can become a potentially significant issue for mine operators due to the sensitive and technologically advanced nature of these systems."[33] The systems need regular performance evaluations to check that the machines operate as expected, "regular testing and verification of detection zones and safety-critical features of all system components," regular calibration, and regular training of everyone working with and around the systems.

Mining Coalition members have found this true of cameras, for example. One company had difficulty with keeping cameras functioning, while another had success, which it believed was possible only because of a very intensive equipment maintenance regime, robust training on fixing equipment, and an overall aggressive and comprehensive safety program. In other words, cameras can work well, but they take a real investment in maintenance and addressing human factors to succeed.

Equipment limitations. On its web site, NIOSH highlights some of the limitations that each type of proximity warning system faces. For instance, it notes that:

- Infrared systems are prone to nuisance alarms.
- Debris and clutter can interfere with certain capacitive sensors.
- External noises from nearby machinery can trigger ultrasonic devices.

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[32] Nat'l Inst. For Occupational Safety and Health, Engineering Considerations and Selection Criteria for Proximity Warning Systems for Mining Operations, available at https://www.cdc.gov/niosh/mining/content/pwsselection.html.

[33] https://www.cdc.gov/niosh/mining/content/pwsselection.html.

- Infrared laser-ranging lose accuracy from temperature variations, dust, and water sprays; target size, surface roughness, and geometric orientations also have impact.
- Microwave radar requires special placement, installation, and maintenance.
- RFID tags have several installation considerations to work properly.
- Camera-based systems have issues with depth measurement, distorted wide-angle images, limited fields of view, too many views, sun glare or reflections on monitors, dirt on cameras, and frequent break-downs without aggressive maintenance.

E. Targeting the specific mines and equipment that present hazards is critical. MSHA should focus on straightforward solutions with the greatest impact.

One of the biggest challenges of new-age collision avoidance and edge detection systems is determining exactly when and where they actually add value in proportion to their complication, expense, challenges, and diversion of safety resources and attention.

1. With wide variations in equipment and mines, any new mandates should narrow in on those operations and equipment types with potential hazards not addressed by existing standards.

Every mine is different, and every model of mobile equipment is different. Haul trucks driving at 30mph near other vehicle traffic pose different risks and challenges than mobile drilling equipment that inches along at 2mph in remote areas.

Some equipment often trams backwards; other vehicles do not. Some have major blind spots; others, like many forklifts, do not. Some mines have fairly simple dumping operations, where a loader operator maintains a berm, can see where he's dumping with full visibility, and cleans up the berms regularly. With so much variation, MSHA should target those particular operations where a hazard exists that is not already addressed by current regulations.

MSHA has quite a few existing regulations to protect against "blind areas," unseen hazards, and overtraveling an edge. These include: signals before moving equipment, audible warnings and lights on loading and haul trucks, parking standards, speed and traffic rules, back-up alarms, spotters for certain activities, berms, guardrails, and similar devices, barricades or warning signs of non-obvious hazards, and safety working near highwalls.[34]

As it ponders powered haulage safety, MSHA should consider: Where exactly are the existing regulations insufficient – if enforced with fair accountability by miners and mine operators? For which mines, locations, activities, and equipment would further technologies be worthwhile? The analysis may suggest that costs and benefits only justify additional regulations for machines of significant size, such as large haul trucks, or machines with certain blind spots.

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[34] *See, e.g.*, 30 C.F.R. § 77.1607(g), 77.1605(g), 77.1600, 77.1605, 77.1607, 77.410(a), 56.14132(b), 56.9101, 56.9100(a-b), 56.14200, 56.14200(a), and 56.9305(a-c), 77.1605(k-l), 77.1607(n), 77.1006(a-c) , 56.9300, 56.9301, 56.3430, and 56.20011.

2. Coalition members have had success with a number of simple, yet effective tools and approaches to reduce collisions and edge accidents.

Because a number of factors can impact equipment safety, MSHA should consider the simplest, most effective approaches. More complicated approaches necessarily lead to diminished implementation, as well as longer implementation timeframes. For instance, more effective training can have an immediate and effective impact. Although they have had difficulties with some technologies referenced in the RFI, Mining Coalition members have found techniques to increase vehicle visibility and highwall safety. These include:

- A blue LED light system to make machines coming in and out of rows of palettes more visible to pedestrians and other vehicles.
- Traffic rules that small vehicles cannot travel within 150 feet of haul trucks.
- Prohibiting vehicle operation or dumping within a certain distance from the edge.
- High-visibility reflective tape strips added to vehicles and mobile equipment at sufficient heights and locations to be seen easily by large-truck drivers.
- Adding visibility devices (including strobe lights and flags) to vehicles, as some states already require. LED whip antenna products work well, too.
- Adding stronger and/or higher berms in key hazard areas.
- Using lasers or GPS (where available) to ensure that berms are high enough, with correct elevations, and level ground.

Most of these approaches are extremely feasible in most mines and could be rolled out in a relatively short period of time.

VI. Conveyor safety can be improved by reinforcing a few proven technologies and procedures.

A good number of existing regulations target hazards of working near belt conveyors at surface and underground mines, including regulations for guarding, crossovers, and lock out/tag out. Among these many rules are three basic tools that work to prevent injuries when conveyors are in operation and under repair: emergency stop cords, guarding, and lock-out/tag-out. While more complicated systems suggested by the RFI are simply infeasible in many places, especially at many surface mines, these core tools can be a useful focus of any further attention by MSHA to address conveyor safety.

A. Emergency stop cords are a highly effective, and easily deployed and maintained, safeguard along conveyors.

Coalition members have found that emergency stop cords are an efficient and effective solution for preventing injuries along conveyor belts and parts. For conveyor lines adjacent to travelways, current regulations generally require emergency stop cords or railings along unguarded belt lines.[35] However, railings are more complicated to install and maintain, as well as less effective. One Coalition member installed guarding along most conveyor lines at one mine only to find that the project was extremely expensive, required significant ongoing maintenance, and seemed to create more hazards and less safety. Another company installed guarding at one site to the tune of $2 million, but still found ongoing compliance challenges.

MSHA could both simplify and improve conveyor safety by doubling down on emergency stop cords wherever sensible, including by:

- Encouraging a best practice of implementing emergency stop cords along unguarded belt lines.
- Encouraging regular maintenance checks of emergency stop cords.

B. MSHA can improve lock-out/tag-out practices by providing more detailed guidance and procedures.

MSHA's RFI suggests that lock-out/tag-out ("LOTO") is insufficient to protect miners because of accidents in which miners fail to follow proper procedures. However, the LOTO rules are broad and lack detail. Currently, equipment must be turned off and "blocked against hazardous motion" before conducting repairs (except as need for adjustments or testing if personnel are protected). Another standard protects against electrical shock by requiring electrically-powered equipment to be de-energized before maintenance using notices and personal locks "or preventive devices" on power switches that can only be removed by the installer or by "authorized personnel."[36]

While MSHA has provided some guidance on implementing these rules, the regulations are very broad and unspecific, particularly compared with OSHA's LOTO rule. As a result, many leading mine operators – as a matter of good practice – have adopted policies with variations of OSHA's LOTO rule, 29 C.F.R. § 1910.147. OSHA's far more detailed rule requires, among other things:

- Creating and enforcing an energy control program.
- Using personal, authorized, and appropriate lockout devices wherever possible, and developing a tag-out program where it provides equivalent protection and lock-out is not feasible.

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[35] 30 C.F.R. §§ 56/57.14109.

[36] 30 C.F.R. §§ 56/57.14105, §§ 56/57.12016.

- Developing, documenting, and enforcing energy control procedures to permit only the employee applying the lock-out/tag-out device to remove it (with some exception).
- Reviewing energy control procedures annually.
- Training employees covered by the standard.

Particularly helpful to MSHA's concerns that some individuals do not appropriately follow LOTO would be the written policies, training, and auditing requirements. Combined with mine operator enforcement of the rules (including with fair and appropriate discipline supported by MSHA), such practices could equalize strong LOTO across the industry. MSHA need not change the rule. It could retain operator flexibility to develop an approach that works at each facility. However, by providing guidance and training resources that emphasize more detailed LOTO procedures, MSHA could empower especially small and medium-sized operators to adopt these good practices, just as the largest and most safety-focused operators have.

C. To prevent operation while guards are missing, MSHA can explore targeted area guard interlocks, paint, and behavior.

In part, MSHA's RFI appears concerned that equipment with guarding may expose miners to injury when equipment is operated while guards are missing, such as when guards are not replaced after maintenance. A couple relatively simple equipment improvements could help protect miners in these situations:

Area guard interlocks. While it is simply infeasible to build an interlock mechanism attached to each guard (large surface mines have thousands of guards), in key locations that utilize area guarding, MSHA could encourage operators to install interlocks that shut off power to the exposed equipment when the area guard is open. Most often, this will be a large fence with a gate that surrounds an area with multiple moving parts. An interlock switch on the gate could cut power to the equipment as long as the gate is open.

Paint guards or paint under guards. Some operators have had success with applying paint to make it easier to spot missing guards from a distance. The paint can either be applied to the guards themselves (which the structure underneath a different color) or to the underlying structure. Either way, the contrast between the guards and the structure shows clearly when a guard is missing. This is a valuable tool to enable miners and supervisors to audit and ensure guards are in place, even as they drive past equipment.

Special emphasis training and discipline. MSHA and mine operators can make guarding, conveyor safety, and LOTO "life-saving rules" that receive priority during training. MSHA could encourage extra attention to these issues as part of annual training. In addition, operators can highlight these safety issues during toolbox talks and periodic training reinforcement opportunities. As with other issues, they must be enforced to be effective. Auditing and discipline should be an operator focus to be sure that miners understand the hazards and the protective measures (supported by MSHA when done fairly and appropriately).

D. Retrofitting miles of conveyor belt with more advanced systems will not add safety and often will simply be infeasible.

MSHA's RFI correctly understands that there are some more advanced conveyor belt technologies in existence that can detect the presence of employees and stop moving parts. However, these systems work best in factories, with short conveyors and controlled conditions. In those environments, "light curtains" can shut down belts and production lines when infrared or laser light beams are interrupted. Pressure-sensitive mats can de-energize a conveyor when someone steps right next to it.

But, such systems are ill-suited for mines, especially large ones. Many feature miles of conveyor belt, making such detection systems prohibitively expensive and complicated to install and maintain. Many mine conveyors are decades old and lack the kind of computerized control systems required to accommodate these technologies. In addition, environmental conditions – dust, debris, and weather – can interfere. In some mines, a high volume of traffic and sometimes narrow passes can bring people and mobile equipment passing in frequent close proximity to belts. This could lead to constant triggering of the system even when no hazard exists.

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The Mining Coalition appreciates the opportunity to submit these comments. We hope that the Coalition members' experiences with both successes and challenges will be helpful as MSHA considers these issues further. The Mining Coalition looks forward to continuing a dialogue on these questions and would be glad to provide further information as may be helpful.

Sincerely,

Avi Meyerstein

Henry Chajet
Erik Dullea
R. Brian Hendrix
Robert Horn
Avi Meyerstein
Donna Pryor
Mark Savit

Counsel for the Mining Coalition