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3M Personal Safety Division Regulations Update

#31 - Lowering Miners' Exposure to Respirable Coal Mine Dust, Including Continuous Personal Dust Monitors
June 2015

MSHA Regulation: 30 CFR Parts 70, 71, 72, 75 and 90

On May 1, 2014, the Mine Safety and Health Administration (MSHA) issued a final rule "Lowering Miners' Exposure to Respirable Coal Mine Dust, Including Continuous Personal Dust Monitors." The standard was published in the *Federal Register*, 84 *Fed. Reg*. 24814 and affects coal mines by revising some of the coal mine health and safety standards that are codified in 30 CFR Parts 70, 71, 72, 75 and 90.

This summary of the final rule on lowering miners' exposure to respirable coal mine dust was prepared by 3M Personal Safety Division (PSD). It does not represent an official, legal nor complete interpretation or summary of the standard. If specific questions arise, the standard itself should be reviewed and relied on, rather than this summary. A copy of the Lowering Miners' Exposure to Respirable Coal Mine Dust, Including Continuous Personal Dust Monitors final rule can be viewed or copied from the 3M PSD website; www.3M.com/ppesafety or from the MSHA website, http://www.msha.gov/REGSFINL.htm.

SUMMARY

MSHA states that the purpose of this final rule is to reduce occupational lung diseases in coal miners. According to MSHA, chronic exposure to certain levels of respirable coal mine dust causes lung diseases known collectively as ''black lung.'' These lung diseases can lead to permanent disability and death. MSHA states that the final rule will greatly improve health protections for coal miners by reducing their occupational exposure to respirable coal mine dust and by lowering the risk that they will suffer material impairment of health or functional capacity over their working lives.

In this final rule, MSHA states that it is revising the Agency's existing standards on miners' occupational exposure to respirable coal mine dust in order to:

- Lower the existing respirable coal mine dust exposure limits;
- Provide for full-shift respirable coal mine dust sampling;

- Redefine the term ''normal production shift''; and
- Add reexamination and decertification requirements for persons certified to sample for dust, and maintain and calibrate sampling devices.

In addition, the rule provides for single shift compliance sampling by MSHA inspectors, establishes sampling requirements for mine operators' use of the Continuous Personal Dust Monitor (CPDM), requires operator corrective action on a single, full-shift operator sample, changes the averaging method to determine compliance on operator samples, and expands requirements for medical surveillance of coal miners.

DATES

- **August 1, 2014**: Effective date of the final rule.
- **September, 30, 2014**: All coal mine operators must have an existing NIOSH-approved plan or have submitted a plan to NIOSH for providing miners with medical examinations for approval under existing 30 CFR 37.
- **February 2016**: Sampling with the continuous personal dust monitor (CPDM) begins.
- **August 1, 2016**: The remaining parts of the revised respirable coal dust standards become effective.

OVERVIEW

With this final rule, MSHA is revising some of the coal mine health and safety standards that are codified in 30 CFR Parts 70, 71, 72, 75 and 90. Part 70 addresses underground coal mines and part 71 addresses surface coal mines and surface work areas of underground coal mines. These two Parts essentially cover all of coal mining. Part 90 contains provisions for coal miners who have evidence of the development of pneumoconiosis whether they work underground or surface. Because the provisions modified are either identical or very similar in all three of these parts, the major revisions of these three parts are discussed together. Part 72 contains health standards for coal mines and is pertinent to both underground and surface and is discussed next. This is followed by a discussion of the sections changed in part 75. Part 75 contains safety standards for underground mines. The revisions to part 75 that were made as a result of this rulemaking are listed in the third section. Finally, some of the definitions that were revised by this rulemaking in parts 70, 71, and 72 and used in this document are included. Words in bold font in the following text (not the headings) are terms for which the definition is either amended or new as a result of this rule. These definitions can be found in appendix A.

MAJOR PROVISIONS OF PART 70, 71, AND 90

1. Lowers the Existing Concentration Limits for Respirable Coal Mine Dust

According to MSHA, lowering the concentration of respirable coal mine dust in the air that miners breathe is the most effective means of preventing diseases caused by excessive exposure to such dust. The final rule lowers the respirable coal mine dust limits. These new limits go into effect August 1, 2016. Table 1 summarizes the concentration limits for respirable coal mine dust when quartz is not present.

Table 1
Maximum Coal Mine Dust Concentration Limits[A]

	Respirable Coal Mine Dust Concentration (until August 1, 2016)	Respirable Coal Mine Dust Concentration (after August 1, 2016)
Underground and surface coal mines	2.0 mg/m^3	1.5 mg/m^3
Intake air at underground coal mines	1.0 mg/m^3	0.5 mg/m^3
Part 90 Miners[B]	1.0 mg/m^3	0.5 mg/m^3

[A] These limits may be reduced based upon the amount of quartz present.
[B] Miners who have evidence of the development of pneumoconiosis

The amount of quartz in the dust has the effect of lowering the respirable coal mine dust limit. The value for these revised limits depends on the percent quartz in the respirable coal mine dust composition. Determining the respirable coal mine dust limit requires knowing the percent quartz in the respirable coal mine dust. In addition to the airborne concentration of respirable coal dust being determined, the sample must also be analyzed for quartz. The applicable respirable coal mine dust standard when quartz is present is computed by dividing the percent of quartz into the number 10. The application of this formula shall not result in a value that exceeds the limits in Table 1 above. The quartz concentration in coal mine dust must not exceed 0.1mg/m^3 (100 $\mu g/m^3$).

To determine the limit based on the quartz present:

Step 1: Determine the respirable coal mine dust limit for your mine.
Determine the equivalent concentration (EC) of respirable coal mine dust in your mine.
Determine the percent (%) quartz in the respirable coal mine dust for this exposure.

Step 2 Determine the quartz dust concentration for this exposure.

This is done by multiplying the respirable coal mine dust equivalent concentration (in mg/m^3) by the percent quartz (as a decimal, i.e., 50% is 0.50)
EC (mg/m^3) X % Quartz = revised respirable coal mine dust limit in $\mu g/m^3$.

Step 3 Determine the acceptable respirable coal mine dust limit for this amount of quartz.

10 divided by the percent quartz (actual number)
10 ÷ %Quartz = maximum limit for airborne quartz dust in $\mu g/m^3$
Example for 100 % quartz: 10 ÷ 100 = 0.1 $\mu g/m^3$

Step 4 Compare the quartz dust concentration to the acceptable quartz dust limit to determine if immediate action is required.

NOTE: These values can also aid in selecting an appropriate respirator in the event one is needed.

MSHA uses the following examples to illustrate how the percent quartz effects the calculation of the respirable coal mine dust limits:

Example #1: Assume the sampled mechanized mining unit (MMU) or designated area (DA) is on a 1.5-mg/m^3 dust standard. Suppose a valid representative dust sample with an **equivalent concentration** of 1.12 mg/m^3 contains 12.3% of quartz dust, which corresponds to a quartz concentration of 138 µg/m^3. This concentration exceeds the 100 µg/m^3 limit for quartz. To determine the acceptable limit of respirable coal mine dust, the percent quartz is divided into the number 10 (10/12.3% = 0.8 mg/m^3). Therefore, the average concentration of respirable dust in the mine atmosphere associated with that MMU or DA shall be maintained on each shift at or below 0.8 mg/m^3. Controlling the respirable coal mine dust to this level keeps the quartz concentration from exceeding 100 µg/m^3.

Step 1:	Respirable coal mine dust limit:	1.5 mg/m^3
	equivalent concentration (EC):	1.12 mg/m^3
	Percent quartz:	12.3%
Step 2:	Quartz dust concentration:	112 mg/m^3 X 0.123 = 138 µg/m^3
Step 3:	Coal mine dust limit with quartz:	10/12.3 = 0.8 mg/m^3

Step 4: Controlling the respirable coal mine dust to 0.8 mg/m^3 level keeps the quartz concentration from exceeding 100 µg/m^3 (0.8 mg/m^3 X 0.123 = ~ 100 µg/m^3. The equivalent dust concentration of 1.12 mg/m^3 exceeds the 0.8 mg/m^3 limit. The dust is over the limit by 1.4 times.

Example #2: Assume the sampled DWP is on a 1.5-mg/m^3 dust standard. Suppose a valid representative dust sample with an equivalent concentration of 1.09 mg/m^3 contains 16.7% of quartz dust, which corresponds to a quartz concentration of 182 µg/m^3. Therefore, the average concentration of respirable dust in the mine atmosphere associated with that DWP shall be maintained on each shift at or below 0.6 mg/m^3 (10/16.7% = 0.6 mg/m^3).

Step 1:	Respirable coal mine dust limit:	1.5 mg/m^3
	Equivalent concentration (EC):	1.09 mg/m^3
	Percent quartz:	16.7%
Step 2:	Quartz dust concentration:	1.09 mg/m^3 X 0.167 = 182 µg/m^3
Step 3:	Coal mine dust limit with quartz:	10/16.7 = 0.6 mg/m^3

Step 4: Controlling the respirable coal mine dust to 0.6 mg/m^3 level keeps the quartz concentration from exceeding 100 µg/m^3 (0.6 mg/m^3 X 0.167 = ~ 100 µg/m^3. The equivalent dust concentration of 1.09 mg/m^3 exceeds the 0.6 mg/m^3 limit. The dust is over the limit by 1.8 times.

Example #3: Assume a part 90 miner is on a 0.5 mg/m^3 dust standard. Suppose a valid representative dust sample with an **equivalent concentration** of 0.50 mg/m^3 contains 25.6% of quartz dust, which corresponds to a quartz concentration of 128 µg/m^3 (0.50 mg/m^3 X 0.256 = 128 µg/m^3). Therefore, the average concentration of respirable dust in the mine atmosphere associated with that part 90 miner shall be maintained on each shift at or below 0.4 mg/m^3 (10/25.6% = 0.4 mg/m^3).

Step 1:	Respirable coal mine dust limit: Equivalent concentration (EC): Percent quartz:	0.5 mg/m^3 0.50 mg/m^3 25.6%
Step 2:	Quartz dust concentration:	0.50 mg/m^3 X 0.256 = 128 µg/m^3
Step 3:	Coal mine dust limit with quartz	10/25.6 = 0.4 mg/m^3
Step 4:	Controlling the respirable coal mine dust to 0.4 mg/m^3 level keeps the quartz concentration from exceeding 100 µg/m^3 (0.4 mg/m^3 X 0.256 = ~ 100 µg/m^3. The equivalent dust concentration of 0.50 mg/m^3 exceeds the 0.4 mg/m^3 limit. The dust is over the limit by 1.25 times.	

2. Requires the Use of the Continuous Personal Dust Monitor (CPDM)

On February 1, 2016, mine operators are required to use the **continuous personal dust monitor** (CPDM) to monitor the exposures of underground coal miners in occupations exposed to the highest respirable coal mine dust concentrations and the exposures of part 90 miners.
Use of the CPDM is optional for surface coal mines, non-production areas of underground coal mines, and for underground anthracite mines using the full box, open breast, or slant breast mining methods.

The CPDM is a new sampling device that measures continuously, and in real-time, the concentration of respirable coal mine dust and provides sampling results at specific time intervals and at the end of the work shift. It is jointly approved for use in coal mines by MSHA and NIOSH under criteria set forth in Title 30, Code of Federal Regulations (30 CFR) part 74. When the CPDM is used, mine operators, miners, and MSHA will be notified of the results in a timelier manner than when the existing approved **Coal Mine Dust Personal Sampler Unit** (CMDPSU) is used. This will enable mine operators to take earlier action to identify areas with dust generation sources, reduce the dust levels in those areas, and prevent miners from being overexposed. The CMDPSU may be used for determining exposures for underground coal miners and part 90 miners until January 31, 2016. This gives the operator 18 months to acquire CPDM and train workers in its use in these areas.

The CMDPSU may still be used after January 2016 for sampling in surface coal mines, non-production areas of underground coal mines, and for underground anthracite mines using the full box, open breast, or slant breast mining methods.

Background on sampling

Since the 1970s, mine operators and MSHA inspectors have used the approved coal mine dust personal sampler unit (CMDPSU) to determine the concentration of respirable dust in coal mine atmospheres. The CMDPSU, which consists of a battery-powered pump unit, a cyclone (a type of particle size selector) and filter assembly, is either worn or carried by the miner and, under MSHA's existing standards, remains operational during the entire shift or for 8 hours, whichever time is less. The CMDPSU samples the mine atmosphere by drawing dust-laden mine air, at a flow rate of 2 liters per minute (L/min) through a 10-mm nylon cyclone that removes non-respirable dust particles from the airstream, allowing respirable dust particles to be deposited on the filter surface. The collection filter is enclosed in an aluminum capsule which is sealed in a protective plastic enclosure, called a cassette, to prevent contamination. After completion of sampling, the filter cassette is capped and sent to MSHA for processing, where it is disassembled to remove the filter capsule for weighing under controlled conditions to determine the amount of dust that was collected on the filter. The measured weight gain is used to determine the average concentration of respirable coal mine dust in the work environment of the affected miners.

Because these samples are typically transmitted through the mail to MSHA for processing, results of air sampling with the CMDPSU are often not known to mine operators, miners, and MSHA for at least a week or more. Consequently, if results indicate the presence of excessive dust concentrations, any corrective action taken to lower dust levels would only impact miners' exposure a week or more after sampling has been completed.

The final rule replaces the use of CMDPSU with newer direct reading technology of the CPDM. The ability to continuously monitor and give mine operators and miners real-time feedback on dust concentrations in the work environment has been an MSHA goal for nearly three decades. The performance criteria in 30 CFR part 74 establish the requirements for bias, precision, and reliability that must be met for direct-reading devices such as the CPDM. The approved CPDM is demonstrated to be accurate, precise, reliable, and durable under in-mine use conditions, and is commercially available. The person sampling the coal mine dust and calibrating and maintaining the sampling equipment must be certified (see below for more details)

MSHA states the use of an approved CPDM, which affords real-time respirable coal mine dust exposure measurements, will significantly improve health protection for current and future coal miners by reducing their cumulative coal mine dust exposure and reducing their risk of developing and dying from occupational lung diseases.

3. *Redefines the Term ''Normal Production Shift''*

The term **normal production shift** is redefined to require that underground mine operators take respirable dust samples in the **mechanized mining unit** (MMU) when production is at least 80 percent of the average production over the last 30 production shifts. The MMU is a unit of mining equipment used in the production of material. Under the existing definition, underground mine operators are required to sample when production is at least 50% of the average production reported during the operator's last sampling period (i.e., last set of five valid samples). Under the revised definition, MSHA believes miners will be better protected because samples will be collected during periods that are more representative of normal mining operations and dust levels to which miners are exposed.

4. *Requires Full-Shift Sampling*

The final rule requires the operator to collect respirable dust samples for the full shift that a miner works. If a miner works a 12-hour shift, respirable dust samples must be taken with an **approved sampling device** for the entire work shift, rather than a maximum of 8 hours as required under the existing standards. According to MSHA full-shift sampling provides more representative measurements of miners' respirable dust exposures.

5. *Changes the Averaging Method to Determine Compliance on Operator Samples*

Under existing standards, corrective action is required only after the average of five operator samples exceeds the respirable coal mine dust standard and a citation is issued. This permits miners to be exposed to levels of respirable coal mine dust that exceed the standard without requiring any corrective action by the operator to reduce concentrations to meet the standard. The final rule requires immediate corrective actions to lower dust concentrations when a single, fullshift operator sample meets or exceeds the excessive concentration value (ECV) for the dust standard. Corrective actions include, for example, engineering or environmental controls that control the level of respirable coal mine dust by:

1. Reducing dust generation at the source with the dust controls on the mining equipment;
2. Suppressing the dust with water sprays, wetting agents, foams or water infusion;
3. Using ventilation to dilute the dust;
4. Capturing the dust with machine-mounted dust collectors; and
5. Diverting the dust being generated by the mining process with shearer clearer or passive barriers.

These corrective actions will result in reduced respirable dust concentrations in the mine atmosphere and, therefore, will provide better protection of miners from further high exposures. The ECV can be found in the *Federal Register*.

6. *Provides for the Use of Single, Full-Shift Samples, by MSHA inspectors, to Determine Compliance*

MSHA inspectors will use single, full-shift samples to determine noncompliance with the respirable dust standards. MSHA has determined that the average concentration of respirable dust to which each miner in the active workings of a coal mine is exposed can be accurately measured over a single shift. MSHA considers a single, full-shift measurement of respirable coal mine dust to ''accurately represent'' atmospheric conditions [Section 202(f) of the Mine Act] at the sampling location, if the sampling and analytical method used meet the NIOSH Accuracy Criterion (see item 2 above). MSHA states that limiting the respirable dust concentration in the active workings ensures that the respirable dust concentration inhaled by any miner is limited.

7. *Expands Medical Surveillance Requirements*

The final rule adds spirometry testing, occupational history, and symptom assessment to the periodic chest radiographic (x-ray) examinations required to be offered by mine operators to underground miners under NIOSH's existing standards (42 CFR 37). A roster specifying the name and current address of each miner covered by the plan must be supplied to NIOSH. The additional medical surveillance requirements will alert miners to any abnormal declines in lung function, which is common evidence of Chronic Obstructive Pulmonary Disease (COPD) and not detected by chest x-rays. Notification of reduced lung function will enable miners to be

proactive in protecting their health. The final rule extends the same medical surveillance requirements afforded underground miners, including chest x-ray examinations, to surface miners because they are also at risk of developing lung diseases and material impairment of health or functional capacity from exposure to respirable coal mine dust. In addition, the final rule extends part 90 miner transfer rights, which are currently provided to underground miners who have x-ray evidence of pneumoconiosis, to surface miners who have evidence of pneumoconiosis. Under 30 CFR part 90, these miners can elect to work in less dusty atmospheres to prevent the progression of disease. The medical surveillance requirements will provide improved health protection for all coal miners.

3M notes that the above requirements are for medical surveillance to identify early indications of those diseases referred to as "black lung." These requirements are different from medical evaluation requirements for respirator wearers to determine a miner's ability to wear the respirator and perform the job as indicated in the American National Standards Institute's 'Practices for Respiratory Protection ANSI Z88.2-1969" incorporated by reference in § 72.710. However, some of this information, such as the symptom assessment and occupational history, are useful information a physician may want to have when evaluating miners for the ability to use respirators.

8. *Strengthens Requirements for Certified Persons*

The final rule revises requirements for **certified persons** who perform dust sampling and who maintain and calibrate sampling equipment. To strengthen the certification process, the final rule adds a requirement that persons must complete an MSHA course of instruction. This complements the existing requirement that, to be certified, the candidate must pass an MSHA examination to demonstrate competency in the tasks needed for respirable dust sampling procedures and in maintenance and calibration procedures. By completing the MSHA course and passing the MSHA examination the final rule will ensure that only trained persons perform these important functions. Certified persons are required under the final rule to pass the MSHA examination every three years to maintain their certification. The final rule adds procedures allowing MSHA to revoke a person's certification for failing to properly carry out the required sampling or maintenance and calibration procedures.

According to MSHA, the final rule was strategically developed to provide a comprehensive, integrated approach to achieve MSHA's goal of reducing miners' exposure to respirable coal mine dust in a protective and feasible manner.

9. *Requires operator corrective action on a single, full-shift operator sample*

The rule requires operators to take immediate corrective action when a sample meets or exceeds the exposure limit. The final rule requires an operator to make respirators available to all persons whenever exposed to concentrations of respirable dust in excess of the levels required to be maintained. MSHA states the use of approved respiratory equipment should be encouraged until the operator determines the cause of the overexposure and takes corrective actions.

If the operator receives a citation for meeting or exceeding the excessive concentration value, the final rule requires that the operator:

1. Provide respiratory protection[1] to affected miners,
2. Take immediate corrective action to comply with the respirable dust standard,
3. Record the corrective action taken, and
4. Begin sampling within 8 days after the citation is issued.

MSHA in a Program Information Bulletin indicates acceptable corrective actions that would lower dust exposures are determined by the mine operator based on an evaluation as to the cause of the high dust concentration. Corrective actions include increasing air, water pressure or water sprays; replacing or unplugging water sprays and tightening ventilation controls; more frequent checking and cleaning of dust filters or dust collectors; or a different placement of the ventilation controls or water sprays' or repositioning of a miner. It may require increased checking of the dust controls during the shift to make sure they are in place.

Final § 72.700(b) provides that when required to make respirators available, the operator must provide training prior to the miner's next scheduled work shift, unless the miner received training within the previous 12 months on the types of respirators made available. It further requires that the training must include the care, fit, use, and limitations of each type of respirator.

Other coal mine standards affected by this final rule include sections in Part 72 and 75:

PART 72—HEALTH STANDARDS FOR COAL MINES

The final rule adds a new Subpart B to the health standards for coal mines, establishing periodic examinations including x-rays, spirometry, symptom assessment and occupational history entitled: **Subpart B—Medical Surveillance § 72.100 Periodic examinations.**

The final rule also adds §§ 72.700, and 72.701 to subpart E of part 72 to read as follows:

§ 72.700 Respiratory equipment; respirable dust.

(a) Respiratory equipment approved by NIOSH under 42 CFR part 84 shall be made available to all persons as required under parts 70, 71, and 90 of this chapter. Use of respirators shall not be substituted for environmental control measures in the active workings. Each operator shall maintain an adequate supply of respiratory equipment.

(b) When required to make respirators available, the operator shall provide training prior to the miner's next scheduled work shift, unless the miner received training within the previous 12 months on the types of respirators made available. The training shall include: The care, fit, use, and limitations of each type of respirator.

(c) An operator shall keep a record of the training at the mine site for 24 months after completion of the training. An operator may keep the record elsewhere if the record is immediately accessible from the mine site by electronic transmission. Upon request from an authorized representative of the Secretary, Secretary of HHS, or representative of miners, the operator shall promptly provide access to any such training records. The record shall include:

(1) The date of training;

[1] While the MSHA rule requires that NIOSH-approved respiratory protection be provided, one interpretation is to "Provide properly selected respiratory protection to affected miners."

(2) The names of miners trained; and
(3) The subjects included in the training.

§ 72.701 Respiratory equipment; gas, dusts, fumes, or mists.
Respiratory equipment approved by NIOSH under 42 CFR part 84 shall be provided to persons exposed for short periods to inhalation hazards from gas, dusts, fumes, or mists. When the exposure is for prolonged periods, other measures to protect such persons or to reduce the hazard shall be taken.

In the preamble to this final rule, it is stated that, "MSHA's longstanding interpretation of the term 'short periods' means, for example, the time required to drill three or four holes for trolley hangers, to drill holes to take down a piece of loose roof, to drill shot holes in a roof fall, to make small spray applications of paint or sealing compound. MSHA considers prolonged periods to be any duration of time that does not fit the interpretation of 'short periods.' "

In discussion of the training requirements of this final rule [§72.700(b)], MSHA states that the value of all personal protective equipment, including respirators, is partially contingent on the correct use, fit, and care of the device by the wearer. Meaningful instruction to miners in how to use, care, and fit the available respirators, as well as their technical and functional limitations, encourages miners to actively participate in maximizing the potential benefits of using a respirator, especially during periods when the respirable dust levels are reported as exceeding the allowable level. In addition, retraining on the respiratory equipment is necessary when the miner has not been trained within the previous 12 months on the specific types of respirators that are made available. Retraining should reiterate the information presented during the initial training session to refresh miners' knowledge.

3M commented on the proposed rule encouraging MSHA to update the training requirements from the American National Standards Institute (ANSI) Z88.2-1969 to include points found in ANSI Z88.2-1992 or 29 CFR 1910.134, such as why the respirator is needed. MSHA responded that final paragraph [72.700] (b) is intended to provide a basic framework for minimum areas of instruction. Because the training required by final paragraph (b) is performance-oriented, operators can adapt the training to best meet the needs of their miners. As clarified in the proposal, operators can develop a training module that includes course content beyond the subject matter requirements set forth in final paragraph (b), or they can choose to allot a different amount of training time to each subject matter, based on the particular skills and knowledge of the miners. Although final paragraph (b) does not explicitly provide that operators must explain why respirators may be needed, MSHA anticipates that such a basic topic will be addressed in any well-designed training curriculum.

Since the publication of the final rule, MSHA in its Program Information Bulletin[(1)] includes the following FAQ related to training:

"Is fit testing required when operators provide respiratory equipment to miners? No. Respirator training is required that includes the care, fit, use and limitations of each type of respirator that is made available."

This answer may seem surprising because the value of fit testing tight-fitting respirators has been well established for years and is a requirement of the OSHA Respiratory Protection Standard 29 CFR 1910.134. In the US, 3M recommends that all workers, including miners, using tight-fitting respirators be fit tested prior to using the respirator. 3M also recommends that tight-fitting respirators not be worn by miners when hair (facial or otherwise) comes between the respirator

sealing surface and the face. To assist mine operators, 3M has respirator fit testing equipment and videos explaining how to perform fit testing. In addition, 3M makes loose-fitting respirator types in addition to the tight-fitting types. Loose-fitting respirators do not require fit testing and can be worn over most facial hair. One example of a NIOSH-approved respirator is the 3M Airstream Helmet.

As pointed out above, MSHA states that the value of all personal protective equipment, including respirators, is **partially** [emphasis added] contingent on the correct use, fit, and care of the device by the wearer. One of the other factors in realizing the value of personal protective equipment is the proper selection of the equipment for the anticipated exposure and the particular job duties at issue. Respirator selection is based in part on consideration of the respirable dust concentration level. A respirator with an appropriate assigned protection factor needs to be selected for the exposure level. The following table identifies respirator types based on exposure concentrations to respirable coal mine dust. A similar table can be for quartz but needs to be based on the calculated limits.

Table 1. Respirator Selection for Respirable Coal Mine Dust

Respirable Coal Mine Dust Concentration	Required Assigned Protection Factor	Respirator Type
≤ 15.0 mg/m3	10	Half facepiece air-purifying respirators, elastomeric or filtering facepiece type[A]
≤ 37.5 mg/m3	25	Powered air-purifying respirator with HE[B] filter and loose-fitting facepiece[C]
≤ 75 mg/m3	50	Full facepiece air-purifying respirator[A]
≤ 2250 mg/m3	1000	Powered air-purifying respirator with HE filter and either a full facepiece[A] or hood[C]

[A] Respirators requiring fit testing
[B] High Efficiency
[c] Respirators not requiring fit testing

Table 2. 3M Respirator Examples

Respirator Type	3M Respirator Examples
Half facepiece air-purifying respirators, elastomeric or filtering facepiece type with an N95 or higher rated filter	• 3M™ Particulate Respirator 8210, N95 • 3M™ Particulate Respirator 8511, with 3M™ Cool Flow™ Valve, N95 • 3M™ Rugged Comfort Quick Latch Half Facepiece 6500QL with 3M Particulate Filter 2091, P100
Powered air-purifying respirator with HE filter and loose-fitting facepiece	• 3M™ Airstream™ Mining Headgear-Mounted Powered Air Purifying Respiratory (PAPR) System AS-600LBC
Full facepiece air-purifying respirator with an N95 or higher rated filter	• 3M™ 6000 Series Full Facepiece Respirator with 3M Particulate Filter 2091, P100

	• 3M™ FF400 Series Full Facepiece Respirator with 3M Particulate Filter 2091, P100
Powered air-purifying respirator with HE filter and either a full facepiece , hood, or helmet	• 3M™ Belt-Mounted Powered Air Purifying Respirator (PAPR) Assembly GVP-CB with the 3M™ Versaflo™ Respiratory Helmet Assembly M-405 and 3M™ Versaflo™ Length Adjusting Breathing Tube BT-30.

In addition, if an operator selects the half- or full-facepiece air-purifying respirators as the NIOSH approved respirator to be made available to help reduce exposures to particles, these respirators will need to be provided with the proper filter. The proper filter depends on the types of aerosols in the air. N-series filters can be selected when all aerosols present are non-oil aerosols. If only respirable coal mine dust is in the air then an N-series filter, such as an N-95 particulate-removing filter, would be appropriate. If oil aerosols are also present with coal dust, then an R- or P- series filter needs to be selected. Oil containing aerosols would be present along with the respirable coal mine dust if diesel particulate matter was in the air also. Another source for oil aerosols is pneumatic tools. These tools are used with oil injected for tool lubrication. The use of these tools results in oil mist being released into the air. In these two examples, R- or P-series particulate-removing filters need to be selected even when respiratory protection is only required for the coal dust. HE filters used with powered air-purifying filters are not selected on the presence or not of oil aerosols.

MSHA moved the requirements addressing gas and vapor removing respirators to § 72.701, because as MSHA clarified in the final rule, the intent is only to extend the respiratory equipment coverage to persons at surface mines, persons at surface areas of underground mines, and part 90 miners. Provisions for chemical cartridge change schedules were not addressed. Any revisions of that nature would be undertaken in a separate rulemaking.

In 1998, NIOSH revised its use restrictions on the use of approved gas- and vapor-removing respirators to require a cartridge change-schedule to be established for air-purifying respirators. 3M has tools available to assist the operator with determining when gas or vapor breakthrough will occur so a change-schedule can be implemented that prevents the miner from being overexposed to the gas or vapor.

PART 75—MANDATORY SAFETY STANDARDS—UNDERGROUND COAL MINES

The final rule also amends several of the existing sections of part 75 by revising the following paragraphs:

§ 75.325 Air quantity.
(a) * * *
(2) The quantity of air reaching the working face shall be determined at or near the face end of the line curtain, ventilation tubing, or other ventilation control device. If the curtain, tubing, or device extends beyond the last row of permanent roof supports, the quantity of air reaching the working face shall be determined behind the line curtain or in the ventilation tubing at or near the last row of permanent supports. When machine-mounted dust collectors are used in conjunction

with blowing face ventilation systems, the quantity of air reaching the working face shall be determined with the dust collector turned off.

§ 75.350 Belt air course ventilation.

(b) * * *
(3)(i) The average concentration of respirable dust in the belt air course, when used as a section intake air course, shall be maintained at or below:
(A) 1.0 mg/m3.
(B) 0.5 mg/m3 as of August 1, 2016.
(ii) Where miners on the working section are on a reduced standard below that specified in §75.350(b)(3)(i), the average concentration of respirable dust in the belt entry must be at or below the lowest applicable standard on that section.

§ 75.362 On-shift examinations.
(a)(1) * * *
(2) A person designated by the operator shall conduct an examination and record the results and the corrective actions taken to assure compliance with the respirable dust control parameters specified in the approved mine ventilation plan. In those instances when a shift change is accomplished without an interruption in production on a section, the examination shall be made anytime within 1 hour after the shift change. In those instances when there is an interruption in production during the shift change, the examination shall be made before production begins on a section. Deficiencies in dust controls shall be corrected before production begins or resumes. The examination shall include: Air quantities and velocities; water pressures and flow rates; excessive leakage in the water delivery system; water spray numbers and orientations; section ventilation and control device placement; roof bolting machine dust collector vacuum levels; scrubber air flow rate; work practices required by the ventilation plan; and any other dust suppression measures. Measurements of the air velocity and quantity, water pressure and flow rates are not required if continuous monitoring of these controls is used and indicates that the dust controls are functioning properly.

(g) * * *
(2) The certified person directing the on-shift examination to assure compliance with the respirable dust control parameters specified in the approved mine ventilation plan shall:
(i) Certify by initials, date, and time on a board maintained at the section load-out or similar location showing that the examination was made prior to resuming production; and
(ii) Verify, by initials and date, the record of the results of the examination required under (a)(2) of this section to assure compliance with the respirable dust control parameters specified in the mine ventilation plan. The verification shall be made no later than the end of the shift for which the examination was made.
(3) The mine foreman or equivalent mine official shall countersign each examination record required under (a)(2) of this section after it is verified by the certified person under (g)(2)(ii) of this section, and no later than the end of the mine foreman's or equivalent mine official's next regularly scheduled working shift. The record shall be made in a secure book that is not susceptible to alteration or electronically in a computer system so as to be secure and not susceptible to alteration.

(4) Records shall be retained at a surface location at the mine for at least 1 year and shall be made available for inspection by authorized representatives of the Secretary and the representative of miners.

§ 75.371 Mine ventilation plan; contents.
* * * * *
(f) Section and face ventilation systems used and the minimum quantity of air that will be delivered to the working section for each mechanized mining unit, including drawings illustrating how each system is used, and a description of each different dust suppression system used on equipment, identified by make and model, on each working section, including:
(1) The number, types, location, orientation, operating pressure, and flow rate of operating water sprays;
(2) The maximum distance that ventilation control devices will be installed from each working face when mining or installing roof bolts in entries and crosscuts;
(3) Procedures for maintaining the roof bolting machine dust collection system in approved condition; and
(4) Recommended best work practices for equipment operators to minimize dust exposure.
* * * * *
(j) The operating volume of machine mounted dust collectors or diffuser fans, if used (see §75.325(a)(3)), including the type and size of dust collector screen used, and a description of the procedures to maintain dust collectors used on equipment.
* * * * *
(t) The locations where samples for ''designated areas'' will be collected, including the specific location of each sampling device, and the respirable dust control measures used at the dust generating sources for these locations (see §§ 70.207 and 70.209 of this chapter).

References

1. MSHA – Program Information Bulletin – Calendar year 2014. http://www.msha.gov/endblacklung/docs/faq.pdf (accessed June 13, 2014).

2. American National Standards Institute, American National Standard Practices for Respiratory Protection, ANSI Z88.2-1969, New York: American National Standards Institute, Inc., 1969.

APPENDIX A

Definitions

The final rule includes several revised or new definitions. Ones used in this document are listed below.
Approved sampling device. A sampling device approved by the Secretary and Secretary of Health and Human Services (HHS) under part 74 of this title.

Certified person. An individual certified by the Secretary in accordance with § 70.202 to take respirable dust samples required by this part or certified in accordance with § 70.203 to perform the maintenance and calibration of respirable dust sampling equipment as required by this part.

Coal mine dust personal sampler unit (CMDPSU). A personal sampling device approved under part 74, subpart B, of this title.

Continuous personal dust monitor (CPDM). A personal sampling device approved under part 74, subpart C of this title.

Equivalent concentration. The concentration of respirable coal mine dust, including quartz, expressed in milligrams per cubic meter of air (mg/m^3) as measured with an approved sampling device, determined by dividing the weight of dust in milligrams collected on the filter of an approved sampling device by the volume of air in cubic meters passing through the filter (sampling time in minutes (t) times the sampling airflow rate in cubic meters per minute), and then converting that concentration to an equivalent concentration as measured by the Mining Research Establishment (MRE) instrument. When the approved sampling device is:

(1) The CMDPSU, the equivalent concentration is determined by multiplying the concentration of respirable coal mine dust by the constant factor prescribed by the Secretary.

(2) The CPDM, the device shall be programmed to automatically report end-of-shift concentration measurements as equivalent concentrations.

Mechanized mining unit (MMU). A unit of mining equipment including hand loading equipment used for the production of material; or a specialized unit which uses mining equipment other than specified in § 70.206(b) or in § 70.208(b) of this part. Each MMU will be assigned a four-digit identification number by MSHA, which is retained by the MMU regardless of where the unit relocates within the mine. However, when:

(1) Two sets of mining equipment are used in a series of working places within the same working section and only one production crew is employed at any given time on either set of mining equipment, the two sets of equipment shall be identified as a single MMU.

(2) Two or more sets of mining equipment are simultaneously engaged in cutting, mining, or loading coal or rock from working places within the same working section, each set of mining equipment shall be identified as a separate MMU.

Normal production shift. A production shift during which the amount of material produced by an MMU is at least equal to 80 percent of the average production recorded by the operator for the most recent 30 production shifts or for all production shifts if fewer than 30 shifts of production data are available.

Other designated occupation (ODO). Other occupation on an MMU that is designated for sampling required by this part in addition to the DO. Each ODO shall be identified by a four-digit identification number assigned by MSHA.

Representative sample. A respirable dust sample, expressed as an equivalent concentration, that reflects typical dust concentration levels and with regard to an MMU, normal mining activities in the active workings during which the amount of material produced is equivalent to a normal production shift; or with regard to a DA, material is produced and routine-day-to-day activities are occurring.