From: Mike Walling <Mike.Walling@strataworldwide.com>
Sent: Monday, December 24, 2018 12:46 PM
To: zzMSHA-Standards - Comments to Fed Reg Group
Subject: RIN 1219-AB91 - Strata Worldwide
Attachments: MSHA RIN 1219-AB91 RFI_Strata Worldwide.pdf

To Whom It May Concern,

Strata Worldwide's comments on RIN 1219-AB91 "Safety Improvement Technologies for Mobile Equipment at Surface Mines, and for Belt Conveyors at Surface and Underground Mines" are attached.

Thanks,

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December 22, 2018

Mr. David G. Zatezalo
Assistant Secretary of Labor for Mine Safety and Health
Office of Standards, Variances and Regulations
Mining Safety and Health Administration
201 12th Street South, Suite 4E401
Arlington, VA 22202-5452

Re: Strata Worldwide Comments on "Safety Improvement Technologies for Mobile Equipment at Surface Mines, and for Belt Conveyors at Surface and Underground Mines", RIN 1219-AB91

Dear Mr. Zatezalo,

Strata has been providing Proximity Detection and Collision Avoidance systems to the mining, tunneling and construction industries for over 10 years, sold as HazardAvert. These systems have been installed and deployed to provide operators with a means to warn personnel and equipment operators of a hazardous condition and the option to stop equipment before a potential collision occurs. This includes machine to pedestrian and machine to machine interactions. Strata's system uses magnetic induction to provide a zone around equipment which is detectable by devices worn by personnel and devices installed on equipment. Magnetic induction provides an extremely stable zone that may even be detected through the earth (e.g. around corners), curtains, various elements of weather and more. Strata's HazardAvert technology has been enhanced throughout the years to include a mixture of technologies for its surface and underground hard rock product to meet EMESRT (Earth Moving Equipment Safety Round Table) protocol. HazardAvert now includes a combination of electromagnetic, Radio Frequency (RF) and GPS technologies. With over 10 years of industry application, HazardAvert has been successfully installed on more than 20 different types of machinery which includes mobile equipment as well as conveyor systems.

Part IV. Information Request

B. Collision Warning Systems and Collision Avoidance Systems

(B.6) Advantages of the system include: warning pedestrians and machine operators of potentially dangerous or hazardous situations before they occur, ability to educate operators of safer working habits, reduce machinery collisions and machine to pedestrian incidents, providing machine locations, capability of warning even in the harshest environments or with blind spots present. Disadvantages may include: difficulty slowing fast moving equipment in a safe manner.

Costs of the systems vary depending on the size of the machinery, but generally range from $3k - $12k per machine. Personal Alarm Devices (PAD) that are worn by the pedestrian generally range from $250-$900/per pedestrian. Several different types of PADs are offered which accounts for the price variance.

(B.7) Strata's HazardAvert system uses magnetic induction to provide a zone around equipment which is detectable by devices worn by personnel and devices installed on equipment. Magnetic induction provides an extremely stable zone that may even be detected through the earth (e.g. around corners), curtains, various elements of weather and more. Furthermore, there are generally two zones, the warning zone and the hazard zone. Both zones create an audible and visual alarm on both the Personal Alarm Device (PAD), worn by the pedestrian, and on the display screen mounted inside the machine's operator's compartment. The HazardAvert system has the ability to interface with the machine in order to slow the machine or stop the machine depending on which zone the machinery or PAD is in. Strata has deployed systems that are running today that are set up to warn only and also have systems that stop machinery when the hazard zone is breached. While the system does provide options to slow and or stop machinery, it is ultimately up to the operator or mining house to decide what works best for their application.
Over the years, Strata's HazardAvert technology has evolved in order to adhere to EMESRT (Earth Moving Equipment Safety Round Table) protocol.
See addendum for more details on EMERST protocol and standards.

(B.8) HazardAvert has been installed on loaders, dozers, drills, haul trucks, LHDs, conveyors and other types of machinery.

(B.9) HazardAvert's technology includes a mixture of technologies which include electromagnetic, Radio Frequency (RF) and GPS. Depending on the environment, different technologies may work better than others. For example, GPS will not work in an underground mining application. While GPS will not work in an underground environment, it can be effective when coupled with electromagnetic technology for a surface application. GPS alone has proven to lose position even in surface applications. Electromagnetic technology provides reliable and repeatable fields in near-field environments that can warn in both surface and underground environments.

E. Belt Conveyors

(E.18) Strata has developed and deployed systems specifically designed for the protection of miners working around mobile and fixed conveyor haulage. These systems may be deployed in surface or underground mines.
The HazardAvert system created for conveyors uses electromagnetic technology in order to create a field around the conveyor. The technology creates a field of fixed distance around the conveyor and around associated objects such as wheels in the case of mobile haulage. Furthermore, exclusion zones may be provided at specific points in the field in order to allow access to control panels or other required points.

(E.19) A specific example of this system is an installation at a nonmetal mine outside the United States. This installation guards five segments of mobile haulage each approximately 17 meters in length. A field of approximately 1.25 meters surrounds the conveyor and is extended outwards where the wheels protrude from the equipment. An exclusion zone approximately 1.5m in width is provided at the control panel. This arrangement has trained personnel to keep their distance from the conveyor and to approach the panel in a direction perpendicular from the conveyor, rather than along the conveyor's path. If a miner enters the zone, a warning indicator is illuminated on the miner's head piece and on the equipment

itself. Should the miner approach even closer, a hazard indicator is illuminated and the equipment is configured to automatically shut down.
Costs of the system used to guard conveyors may range from $7k to $14k per segment. System costs will vary depending on the length/size of the machinery outfitted with HazardAvert. Cost per personnel ranges from $250 to $900 depending on which Personal Alarm Device is used as there are multiple variations, including PADs that can be integrated into a cap lamp. As is the case with Strata's HazardAvert system, the benefit of the system is the ability to train personnel and reinforce safety procedures regarding the position of the miner and activities performed when potentially hazardous equipment is operating.

Sincerely,

David Hakins
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Electronic Safety
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Strata has developed and deployed systems specifically designed for the protection of personnel when working around mining equipment. These systems have been deployed in surface or underground mining operations worldwide including the United States, South Africa, South America and Australia.

Strata has also been a member of the Earth Moving Equipment Safety Round Table (EMESRT) since 2013. The EMESRT group was established by Alcoa, Anglo American, Barrick, Glencore, Peabody, Newcrest and Rio Tinto in 2005 to advance the design of mining equipment to improve safe operability and maintainability.

In 2013 due to the large number of fatalities (35%) involving vehicle interaction and high number of those involving pedestrians (53%) in the Australian mining market, the EMESRT group created a "Vehicle Interaction" working group. The Vehicle Interaction group is led by personnel from the mining companies and members include OEMs, Proximity and Collision avoidance equipment providers and government representatives. The OEMs members include Sandvik, Komatsu/Joy, Caterpillar, Atlas Copco, Liebherr and Hitachi. The Proximity Detection and Collision Avoidance equipment providers include Strata Worldwide and others. The government representatives include from Australia: Australian Coal Association Research Program (ACARP), and Commonwealth Scientific and Industrial Research Organization (CSIRO); From South African, Mine Occupational Safety and Health (MOSH), and from the USA both MSHA and NIOSH have made contribution to the working group.

The goals of the EMESRT Vehicle Interaction group are:

1. To clearly define the problem and risks associated with vehicle to vehicle and vehicle to person interactions
2. Understand the scenarios where the risks are high
3. To build a set of performance criteria by which to evaluate proximity detection and collision avoidance technologies.

As a member of this group, Strata Worldwide participated in the development of the nine levels or design philosophies ranging from **Level-1: Site Requirements** which include mine design and equipment specifications to **Level-9: Intervention Controls** interlocking or collision avoidance. The group is led by the mining operators, created 25 operational scenarios for surface mining and 25 for underground mining to assist operators define a risk profile. The same scenario definitions were used to create performance criteria to be used to certify compliance of the different proximity and collision avoidance devices on the market today. In 2016, Strata Worldwide's HazardAvert Proximity Detection and Collision Avoidance system was the first system to obtain EMESRT level-9 (Intervention Controls) certification. This body of work has continued and many of the Proximity Detection System and Collision Avoidance System available on the market have either completed certification or are currently in the process of assessing performance compliance.

The mine operators identified early in the EMESRT Vehicle Interaction development process, no two mine sites are identical and each site can have unique operator procedures. The vehicle interaction scenarios were developed to help corporate and site safety teams identify the highest risk activities and then select the appropriate level of technology to address these risks. This is to help reduce the possibility of purchasing a technology which is not certified for the operation scenarios and to help find the technologies that address the operator's risk scenarios.
The EMESRT nine levels of mine site safety greatly assists in defining not only how a technology or system works (warning vs active control) but also defining terms such as "Traffic Awareness",

"Proximity Detection" and "Collision Avoidance". This helps the mine operators compare the capabilities from different proximity and collision avoidance providers. It allows the operators to compare devices that have been certified to required level. The EMESRT working group has developed resources for operators to help assist risk and assign risk level to activities on site. Information can be found from EMESRT or from technology providers on certification successes of different mining scenarios.

Although the EMESRT mining operators wanted to be inclusive of every piece of mining equipment in the initial risk assessments, the highest level of risk is typically associated with the vehicles with the limited visibility such as haul trucks. But due to the large percentage of vehicle interactions with pedestrians and light utility vehicles, it is important that high risk activities protect all vehicles and personnel whom are present. Most surface operations will find that EMESRT Scenario "L2 Reverse-On" and Scenario "L1 Head-On" with the RO equipment usually being a smaller vehicle or light utility are high risk activities that justify a Level-9 (collision avoidance) technology.
The EMESRT approach was to define operating scenarios and the performance criteria for each scenario. The criteria is not dependent on the technology or mix of technologies, but rather the system's ability to achieve performance criteria.

Strata's HazardAvert system utilizes a mixture of electromagnetic, Radio Frequency (RF) and GPS technologies to produce systems that are appropriate for level-8 (warning only); low risk scenarios and level-9 (collision avoidance); high risk scenarios. The technologies can be deployed in a hybrid environment, allowing a mixture of warning only and collision avoidance in order to interoperate at the same site. Strata HazardAvert's mixture of technology and the uniqueness of the technology's interoperability is key to providing a solution that is appropriate for the site's risk profile while also offering a cost effective solution.