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DEPARTMENT OF LABOR

Mine Safety and Health Administration

30 CFR Parts 56, 57, 70, 71, 72, and 90

[Docket No. MSHA-2016-0013]

RIN 1219–AB36

Respirable Silica (Quartz)

AGENCY: Mine Safety and Health Administration, Labor.

ACTION: Request for information.

SUMMARY: Metal and nonmetal (MNM) miners and coal miners exposed to silica (quartz) in respirable dust can develop various forms of pneumoconiosis that are irreversible, life limiting, and may lead to death. MSHA's existing standards limit miners' exposures to quartz in respirable dust. In this Request for Information (RFI), MSHA solicits information and data on feasible, best practices to protect miners' health from exposure to quartz in respirable dust, including an examination of an appropriately reduced permissible exposure limit, potential new or developing protective technologies, and/or technical and educational assistance.

DATES: Comments must be received or postmarked by midnight (12 a.m.) Eastern Daylight Savings Time on **[INSERT DATE 60 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER]**.

ADDRESSES: Submit comments and informational materials, identified by RIN 1219–AB36 or Docket No. MSHA 2016-0013, by one of the following methods:

- *Federal E-Rulemaking Portal*: https://www.regulations.gov. Follow the on-line instructions for submitting comments.
- *Email*: zzMSHA-comments@dol.gov.
- *Mail*: MSHA, Office of Standards, Regulations, and Variances, 201 12th Street South, Suite 4E401, Arlington, Virginia 22202-5452.
- *Hand Delivery or Courier*: 201 12th Street South, Suite 4E401, Arlington, Virginia, between 9:00 a.m. and 5:00 p.m. Monday through Friday, except Federal holidays. Sign in at the receptionist's desk on the 4th floor East, Suite 4E401.
- *Fax*: 202-693-9441.

Instructions: All submissions must include RIN 1219–AB36 or Docket No. MSHA 2016-0013. Do not include personal information that you do not want publicly disclosed; MSHA will post all comments without change to http://www.regulations.gov and http://arlweb.msha.gov/currentcomments.asp, including any personal information provided.

Docket: For access to the docket to read comments received, go to http://www.regulations.gov or http://arlweb.msha.gov/currentcomments.asp. To read background documents, go to http://www.regulations.gov. Review the docket in person at MSHA, Office of Standards, Regulations, and Variances, 201 12th Street South, Arlington, Virginia, between 9:00 a.m. and 5:00 p.m. Monday through Friday, except Federal Holidays. Sign in at the receptionist's desk in Suite 4E401.

Email Notification: To subscribe to receive email notification when MSHA publishes rulemaking documents in the Federal Register, go to https://www.msha.gov/subscriptions.

FOR FURTHER INFORMATION CONTACT: Sheila A. McConnell, Director, Office of Standards, Regulations, and Variances, MSHA, at mcconnell.sheila.a@dol.gov (email), 202-693-9440 (voice), or 202-693-9441 (fax). These are not toll-free numbers.

SUPPLEMENTARY INFORMATION:

I. Background

A. Crystalline silica sources, adverse health effects, and existing standards in Metal and Nonmetal (MNM) and Coal Mining.

Crystalline silica refers to a chemical compound, silicon dioxide (SiO_2), that is most commonly found in nature as quartz but sometimes occurs as cristobalite or, rarely, as tridymite. Quartz accounts for the overwhelming majority of naturally occurring crystalline silica and is present in varying amounts in almost every type of mineral. Quartz is found in rocks such as granite, sandstone, limestone, and shale. Mining, milling, and processing crystalline silica-containing substances can create airborne respirable particles. Some activities generate more respirable dust than others including, but not limited to, cutting, sanding, drilling, crushing, grinding, milling, sawing, scraping, jack hammering, excavating, or disturbing materials that contain quartz.

Mechanized operations can generate large amounts of dust, potentially exposing miners to elevated levels of airborne dust, including quartz.[1] Particles with an aerodynamic diameter smaller than 10 micrometer (µm) are more likely to be respirable, and as particle diameter

[1] National Institute for Occupational Safety and Health (NIOSH). 2019. *Dust control handbook for industrial minerals mining and processing*. Second edition. By Cecala AB, O'Brien AD, Schall J, Colinet JF, Franta RJ, Schultz MJ, Haas EJ, Robinson J, Patts J, Holen BM, Stein R, Weber J, Strebel M, Wilson L, and Ellis M. Pittsburgh PA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 2019-124, RI 9701. https://doi.org/10.26616/NIOSHPUB2019124.

decreases, the proportion of particles that can reach the lungs' alveolar region increases. Quartz particles that are small enough to reach the alveolar spaces (respirable particles) may be deposited and retained there, leading to disease development. The amount of time for a miner to develop lung disease such as chronic obstructive pulmonary disease (COPD) or various forms of pneumoconiosis such as silicosis, coal workers' pneumoconiosis (CWP), progressive massive fibrosis (PMF), and rapidly progressive pneumoconiosis (RPP) depends on various factors such as cumulative dust exposure and genetic predisposition to lung damage.[2,3] The MNM mining industry includes many commodities that contain various percentages of quartz. MNM miners' exposure to quartz dust depends, in part, on the type of rock or mineral being mined or processed. Each commodity, however, has common dust sources related to the mining process, which includes drilling, blasting, loading, hauling, and crushing. MSHA regulates MNM miners' exposure to respirable dust containing quartz under 30 CFR 56.5001

[2] Blanc P. and A. Seaton. 2016. Editorial Pneumoconiosis Redux - Coal Workers' Pneumoconiosis and Silicosis Are Still a Problem. Am J Respir Crit Care Med. 193(6): 603-604.

[3] Cohen, R. 2015. *Clarifying Distribution, Trends, and Determinants of Adverse Health in United States Miners: Exploration and Integration of Existing Data Systems*. ALPHA Foundation for the Improvement of Mine Safety and Health. - Final Technical Report. Grant Number: AFC113-4. University of Illinois at Chicago, School of Public Health.

for surface mining operations and under 30 CFR 57.5001 for underground mining operations. MSHA's existing standard is based on the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV)® published in 1973[4] that was incorporated by reference by MSHA's predecessor agency, the Mine Enforcement Safety Administration (MESA) in 1974[5] and then recodified by MSHA in 1985.[6] MSHA's existing standard for MNM mines is 10 mg/m^3 /(percent respirable quartz + 2) expressed as the concentration of respirable dust for a full shift or an 8-hour equivalent time-weighted average (TWA)[7].

Coal miners are exposed to quartz during the extraction and processing of coal. Exposure to quartz during extraction occurs when miners disturb the rock above, below, or within the coal seam. Exposure also occurs in processing plants as the coal is being sized, crushed, dried, and conveyed. MSHA's standards (30 CFR 70.101, 71.101, and 90.101) limit coal miners' exposure to respirable quartz in relation to the respirable dust

[4] American Conference of Governmental Industrial Hygienists (ACGIH). 1973. *TLVs Threshold Limit Values for Chemical Substances in Workroom Air* Adopted by ACGIH for 1973. Cincinnati, Ohio.
[5] Mine Enforcement Safety Administration (MESA). 1974. Parts 55/56/57 - Health and Safety Standards – Miscellaneous Amendments. 39 FR 24316.
[6] Mine Safety and Health Administration (MSHA). 1985. Recodification of Safety and Health Standards for Metal and Nonmetal Mines – Final Rule. 50 FR 4048.
[7] Example: If the quartz content of the sample is 18.0%, the TLV® for quartz is: 10 mg/m^3/ 18.0 % quartz + 2 = 10 mg/m^3/ 20.0 = 0.50 mg/m^3.

standard. When respirable dust samples are analyzed for quartz and the concentration of quartz exceeds 0.1 mg/m^3 (100 micrograms per cubic meter of air or µg/m^3) MRE (British Mining Research Establishment) equivalent concentration, MSHA reduces the applicable respirable dust standard for sections of the mine represented by the sample data. MSHA computes the reduced dust standard by dividing 10 by the percent of quartz (10/percent quartz[8]).

Since 1974, the National Institute for Occupational Safety and Health (NIOSH) has recommended an exposure limit for respirable crystalline silica (quartz) of 0.05 mg/m^3 (50 µg/m^3)ISO.[9] In 2000, the ACGIH revised its Threshold Limit Value (TLV®) for respirable crystalline silica (quartz) to 50 µg/m^3 (ISO) and has since further lowered its TLV® to 25 µg/m^3 (ISO).[10] In 2016, the Occupational Safety and Health Administration (OSHA) amended MSHA's existing

[8] Example: A valid representative dust sample with an equivalent concentration of 1.12 mg/m^3 contains 12.3% of quartz dust corresponds to a quartz concentration of 138 mg/m^3. The respirable dust standard when quartz is present is maintained on each shift at or below 0.8 mg/m^3 (10/12.3% = 0.8 mg/m^3).

[9] National Institute for Occupational Safety and Health (NIOSH). 1974. *Criteria for a recommended standard…Occupational Exposure to Crystalline Silica*. HEW Publication No. (NIOSH) 75-120.

[10] American Conference of Governmental Industrial Hygienists (ACGIH). 2006. *Silica, Crystalline: α-Quartz and cristobalite.* Cincinnati, Ohio.

respirable crystalline silica standards to establish a permissible exposure limit (PEL) of 50 µg/m^3 (ISO).[11]

B. Existing controls, including respiratory protection.

MSHA requires engineering or environmental controls as the primary means of controlling respirable dust. This is consistent with section 202(h) of the Federal Mine Safety and Health Act of 1977 (Mine Act), which provides that the use of respirators shall not be substituted for environmental control measures in the active workings. Engineering or environmental controls reduce dust generation by suppressing, diluting, capturing, or diverting the dust being generated by the mining process.

MSHA addressed the use of supplementary means of controlling miners' exposures to respirable dust in previous rulemakings. In the preambles to the 2000[12] and 2003[13] proposed rules[14] on Verification of Underground Coal

[11] Occupational Safety and Health Administration (OSHA). 2016. Occupational Exposure to Respirable Crystalline Silica – Final Rule. 81 FR 16286.

[12] Mine Safety and Health Administration (MSHA). 2000. Verification of Underground Coal Mine Operators' Dust Control Plans and Compliance Sampling for Respirable Dust - Proposed rule; notice of hearings. 65 FR 42122.

[13] Mine Safety and Health Administration (MSHA). 2003. Verification of Underground Coal Mine Operators' Dust Control Plans and Compliance Sampling for Respirable Dust - Proposed rule; notice of hearings; close of record. 68 FR 10784.

[14] The 2010 proposed rule (75 FR 64413) combined the following rulemaking actions: (1) ''Occupational Exposure to Coal Mine Dust (Lowering Exposure);'' (2) ''Verification of Underground Coal Mine Operators' Dust Control Plans and Compliance Sampling for Respirable Dust'' (Plan Verification) (65 FR 42122, July 7, 2000, and 68 FR 10784,

Mine Operators' Dust Control Plans and Compliance Sampling for Respirable Dust (Plan Verifications proposed rules), MSHA discussed a petition for rulemaking to allow the use of powered air purifying respirators (PAPRs) as a supplemental means of compliance. In the preamble to the 2000 proposed rule, MSHA proposed to "permit, under certain circumstances, the limited use of either approved loose-fitting PAPRs or verifiable administrative controls for compliance purposes" (65 FR 42135). In the preamble to the 2003 proposed rule, MSHA proposed to "permit the limited use of either approved PAPRs, administrative controls, or a combination of both for compliance purposes in those circumstances where further reduction of dust levels cannot be reasonably achieved using all feasible engineering controls." (68 FR 10800).

MSHA explained that there may be only limited situations where exposures could not be consistently controlled by available technologies (65 FR 42134; 68 FR 10798–10799, 10818). MSHA reiterated that engineering or environmental controls are the primary means to control respirable dust in the mine atmosphere, which is

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March 6, 2003); (3) ''Determination of Concentration of Respirable Coal Mine Dust'' (Single Sample) (65 FR 42068, July 7, 2000, and 68 FR 10940 March 6, 2003); and (4) ''Respirable Coal Mine Dust: Continuous Personal Dust Monitor (CPDM)'' (74 FR 52708, October 14, 2009). The 2010 proposed rule was finalized on May 1, 2014 (84 FR 24814).

consistent with sections 201(b) and 202(h) of the Mine Act. MSHA also noted that the Dust Advisory Committee unanimously recommended that respiratory protection should not replace engineering or environmental controls, but should continue to be provided to miners until controls are implemented that are capable of maintaining respirable dust levels in compliance with the standards.[15] In those limited situations, mine operators are required to provide respiratory protection to miners while they adjust engineering and environmental controls to reduce dust levels to at or below the standard.

In addition, in MSHA's 2014 rulemaking on Lowering Miners' Exposure to Respirable Coal Mine Dust, including Continuous Personal Dust Monitors (Dust Rule),[16] commenters advocated the use of PAPRs, not only as a temporary supplementary control, but also as an engineering control. Other commenters stated that using respirators as a means of complying with the dust standard is contrary to the Mine Act and would provide miners with a false sense of protection. Some commenters cited the

[15] U.S. Department of Labor, Mine Safety and Health Administration. 1996. *Report of the Secretary of Labor's Advisory Committee on the Elimination of Pneumoconiosis Among Coal Mine Workers*. Washington, DC. October 1996.

[16] Mine Safety and Health Administration (MSHA). 2014. Lowering Miners' Exposure to Respirable Coal Mine Dust, Including Continuous Personal Dust Monitors – Final rule. 79 FR 24814.

difficulty of wearing respirators in hot and sweaty jobs, and in dusty, dirty conditions, including in low coal. While the final rule allows operators to use engineering and administrative controls, the rule did not contain provisions to allow operators to use respirators, including PAPRs, as supplementary controls to achieve compliance with the respirable dust standards. As specified in Sections 201(b) and 202(h) of the Mine Act and since passage of the Federal Coal Mine Health and Safety Act of 1969, MSHA has enforced an environmental standard at coal mines; that is, the concentration of respirable dust in the mine atmosphere is measured rather than the breathing zone of any individual miner.

Engineering controls, also known as environmental controls, are the most protective means of controlling dust generation at the source. MSHA is aware that there may be conditions where existing engineering or environmental controls may not be adequate to continuously protect miners' health in areas where there are high levels of quartz dust.

NIOSH researchers have documented large clusters of coal miners in eastern Kentucky, West Virginia, and southwest Virginia with PMF, the most severe form of black

lung disease.[17,18] NIOSH reported that a high proportion of these cases had r-type opacities, category B and C large opacities, and coal mining tenure of less than 20 years, which are indications of exceptionally severe and rapidly progressive disease. Historically, the typical progression (latency) from a normal chest X-ray to advanced pneumoconiosis in coal miners exposed to coal dust was 15 to 25 years of working tenure.[19] However, as mining has become highly mechanized, some miners may be exposed to higher concentrations of dusts, including quartz.[20] NIOSH defined rapid progression of the disease as an increase of greater than one small ILO (International Labor Organization) category within a period of 5 years, or the development of PMF.[21,22,23] Researchers also noted that one

[17] Blackley, D., C. Halldin, and A. Laney. 2016. Resurgence of Progressive Massive Fibrosis in Coal Miners — Eastern Kentucky, 2016. Morbidity and Mortality Weekly Report, 65 (49):1385-9.
[18] Blackley, D., L. Reynolds, C. Short, et al. 2018b. Research Letter: Progressive Massive Fibrosis in Coal Miners from 3 Clinics in Virginia. JAMA, 319(5):500-1.
[19] Petsonk, E., C. Rose, and R. Cohen. 2013. Coal Mine Dust Lung Disease - New Lessons from an Old Exposure. Am J Respir Crit Care Med., 187(11):1178–1185.
[20] "Drilling into the typical quartz-containing rock surrounding coal seams (e.g., driving tunnels to the seam and drilling the roof to bolt supports to rock above to prevent collapse) long has been recognized to cause silicosis. In addition, however, extrusions of quartz into coal seams may occur… accelerated silicosis may result from exploitation of thin seams using coal cutters that take slices of the roof and floor" (Blanc and Seaton, 2016, page 604).
[21] Antao, V.C. dos S., E.L. Petsonk, L.Z. Sokolow, et.al. 2005. Rapidly Progressive Coal Workers' Pneumoconiosis in the United States: Geographic Clustering and Other Factors. Occup Environ Med., 62(10):670–674.

potential cause of a rapidly progressive disease is overexposure to respirable quartz.[24, 25, 26]

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[22] Cohen, R.A., A. Patel, and F.H. Green. 2008. Lung Disease Caused By Exposure to Coal Mine and Silica Dust. Seminars in Respiratory and Critical Care Medicine, 29(6):651–661. Epub. Feb 16, 2009.

[23] National Academies of Sciences, Engineering, and Medicine. 2018. M*onitoring and Sampling Approaches to Assess Underground Coal Mine Dust Exposures*. Washington, DC: The National Academies Press. doi: https://www.nap.edu/catalog/25111/monitoring-and-sampling-approaches-to-assess-underground-coal-mine-dust-exposures. Page 16.

[24] Halldin, C., A. Wolfe, and A. Laney. 2015(b). Debilitating Lung Disease Among Surface Coal Miners With No Underground Mining Tenure. JOEM, 57():62-67.

[25] Petsonk, E., C. Rose, and R. Cohen. 2013. Coal Mine Dust Lung Disease - New Lessons from an Old Exposure. Am J Respir Crit Care Med., 187(11):1178–1185.

[26] Cohen, RA., E. Petsonk, C. Rose, et al. 2016. Lung Pathology in U.S. Coal Workers with Rapidly Progressive Pneumoconiosis Implicates Silica and Silicates. Am J Respir Crit Care Med Vol 193(6): 673–680.

Recent studies indicate that over-exposure to quartz presents same health risks to MNM miners.[27, 28, 29, 30] Although most MNM miners with early-stage silicosis (ILO categories 0/1 or 1/0) typically do not experience respiratory symptoms, the primary risk to the affected miner is progression of disease with progressive decline of lung function. Several studies of MNM miners exposed to respirable crystalline silica (quartz) have shown that, once silicosis is detected by x-ray, a substantial proportion of affected miners can progress beyond ILO category 1 silicosis, even after exposure has ceased.[31, 32,33, 34]

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[27] Institute of Occupational Medicine (IOM 2011). *Health, socio-economic and environmental aspects of possible amendments to the EU Directive on the protection of workers from the risks related to exposure to carcinogens and mutagens at work – Respirable crystalline silica*. IOM Research Project: P937/8. May 2011. Edinburgh, UK.

[28] National Institute for Occupational Safety and Health (NIOSH). 2019. Dust control handbook for industrial minerals mining and processing. Second edition. By Cecala AB, O'Brien AD, Schall J, Colinet JF, Franta RJ, Schultz MJ, Haas EJ, Robinson J, Patts J, Holen BM, Stein R, Weber J, Strebel M, Wilson L, and Ellis M. Pittsburgh PA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 2019-124, RI 9701. https://doi.org/10.26616/NIOSHPUB2019124.

[29] Occupational Safety and Health Administration (OSHA). 2016. Occupational Exposure to Respirable Crystalline Silica – Final Rule. 81 FR 16286.

[30] U.S. Department of Labor (USDOL). 2008. A Practical Guide to an Occupational Health Program for Respirable Crystalline Silica. A Joint Project of: The Industrial Minerals Association – North America and the Mine Safety and Health Administration. Instruction Guide Series IG 103. January 25, 2008.

[31] Hessel, P.A., G.K. Sluis-Cremer, E. Hnizdo; et al. 1988. Progression OF Silicosis in Relation to Silica Dust Exposure. Ann. O. Hyg., 32(Suppl 1):689-696.

Respiratory protection may play an important role in reducing miners' exposure to respirable quartz. MSHA's existing coal (30 CFR 72.700, 72.701, and 72.710) and MNM standards (30 CFR 56/57.5005) require respiratory protection to be approved by NIOSH under 42 CFR part 84 (Approval of Respiratory Protective Devices), and incorporate by reference the American National Standards Institute's (ANSI's) "Practices for Respiratory Protection ANSI Z88.2–1969" standard.[35] MSHA is aware that in 2015, ANSI updated the Z88.2 standard.[36] A copy of the 2015 ANSI standard is in the docket and MSHA seeks comment on this updated standard.

Under MSHA's MNM standards (30 CFR 56/57.5005), control of miners' exposure to respirable quartz must, where feasible, be achieved by exhaust ventilation, or by dilution with uncontaminated air. However, where accepted engineering control measures have not been developed or

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[32] Kreiss K. and B. Zhen. 1996. Risk of silicosis in a Colorado mining community. Am J Ind Med., 30(5):529-39.
[33] Ng T.P., S.L. Chan, and K.P. Lam. 1987a. Radiological progression and lung function in silicosis: A ten year follow up study. Br Med J., 295:164-168.
[34]Yang, H., L. Yang, J. Zhang, et al. 2006. Natural Course of Silicosis in Dust-exposed Workers. J. Huazhong University of Science and Technology, [Med Sci]. 26(2):257-260.
[35] American National Standards Institute (ANSI). 1969. *Practices for Respiratory Protection ANSI Z88.2–1969*. New York, New York.
[36]American National Standards Institute (ANSI). *American National Standard – Practices for Respiratory Protection – ANSI/ASSE Z88.2 – 2015*. American National Standards Institute, Inc. American Society of Safety Engineers, Park Ridge, Illinois. Approved March 4, 2015.

when necessary by the nature of work involved, miners may work for reasonable periods of time in a location where concentrations of respirable quartz exceed permissible levels only if they are protected by appropriate respiratory protective equipment.

MSHA's standards for coal dust (30 CFR 70.208, 70.209, 71.206, and 90.207) require that either during operator exposure monitoring when a valid representative sample meets or exceeds the excessive concentration value, or when the mine operator receives a citation for a violation of the applicable standard, the mine operator must take actions to protect miners, including making respiratory protection available while evaluating and implementing dust control measures, as necessary, to reduce miners' exposures to respirable dust. Under MSHA's existing coal standards, however, miners are not compelled to wear respirators and mine operators cannot use respirators as a substitute for engineering or environmental controls. Also MSHA cannot credit mine operators' use of respiratory protection in achieving compliance.

C. Hierarchy of Controls.

Controlling exposures to occupational hazards is the primary way to protect workers. Traditionally, mine operators use a hierarchy of controls to determine how to

implement feasible and effective control solutions and are considered generally accepted industry hygiene principles. The hierarchy of controls begins with the most effective controls: elimination and substitution of hazards. Elimination and substitution of hazards, while most effective at reducing risks, are not feasible to reduce exposures to respirable crystalline quartz for MNM or coal mining. The controls that are relevant in mining are: engineering controls, administrative controls, and personal protective equipment (PPE).

Engineering controls are favored over administrative controls and PPE for controlling miner exposures in the workplace because they are designed to remove the hazard at the source, before miners are exposed. Well-designed, installed, and maintained engineering controls can be highly effective in protecting miners and are typically independent of worker interactions (human factors) to provide a high level of protection.[37]

Administrative controls and PPE are frequently used with existing workplace practices where hazards are not well controlled. These methods for protecting miners have

[37] National Institute for Occupational Safety and Health (NIOSH). 2015. Hierarchy of Controls. NIOSH website at: https://www.cdc.gov/niosh/topics/hierarchy/. Accessed June 4, 2019, last reviewed January 13, 2015.

proven to be less effective than engineering controls, requiring significant effort by the mine operator and affected miners.

In mining, engineering or environmental controls include all methods that control the level of respirable dust by reducing dust generation (machine parameters) or by suppressing (water sprays, wetting agents, foams, water infusion, etc.), diluting (ventilation), capturing dust (dust collectors) or diverting dust (shearer clearer, passive barriers, etc.).

Administrative controls refer to work practices that reduce miners' daily exposure to respirable dust hazards by altering the way in which work is performed. Administrative controls consists of such actions as rotation of miners to areas having lower dust concentrations, rescheduling of tasks, and modifying work activities. The effectiveness of administrative controls requires oversight to ensure that miners adhere to the controls, such as restrictions of time in an area or switching duties. Using administrative controls also requires a sufficient number of qualified miners available to perform the specific duties.

A form of PPE, an air purifying respirator is designed to protect miners from the inhalation of hazardous

contaminants. Respirators can protect miners by removing contaminants from the air they breathe. Particulate air-purifying respirators remove or filter airborne contaminants from the air before they can be inhaled. Examples of this type of respirator include dust masks (filtering face pieces), half or full-mask (elastomeric) respirators, and PAPRs.

Engineering controls are more effective than respirators in continuously protecting miners from respirable crystalline quartz. Many factors affect the effectiveness of respirators to protect miners. The protection of a respirator is reduced dramatically or voided when the respirator is improperly worn such as with facial hair that interferes with the seal or when the respirator is removed in contaminated atmospheres during periods of exposure, even for short durations. For example, if a miner properly wears a half-mask respirator continually during an 8-hour exposure duration, the protection factor afforded is 10; however, removing the respirator for 24 minutes during the 8-hour exposure duration reduces the protection factor to 6.9. If the miner wears the respirator for only half of the exposure duration, the protection factor is reduced to 1.8 (2015 ANSI Z88.2 – Table A.7-1). Many respirators may not be

comfortable, and a miner's tolerance to wearing a respirator can decrease over an extended period of time. Miners are also likely to remove respirators when performing arduous tasks, communicating, chewing tobacco, are sick, hot or sweaty, or when the respirator is uncomfortable, thereby subjecting miners to respirable crystalline silica concentrations above the standard.

MSHA addressed the "hierarchy of controls" in the 2000 (65 FR 42122) and 2003 (68 FR 10784) Plan Verification proposed rules, and in the 2014 Dust rule (79 FR 24814). Commenters to the Dust rule noted that MSHA permits the use of "hierarchy of controls" in MNM mines to control miners' exposure to diesel particulate matter (79 FR 24930). In the Plan Verification proposed rules, and in the Dust rule, MSHA reiterated that engineering or environmental controls are the primary means to control respirable dust in the mine atmosphere, which is consistent with sections 201(b) and 202(h) of Mine Act. However, MSHA also recognizes the importance of controlling miners' exposure to quartz and seeks information and data to determine if existing engineering and environmental controls can continuously protect miners and ensure that they do not suffer material impairment of health or functional capacity over their

working lives from working in areas with high levels of quartz.

II. Information Request

MSHA is interested in data and information on economically and technologically feasible best practices to protect coal and MNM miners' health from exposure to quartz, including a reduced standard, new or developing protective technologies, and/or technical and educational assistance.

MSHA specifically requests input from industry, labor, and other interested parties on best practices that will improve health protections for coal and MNM miners from exposure to quartz dust.

1. Please provide any information on new or developing technologies and best practices that can be used to protect miners from exposure to quartz dust.
2. Please provide any information on how engineering controls, administrative controls, and personal protective equipment can be used, either alone or concurrently, to protect miners from exposure to quartz dust.
3. Please provide any information on additional feasible dust-control methods that could be used by mining operations to reduce miners' exposure to respirable quartz during high-silica cutting situations, such as on

development sections, shaft and slope work, and cutting overcasts.

4. Please provide any other experience, data, or information that may be useful to MSHA in evaluating miners' exposures to quartz.

Authority: 30 U.S.C. 811, 813(h), 957.

David G. Zatezalo,

Assistant Secretary of Labor for

Mine Safety and Health Administration.

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