Comments to the Occupational Safety and Health Administration (OSHA)

RIN 1218-AD18

Response from the International Society of Environmental Enclosure Engineers to Requests for Information: Occupational Exposure to Respirable Crystalline Silica—Specified Exposure Control Methods (RFI)

Docket Number: OSHA-2010-0034; RIN 1218-AD18

October 14, 2019

The International Society of Environmental Enclosure Engineers (ISEEE) strongly supports the Occupational Safety and Health Administration's (OSHA) efforts to improve the effectiveness of the engineering and control methods not currently included in the tasks and equipment listed on Table 1 of the Respirable Crystalline Silica standard for construction(the "silica rule") and offers the following comments in response to the Request for Information (RFI): *Occupational Exposure to Respirable Crystalline Silica—Specified Exposure Control Methods* published in the Federal Register (FR) on August 15, 2019 (84 FR 41667)[Docket Number: OSHA-2010-0034]. ISEEE offers the following specific comments regarding ways to align the tasks and equipment listed in Table 1 of the silica rule with the existing and proposed international standards which will allow for better user comprehension of and conformance to the intent of the silica rule – reduced exposure to respirable crystalline silica.

BACKGROUND

Effective operator protection requires; (i) effective design controls, which are clearly communicated; (ii) performance testing of these controls to determine their effectiveness; (iii) adequate maintenance instructions to insure continuous protection, and (iv) instruction for operational integration of the enclosure and effective field test methods to insure continuous operator protection

Over the past decades, several standards have been published[i] that address various aspects of the environmental enclosure's air quality performance. However, there has not been a comprehensive standard for operator enclosures that addresses the life cycle of the environmental enclosure. A life cycle approach would benefit those required to apply the silica rule Table 1 to their operator enclosures.

Environmental enclosure air quality requirements vary significantly from region to region and country to country. This results in enclosures that are designed to meet a minimum standard, most commonly ISO 10263, which does not provide compliance with the silica rule. While Table 1 refers to engineering controls, it is not designed to educate a machine owner on how to apply the standard to an enclosure. Without this guidance, aftermarket installations are inconsistent in their effectiveness.

RATIONALE FOR THE ADOPTION OF ISO 23875

ISO has created a working group, Technical Committee 82 – Mining, Working Group Nine, tasked with the development of a consensus international standard that would address the interests of each of the stake holders in the enclosure by taking a life cycle approach to environmental enclosures, ISO 23875. The ISO working group is comprised of thirty subject matter experts from nine countries representing academia, heavy equipment manufacturing, industrial hygiene, international mining, mining equipment manufacturing, after market retrofitting, component and filter manufacturing and standards writing.

ISO 23875 addresses the need to reduce respirable dust exposures below the occupational exposure limit ("OEL"). Additionally, it addresses the needs of stake holders involved in the design, manufacturing, post manufacture testing, maintenance instructions, field retrofitting, operational integration and ongoing field validation of enclosure performance. The primary goal of both ISO 23875 and the silica rule Table 1 is operator protection.

Greatest adoption of standards takes place when standards and regulations are aligned. The critical nature of this cannot be over stated. Standardization is the method used to achieve operator protection regulatory compliance and the economies of scale in production.

It is our understanding that OSHA can and should use consensus standards, when available, in the regulation. We are strongly encouraging OSHA to adopt ISO 23875 when it is published to address operator enclosures in Table 1. If this is not possible, then we would ask that every effort is made to get alignment everywhere possible between Table 1 and ISO 23875. A comprehensive and integrated approach, which allows for silica rule compliance throughout the life cycle of the environmental enclosure, will provide the highest level of operator protection at the lowest cost to the machine owner.

COMMENTS ON TABLE 1

If ISO 23875 cannot be adopted as a complete standard, the following modifications and additions to the current Table 1 can be made to gain alignment with ISO 23875 and eliminate dissonance in the market place regarding the requirements of the silica rule and ISO 23875.

(iii) For measures implemented that include an enclosed cab or booth, ensure that the enclosed cab or booth:
(A) Is maintained as free as practicable from settled dust;
[ii]Dust which enters the environmental enclosure can be re-entrained in the airflow continuously exposing the operator to recirculated dust. To maintain the enclosure as free as practicable from settled dust, the HVAC system should be equipped with a recirculation filter[iii] with a minimum classification efficiency as required under section (E). Additionally, the interior of the environmental enclosure should be wiped down at the end of each shift to remove settled dust.
(B) Has door seals and closing mechanisms that work properly;
Properly maintained seals are required to reduce air leakage so that pressurization can be achieved. If the pressure monitor continuously alarms, the cab seals should be checked for seal leakage, if no leakage is found, the fresh air filter should be replaced.
(C) Has gaskets and seals that are in good condition and working properly;
All potential leakage points in the environmental enclosure must have gaskets and seals that are in good condition and working effectively. If the pressure alarm continuously sounds, gaskets and seals should be inspected for leakage points. If no leakage is found, the fresh air filter should be replaced.
(D) Is under positive pressure maintained through continuous delivery of fresh air;
A minimum pressure of .1" W.G. is to be maintained through continuous delivery of fresh air. Active monitoring of the environmental enclosure pressure is required to ensure that positive pressure is continuously maintained during machine operations. [iv]
(E) Has intake air that is filtered through a filter that is 95% efficient in the 0.3-10.0 µm range (e.g., MERV-16 or better); and
Has a fresh air intake filtration and recirculation filtration with a minimum efficiency classification according to ISO 29463 Parts 1-5[v]
(F) Has heating and cooling capabilities.
Has a Heating Ventilation and Air Cooling (HVAC) System [vi]
(G) Has a real-time CO_2 monitor.[vii]
If CO_2 levels within the environmental enclosure exceeds 1000 ppm, the CO_2 monitor shall alarm. If the CO_2 levels exceed 2500 ppm, the CO_2 alarm cannot be silenced manually. Action must be taken to reduce the CO_2 levels in the enclosure. Actions may include moving the machine into an area with a lower ambient CO_2 e.g. outside, or into a fresh air ventilation airflow. An additional step that can be taken includes replacing the fresh air filter. Fresh air intake is reduced when the filter is clogged. If the pressure alarm sounds and CO_2 levels are elevated, it is an indication that an insufficient amount of fresh air is entering the environmental enclosure. Change the fresh air filter to restore fresh air intake volume, lower CO_2 levels, and to restore cab pressurization.

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[i] ISO 10263 Parts 1-5, EN 15965, ASABE S613 Parts 1-4

[ii] Red text are comments and recommendations which would be additive to current Table 1 text.

[iii] Cecala, A., Noll, J., and Organiscak, J.A. U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, Office of Mine Safety and Health Research. (2013). *Key components for an effective filtration and pressurization system for mobile mining equipment.* Pittsburgh, PA.

[iv] Cecala, A., Noll, J., and Organiscak, J.A. U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, Office of Mine Safety and Health Research. (2013). *Key components for an effective filtration and pressurization system for mobile mining equipment.* Pittsburgh, PA.

[v] After careful consideration of all standards currently available e.g. EN779, ASHRAE 52.2, ISO 16890, EN1822, ISO 29463 an EN1822 are the only filter standards available that provide a test method and system of classification for high efficiency filters, new technology membrane filters, radial and panel filter configurations with low nominal airflows. ISO 29463 (which superseded EN1822) was the best and most logical test standard for fixed and mobile environmental enclosure filtration.

[vi] Cecala, A., Noll, J., and Organiscak, J.A. U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, Office of Mine Safety and Health Research. (2013). *Key components for an effective filtration and pressurization system for mobile mining equipment.* Pittsburgh, PA.

[viivii] While current standards do not require real time permanently mounted CO_2 monitors within the operator enclosure, ISO 23875 will likely include this requirement. The rationale is found in the CO_2 studies cited in endnote viii. High levels of CO_2 are immediate indicators of poor cab air quality and a cab that is out of balance. To ensure that the operator mental acuity is not compromised by high CO_2 levels in the enclosure the CO_2 monitor is required. While there have not been specific studies that document work place accidents that have take place due to high CO_2 levels, ISEEE has been made aware of three incidents where there was evidence that high CO_2 levels were present in the operator cab when the accident occurred. In all three cases the operator fell asleep while operating a work vehicle causing significant material damage. Annex A has two ISEEE Real World Case Studies, taken from the Advanced Cab Theory Workbook, that demonstrate how quickly CO_2 can rise to a hazardous level when fresh air is not continuously brought into the operator enclosure.

[VIII] Satish, U., Mendell, M. J., Shekhar, K., Hotchi, T., Sullivan, D., Streufert, S., & Fisk, W.J. (2012). Is CO2 an Indoor Pollutant? Direct Effects of Low-to-Moderate CO2 Concentrations on Human Decision-Making Performance. *Environmental Health Perspectives*. doi:10.1289/ehp.1104789

Mathur, Gursaran D., Field Tests to Monitor Build-up of Carbon Dioxide in Vehicle Cabin with AC System Operating in Recirculation Mode for Improving Cabin IAQ and Safety. ©SAE International 2008

ANNEX A – REAL WORLD CASE STUDIES

Wheel Loader

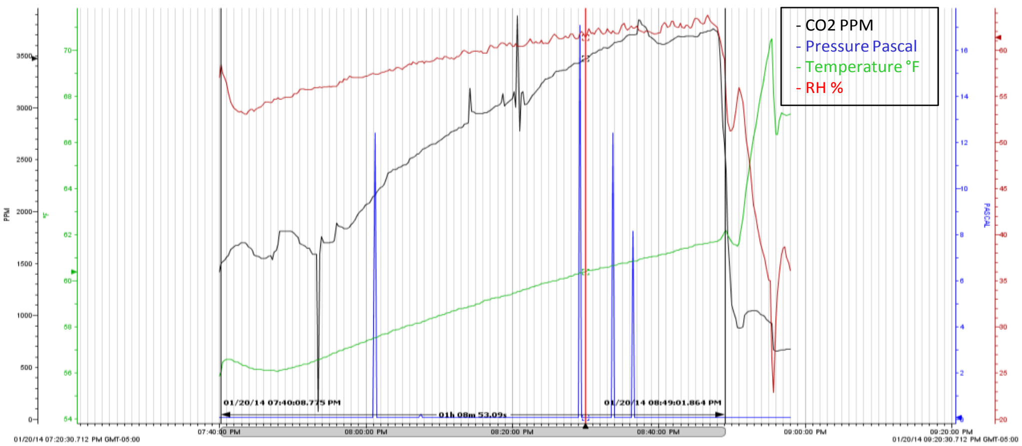


Figure7 Data set graphically displayed, Run time 1hour and 8 min.

Test Result Observations

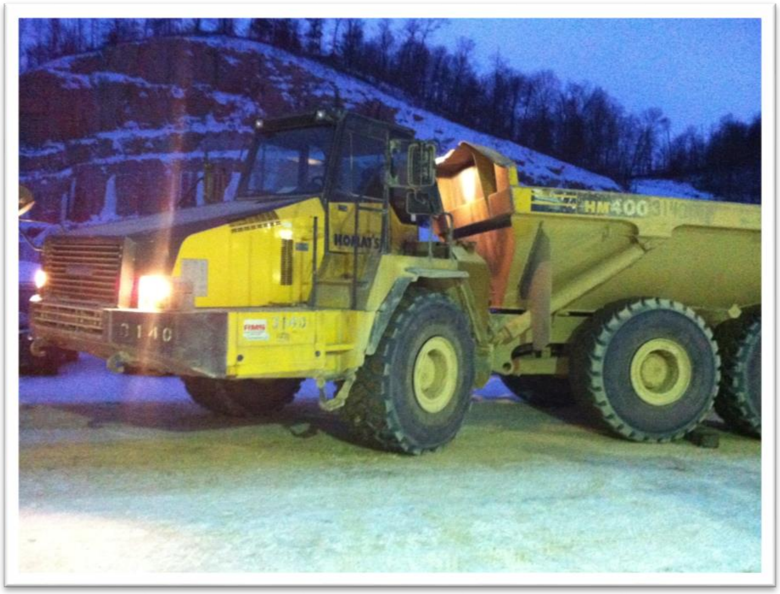
Elevated CO_2 levels in the cab were caused by the operator electing not to run the heater or HVAC system fan. No fresh air was being brought into the cab to offset the CO_2 being generated by the operator's respiration.

The HVAC fan was not running so there was no opportunity for the cab to generate pressure. Because the HVAC blower was not turned on, the cab did not generate negative pressure.

This also explains the high humidity and slow temperature rise in the cab. There is no wind in the mine so the operator was able to keep dust from getting into the cab by keeping the door shut and the HVAC blower off.

Note: If the doors and windows are kept shut, the cab should be able to protect the operator. The lack of fresh air being brought into the cab creates high CO_2 levels.

Articulated Haul Truck



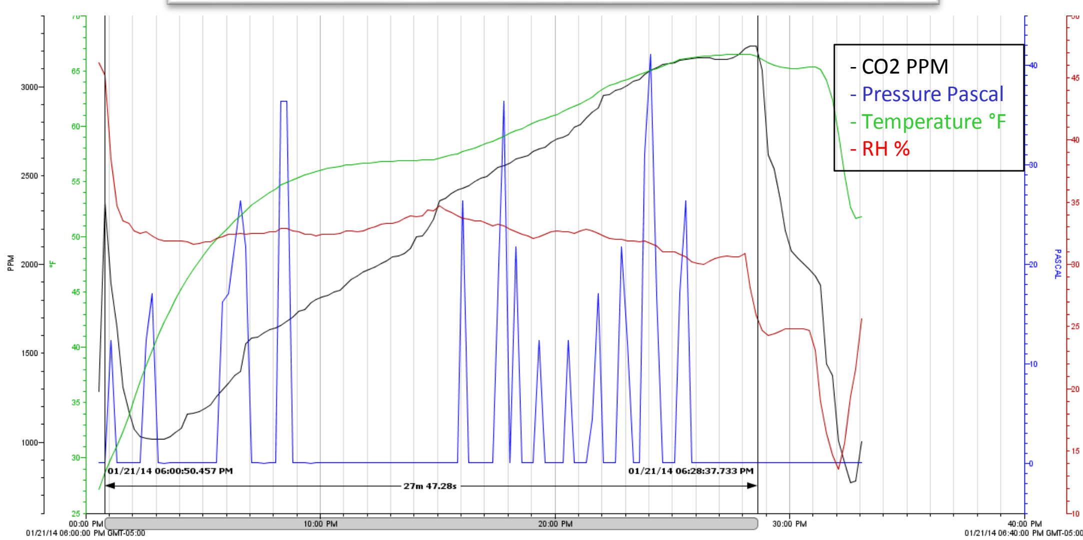


Figure 9 Data set graphically displayed, Run time 27 min.

Test Result Observations

CO_2 concentrations of nearly 4000 ppm where recorded from a starting point of around 1000 ppm after 27 minutes of continuous operation. The operator reported having trouble keeping his eyes open. Drowsiness is one of the many symptoms associated with continuous exposure to CO_2 above 1000 ppm, and can be more severe as CO_2 concentrations increase.

The machine was hauling into the mine from very cold outside temperatures. The cab was generally not pressurized. The heater was working well and relative humidity was effectively reduced.

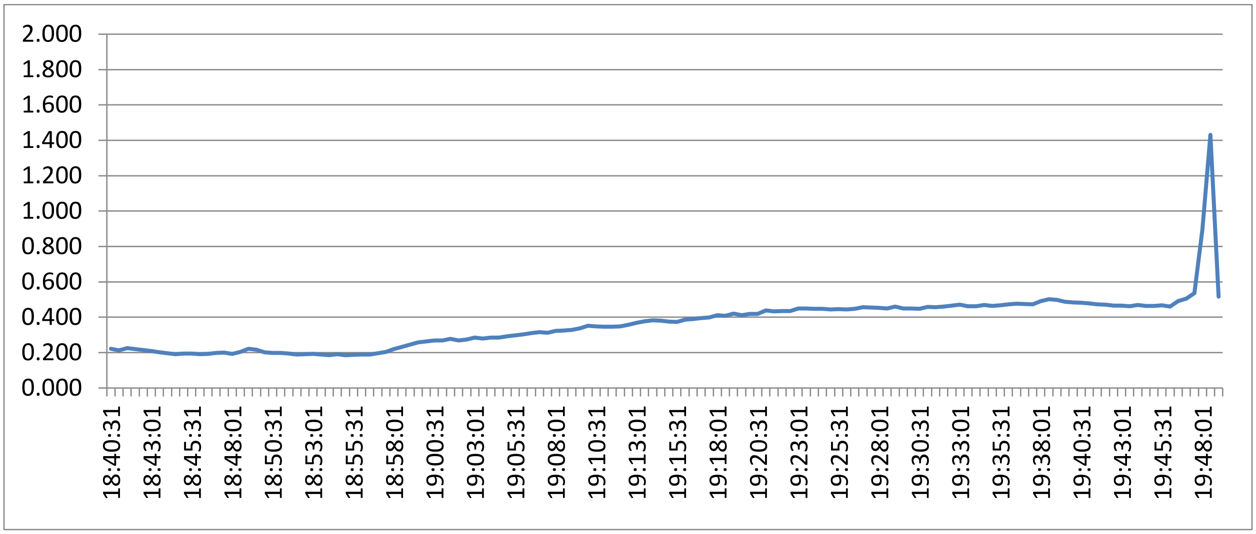


Figure 10 Shift Weighted Average in mg/m³ RCS

The cab experienced negative pressurization. The appearance of pressure in the test data was caused by wind passing over the differential pressure tube, while the truck was driving along the haul road, creating a venturi effect which caused a spike in the pressure readings. As evidenced in the pressure data cab pressure was either zero or negative.

The lack of high efficiency fresh air filtration, negative pressure and low recirculation filtration efficiency resulted in the consistent increase in respirable dust in the cab as shown in Figure 10. The cab environment was growing increasingly more concentrated with respirable dust throughout the test period.