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30 CFR Parts 70, 75, and 90
Verification of Underground Coal Mine Operators' Dust Control Plans and Compliance Sampling for Respirable Dust; Proposed Rule

DEPARTMENT OF LABOR

Mine Safety and Health Administration

30 CFR Parts 70, 75 and 90

RIN 1219–AB14

Verification of Underground Coal Mine Operators' Dust Control Plans and Compliance Sampling for Respirable Dust

AGENCY: Mine Safety and Health Administration (MSHA), Labor.

ACTION: Proposed rule; notice of public hearings; close of record.

SUMMARY: This proposed rule supercedes the proposed rule published by MSHA on July 7, 2000. Under this proposed rule mine operators would be required to verify and periodically monitor, through sampling, the effectiveness of the dust control parameters for each mechanized mining unit (MMU) specified in the mine ventilation plan. For samples to be valid, the operator would be required to sample on a production shift during which the amount of material produced by a MMU is at or above the verification production level using only the dust control parameters listed in the ventilation plan. The use of approved powered, air-purifying respirators (PAPRs) and/or verifiable administrative controls would be allowed as a supplemental means of compliance when MSHA determines that all feasible engineering or environmental controls are being used. MSHA is also proposing to rescind operator compliance sampling in underground coal mines. The use of a personal, continuous dust monitor (PCDM), once developed and approved, could be used by an operator in conjunction with the dust control parameters specified in the mine ventilation plan. The proposed rule would significantly improve miners health protection by limiting the exposure of individual miners to respirable coal mine dust.

DATES: Comments on the proposed rule should be submitted on or before June 4, 2003.

MSHA also is announcing that the Agency will hold public hearings on the proposed rule. The hearing dates and times will be announced by a separate document in the **Federal Register**.

ADDRESSES: Comments must be clearly identified as such and transmitted either electronically to *comments@msha.gov,* by facsimile to (202) 693–9441, or by regular mail or hand delivery to MSHA, Office of Standards, Regulations, and Variances, 1100 Wilson Blvd., Room 2313, Arlington, Virginia 22209–3939. You may contact MSHA with any format questions. Comments are posted for public viewing at *http://www.msha.gov/currentcomments.htm.*

Information Collection Requirements

Send written comments on the information collection requirements to both the Office of Management and Budget (OMB) and MSHA as follows:

(1) To OMB: If under 10 pages, by facsimile (202) 395–6974 to Attn: Desk Officer for MSHA; or by email to: *cathomas@omb.gov.* All comments may be sent by mail addressed to the Office of Information and Regulatory Affairs, Office of Management and Budget, New Executive Office Building, 725 17th Street, NW., Washington, DC 20503, Attn: Desk Officer for MSHA; and

(2) To MSHA: Comments must be clearly identified as comments on the information collection requirements and transmitted either electronically to *comments@msha.gov,* by facsimile to (202) 693–9441, or by regular mail or hand delivery to MSHA, Office of Standards, Regulations, and Variances, 1100 Wilson Blvd., Room 2313, Arlington, Virginia 22209–3939.

FOR FURTHER INFORMATION CONTACT: Marvin W. Nichols, Jr., Director, Office of Standards, Regulations and Variances, MSHA; phone: (202) 693–9440; facsimile: (202) 693–9441; E-mail: *nichols-marvin@msha.gov.*

This proposed rule is also available on MSHA's webpage at *http://www.msha.gov,* under Statutory and Regulatory Information; **Federal Register** Documents; Proposed Rules. You can view comments filed on this rulemaking at *http://www.msha.gov/currentcomments.htm.*

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II. Background

A. Procedural History

On July 7, 2000, the Mine Safety and Health Administration published a Notice of Proposed Rulemaking (NPRM) in the **Federal Register:** Verification of Underground Coal Mine Operators' Dust Control Plans and Compliance Sampling for Respirable Dust (65 FR 42122). A notice of public hearing and close of record was also published in the **Federal Register** (65 FR 42186) on July 7, 2000. During August 2000, three public hearings were conducted in Morgantown, West Virginia; Prestonsburg, Kentucky; and Salt Lake City, Utah. Transcripts of those proceedings were made available to the public. The close of the rulemaking record was originally scheduled for August 24, 2000. In response to requests from commenters, an extension of the comment period for the NPRM was published in the **Federal Register** (65 FR 49215) on August 11, 2000; the rulemaking comment period was extended to September 8, 2000. Supplementary statements and data postmarked on or before the close of the record, September 8, 2000, were included in the rulemaking record and made available to the public.

Many commenters on the proposed rule urged MSHA to withdraw the proposed rule and publish another. In their opinion, the agency failed to adequately address the concerns of mine operators and ignored other reforms in the dust sampling program urged by coal miners since the mid 1970s or that were recommended by the Secretary of Labor's Advisory Committee on the Elimination of Pneumoconiosis Among Coal Workers (Dust Advisory Committee) and the NIOSH Criteria Document addressing respirable coal mine dust.

After carefully considering all the facts, issues, and concerns raised by commenters during this rulemaking, MSHA concluded that, to proceed to a final rule would not be in the best interest of miners' health or the mining community. The Agency is re-proposing for further public comment, the rule which is the subject of this rulemaking.

B. Overview of Proposed Rule

In preparing this proposed rule, MSHA has responded to comments that were made to the July 7, 2000 proposed rule. However, since this proposed rule differs from the earlier proposed rule in several areas, the agency may not have addressed each concern that was identified by the earlier commenters.

MSHA believes that the proposed rule would significantly improve miners' health protection from the debilitating effects of occupational respiratory disease by limiting their exposures to respirable coal mine dust to no more than the applicable dust standard on each shift.[1] Accordingly, this proposed rule revises 30 CFR part 70, subparts A, B, and C; amends two existing sections of part 75; and revises part 90, subparts A, B, C, and D.

Under this proposed rule, MSHA would be responsible for all compliance and abatement sampling, which is currently being carried out by the operator. This includes frequent sampling of each mechanized mining unit (MMU) and part 90 miner, sampling of outby Designated Areas (DAs) and occupations, and abatement sampling. This proposed rule specifies that compliance and abatement determinations will be based on the results of single samples. Also, only MSHA samples would be used to set a reduced dust standard when the quartz content of the respirable dust exceeds five percent.

In response to comments raised in the earlier proposed rule, mine operators will continue to play a role in monitoring the mine environment. The proposed rule requires each underground operator to verify, through sampling, that the dust control parameters specified in a mine ventilation plan are effective in controlling the concentration of respirable coal mine dust and quartz dust at or below the verification limits of 2.0 mg/m^3 and 100 $\mu g/m^3$ respectively. For a sample to be valid for verification purposes, the amount of material produced must be at or above the ''verification production level'' or VPL. The VPL is defined as the tenth highest production level recorded in the most recent 30 production shifts. In addition, the engineering or environmental control parameters must not exceed 115% of the quantities specified in the ventilation plan and the sampling must take place over the entire production shift.

The dust control parameters specified in mine ventilation plans must be designed to maintain dust concentrations at or below the applicable standard on each shift. If during the initial verification sampling, the VPL is achieved and dust concentrations are sufficiently low, the district manager could approve a plan based on one shift of sampling. However, if dust concentration measurements are higher, or if the actual production was less than the VPL, MSHA will require the operator to sample additional shifts. All verification samples would be submitted to MSHA for analysis. However, mine operators would not be cited if sample results show an overexposure so long as the operator takes steps to identify and correct the condition that caused the verification limit to be exceeded.

Also, to confirm the continued effectiveness of the plan parameters, mine operators would be required to sample quarterly each producing MMU designated by MSHA under the same conditions that were in place when the plan parameters were initially verified. As in the earlier proposed rule, mine operators would be required to maintain records of the total amount of material produced by shift for each MMU.

In the earlier proposed rule, commenters expressed concern about a provision in the July 7, 2000 proposed rule allowing the use of supplementary controls (powered, air-purifying respirators (PAPRs) and administrative controls), on an interim basis, in mines utilizing longwall mining technology. Commenters offered a wide range of opinions on this part of the proposed rule. Some commenters supported MSHA's decision to allow the use of supplementary controls, but criticized the proposed rule for being too restrictive. Other commenters objected to the proposed provision, claiming that the requirement was inconsistent with the provision of the Mine Act which prohibits respirators to be used as substitutes for engineering controls. These commenters were also concerned that operators would have no incentive to implement available engineering controls once they are permitted to use supplementary controls as proposed.

This proposed rule recognizes that there may be circumstances where, even after implementing all feasible engineering or environmental controls, a mine operator may be unable to maintain concentrations at or below the verification limits. This includes operations that employ longwalls or other mining systems. In those

[1] For details, see the Quantitative Risk Assessment and Significance of Risk Sections.

instances, the proposed rule would allow a mine operator, with the approval of the Administrator of Coal Mine Safety and Health, to use either PAPRs or administrative controls or a combination of both to supplement engineering or environmental controls to reduce the dust exposure of individual miners. Approval to use supplementary control measures would be contingent on the mine operator adopting new engineering and environmental controls when they become available. The proposed rule also recognizes that there may be special situations that occur intermittently and for short periods of time where the approved dust control measures may not protect miners from overexposure. An example would be where the operator is required to mine through a rock parting with high quartz content. In these situations, the district manager may allow the operator to use PAPRs for a period not to exceed 30 calendar days.

This proposed rule would require that the mine operator provide a copy of any request for supplemental controls to the representative of the miners. This would provide an opportunity for miners' input prior to MSHA making any determination.

A full discussion of these and other provisions is provided in the section-by-section analysis of this proposed rule.

A number of commenters stated that MSHA's earlier proposed rule was incomplete because it did not address some key recommendations of by the Dust Advisory Committee, and by NIOSH in its Criteria Document (see sections II.E. and II.F. of the preamble). Some of these commenters expressed concern that the proposed rule failed to recognize and consider alternatives involving continuous dust monitoring technology. Since publication of that earlier proposed rule, technology has advanced to a point that will likely allow for continuous monitoring of dust exposures in the near future. Accordingly, this proposed rule has provisions that would allow mine operators to adopt such technology to meet the requirements for operator monitoring of dust control effectiveness and miner exposure.

The recommendations regarding exposure limits for respirable coal mine dust and crystalline silica were beyond the scope of either the single sample or plan verification rules. In the interim, MSHA enforcement efforts continue to focus on lowering the quartz exposure of miners as recommended by the Dust Advisory Committee.

1. New Proposed Respirable Dust Sampling Program

In order to improve miner confidence in the respirable dust sampling program, the proposed rule revises the existing operator sampling requirements for underground mines and for part 90 miners under 30 CFR parts 70 and 90, respectively, and provides that MSHA conduct compliance and abatement sampling.

This proposed rule would result in fewer shifts being sampled than under existing requirements. However, MSHA believes that the amount of sampling it will conduct under the proposed rule will be more protective because a greater number of individual compliance determinations would be made. MSHA samples the Designated Occupation (DO) and at least four other occupations, if available, on each sampling inspection. Also, since all MSHA sampling is unannounced, sampling will occur under conditions that are more typical of the actual mining environment. In addition, compliance determinations would be based solely on a single-sample measurement and not on an average of multiple shift measurements. Multiple shift measurements can mask overexposures by diluting a measurement of high dust exposure with lower measurements made on different shifts or at different occupational locations.

Commenters to the July 7, 2000 proposed rule also criticized MSHA for failing to fully incorporate the preamble discussion on the Agency's sampling procedures into the proposed regulation to prevent those procedures from being changed or modified in the future. MSHA does not believe that it would be appropriate to incorporate agency enforcement procedures into rules that are designed to regulate the mining industry. It is necessary for MSHA to retain the ability to modify its enforcement policies and procedures in response to, among other things, case law, new health or safety concerns, major mine emergencies, or changes in technology which may require the agency to redirect its efforts to protect miner health and safety.

In order to provide the mining community with an understanding of how the agency intends to enforce this proposed rule, MSHA has published a draft of Chapter 1 (Respirable Dust) of MSHA's health inspection procedures (see *http://www.msha.gov*) which it intends to adopt as its enforcement strategy when the final rule becomes effective.

2. Verification of Ventilation Plan Effectiveness

The proposed rule requires that each underground coal mine operator must have a mine ventilation plan verified by operator sampling. The verified plan must be effective in controlling respirable dust in each MMU under typical mining conditions prior to approval of the plan by the district manager. In addition, mine operators would be required to sample quarterly each producing MMU designated by MSHA to determine if the dust control measures specified in the approved ventilation plan, continue to protect miners from overexposure. No citations would be issued to mine operators based on the results of this sampling as long as the operator takes steps to eliminate the conditions which caused any overexposure identified through such sampling.

Consistent with the Mine Act and its implementing regulations, this proposed rule preserves the primacy of engineering controls to the extent that they are technologically and economically feasible.

The dust control parameters specified in the mine ventilation plans should be designed to control respirable dust and prevent overexposures on individual shifts. These plans should accurately reflect the engineering or environmental controls that are suitable to the mining system and operating conditions at the MMU.

Under the proposed rule, the mine operator will collect respirable dust samples to demonstrate the adequacy of the dust control parameters specified in the mine ventilation plan in maintaining the concentration of respirable coal mine and quartz dust at or below the ''verification limits'' of 2.0 mg/m^3 and 100 $\mu g/m^3$, respectively. The adequacy of the dust control parameters must be demonstrated on shifts during which the amount of material produced is at or above the ''verification production level'' (VPL) or the tenth highest production level recorded in the most recent 30 production shifts, and using only the engineering or environmental control parameters proposed in the ventilation plan, at levels not exceeding 115 percent of the quantities specified in the plan.

The proposed rule would require mine operators to: (a) Set and maintain the dust control parameters during verification sampling at levels specified in the plan; (b) maintain and make available to MSHA records of the amount of material produced by each mechanized mining unit during each production shift; (c) provide additional

information in mine ventilation plans such as the VPL, shift length, etc.; and (d) provide the miners' representative the opportunity to participate in the plan verification process.

During sampling to secure plan approval, the district manager could approve a plan based on one shift of sampling if the VPL is achieved, and respirable dust concentrations are sufficiently low. However, if dust concentration measurements are higher, or if the actual production was less than the VPL, the mine operator would be required to sample additional shifts.

3. Measures To Supplement Engineering Controls to Reduce Exposures

Under the proposed rule, if a ventilation plan cannot be verified using all feasible engineering or environmental controls, the mine operator may be permitted to use either powered, air-purifying respirators (PAPRs) or verifiable administrative controls, or a combination of both, as a supplemental means of control (see section III.D. Hierarchy of Dust Controls). MSHA may, under certain conditions, approve such use only after the Administrator for Coal Mine Safety and Health has determined that all feasible engineering or environmental controls have been adopted in the ventilation plan, but miners continue to be at risk of overexposure. District managers may also approve the use of supplementary controls for limited periods of time when unusual or intermittent adverse conditions could result in miners not being fully protected by the approved dust control plan.

These and other provisions of the proposed rule are explained in more detail in the Section-by-Section Discussion of this preamble.

C. Control of Coal Mine Respirable Dust

Maintaining a work environment free of excessive levels of respirable coal mine dust and quartz dust (hereafter referred to as ''respirable dust'') is essential for long-term health protection. Section 202(b)(2) of the Federal Mine Safety and Health Act of 1977 (Mine Act) requires each operator to continuously maintain the average concentration of respirable dust in the mine atmosphere, during each shift to which each miner in the active workings of such mine is exposed, at or below 2.0 milligrams of respirable dust per cubic meter of air (mg/m^3). Under the Mine Act and the implementing regulations, when respirable coal mine dust contains more than five percent quartz, the applicable dust standard is further reduced by means of a formula. Although MSHA does not enforce a separate standard for respirable quartz dust, the formula (10 divided by the percentage quartz) used to establish an applicable dust standard, in effect, limits respirable quartz concentrations to 100 $\mu g/m^3$ (as an MRE equivalent).

Consistent with the Mine Act and MSHA regulations, the primary focus of the federal respirable dust program is on controlling the concentrations of respirable dust in the environment where miners work or travel through the application of feasible engineering or environmental control measures. Engineering or environmental controls for respirable dust in the mine environment are the proven dust-control techniques and the principal methods for protecting miners' health. These include all methods for controlling the quantity of respirable dust in the air that a miner breathes by either reducing dust generation, or by suppressing, diluting, capturing, or diverting the dust that is being generated by the mining process. Under the Mine Act, the mine operator has primary responsibility for implementing a program to control respirable dust so that all miners work in an environment free of excessive levels of respirable dust. Mine operators must develop, implement, and maintain effective measures to control the level of respirable dust in the mine environment, and evaluate these control measures at regular intervals to ensure that they function as intended. These control measures, or ''dust control parameters,'' are required to be specified in the dust control portion of the operator's mine ventilation plan under § 75.370.

Mine ventilation plans are a long-recognized means of addressing health issues that are mine-specific and for achieving work environments that are free of excessive concentrations of respirable dust. Currently, section 75.370 requires each operator of an underground coal mine to develop and follow a ventilation plan that is designed to control methane and respirable dust in the mine. The plan must be suitable to the conditions and mining systems employed at the mine. Although ventilation plans must be designed to control respirable dust, there has been no requirement that the plan's effectiveness be verified.

The dust control portion of the mine ventilation plan is a key element of the operator's strategy to control respirable dust in the working environment of each mechanized mining unit (MMU) during each shift. Existing section 70.2 defines, in part, a MMU to mean ''a unit of mining equipment, including hand loading equipment, used for the production of material.'' The plan provides a description of the specific engineering control measures in use. The plan also contains procedures for maintenance of specific dust control equipment, such as scrubbers, dust collectors on roof bolters, and spray nozzles, or for the replacement of cutting picks to minimize dust generation. Once approved by the district manager, the dust control parameters must be employed on a continuous basis to provide protection from the hazards of respirable dust to coal miners. By insuring that the parameters are being maintained on each production shift, miners can be assured that respirable dust levels are being adequately controlled without the need to continuously monitor respirable dust levels in the mine environment. Implementing dust control parameters that have been determined effective under typical mining conditions, and maintaining these controls in proper working order, provides reasonable assurance that no miner will be overexposed. Because technology that continuously monitors respirable dust and displays dust concentrations in real-time is not yet available for use in underground coal mines, the implementation of effective ventilation plans is the only practical means of reasonably ensuring, on a continuous basis, that miners are not overexposed.

In 1996, MSHA implemented revised ventilation standards which, among other provisions, required an on-shift examination of the dust control parameters before coal production begins on each MMU to assure compliance with the dust control parameters specified in the ventilation plan. Based on the recommendations of MSHA's Coal Mine Respirable Dust Task Group (MSHA, 1992), this requirement is intended to focus attention on the need for properly functioning dust controls before production begins. On-shift examinations of dust control parameters under existing § 75.362 are one important component for an effective respirable dust control strategy. Recent advances in technology make it feasible to continuously monitor certain parameters, such as air quantity and velocity and spray water flow rate and pressure (Spencer, *et al.* 1996). Existing §75.362 encourages the use of such monitors as it would eliminate the need for periodic physical measurements of some dust controls to verify if they are operating properly. Although current technology allows real-time data to be obtained on certain dust control parameters such as air quantities,

MSHA is not aware of its use by any operator.

Since establishment of the first comprehensive dust standards in 1969, the implementation of ventilation plans by mine operators and their enforcement by MSHA has had a significant impact on control of dust levels in underground coal mines. For example, based on federal mine personnel sampling results, the average dust concentration in the environment of a continuous miner operator (occupation code—036) has been reduced by 87 percent over the past 32 years, from 7.7 mg/m^3 to approximately 1.0 mg/m^3. This accounts for the significant decline in the percentage of operator continuous miner designated occupation (DO) samples with concentrations of 2.1 mg/m^3 or higher, from 49 percent (over 32,000 samples/shifts) in 1971, to 7 percent (over 1,250 samples/shifts) during the first three quarters of 2002. Analysis of all valid operator DO samples collected during the same time period as above indicates that in 1971, 53,463 (44 percent) of the 122,404 shifts sampled, were at or above 2.1 mg/m^3, compared to 1,450 (7 percent) of the 19,336 shifts sampled in 2002 (MSHA, DO Samples by Calendar Year, 2002). Despite this progress, MSHA has found evidence that a significant number of overexposures still occur on the shifts sampled during which the approved dust control parameters are operating at or above approved levels. This evidence suggests that it is highly probable that some miners are overexposed to respirable dust on shifts not sampled by either the operator or by MSHA. In addition, recent medical surveillance data suggests that miners continue to be at risk of developing simple coal workers' pneumoconiosis (CWP), progressive massive fibrosis (PMF), and silicosis (Elam, April 1999).

Two expert panels, that reviewed the federal program designed to prevent pneumoconiosis among coal miners, found that certain aspects of the current respirable dust program limit MSHA's ability to determine the adequacy of the dust control parameters under typical mining conditions. Both the *Coal Mine Respirable Dust Task Group,* (Task Group) an interagency task group established in 1991 by the Assistant Secretary for Mine Safety and Health, and the *Advisory Committee on the Elimination of Pneumoconiosis Among Coal Mine Workers,* (Dust Advisory Committee) established in 1995 by the Secretary of Labor, considered all aspects of the respirable coal mine dust control program and made recommendations for improvement. In addition, in November 1995, NIOSH issued a criteria document that contained recommendations to improve miner health protections.

D. Coal Mine Respirable Dust Task Group

In response to concerns about the Federal coal mine dust program (MSHA, 1992), MSHA's Task Group undertook an extensive review of the program to control respirable coal mine dust and made recommendations to improve the program in 1991. As part of that review, MSHA developed a special respirable dust ''spot inspection program'' (SIP). This program was designed to provide the Agency and the Task Group with information on the dust levels to which underground miners are typically exposed.

The Task Group found that MSHA's current program did not promote the development and implementation of quality plans. Based on its review of a representative number of dust control plans, the Task Group found that some plans lacked specificity or did not include all the dust control parameters actually used. For example, the plans for three major underground coal mines listed the air quantity, the primary means of controlling concentrations of respirable coal mine dust, to be 18,000 cubic feet per minute (cfm) in the mining section. The actual quantities measured by MSHA samples at these mines during the SIP varied from 40,000 cfm to over 120,000 cfm.

Based on a review of MSHA Form 2000–86 (Revised), *Respirable Dust Sampling and Monitoring Data,* similar differences were found between air quantities specified in approved ventilation plans and the levels observed at a number of longwall MMUs inspected in 1999. For example, 20 of the 47 longwall MMUs were using significantly more air than specified in the ventilation plan (MSHA, September 1999). Under these circumstances, it would be impossible to assess whether the air volume specified in the plan was adequate to maintain dust concentrations at or below the applicable dust standard. It should be noted that air quantities, air velocities, water spray pressures, and other control parameters, specified in the plan are considered to be minimum requirements and MSHA encourages mine operators to exceed their plan parameters, but only after the levels specified in the plan have been shown to be effective under the conditions in effect during sampling. In addition, a lack of specificity in some plans made it difficult for MSHA samples to determine whether the operator was complying with the approved plan. Although several plans indicated that the mining equipment was to be provided with water sprays, the plan did not specify the location of the sprays or the water pressure at the spray nozzle.

Currently, MSHA relies on information provided by the operator to determine at what production level the plan should be evaluated. No production records are required for each MMU. Although operators must submit production data on a quarterly basis, the data is compiled for the entire mine. In addition, these quarterly reports provide information on the amount of clean coal produced, which are much lower than the tonnage of total material produced, and are not useful for establishing what constitutes ''normal production shifts'' for sampling purposes.

The Task Group determined that the use of low production levels for evaluating the effectiveness of dust control parameters can result in marginal or inadequate plans. Therefore, the Task Group recommended that MSHA require mine ventilation plans to be effective under typical mining conditions. A more detailed discussion of the impact of production on the quality of dust control parameters specified in mine ventilation plans is contained in sections III.C.1. and IV.B. of this preamble.

A survey conducted by MSHA in August of 2002 found that 48 percent of producing MMUs worked at least a 9-hour shift. The Task Group concluded that current regulations limiting the duration of sampling to eight hours do not provide for adequate assessment of respirable dust exposure during nontraditional shifts of more than eight hours.

Implementation of the Task Group recommendations would have required regulatory change. The effort to implement these changes was suspended pending the deliberations and recommendations of the Advisory Committee on the Elimination of Pneumoconiosis Among Coal Mine Workers, which was convened in 1995.

E. NIOSH Criteria Document

On November 7, 1995, MSHA received the document, *Criteria for a Recommended Standard: Occupational Exposures to Respirable Coal Mine Dust,* (Criteria Document) from the National Institute for Occupational Safety and Health (NIOSH). That document contains recommendations to minimize the health risks encountered by surface and underground coal miners due to their occupational exposure to respirable coal mine dust and

crystalline silica, hereafter referred to as ''quartz.''

According to NIOSH,

> By means of criteria documents, NIOSH communicates these recommended standards to regulatory agencies (including the Occupational Safety and Health Administration (OSHA) and MSHA) and to others in the community of occupational safety and health * * *. In addition to transmitting these documents to the Department of Labor, NIOSH also distributes them to health professionals in academic institutions, industry, organized labor, public interest groups, and other government agencies. (NIOSH, 1995, p. iii).

Pursuant to the Mine Act, MSHA was required to issue a public response to this criteria document within 60 days. The statutory deadline for MSHA's response fell on January 7, 1996. In the fall of 1995, there was a lapse in funding for the Federal government, and the Department of Labor was unable to take timely action on this matter (61 FR 731). On April 25, 1996, MSHA published its response to the Criteria Document in the **Federal Register** (61 FR 18308) stating it would develop its regulatory response to the Criteria Document in conjunction with its response to the outcome of the Dust Advisory Committee. (See section II.F.).

Some commenters criticized the earlier proposed rules for not addressing all the recommendations of the Criteria Document. During the August 2000 hearings when these comments were made, a NIOSH representative stated, ''* * * strong steps are necessary * * * oftentimes they do need to be incremental in nature.'' Among the relevant recommendations from the Criteria Document raised by commenters were the following:

- Sampling should be conducted with a device that operates in accordance with NIOSH Accuracy Criteria Document, using the international definition of respirable dust.
- Single-shift measurements should be used to determine noncompliance.
- The exposure limit for respirable coal mine dust should be limited to 1.0 mg/m^3 as a time-weighted-average (TWA) concentration for up to 10 hours per day, during a 40-hour workweek.
- There should be a gravimetric standard for silica of 0.05 mg/m^3 as a TWA for up to 10 hours per day, for a 40-hour workweek.
- Sampling goals should include determining the effectiveness of a dust control system and determining compliance with exposure limits to ensure that exposure conditions are comparable between shifts which are sampled and those which are not.
- Engineering controls and work practices should reflect reasonable efforts to reduce exposures to respirable coal mine dust below the exposure limit.
- MSHA should not make an upward adjustment of the exposure limit to account for measurement uncertainties (*i.e.,* citation threshold values (CTV)). (See section III.A.4.a.).
- Continuous monitoring devices should be developed for use in sampling respirable coal mine dust.
- Sampling frequency should be enough that a significant and deleterious change in the contaminant generation process or exposure controls is not permitted to persist.

MSHA has carefully considered the applicability of each NIOSH recommendation to reduce miners' exposure to respirable coal mine dust, and the agency has integrated these recommendations into our programs, policies, and promulgation of standards. The proposed rule published today are, in part, responsive to NIOSH's recommendations.

For example, the single sample rule, for which the record is reopened in today's **Federal Register** notice is responsive to the Criteria Document. This rule was jointly developed with NIOSH.

The two recommendations regarding exposure limits for respirable coal mine dust and quartz dust are beyond the scope of either the single sample or plan verification proposed rules.

MSHA and NIOSH agree that the level of ''coal production significantly affects the amount of airborne respirable coal mine dust'' (NIOSH 1995, p. 86). NIOSH recommended that ''The mine operator, therefore, should establish a production-level threshold to ensure that exposure conditions are comparable between sampled and unsampled shifts'' (NIOSH, 1995, p. 86). NIOSH recommended that, for a production shift to be considered a normal production shift, it must produce at least 80% of the average production, over the last 30 production shifts.

Through this plan verification proposed rule, MSHA would require operators to design their ventilation plan to be effective in controlling respirable coal mine dust at or above the ''verification production level'' (VPL). The VPL is defined as the tenth highest production level recorded in the most recent 30 production shifts. This quantity generally exceeds the production criteria recommended by NIOSH by a substantial amount.

In addition, for MSHA to approve an operator's mine ventilation plan, the plan's dust control parameters must be shown to be effective in meeting the verification limits of 2.0 mg/m^3 for respirable coal mine dust and 100 μg/m^3 for respirable quartz dust, under typical mining conditions. MSHA expects that most ventilation plans will be verified at or below those values. Therefore, for most mechanized mining units (MMUs), engineering controls will be in place that can control respirable coal mine dust at or below the exposure limit. (See chapter IX. Costs in the Preliminary Regulatory Economic Analysis (REA) for details).

Citation threshold values (CTV) are calculated to ensure that citations are issued only when a single sample measurement demonstrates, with at least 95-percent confidence, that the applicable dust standard had been exceeded.[2] Thus, before issuing a citation, the Secretary requires a high level of confidence that there has been an overexposure. Even so, a dust concentration measurement that falls between the applicable dust standard and the corresponding CTV does not demonstrate that the sampled environment is in compliance. MSHA would identify such environments for further sampling to determine if engineering controls are adequately protective.

As mentioned earlier, several commenters to the 2000 proposal expressed concern that, under MSHA's proposed sampling program, the number of shifts to be sampled would be less than under the current operator and MSHA sampling programs combined. Although MSHA will sample fewer shifts than what was recommended by the Dust Advisory Committee, the number of compliance determinations per MMU will not decrease. Under the existing sampling programs, each MMU averages 10 compliance determinations per year.[3] Each of these compliance determinations is based on the average

[2] CTVs are listed in Table 70.2

[3] Currently, six of the ten compliance determinations are based on the average of five operator, ''designated occupation'' (DO) exposure measurements. Each of these measurements is collected on a different shift within a bimonthly cycle. The remaining four determinations are based on the average of five inspector samples taken quarterly on different occupations from a MMU. Since the publication of the earlier proposed rule, the number of yearly MSHA sampling inspections at each MMU was reduced from six to four. This was the result of the impact on Agency resources due to a decision by the Federal Mine Safety and Health Review Commission that violations of the applicable dust standard must be based on samples taken on multiple shifts. Prior to that decision, MSHA compliance decisions were based on multiple samples taken on a single-shift. Accordingly, there has been a need to increase the number of shifts of MSHA sampling at MMUs where overexposures are found on the first sampling shift. This results in fewer sampling inspections being available at other MMUs.

of five 8-hour exposure measurements. (See III.A.2. Post-1980 Sampling Program). Under this proposed rule, each MMU will average significantly more compliance determinations annually using the results of single sample measurements taken by MSHA personnel (30 CFR 70.202).[4] This increase does not reflect the additional compliance determinations that will be made as a result of sampling, concurrently with MMUs, each intake DA, roof bolter DA and outby occupations.

The new sampling program will be far more effective in monitoring the quality of the mine air that miners must breathe, and in preventing overexposures on individual shifts, because MSHA will be making compliance determinations using measurements that are more representative of the dust concentrations to which miners are exposed on individual shifts. As such, MSHA believes the new MSHA sampling program addresses the NIOSH recommendation that sampling be conducted ''frequently enough that a significant and deleterious change in the contaminant generation process or exposure controls is not permitted to persist'' (NIOSH, 1995, p. 85).

Significant progress in monitoring technology has been made since MSHA published the earlier proposed rule on plan verification. The agency has been informed by NIOSH that a continuous dust monitor may be available for in-mine use by the middle of 2004. Accordingly, as recommended in the criteria document, MSHA is proposing a new standard that would permit operators to use this new technology in conjunction with existing dust controls specified in the ventilation plan to prevent overexposures on individual shifts.

Today's proposed rule does not adopt all the Criteria Document recommendations since many of the recommendations are outside the scope of these rules. However, MSHA continues to be committed to the principles that ''preventive efforts [must] be focused primarily on reducing work exposures (NIOSH, 1995).''

The Secretary of Labor and the Secretary of Health and Human Services believe that miners' health will be further protected from the debilitating effects of occupational respiratory disease by limiting their exposures to the applicable dust standard through the implementation of the single sample rule which conforms to the NIOSH Accuracy Criteria. Furthermore, as stated by NIOSH during the hearings:

> NIOSH does support efforts by MSHA and anyone else that will reduce miners' exposures to dust and silica dust and also eliminate or at least reduce significantly the incidence of the diseases * * *.

MSHA believes that this proposed plan verification rule provides an improved program for measuring, monitoring, and reducing overexposures to respirable coal mine dust and quartz dust, under typical mining conditions. As such, it greatly advances the level of health protection afforded underground miners and is consistent with recommendations issued by NIOSH in its Criteria Document.

F. Advisory Committee on the Elimination of Pneumoconiosis Among Coal Mine Workers

On January 31, 1995, the Secretary of Labor established the *Advisory Committee on the Elimination of Pneumoconiosis Among Coal Mine Workers* (Dust Advisory Committee). The Dust Advisory Committee was chartered to ''make recommendations for improving the program to control respirable coal mine dust in underground and surface mines in the United States.'' The Dust Advisory Committee identified and addressed many of the same issues considered by the Task Group. Findings and consensus recommendations were developed for each issue (MSHA, 1996). The Dust Advisory Committee concluded that the dust control portion of the mine ventilation plan is the key element of an operator's strategy to control respirable dust in the work environment. They concluded that the initial evaluation, approval, in-mine verification and monitoring to demonstrate the effectiveness of the operator's proposed dust control plan is critical for the protection of miners from lung disease. Also, believing that the credibility of the current system of mine operator sampling to monitor compliance with exposure limits has been severely compromised, the Dust Advisory Committee concluded that restoration of miner and mine operator confidence in the respirable coal mine dust sampling program should be one of MSHA's highest priorities. Accordingly, there was unanimous agreement that in order to restore confidence in the program MSHA should take full responsibility for all compliance sampling currently being carried out by mine operators under 30 CFR parts 70 and 90.

The November 1996 Dust Advisory Committee Report recommended numerous improvements for the federal program to protect miners from simple CWP, PMF, and silicosis. Of these, the following have been incorporated in this proposed rule:

1. MSHA will take full responsibility for all compliance sampling (periodic and abatement) at a level which ensures that representative samples are collected of respirable dust exposures under usual conditions of work without adversely impacting the Agency's resources and responsibilities.

2. Operators would be required to verify, through sampling, the effectiveness of the dust controls in the ventilation plan prior to approval by MSHA. The plan must be verified utilizing only those controls that are listed in the plan. In addition, mine operators would sample designated MMUs quarterly to ensure that the dust controls continue to protect miners from overexposure.

3. MSHA will redefine the range of production levels which must be maintained during sampling to verify the plan. The value will be sufficiently close to maximum anticipated production levels in order to reasonably ensure that the plan is effective under typical operations.

4. MSHA will review compliance and production records to determine when there is a need for plan verification and modification.

5. MSHA would allow mine operators to use newly developed technology to continuously monitor the work environment and prevent overexposures on individual shifts.

This proposed rule is intended to eliminate overexposures on individual shifts and to restore the confidence of miners and mine operators in the respirable coal mine dust sampling program by addressing the shortcomings identified by the Task Group and the Dust Advisory Committee in the current respirable coal mine dust program. This proposed rule would revise the operator dust sampling programs under 30 CFR parts 70 and 90 and require the implementation of mine ventilation plans demonstrated to be effective in maintaining respirable dust at or below applicable dust standards on each shift. These ventilation plans will be verified through sampling by the mine operator, and the plans' effectiveness may be monitored on a quarterly basis by the operator. MSHA intends to periodically monitor operator verification sampling and on a recurring basis will conduct sampling on each MMU to assure

[4] On a re-occuring basis MSHA will sample an average of five different occupations on each producing MMU. Since every measurement will be compared with the CTV corresponding to the applicable dust standard in effect, MSHA will be making significantly more compliance determinations yearly than under the current operator and MSHA sampling programs combined.

compliance with the provisions of the ventilation plan and the applicable dust standard. A notice reopening the record regarding the use of single-shift sample measurements of respirable coal mine dust to determine average concentration is also published in today's **Federal Register**.

MSHA recognizes that the Dust Advisory Committee made several recommendations that also impact on surface coal mine workers. These surface coal mine issues are beyond the scope of this proposed rule and will be addressed by the Agency at a later date.

In response to comments received, MSHA has specifically stated in this proposed rule that the representative of miners has the right to observe MSHA sampling with no loss of pay as recommended by the Dust Advisory Committee. The proposed rule also allows the miners' representative the opportunity to participate in operator sampling to verify the ventilation plan. However, such participation would be with no loss of pay, only when MSHA personnel are present to observe that sampling. This proposed rule does not specifically address the committee's recommendations concerning specialized miner training on verification sampling procedures. However, MSHA does intend, during the implementation of any final rule, to provide training to miners, miners' representatives and mine operators on the requirements of the new regulations. In addition, agency personnel are available to provide training to miners and their representatives on the verification procedures as needed.

This proposed rule does not incorporate full-shift sampling as recommended by the Dust Advisory Committee. In this proposed rule, MSHA does require that verification and operator quarterly sampling occur for the entire production shift since the purpose of that sampling is to evaluate the effectiveness of the dust controls on the MMU. Therefore, outby travel time is not included. With regard to compliance sampling by MSHA, the agency believes that sampling portal to portal for the entire shift or eight hours, whichever is less, provides the agency with sufficient data to determine if the dust control measures outlined in the ventilation plan are adequate and being followed or to determine if overexposures are occurring.

Although the Dust Advisory Committee also recommended that MSHA adjust the exposure limit to account for extended work weeks, such a change is considered to be outside the scope of this rulemaking.

MSHA has clarified in this proposed rule that the Secretary will cite for overexposure when an MSHA sample demonstrates that the applicable dust standard has been exceeded, based on the citation threshold value (CTV). In response to concerns that, by using a CTV, MSHA is increasing the standard, MSHA has clarified that respirable dust concentration levels must always be maintained at or below the applicable dust standard. In order to obtain ventilation plan approval from MSHA, operators must demonstrate that the dust control parameters adequately prevent excessive dust concentrations on individual shifts. The plan's effectiveness is evaluated against the applicable dust standard itself—not the CTV—and must be demonstrated at a high level of confidence.

This proposed rule also provides for the limited use of measures to supplement engineering or environmental controls for exposure control. These supplemental measures would be permitted at certain times when the Administrator for Coal Mine Safety and Health has determined that all feasible engineering and environmental controls have been applied and the mine operator is unable to verify the ventilation plan. Supplementary controls may also be approved by MSHA for short-term use to protect individual miners when operators encounter intermittent, adverse conditions under which exposures cannot be maintained within the applicable standard using the approved dust control parameters.

Finally, MSHA received comments suggesting that this rule address the Dust Advisory Committee recommendation to establish a separate silica standard. This issue is outside the scope of this rule.

III. General Discussion

A. Proposed Reforms to the Respirable Dust Monitoring Program

One of the Dust Advisory Committee's key recommendations was that MSHA take full responsibility for all compliance sampling at a level which assures representative samples of respirable dust exposure under usual conditions of work. This was based on the belief that one of MSHA's highest priorities must be to restore the confidence of miners and mine operators in the respirable coal mine dust sampling program.

Accordingly, MSHA is proposing to revise the operator dust sampling programs under current 30 CFR parts 70 and 90 and to take full responsibility for all compliance sampling (*i.e.*, periodic and abatement sampling) in a manner that it believes will be more protective than the current operator sampling program. MSHA intends to monitor miners' dust exposure and compliance with the dust control provisions of the approved mine ventilation plan, or with the respirable dust control plan for a Part 90 miner at underground mines, in accordance with the procedures and guidelines established in Chapter 1 of the Coal Mine Health Inspection Procedures Handbook.

(a) Compliance Sampling

MSHA will routinely collect samples from the working environment of the DO, Part 90 miners and, if available, four or more other occupations working in each producing MMU. The data from this sampling will be utilized by MSHA to formulate an effective compliance sampling strategy that focuses on the performance of individual sampling entities and to target MMUs for operator quarterly sampling. The strategy will be detailed in the Agency's respirable dust inspection procedures.

Each DA inby the section dump point, such as intake and roof bolter DAs, and other DAs that can be sampled concurrently with the MMU will also be sampled routinely. If the MMU sampled is operating with approved supplemental control measures, the five or more occupations sampled will include the DO and all miners whose exposure is being controlled through the use of PAPRs or verifiable administrative controls.

Since MSHA's inspections are unannounced, the primary objective is to assess the respirable dust conditions to which miners are exposed under the operating conditions in effect at the time of sampling (*i.e.*, production level, air quantities and velocities, *etc.*). All respirable dust samples collected will be considered valid, unless voided by MSHA for other reasons, such as a malfunctioning pump. Because the primary purposes are to measure the quality of the mine air miners breathe and to evaluate the operating conditions on a particular shift, the Agency believes there is no reason to invalidate any sample if a certain level of production is not attained as under the previous sampling procedures. Compliance sampling results, however, will provide MSHA personnel with sufficient information to make a sound engineering judgement about the effectiveness of the dust control parameters in use.

Also, since the purpose of this sampling is not intended to evaluate plan effectiveness, the term ''full shift'' for purposes of compliance and

abatement sampling will continue to mean the entire work shift including travel time but excluding any time in excess of 480 minutes. This is different from the definition of ''full shift'' that is proposed for verification sampling. For purposes of verification sampling, ''full shift'' would mean an entire work shift during which material is produced by a MMU. MSHA solicits comments on whether full shift for compliance sampling should be defined in the same way as for verification sampling.

MSHA is proposing to continue the current policy of sampling outby locations only once per year. The historical data that has been collected by MSHA personnel at outby locations confirms our belief that, if the working sections are in compliance with the applicable dust standard and if controls are in place at outby dust generating locations, workers throughout the mine are being protected from overexposure. MSHA personnel will continue to sample each DA located outby the section dump point on a production shift and any other dust-generating sources that can be sampled concurrently with the DA.

MSHA will issue a citation for noncompliance when a valid single sample measurement, expressed as an equivalent dust concentration, meets or exceeds the Citation Threshold Value (CTV) corresponding to the applicable dust standard in effect.

The current CTVs are contained in Table 70.2 of this proposed rule. The CTVs and an explanation of how they were derived was originally published in the **Federal Register** notice of February 3, 1998 (63 FR 5687), entitled ''Coal Mine Respirable Dust Standard Noncompliance Determinations.'' As explained in that notice and in Appendix ''C'' of the current notice of proposed rulemaking, each CTV is calculated so that citations are issued only when a single-shift measurement demonstrates noncompliance at least at a 95 percent confidence level.

Noncompliance determinations based on single-shift measurements will reduce the chances for failure to cite cases of noncompliance. According to the federal sampling inspections conducted in 1995, only 132 MMUs were found to be in violation of the applicable dust standard. These MMUs were cited under the existing enforcement policy of measurement averaging, compared to 545 MMUs that would have been citable using single sample measurements in combination with the CTV table. This clearly demonstrates that the new enforcement strategy will not compromise miners' health, instead it would have identified 413 additional instances of overexposure. Otherwise, these overexposures would continue to go uncorrected under the previous policy of measurement averaging.

Many commenters believed that miners would receive greater protection if MSHA cited for noncompliance whenever any single-shift measurement exceeded the applicable dust standard. MSHA has carefully considered, but rejected this suggestion. Such citations may not be sustained with a sufficient degree of confidence for enforcement action. If the mine environment is sufficiently controlled, the likelihood that a particular measurement exceeds the applicable dust standard, but not the CTV, due to measurement error, can actually exceed the likelihood that the measurement exceeds the standard due to excessive dust concentration. A thorough technical discussion of this issue is provided at 63 FR 5709–5712 (Appendix D of the **Federal Register** notice cited above) and is incorporated into this notice by reference. Basing noncompliance determinations on a single sample measurement, in conjunction with the CTV table, will improve working conditions for miners.

Many commenters contended that a policy of citing in accordance with the CTV table, rather than citing whenever a measurement exceeds the applicable dust standard, would effectively increase the allowable dust concentration limit. These commenters expressed concern that MSHA was raising the applicable dust standard when it proposed to cite violations only when the measurement demonstrated noncompliance at a high level of confidence.

The CTVs do not raise the applicable dust standard. Instead, MSHA must ensure a sufficiently high level of confidence in noncompliance determinations to withstand a legal challenge. For those MMUs with measurements above the applicable dust standard but below the CTV, MSHA will thoroughly review their dust control parameters. Special emphasis will be directed to working environments required to comply with standards below 2.0 mg/m^3. As a result of such reviews MSHA may initiate additional sampling.

The Secretary has concluded that using single sample measurements for noncompliance determinations in accordance with the CTV table neither increases nor decreases the applicable dust standard. Operators are required to maintain compliance with the applicable dust standard at all times. Dust controls must be verified as adequate to maintain dust concentrations at or below the applicable dust standard on all shifts, not merely at or below the CTV. If a measurement exceeds the applicable dust standard by an amount insufficient to warrant citation—that is, the level does not meet or exceed the CTV—MSHA will target that mine or area for additional sampling to ensure that dust controls are adequate.

(b) Abatement Sampling

Under this proposed rule, MSHA would also assume responsibility for all abatement sampling. As recommended by the Dust Advisory Committee, MSHA would utilize single samples to demonstrate abatement. Since the criteria under which the effectiveness of ventilation plans are required to be verified are significantly more stringent than those for compliance sampling, MSHA does not anticipate issuing many citations to MMUs and sectional DAs.

When a mine operator is cited for violation of the applicable dust standard, MSHA will require that approved respiratory equipment be made available to the affected miners in accordance with existing § 70.300 of this part. The mine operator also will be required to review the dust control practices to identify the cause of the excessive dust concentration and correct any deficiencies within the abatement period fixed in the citation.

The mine operator must notify the district manager of the corrective measures taken within 24 hours of implementation to enable MSHA to determine whether abatement or verification sampling should be scheduled. This determination will be based on the review of the information the mine operator provides and the latest inspection reports documenting the measured quantities of the dust control parameters that were in use at the time the citation was issued.

If it is determined that the existing dust control parameters are likely to be adequate to maintain compliance, the district manager will initiate abatement sampling under § 70.218. For example, if the operator believes that the overexposure was caused by improper work practices, the proper course of action would be to review these work practices with the affected miners rather than requiring the operator to upgrade the engineering or environmental controls. Since there was no need to change the plan parameters, MSHA would initiate abatement sampling in this particular case.

If, on the other hand, the district manager determines that the dust control parameters may not maintain respirable dust levels at or below the

applicable dust standard, the mine operator will be notified to revise the dust-control portion of the mine ventilation plan as specified in this Part.

When MSHA samples a MMU for abatement purposes, single samples will be collected from the working environment of the cited occupation and, if available, four other occupations that will include the DO. Like compliance sampling, abatement sampling will be conducted portal to portal, for the entire shift or 8 hours, which ever is less.

When sampling DAs and outby occupations, MSHA will collect a similar single-shift abatement sample from the environment of the cited DA or occupation.

A citation for excessive dust will be terminated when all valid abatement samples collected are at or below the applicable dust standard. The subsequent action form will clearly and fully describe the action taken to abate the violation. Mine operators may be required to revise the ventilation plan in accordance with § 75.370(a)(2) of this title depending on the type of corrective measures taken to abate the violation. This includes, at a minimum, the actual dust control parameters that were in effect when MSHA sampled.

If the district manager requires the mine operator to initiate the plan verification process under § 70.206 of this part instead of abatement sampling, the citation for excessive dust will be terminated after a revised plan has been verified to be effective for the current mining conditions.

(c) Operator Verification Sampling and Quarterly Sampling

Mine operators are required, under this proposed rule, to verify, through sampling, the effectiveness of the dust control parameters for each MMU prior to receiving MSHA approval of the mine ventilation plan. In addition, certain mine operators must sample quarterly each DO, any occupation required to wear a PAPR or using administrative controls, and any other occupation designated by the district manager. The purpose of the quarterly sampling is to evaluate the continued effectiveness of the approved dust control parameters. These provisions are discussed elsewhere in this proposed rule.

(d) Advantages of MSHA Compliance Sampling Over the Existing Program

Under section 101(a)(9) of the Mine Act, no health standard promulgated under the Act shall reduce the protection afforded miners by an existing mandatory health standard. The joint promulgation of this proposed rule and the proposed single sample rule, would provide protection to miners from the debilitating effects of occupational respiratory disease by limiting their exposures to respirable coal mine dust and quartz dust on every shift:

- Providing and maintaining a work environment free of excessive levels of respirable dust is essential for long-term health protection. While monitoring of the work environment provides an indication of how effective the existing dust control measures are, monitoring alone does not control dust levels. Requiring mine operators to implement and maintain dust control parameters which have been determined effective under typical mining conditions, will provide reasonable assurance that no miner will be overexposed on individual shifts.
- Implementing single-shift sample determinations will more likely detect excessive dust concentrations and thus protect miners. Averaging samples taken on multiple shifts can mask overexposures on individual shifts. Although fewer shifts will be sampled under this proposed rule, MSHA believes the revised sampling methodology will provide a more accurate representation of dust conditions to which miners are exposed.
- Under the existing operator sampling program, only the DO is sampled. Under the new sampling program, MSHA will sample multiple occupations on the same shift. As a result, MSHA will make several times as many compliance determinations as under the previous operator and MSHA sampling programs combined, providing a more comprehensive assessment of dust conditions to which miners are exposed.
- Since MSHA will be conducting all compliance sampling, the Agency will be able to monitor the dust control parameters and work practices in effect during sampling. This will enable MSHA to determine the effectiveness of the mine operator's dust control program.
- Unlike the current sampling program, which allows operators' control over when to sample and under what operating conditions, MSHA's visits for compliance sampling will be unannounced. As a result, all phases of the mining cycle are likely to be sampled eventually (*i.e.*, construction activity, longwall start-up, turning crosscuts, *etc.*), and samples should be more representative of typical mining conditions.
- The miners' representative will have walkaround rights during all MSHA sampling, thereby increasing miners' confidence in the dust sampling program.

B. Procedures for Setting the Applicable Dust Standard When Quartz Is Present

1. Proposed Procedures

Consistent with MSHA's proposed rule to assume full responsibility for compliance sampling, the Agency also proposes to rely only on MSHA samples, *i.e.*, compliance or abatement samples, as the basis for setting the applicable dust standard when quartz is present. As discussed below, while today's proposed rule would reduce the burden and cost on mine operators to take and submit optional samples, it would not diminish the advantages afforded operators under the current program. In particular, it continues to consider temporal variability associated with quartz determinations by averaging three MSHA samples collected on different shifts.

MSHA believes that results under this revised process will be more representative of the quartz levels to which miners are exposed. Unlike the current process, which may cause a standard to be set based on the quartz content of an individual MSHA sample, three valid MSHA samples would be used to set a reduced standard under the revised procedures (64 FR 65671).[5] Since, under the rules being proposed today, MSHA intends to frequently sample underground mines and surface mines, MSHA personnel will have no difficulty in collecting the required number of samples to arrive at the average quartz percentage. If initial sampling shows that miners may be exposed to excessive levels of quartz, MSHA intends to sample at a greater frequency to ensure that miners are being protected. This level of sampling should also allay any operator concerns regarding the collection of ''misleadingly high'' samples during atypical periods. MSHA also intends to begin reporting quartz levels to the nearest tenth of a percent. This will be more protective for the miner than the current truncation of results to a full percentage point.

Under the revised procedures, when an MSHA sample contains more than five percent quartz, the agency will average the percent of quartz present in three most recent MSHA respirable coal mine dust samples to set the applicable

[5] Unlike MSHA's objective in compliance sampling, the objective in measuring quartz content is to establish a reduced standard that will apply to all shifts. This enables an operator to design a ventilation plan that will be protective on every shift. Therefore, it is appropriate to estimate the quartz content by averaging quartz measurements obtained over an extended time period.

dust standard. If a MMU, DA, Designated Work Position (DWP) at an underground mine, or Part 90 miner is already on a reduced standard, a new applicable dust standard will be established by averaging the results of the first two MSHA samples, taken under the revised procedures, with the quartz percentage associated with the reduced standard in effect. If fewer than two MSHA samples are taken, the existing reduced standard will continue to remain in effect.

Assume a MMU is on a 1.0 mg/m^3 standard (10 percent quartz). If the first MSHA sample contains 7.2 percent of quartz, the existing standard of 1.0 mg/m^3 would continue to remain in effect. If, however, the next sample contains 16.1 percent, the average quartz percentage would be 11.1 percent [(10.0% + 7.2% + 16.1%) 3 = 11.1%], resulting in a 0.9 mg/m^3-standard (10 11.1% = 0.9 mg/m^3). For any MMU, DA, DWP, or Part 90 miner not on a reduced standard, MSHA will collect and analyze three samples for quartz to determine if a reduced standard is warranted.

Under the revised procedures, if the newly-established standard is lower than the one in effect, the new standard will become effective seven days after the date of the notice informing the mine operator of the change in the applicable dust standard. However, if it is higher than the current standard, the newly-established applicable dust standard will become effective on the date of the notice.

As published elsewhere in today's **Federal Register**, MSHA is proposing to take enforcement actions on the basis of single-shift sample measurements. For entities on reduced standards, MSHA would delay enforcement action until the sample is analyzed for quartz. If an exposure measurement significantly exceeds the existing standard and the quartz content of that sample would cause the standard to be lowered below the existing reduced standard, the operator will be cited for violation of the applicable dust standard currently in effect. On the other hand, if the quartz content of the sample would cause the applicable dust standard and the corresponding citation threshold value (CTV) to increase so that the single-shift sample measurement would no longer indicate noncompliance, no citation will be issued. This is illustrated by way of the following example.

For example, suppose that the MMU is on a 1.3 mg/m^3 standard and a single-shift sample measurement of 1.6 mg/m^3 is obtained. Since this measurement exceeds the CTV value, the operator is in violation of the standard. However, analysis of the DO sample shows that the sample contained 5.6 percent quartz which, if averaged with the previous two MSHA quartz levels, would result in a 1.7-mg/m^3 standard. This indicates that the quartz level in the environment of the DO has changed, indicating that the current standard is no longer valid. Therefore, since the original measurement of 1.6 mg/m^3 is less than the 1.7-mg/m^3 standard that could have been in effect for the shift sampled, a citation would not be issued.

Since MSHA samples are viewed to be more representative of the respirable dust concentration to which miners are exposed, MSHA is proposing to revise section 70.101 to clarify that the Secretary will determine the quartz level by sampling. Operator samples would no longer be submitted to determine the applicable dust standard. It is our belief that the procedures being proposed today for setting reduced standards will be more protective for the miners than those in effect at this time. The revised approach provides for stringent monitoring of miners' exposure to quartz which is consistent with the Dust Advisory Committee's recommendation that MSHA increase surveillance and reduce exposure to this serious health hazard.

As under the current program, if operating conditions change following establishment of a lowered applicable dust standard and affect the level of quartz in the working environment, MSHA intends that mine operators or miners' representatives will be able to request MSHA to conduct a quartz reevaluation.

2. *Validity of Averaging Percentages*

The average quartz percentage that MSHA intends to use to set the applicable dust standard for a particular sampling location or area of a mine would be determined in accordance with accepted mathematical procedures for arriving at an average value from a set of values (*i.e.*, adding together the individual quartz percentages and dividing by the number of analyses that are in the set). MSHA believes that this is the most appropriate method to use.

One commenter who responded to a draft 1999 program policy letter (November 23, 1999, 64 FR 65671) concerning this issue contended that MSHA's approach of arriving at the average quartz percentage was mathematically incorrect. This commenter recommended that, to more accurately reflect the true quartz concentration, the average quartz percentage be calculated by dividing total mass of quartz in micrograms by the total mass of dust collected (based on three samples in the example submitted). In the commenter's example, the average percentage obtained using MSHA's proposed averaging method was larger than that obtained using the commenter's approach.

The following two scenarios in Table III–1 clearly demonstrate that MSHA's intended averaging method does not always result in a larger average quartz percentage value.

Scenario I			Scenario II		
Dust Mass	SiO_2 Mass	% SiO_2	Dust Mass	SiO_2 Mass	% SiO_2
1.7	0.136	8.0	1.7	0.17	10.0
1.0	0.04	4.0	1.0	0.08	8.0
2.5	0.3	12.0	2.5	0.15	6.0
MSHA's Method	Average of % SiO_2 = 8.0		MSHA's Method	Average of % SiO_2 = 8.0	
Commenter's Method	$\frac{\text{Sum } (SiO_2 \text{ Mass})}{\text{Sum (Dust Mass)}}$ = 9.2%		Commenter's Method	$\frac{\text{Sum } (SiO_2 \text{ Mass})}{\text{Sum (Dust Mass)}}$ = 7.7%	

These examples show that for situations where MSHA would have determined a quartz percentage of 8.0 percent, the commenter's method would yield 9.2 percent in one case and 7.7 percent in the other.

C. Respirable Dust Control Program for Underground Coal Mines

The primary focus of the underground coal mine respirable dust program is to limit the concentration of respirable dust to which miners are exposed in the work environment. To ensure that miners are not being exposed to excessive concentrations of respirable dust, current regulations require mine operators to:

- Design a mine ventilation plan that effectively controls respirable dust under typical mining conditions;
- Implement the plan's dust control parameters when approved by MSHA before commencing production;
- Maintain the dust control parameters specified in the approved plan and monitor their function and operation through required on-shift examinations; and
- Evaluate the effectiveness of dust control parameters with bimonthly samples in order to provide reasonable assurance that such parameters continue to function as intended.

In addition, each plan must be suitable to the conditions and mining system in use at the mine. These plans provide detailed requirements for the protection of miners by specifying engineering controls. These engineering controls may include:

- The quantity and the velocity of the air current used to ventilate the MMU;
- The number, type, and location of water sprays;
- The pressure and quantity of water delivered by the sprays; and
- Additional environmental controls, such as dust scrubbers or devices which collect mine air and filter out dust particles.

Plans also contain procedures for maintenance of dust control equipment used on the mining machine and roof bolter. Mine operators frequently do not describe all dust controls in use at the mine. If such information is not included in the plan, it is impossible for MSHA to enforce those provisions or to determine if the ventilation plan provisions as approved are adequate to protect miners from overexposure.

When an operator submits a proposed mine ventilation plan or revision in accordance with § 75.370, the MSHA district office reviews it for completeness and adequacy. The district manager will approve the plan if it meets MSHA requirements, and he or she is confident that the dust control parameters specified will have a reasonable likelihood of maintaining dust concentrations within the allowable limits. Most proposed plans or revisions are approved immediately, or tentatively approved, based on engineering judgement, or experience, or both, until they are assessed by MSHA sampling or, to a lesser extent and only under certain circumstances, by mine operator bimonthly sampling. Generally, MSHA takes samples within 60 days of plan approval. Current regulations prohibit a mine operator from initiating any mining activity without an approved ventilation plan. MSHA allows operators to commence mining by granting tentative approval. However, under the existing process, plans may be implemented which are later determined to be inadequate under typical mining conditions.

1. Proposed Procedures for Evaluating, Approving, and Monitoring Ventilation Plan Requirements

The dust control portion of the mine ventilation plan is the key element of an operator's strategy to control respirable dust in the work environment, thereby protecting miners. In recognition of this, MSHA is proposing to make a number of changes to the process for evaluating, approving, and monitoring mine ventilation plans, many of which are based on the Dust Advisory Committee's recommendations. These are addressed in detail under proposed §§ 70.201 through 70.220 of the preamble.

Consistent with the Dust Advisory Committee recommendations, MSHA is proposing to add provisions to verify the effectiveness of the ventilation plan in controlling dust, at a production level which will demonstrate the plan's effectiveness under typical operating conditions. Dust control parameters and production associated with samples on a given shift would be recorded in order to demonstrate that parameters specified in the ventilation plan continue to be effective in controlling respirable dust.

This proposed rule requires a ventilation plan to include all engineering or environmental controls necessary for maintaining dust concentrations at acceptable levels. A plan must also include any specific work practices or other means used to supplement these controls in order to minimize the dust exposure of individual miners. Unlike plans under the existing program, mine operators will have to identify all measures necessary for achieving continuous

compliance with the applicable dust standard in the plan.

MSHA would require mine operators to include information on the length of each normal production shift in § 75.371(f) and to specify the VPL, as defined in § 70.2, in every ventilation plan. The VPL is the tenth highest production level recorded in the most recent 30 production shifts. This value will represent the minimum production level at which effectiveness of the plan must be demonstrated.

MSHA believes that the current production criteria used to evaluate plan effectiveness may not adequately represent typical conditions under which miners work. Requiring that plans be verified at or above the VPL will provide assurance that excessive dust concentrations will be avoided, even on shifts with higher-than-average production. This is far more protective of miners than the current practice of evaluating plan adequacy based on MSHA samples taken when production can be as low as 60 percent of the average production.

Some commenters on the earlier proposed rule expressed confusion about the relative magnitude of the VPL, compared to average production or other possible production criteria. Figure 1 shows a typical distribution of 30 shift production levels recorded at a longwall MMU. As illustrated by this example, the VPL, defined as the 10th highest production achieved during 30 shifts, generally exceeds the average production by a substantial amount.

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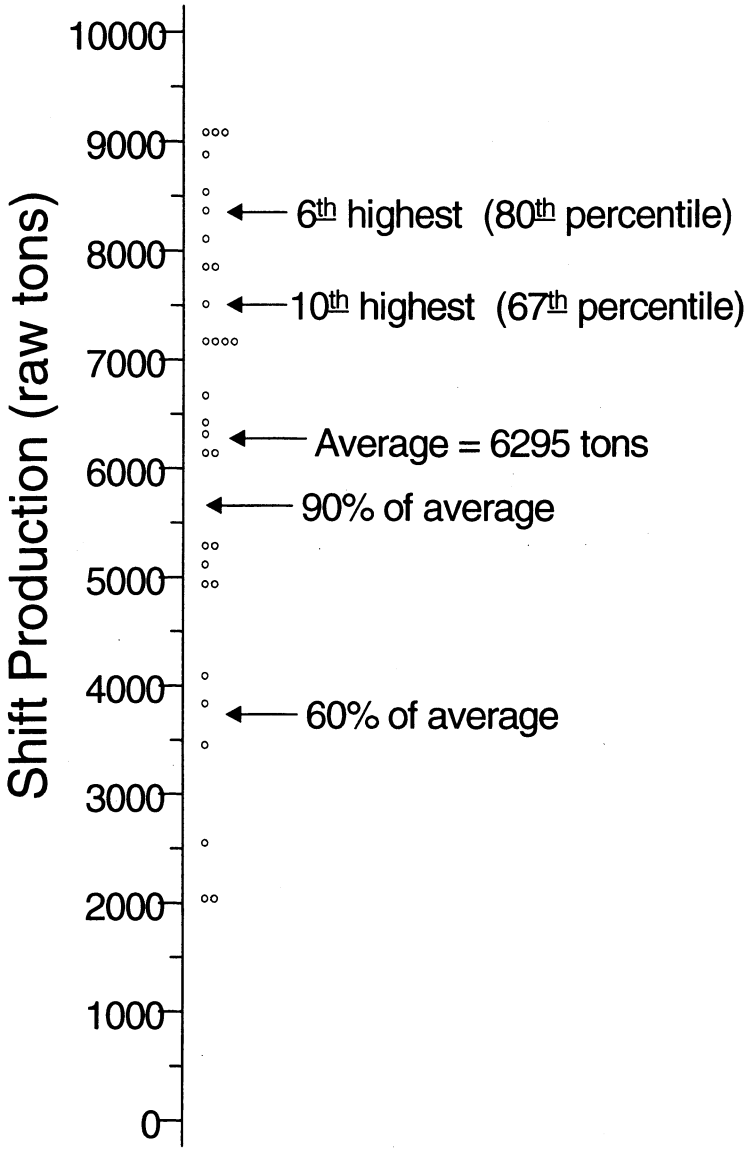

Figure 1. Example of a typical distribution of 30 shift production levels achieved at a longwall MMU.

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MSHA proposes to require mine operators to maintain records of the amount of material produced by each MMU during each shift. This will enable operators to establish the VPL. Because verification of a plan's effectiveness is conditioned on the VPL, these records are necessary to ensure that the VPL continues to represent typical production levels. Although a VPL must be included in the ventilation plan, MSHA will not cite mine operators for producing at levels exceeding the VPL.

MSHA considers the VPL to be a plan design criteria, not a minimum plan parameter that must be in effect on every shift. The Agency would expect production on a MMU to exceed the VPL on about 33 percent of all production shifts. If the district manager determines that an operator's actual production exceeds the VPL on more than 33 percent of the production shifts over a six-month period and the operator or MSHA samples exceed the applicable standard, the district manager may require that the adequacy of the plan parameters be verified under

different operating conditions of production.

Under the proposed plan verification procedures, mine operators will be required to verify through sampling the effectiveness of the dust controls specified in the ventilation plan prior to approval of that plan by the district manager. Sampling would occur when production is at or above the VPL specified in the plan and using only those control parameters and other measures listed in the plan. The sampling pumps must be turned on upon arrival on the MMU and remain operational during the entire production shift. The pumps must be turned off upon leaving the MMU. Samples would be collected on multiple occupations which are specified in proposed § 70.206. All verification samples must be transmitted to MSHA. However, no citations would be issued to mine operators if the verification sample results show that the applicable dust standard has been exceeded. Operators would be cited only if they fail to take steps to determine the cause and take corrective action to eliminate the overexposure. The agency would approve a plan only when a sufficient number of verification samples demonstrate, at a high level of confidence, that the plan is effective at production levels at or above the VPL.

Unlike the existing program, this proposed rule would allow certain longwall and other operations to use either approved PAPRs, administrative controls, or both, to supplement engineering or environmental controls if the mine operator is unable to verify the ventilation plan. This will be permitted only after the Administrator for Coal Mine Safety and Health determines that the operator has exhausted all feasible engineering or environmental controls. District managers also may allow mine operators to use PAPRs to achieve compliance with the applicable dust standard when unusual operating conditions are encountered briefly and intermittently and the operator believes that the approved plan parameters will not adequately protect all miners from overexposure. The period of time when PAPRs may be used cannot exceed 30 calendar days under this proposed rule. An example of when such approval may be granted is when an operator periodically must mine through rock strata with high quartz content.

Finally, under this proposed rule, mine operators also would be required to sample each DO and occupation using PAPRs or administrative controls at least once every three months to evaluate the continued adequacy of the approved plan parameters. As with verification samples, operators would only be cited if they fail to take corrective action to eliminate any overexposure identified through such sampling.

D. Hierarchy of Dust Controls

1. Primacy of Engineering Controls

Consistent with the Mine Act, engineering or environmental controls have been the principal method used for preventing or minimizing miners' exposure to both primary and secondary dust sources in the workplace over the past 30 years. Engineering controls that are able to manage the amount of dust throughout the work environment give reasonable assurance that all miners in the area will be adequately protected. Well-designed engineering or environmental controls provide consistent and reliable protection to all workers because they are not dependent upon constant human supervision or intervention, except for the periodic checks, to ensure that they are functioning as intended. Under this proposed rule, operators would be required to utilize, on each production shift, all engineering or environmental controls as specified in their mine ventilation plans. These controls will maintain concentrations of respirable dust in the work environment of MMUs at or below the applicable dust standard. Engineering or environmental controls include all methods that control the level of respirable dust by reducing dust generation (*e.g.*, machine parameters) or by suppressing (*e.g.*, water sprays, wetting agents, foams, water infusion, etc.), diluting (*e.g.*, ventilation), capturing (*e.g.*, dust collectors), or diverting (*e.g.*, shearer clearer, passive barriers, etc.) the dust being generated by the mining process.

The importance of using engineering or environmental controls was recognized by the Dust Advisory Committee and by NIOSH in *Occupational Exposure to Respirable Coal Mine Dust* (NIOSH, 1995). NIOSH recommended that such controls must continue to be relied upon as the primary means of protecting coal miners. The primacy of engineering or environmental controls would be preserved under this proposed rule. The proposed rule requires a mine operator to utilize all feasible engineering or environmental controls, specified in the approved ventilation plan, to reduce concentrations of respirable dust to a level at or below the applicable dust standard.

2. Administrative Controls

Administrative controls are another method of avoiding overexposure. Administrative controls refer to work practices that reduce a miner's daily exposure to respirable dust hazards by altering the way in which work is performed. They consist of such actions as rotation of miners to areas having lower dust concentrations, rescheduling of tasks, and modifying work activities. The Task Group found that administrative controls were used increasingly, even when it was feasible to implement additional engineering or environmental controls. The use of administrative controls was found to be increasing at mines employing longwall mining systems.

The most frequent administrative control in use consisted of restricting the activities of miners required to work downwind of the longwall shearer operator, the occupation designated as 044 by MSHA. This particular form of administrative control was in use at some of the 51 longwall MMUs that were operating on October 28, 1999. MSHA has observed the use of this particular administrative control, even after changing the location of the DO from the 044 to the 060 occupation—the miner who works nearest the return air-side of the longwall working face. Unlike engineering or environmental controls, to be effective, administrative controls rely on the ability of miners to follow specified procedures. However, difficulty in ensuring that miners adhere to the administrative controls, labor/management agreements, and limitations on the number of qualified miners capable of handling specific tasks may limit the use and effectiveness of such controls.

The Dust Advisory Committee Report stated that the use of administrative controls does not reduce the operator's responsibility to maintain ambient dust levels in active workings at or below the applicable dust standard. However, the Dust Advisory Committee noted that ''while not a substitute for engineering controls, administrative controls, which restrict the amount of time that miners spend in an area with uniform exposure level, can result in lower personal exposures (MSHA, 1996).''

3. Limitations of Engineering Controls

It is MSHA's position that technology is generally available to control respirable dust to, or below, the applicable dust standard at MMUs employing continuous and conventional methods of mining. However, where unusual or adverse conditions are encountered it is possible that available

controls may be inadequate to continuously protect all miners from overexposure. This is most likely to occur in areas where high levels of quartz are encountered that may result in the setting of lowered standards on a MMU.

However, MSHA recognizes that, unlike other mining systems, longwall MMUs may have acute dust problems. These problems can be caused by the face-ventilation airstream carrying the shearer-generated dust over the miners working along the face downwind of the longwall shearer operator (occupation code 044). This makes it more difficult to control the work environment downwind of the longwall shearer operator on a consistent basis.

Improvements in dust control technology have not kept pace with increases in production technology associated with high-production longwall MMUs. Average longwall shift production reported during bimonthly sampling has increased more than six-fold since 1980, from approximately 890 tons per shift (tps) to 5,500 tps in 2002. In fact, 49 percent of the shifts sampled averaged 4,000 to 8,000 tps, while approximately 8 percent of the shifts exceeded 8,000 tps. A major milestone in mining production was achieved in 1997 when a single longwall mine produced more than 1 million tons of coal in a single month (Fiscor, 1998).

Unfortunately, as more coal is mined, greater quantities of respirable dust are generated. The increase in longwall production levels has resulted in the generation of far more dust which must be controlled (Webster, *et al.,* 1990; Haney, *et al.,* 1993; O'Green, 1994). According to published literature, several thousand milligrams of respirable dust per ton of coal cut can be formed and liberated during the cutting process (National Research Council, 1980). Of course, the quantity of respirable dust produced by the cutting process can vary greatly, depending on the type of coal, its moisture content, the amount of rock bands in the coal, sharpness of the cutting bits, the particular mining machine, and many other factors. Although a considerable amount of respirable dust is formed by the cutting operation, not all of it becomes airborne. Nevertheless, given the amount of dust that is produced per ton of coal mined, a larger quantity of respirable dust would be generated and released to the mine environment from cutting 8,000 tons of coal than from cutting 4,000 tons. Currently, an operator is not required to produce, on a sampled shift, more than 50 percent of the average production reported during the last bimonthly sampling period. Therefore, dust concentrations on sampled shifts may be substantially lower than what is typical on nonsampled shifts.

While significant efforts have been made to implement available control technology, no significant new advancements in longwall dust control technology have been reported since 1989 (U.S. Bureau of Mines, undated). From 1989 to 2002 (Jan.–Sept.), the percentage of operators' longwall DO samples with concentrations of 2.1 mg/m^3 or higher dropped from 22 percent to 14 percent, reflecting the impact of implementing the pre-1990 advances in longwall control technology. Although this represents a significant improvement, especially in view of the six-fold increase in average shift production, the 2002 data suggests that miners continue to be overexposed on a significant number of shifts.

Over the past ten years, MSHA and the former U.S. Bureau of Mines, now part of NIOSH, have made unsuccessful efforts to conduct a joint research program that would evaluate the effectiveness of available longwall dust control technology. The objective of such research would have been to quantify the effects of employing all state-of-the-art dust control technology available for a longwall operation. Unfortunately, the two agencies have been unsuccessful in finding an industry partner to participate.

MSHA has worked with mine operators on an individual basis to determine the effectiveness and feasibility of existing and additional respirable dust controls on a particular longwall. However, the design and goals of those studies were neither intended nor sufficient to meet MSHA's broader research objective. Rather, the scope of those studies was to evaluate the effectiveness of control technology that both MSHA and the mine operator agreed were applicable to that one particular longwall MMU. The objective of the cooperative research program that MSHA and the Bureau of Mines were attempting to conduct, was to establish the combined efficiency of the various control technologies that the Bureau of Mines had developed through their ongoing dust control research program.

However, even though no such study has been conducted, based on our experience, MSHA's position remains that feasible engineering or environmental controls exist for maintaining dust exposures at or below the applicable dust standard, for most, if not at all longwall operations. MSHA believes that the plan verification provision contained in this proposed rule will foster further improvements in the design and quality of mine ventilation plans for longwall MMUs.

4. Respiratory Protection

While the Mine Act provides that operators ''make available'' approved respirators to miners during periods of noncompliance, when miners may be overexposed, the Act specifically prohibits using such devices as a substitute for environmental controls in the active workings of the mine. As previously discussed elsewhere in the preamble, this is because environmental or engineering controls are reliable, provide consistent levels of protection to large number of miners, allow for predictable performance levels, can be monitored continually and inexpensively, and can remove harmful levels of respirable coal mine dust from the workplace. MSHA recognizes that approved respirators, such as the powered air-purifying type (*e.g.,* Racal® Airstream helmet or air helmet),[6] can be effectively used as an interim method of protecting miners from respirable dust hazards when properly selected, used, and maintained. Although a respirator may achieve satisfactory air quality in the miner's breathing zone when used in a good respirator program, their use will not achieve the intent of the Act, which is to control the level of respirable coal mine dust in the mine atmosphere in the active workings at or below specific limits. Accordingly, consistent with the intent of the Act and general industrial hygiene practice, it has been MSHA's long-established practice to rely on the strict adherence to a hierarchy of controls that prefers engineering controls over dependence on supplementary control measures (*e.g.,* respirators, work practices or both) to achieve compliance with the applicable dust standard.

Nevertheless, the mining industry has urged MSHA over the years to accept the use of powered air-purifying respirators (PAPRs) or air helmets as an alternative method of complying with the applicable dust standard when engineering controls did not adequately control respirable exposure or were not feasible. Most recently, Energy West Mining Company (Energy West) petitioned the Secretary of Labor:

> [t]o amend the mandatory health standards for underground coal mines contained in the Secretary's regulations at 30 CFR part 70 in order to allow the use of airstream helmets or other types of powered air-purifying respirators (PAPRs) approved by the National Institute for Occupational Safety and Health (NIOSH) as a supplemental means of

[6] References to specific equipment, trade names or manufacturers does not imply endorsement by MSHA.

compliance with the respirable dust standards of subpart B of part 70. (Energy West, September 1997).

Energy West contended that PAPRs are necessary as a supplemental means of controlling respirable dust because even the most diligent application of feasible engineering or environmental controls could not always prevent overexposure. This proposed rule responds to Energy West's petition for rulemaking.

Although, as stated above and elsewhere in the preamble, the Agency does not believe that supplementary controls are as effective or as safe as engineering controls, MSHA believes, on balance, that under certain circumstances reliance upon the limited use of such measures is appropriate. Accordingly, MSHA is proposing 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. In these situations, the burden of proof of infeasibility is appropriately placed on the operator. Also, as provided for under proposed § 70.212, MSHA recognizes that the use of PAPRs as a supplementary control may be appropriate on an intermittent basis when unusual operating conditions are encountered that adversely impact the ability of the previously verified plan parameters to effectively control respirable dust under prevailing conditions. MSHA will permit the use of PAPRs for a period not exceeding 30 calendar days if the operator demonstrates that the particular circumstances that necessitate the use of PAPRs occur only intermittently and are beyond the control of the operator.

While the conditions under which MSHA would permit supplementary controls to be used introduces an added element of complexity to the proposed standard, the Agency believes that it will provide operators the flexibility to select the most appropriate option for supplementing the engineering controls which best meet the needs of the miners under the prevailing operating conditions.

MSHA believes that the use of these supplementary control measures, under the conditions of use set forth in the proposed rule, will enhance the level of health protection for miners by preventing overexposures on all shifts when engineering controls cannot achieve the necessary reduction to or below the applicable dust standard. The combination of engineering and supplementary controls will provide reliable and effective exposure control when used in accordance with the approved plan provisions. This proposed rule, which provides for expanded use of supplementary controls under limited circumstances to protect individual miners, is not a departure from the Agency's long-standing practice of relying on engineering controls to achieve compliance, since these measures would not be used as a substitute or replacement for engineering control measures in the active workings. Rather, it is a recognition that, in those limited instances where supplementary controls may be used, engineering controls alone may not protect some miners from overexposure.

a. Selection of Respirators: Powered Air-Purifying Respirators (PAPR)

By choice, underground coal miners wear various styles of respirators to protect themselves from exposure to respirable coal mine dust including: disposable filtering facepieces, tight-fitting elastomeric masks, and PAPRs. Currently, over 50 percent of the operating longwall mines have miners who have chosen to wear PAPRs (MSHA, Longwall Summary, January, 1999) for added protection.

The Racal® Airstream, or air helmet as referred to by miners, is a type of loose-fitting PAPR which has long been the respirator of choice in underground coal mines. Due to the weight of the device, its use has generally been limited to mines with coal seam heights exceeding six feet. The functional and physical characteristics of air helmets, as described below, make them especially well-suited to underground coal mining conditions. Accordingly, MSHA has chosen PAPRs as the type of respirator to be used when such devices are approved under this proposed rule.

The air helmet has been in use in underground coal mines since the late 1970s. Developed primarily for mining use by the Safety in Mines Research Establishment (SMRE) in England, this respirator combines face, head, and respiratory protection in a single convenient unit. The support hardware, which provides the filtered air, is enclosed within the air helmet. Power for the system is provided by a belt-mounted battery. Mine air enters the helmet through a rear entrance port, passes through a pre-filter assembly that removes the coarse material, and then passes through the fan and into a final-filter assembly that is located between the head of the wearer and the outer helmet shield. The filtered air then sweeps down across the wearer's face, behind the face-shield visor, imposing minimal breathing resistance, and exits at the chin. A partial seal between the visor (inlet covering) and the face is accomplished using a flexible medium which contours to the wearer's neck and face. The original air helmet has undergone numerous design improvements since it was first introduced in British coal mines. The unit is now produced by the Minnesota Mining and Manufacturing Company (3M) (3M™ Helmet-Mounted Airstream™ series).

Unlike other styles of PAPRs (*e.g.*, hoods) and negative pressure, tight-fitting respirators, the air helmet is better able to provide various types of required personal protective equipment in an efficient package. For example, in addition to protecting the lungs, the helmet and visor (the inlet covering) of a PAPR can simultaneously protect the face and head from high-velocity nuisance dust, spray, and small pieces of coal from the cutting drums and face. PAPRs do not require fit-testing, unlike tight-fitting respirators.

By definition, for PAPRs to be approved for use under this proposed rule, the visor must form a partial seal with the face, limiting entry of unfiltered mine air. Because this style of respirator does not have a tight-fitting facepiece, miners are not required to be clean shaven in order to wear this respirator correctly. MSHA's allowance of facial hair with this style of PAPR is also consistent with the Occupational Safety and Health Administration's (OSHA) regulation that facial hair prohibition applies only to tight-fitting respirators (29 CFR 1910.134 (g)(1)(i)(A) as discussed in 63 FR 1152). MSHA recognizes that there may be facial conditions which may prevent the proper fit of a PAPR. However, a well-designed respirator protection program should identify and address any extreme facial conditions, including excessive facial hair, which prevent the partial seal of the inlet covering and the face as intended, and thereby compromise the efficacy of the PAPR. For example, a miner could have exceptionally bushy sideburns which prevent the inlet covering from forming an appropriate partial seal with the face, and leave a significant gap between the inlet covering (visor) and chin. This situation would have to be rectified in order for the PAPR to be worn properly.

Greenough (1978) summarized limitations of other styles of respirators as follows:

[T]he objections to conventional face-mask respirators arise primarily from the mask being clamped to the wearer's face, often causing irritation and soreness: also the breathing resistance, though small, can affect the wearer's capacity to work over long

periods (Johnson, 1976). Speech is impeded and if the respirator harness fits under the wearer's safety helmet it is necessary to remove the helmet when replacing the respirator.

Greenough's description illustrates how other styles of respirators are less compatible with the other safety requirements for miners, as well as miners' comfort, and their need to communicate. It would be more difficult for a miner to perform his/her job effectively and communicate with fellow workers, wearing a tight-fitting respirator their entire work shift. Voice transmission through a tight-fitting respirator can be difficult, annoying and fatiguing. In addition, movement of the jaw in speaking can cause leakage, thereby reducing the efficiency of the respirator and decreasing the protection afforded the wearer. While voice communication is somewhat easier with a PAPR than with other respirator styles, the face shield is generally raised to communicate. Also skin irritation can result from wearing a tight-fitting respirator in hot, humid conditions. Tight-fitting respirators have straps which go across the crown and back of a miner's head which is under a miner's helmet (*i.e.*, hard hat). Because miners are required to wear hard hats *at all times* while in the mine (30 CFR 75.1720(d)), each time a miner needs to break the seal of a tight-fitting respirator, to eat, or to speak, or to relieve the discomfort of the seal, he/she would have to remove the hard hat. Similarly, each time a miner would need to put a tight-fitting respirator back on he/she would have to remove their hard hat. It should be noted that both tight-fitting elastomeric respirators and disposable facepieces, if worn correctly, would require the wearer to be clean shaven. A large proportion of miners have a tendency to wear facial hair, especially during the fall and winter season.

The unique qualities of the PAPR identified within this proposed rule are such that it could fall into either the helmet or loose-fitting facepiece categories. ANSI defines a loose-fitting PAPR with a helmet to be ''a hood that offers head protection against impact and penetration (ANSI, 1988).'' ANSI defines a loose-fitting PAPR with a loose-fitting facepiece as ''A respirator inlet covering that is designed to form a partial seal with the face, does not cover the neck and shoulders, and may offer head protection against impact and penetration (*Ibid.*).'' In this proposed rule, a powered air-purifying respirator (PAPR) is defined as an air-purifying respirator that uses a blower to force ambient air through the air-purifying elements to the inlet covering, which provides a partial seal with the face. This respirator must be approved by NIOSH under 42 CFR part 84 and by MSHA under 30 CFR 18 and offer head and face protection in compliance with 30 CFR 75.1720(a)and(d).

A current list of equipment, including PAPRs, approved under 30 CFR 18 can be obtained from MSHA's Approval and Certification Center on the internet at *http://www.msha.gov/TECHSUPP/ACC/lists/18instrm.pdf.* A searchable index of approved respirators is available from NIOSH at *http://www2.cdc.gov/drds/cel/cel_form.asp.* As of 2002, the 3M Airstream Air-Purifying Helmet (MSHA Approval 2G–3143, originally issued to Racal 3/29/1979), was the only approved PAPR model suitable for use under this proposed rule.

b. PAPR Protection Program

In an underground coal mine, the degree of respiratory protection that a properly functioning PAPR will provide the wearer is a function of the type and condition of the air-purifying medium used to filter out the respirable dust particles from the mine air, the workplace environment (*i.e.*, nature and concentration of the respirable coal mine dust), the work activity of the wearer in that environment, how the wearer uses the device (*i.e.*, how often is the visor raised during the shift), and the care and maintenance of the PAPR's functional components and power source. These parameters are required to be addressed in the approved PAPR protection program (see example in Appendix B).

In 1998, to increase the efficiency of the filtering medium used in PAPRs, NIOSH began requiring PAPRs to be equipped with a high efficiency particulate air (HEPA) filter. This change introduced a denser medium to filter the air, providing an extra margin of safety at all levels of respirable coal mine and quartz dust exposure. However, as a result of this change, the PAPR's average airflow dropped from about 9 cubic feet per minute (cfm) to 7 (cfm). While the current airflow still exceeds the required minimum airflow of 6 cfm (42 CFR 84.1152(b)), the drop in airflow reduced the level of comfort the PAPR provides to the miner.

MSHA realizes that miners' comfort with a particular respirator is an important determinant to miners' proper use of it. Several previous commenters testified that PAPRs were not being used as approved.[7] Many of these examples related to reports that visors were fogging. These commenters attributed the fogging problem to NIOSH's recent (mid-1998) improvement in the filtering medium for PAPRs. One commenter testified:

> I would have to answer honestly and say they [PAPRs] are being used in a modified condition. Miners some, you know, have typically removed the shroud * * * [miners] raise the face piece to communicate and so on * * *. We've had that [fogging of the visor] problem recently, * * * since we've been required [by NIOSH] to use the new version of the filter [the HEPA filter]. There has been what seems to be reduced flow in the unit and that has also resulted in more fogging. And we've worked real hard to try to—[work] with 3–M to try to resolve that.

MSHA's experience has shown that fogging of PAPRs has been an intermittent problem since the introduction of PAPRs in underground mines. This is due to the inclement conditions of underground mining such as: High humidity, fluctuation in temperature, and physical exertion by miners.

Some miners indicated that they had to replace the HEPA filters with socks to increase the PAPR airflow. Using socks in lieu of required filters is unacceptable. This one example of PAPRs being used outside the manufacturer's recommendations and the requirements of an approved respiratory protection program. Various approved remedies are available to control fogging of visors including: intermittent wiping down of the visor, ''anti-fogging'' visors, application of anti-fogging sprays, and the use of a new visor design with an anti-fog impregnate baked directly into the visor. A properly functioning respiratory protection program would address this issue, with respect to the appropriate selection and maintenance of a respirator.

MSHA recognizes that for a PAPR protection program to be effective, the miner must be properly trained to wear the respirator, to know why the respirator is needed, and to understand the limitations of the respirator. Appendix B contains a model PAPR protection program to assist an operator in developing a mine-specific program in accordance with the provisions of the American National Standards Institute's ''Practices for Respiratory Protection ANSI Z88.2–1969'' as required by 30 CFR 72.710. Additionally, mine management must regularly conduct reviews to ensure continued effectiveness of the PAPR protection

[7] NIOSH requirements for PAPR performance, including airflow are specified in 42 CFR subpart kk. Although § 84.1136 specifies that facepieces, hoods, and helmets shall be designed and constructed to provide adequate vision which is not distorted by the eyepiece, NIOSH does not have requirements for a visor's predisposition to fogging.

program. Under this proposed rule an operator will not be permitted to use PAPRs as a supplementary control without an MSHA approved respiratory protection program which meets the requirements of § 72.710 and incorporates the information required by proposed § 70.210(a)(2).

c. PAPR Protection Factor

The degree of workplace respiratory protection provided to the wearer by a properly functioning PAPR when correctly worn and used depends on the unit's ability to prevent the contaminant from entering the wearer's breathing zone. In general, the protection factor (PF) expresses PAPR performance as the ratio of the respirable dust concentration outside the respirator facepiece to the concentration inside the facepiece. It reflects the effectiveness of a respirator used in conjunction with a good respirator protection program. For example, a PF of 4 means that the particular respirator will reduce the concentration of respirable dust actually breathed to one forth of the concentration outside the respirator.

In terms of worker health, there are various forms of the PF. One form is the assigned protection factor (APF). Terry Spear, *et al.*, 2000, defined an APF as follows:

> APF is a special application of the general protection factor concept, defined as a measure of the minimum nominal anticipated workplace level of respiratory protection that would be provided by a properly functioning respirator or class of respirators to a high percentage (usually 95% or more) of properly fitted and trained users * * *. The maximum specified use concentration for a respirator is generally determined by multiplying the exposure limit for the contaminant by the protection factor assigned to a specific class of respirator.

In the *NIOSH Respirator Decision Logic* (May 1987), based on simulated laboratory tests and some workplace protection tests (none of which replicated conditions in underground coal mines), NIOSH assigned, helmeted PAPRs, properly worn, a protection factor (APF) of 25. NIOSH made the following cautionary statement:

> Despite the fact that some of the PF's [APFs] have a statistical basis, they are still only estimates of the approximate level of protection. It must not be assumed that the numerical values of the APF's presented in this decision logic represent the absolute minimum level of protection that would be achieved for all workers in all jobs against all respiratory hazards. The industrial hygienist or other professional responsible for providing respiratory protection or evaluating respiratory protection programs is therefore encouraged to evaluate as accurately as possible the actual protection being provided by the respirator (NIOSH, May 1987).

Furthermore, in its *Guide to Industrial Respiratory Protection* (September 1987), published after the *NIOSH Respirator Decision Logic,* NIOSH offered an additional caution with regard to the effectiveness of PAPRs:

> Until recently, powered air-purifying respirators were considered positive pressure devices. Field studies by NIOSH as well as others, have indicated that these devices are not positive pressure, and that their assigned protection factors are inappropriately high. (NIOSH, September 1987).

There is virtually no positive pressure in the PAPR. Respirable dust may enter the miners' breathing zone through openings along the side and bottom of the visor, even when it is in the full lowered position. The extent to which respirable dust enters a miner's breathing zone, depends, in part, on the velocity of air provided to the MMU and on the miner's work rate and his or her angle of orientation to the airflow.

NIOSH recommended in their 1987 Respirator Decision Logic an APF of 25 for all loose-fitting hood or helmet PAPRs. However, the environmental conditions assumed in NIOSH's estimation of an APF for PAPRs are not consistent with those in underground longwall mining operations, where high air velocities for methane and dust control are common. Other, unique conditions of coal mining (obstructed views and difficulty communicating) will compel miners to lift their visors. Once the visor is raised, the respirator is no longer being worn in accordance with conditions required for an APF of 25.

The actual fit or seal of the respirator helmet to the wearer, repeated work-task motions in confined work spaces, raising the visor, and high air velocities along the longwall face all may significantly reduce the actual degree of respiratory protection provided in the workplace. Therefore, it is imperative that such factors be taken into account when estimating the degree of workplace respiratory protection a PAPR provides to the wearer.

According to Spear (2000) a workplace protection factor (WPF) is:

> [a] measure of the actual protection provided in the workplace under conditions of that workplace by a properly functioning respirator when correctly worn and used * * * samples [are] taken * * * while the respirator is being properly worn and used during normal work activities. In practice, the WPF is determined by measuring the concentration inside and outside the donned [worn] respirator during the activities of a normal workday.

An effective protection factor (EPF) is another form of estimate of efficacy of a respirator given its typical use. According to Spear (2000) an EPF is:

> [a] measure of the actual protection provided in the workplace under the conditions of that workplace by a properly functioning respirator, defined as the ratio of concentration outside to concentration inside * * * samples [are] taken * * * during normal work activities, while the respirator is being worn and not worn. Because concentration outside and concentration inside are measured during periods of use as well as during periods of non-use, EPFs are considered as estimates of the effectiveness of respirator use policies, rather than of intrinsic respirator performance capability.

A fourth type of protection factor, a program protection factor (PPF) was presented by 3M. In addition to the variables accounted for in an EPF, a PPF reflects factors affecting the respirator programs effectiveness including:

> * * * respirator selection, the respirator design, training, maintenance, storage, supervision, program administration and monitoring, and any other variable that affects program effectiveness. If any of these program elements are deficient, the program protection factor will be adversely affected.

An EPF is predicated upon proper fit and maintenance of a respirator, where a PPF is not. Unlike an APF or a WPF, an EPF reflects the degree of respiratory protection provided by a respirator over an actual work shift given specific occupational environmental conditions, such as the velocity of air provided to control methane and respirable dust, and the time when miners must raise their visors to speak or see, given that a miner performs typical work activities and uses the respirator in a typical manner. Based on MSHA experience and miners' testimony, it is not reasonable to expect underground coal miners to always wear the visor down. Due to this eventuality and MSHA's requirement for an approved respiratory protection program, an EPF study or studies, which reflect the conditions on longwall MMUs, such as high air velocities (*i.e.*, exceeding 800 feet per minute (fpm)), would provide suitable data for determining the effectiveness of PAPRs used there.

Although not specifically discussed in the 2000 proposed rule, MSHA had reviewed each of the more than one dozen protection factor studies submitted in Energy West's 1997 petition for rulemaking. The Agency also reviewed the additional relevant studies submitted by commenters in response to the previous proposed rule, as well as studies MSHA identified. A review of the literature identified the fundamental fact that effectiveness of

PAPRs in longwall mines is mediated by the high velocities of air customarily found there. Those velocities are not comparable to the air velocities experienced in most industry sectors nor in those represented in the studies used to determine the APF of 25, nor in the majority of studies submitted by Energy West in 1997.

The headgate and tailgate air velocities observed by MSHA at 55 longwall MMUs were reviewed in 1999. These velocities ranged from 365 to 1,645 fpm and from 200 to 1,400 fpm, respectively. More importantly, headgate velocities at 60 percent of the MMUs exceeded 500 FPM and some 18 percent exceeded 800 fpm. Approximately 55 percent of tailgate velocities exceeded 500 fpm and 11 percent exceeded 800 fpm.

Laboratory and in-mine studies (EPF studies) show that air velocity is the single biggest factor affecting the degree of respiratory protection provided by a PAPR. While important at longwall MMUs, air velocity does not significantly affect PAPR performance at non-longwall MMUs where the velocity of air provided to control methane and respirable dust is normally less than 100 fpm. There, the primary concern is the PAPR's ability to protect the miner from exposure to excessive quartz levels. Cecala, *et al.*, (1981) found protection of Racal® Airstream helmets to be inversely related to ambient air velocity in both laboratory and in-mine settings (Ibid). In other words, increased air velocity leads to decreased effectiveness of the PAPR.

The expected degree of workplace respiratory protection that would be provided by a properly functioning PAPR is also affected by the orientation of the helmet to the airflow. Cecala's wind tunnel tests clearly showed that, at the higher airflow rates, helmet efficiency was greatest when facing directly against the airflow and was reduced when the helmet was oriented in other directions. This is extremely important since miners are more likely to orient their heads at an angle to the airflow, or to face downwind, than to face directly into the airflow.

Cecala's in-mine testing of the PAPRs produced an EPF confirming the inverse relationship between air velocity and the level of protection provided by PAPRs shown during wind tunnel testing. Under air-velocity conditions less than 400 fpm, the Airstream helmet averaged a respirable dust reduction of 84 percent, which is equivalent to an EPF of 6.4. However, under higher air-velocity conditions (1,200 fpm), the helmet's dust reduction performance decreased significantly, averaging only 49 percent, which is equivalent to an EPF of 2. The higher face air-velocity conditions in this study best represent the higher velocities observed on longwalls. Today, the face air velocity in over 60 percent of the longwall MMUs exceed 500 fpm (MSHA, October 1999). Thus, it is critical to take into account the air velocity conditions when determining a PF for PAPRs used in underground coal mines.

Other researchers have reported that helmeted PAPR systems are vulnerable to inward leakage into the wearer's breathing zone (Howie, *et al.*, 1987; Sherwood, 1991). For example, Howie, *et al.*, found that increasing airflow velocities from approximately 400 to 800 fpm doubled the inward leakage of the helmet when the airflow impinged on the wearer's head only, and increased the leakage further when the airflow impinged on the wearer's body and head (Howie, 1987). Subsequent testing of a redesigned unit at a wind velocity of approximately 700 fpm showed decreased inward leakage, yielding a PF of 6.3. This met the target PF of 5, which was subsequently proposed by the European Community to be the standard for powered helmet respirators.

More recent studies conducted by Bhaskar, *et al.* (1994) at four western longwall MMUs indicated that, under these workplace conditions, PAPRs had an average dust reduction efficiency of 83.8 percent (*Ibid.*). Although a different sampling procedure was employed, this result is consistent with the performance (average value of 84 percent) obtained by Cecala, *et al.*, under air-velocity conditions less than 400 fpm. During the test period, Bhaskar reported headgate face velocities ranging from 345 to 500 fpm, with approximately 88 percent of the recorded velocities falling below 500 fpm. The tailgate face velocities ranged from 280 to 550 fpm and only one exceeded 500 fpm. None of these tests were conducted under face-velocity conditions that exceeded 800 fpm. As such, this study provides information on their effectiveness at lower velocity applications (*i.e.*, under 500 fpm).

In summary, there is consensus among studies that the effectiveness of the PAPR is reduced when air velocities are increased. The Cecala (1981) study alone, provided reasonable estimates of the degree of respiratory protection that PAPRs would provide to a wearer working on a longwall MMU where the face velocity exceeds 800 fpm. Consequently, this study provides the best data from which to estimate PAPR performance or the PF that should be assigned to PAPRs authorized for a particular MMU. As discussed elsewhere in this proposed rule, MSHA is proposing to allow the use of PAPRs only as a supplementary control measure after all feasible engineering controls have been applied to reduce exposure to the lowest possible level. In our view, these measures, when properly applied and maintained, will control respirable dust to a level reasonably near the applicable dust standard. Therefore, it would not be in the miner's best interest or necessary for compliance purposes to apply the highest PF suggested by these studies. Accordingly, MSHA is proposing that a PF factor of 4 be applied when using a PAPR under air velocity conditions of 400 fpm or less and a PF of 2 when the air velocity is equal or exceeds 800 fpm. This approach recognizes the increased level of respiratory protection that PAPRs afford at lower air velocities and, based on our engineering judgement, will allow operators to achieve compliance with the applicable dust standard on longwalls and other MMUs. Furthermore, the level of protection provided by a properly used PAPR will assure miners that they are being protected from overexposure.

For example, if the air velocity to be maintained in the headgate and tailgate of a longwall MMU ventilated head to tail is 400 fpm and 300 fpm, respectively, then PAPRs used there would be assigned a PF of 4. If on the other hand, the ventilation plan calls for 850 fpm to be maintained in the headgate location and 450 fpm in the tailgate location, then the applicable PF would equal 2. Because of the lack of data on PAPR performance under air-velocity conditions ranging between 400 fpm and 800 fpm, MSHA has proposed that, whenever plan velocities fall in that range, PAPRs used in the MMU be assigned a corresponding PF falling between 2 and 4 which would be determined using an interpolation formula [2 × (800/air velocity)]. For example, if the air velocity to be maintained in the headgate location is 700 fpm, then the applicable PF would equal 2.3 [2 × 800fpm/700fpm].

The following example is meant to illustrate the application of the PF to determine the dust concentration to which the wearer of a PAPR is expected to be exposed. Assume for purposes of the example that the applicable dust standard is 1.5 mg/m^3 and the airborne concentration of respirable dust is 2.6 mg/m^3. Therefore, using a PAPR with a PF =4 is expected to reduce the miner's exposure to 0.65 mg/m^3 (2.6 mg/m^3 4).

The range of PFs that MSHA will allow to be assigned to PAPRs under this proposed rule will provide a margin

of safety for the miner. However, regardless of the particular PF allowed by MSHA, full compliance with the provisions of the approved respiratory protection program is necessary to ensure that a PAPR's protective value is not compromised.

E. Guidelines for Determining What Is a Feasible Dust Control

This proposed rule requires a mine operator to implement all feasible engineering or environmental controls that are technologically and economically feasible to control respirable coal mine dust. The Federal Mine Safety and Health Review Commission (Commission) has addressed the issue of what MSHA must consider when determining what is a feasible control for enforcement purposes. In cases involving the noise standard for metal and nonmetal mines, the Commission has held that a control is feasible when it: (1) Reduces exposure, (2) is economically achievable, and (3) is technologically achievable. *See Secretary of Labor* v. *Callanan Industries, Inc.,* 5 FMSHRC 1900 (1983), and *Secretary of Labor* v. *A.H. Smith,* 6 FMSHRC 199 (1984).

In determining technological feasibility of an engineering control, the Commission has ruled that a control is deemed achievable if through reasonable application of existing products, devices, or work methods with human skills and abilities, a workable engineering control can be applied to the exposure source. The control does not have to be ''off-the-shelf'' or already available but, it must have a realistic basis in present technical capabilities. Further, the Commission has held that MSHA must assess whether the cost of the control is disproportionate to the ''expected benefits,'' and whether the cost is so great that it is irrational to require its use to achieve those results. The Commission has expressly stated that a cost-benefit analysis is unnecessary in order to determine whether an engineering control is feasible. According to the Commission, an engineering control may be feasible even though it fails to reduce the exposure to permissible levels in the standard, as long as there is a significant reduction in exposure.

Consistent with the Commission case law, MSHA would consider three factors in determining whether engineering or environmental controls are feasible at a particular mine: (1) The nature and extent of the overexposure; (2) the demonstrated effectiveness of available technology; and (3) whether the committed resources are disproportionate to the expected results. As explained in the discussion of § 70.209 in Section IV of this proposed rule, the formal determination of whether all feasible engineering or environmental controls have, in fact, been implemented at a specific mine to prevent excessive dust concentrations will be made by the Administrator for Coal Mine Safety and Health based on the best available information, experience, and engineering judgement.

F. Application of New Technology for Monitoring Coal Mine Dust Levels

Because of the ever changing mining environment, more timely feedback on current dust conditions in the workplace should enhance miner health protection from coal workers' pneumoconiosis (CWP) and silicosis. To obtain such feedback requires a type of dust monitoring instrument designed to directly measure on a continuous basis the amount of respirable coal mine dust that is present in the work environment. The availability of this information on a real-time basis would enable mine personnel to optimize mining procedures and dust control parameters when dust levels approach the applicable dust standard, thus averting possible overexposure. Knowing the actual dust levels during the shift would also empower the miner to be more directly involved in the dust control process to safeguard their health.

The current monitoring program, which has been in effect since 1970, lacks this capability. Samples results are not known by mine personnel until days after completion of sampling. If there is an overexposure, corrective action does not occur until the overexposure has been confirmed by the dust processing laboratory and communicated to the operator and MSHA. Consequently, any corrective action that may be taken would only impact exposures on subsequent shifts. Therefore, the ability to continuously monitor and display dust concentrations during the shift, rather than depend solely on periodic measurements under the existing program, has been a goal for nearly two decades. Recent advancements in personal dust monitoring technology make this goal achievable within the next two years, presenting opportunities to further improve miner health protection from disabling occupational lung disease.

The health benefits of continuous monitoring were recognized by both the Task Group and the Dust Advisory Committee. In 1992, the Task Group concluded that continuous monitoring of the mine environment and dust control parameters offered the best long-term solution for preventing occupational lung disease among coal miners. Similarly, the Dust Advisory Committee found that:

> Worker exposure to excessive levels of dust can be prevented by implementing a hazard surveillance program that provides mine personnel with current information on actual dust levels in the work environment at all times, and on the status of key dust control parameters.

The Dust Advisory Committee's final report issued in 1996 made the following recommendation with regard to continuous dust monitors:

> Once the technology for continuous dust monitors has been verified, these measures should be broadly applied in conjunction with other sampling methods for surveillance and determination of dust control at all MMUs and other locations at high risk of elevated dust exposure.

Over the past decade significant progress has been made as a result of the R&D efforts sponsored by the former U.S. Bureau of Mines in conjunction with MSHA. These efforts have advanced the technology for directly measuring and displaying the amount of respirable coal mine dust contained in mine air in real time, based on an inertial microweighing method called tapered element oscillating microbalance (TEOM®). The development and commercialization of this technology was pioneered by Rupprecht & Patashnick Co., Inc. (R&P).

A TEOM-based monitor consists of a filter mounted on the end of a hollow tapered tube. The other end of the tube is fixed rigidly to a base. The tube with the filter on the free end is oscillated at its natural frequency. This frequency depends on the physical characteristics of the hollow tube and the mass on its free end. Mine air is drawn through the filter that removes the respirable coal mine dust and then through the hollow tube. As more respirable dust particles are removed and deposited on the filter, the mass of the filter increases which causes the frequency of the tapered element to decrease. Because of the direct relationship between mass and frequency change, the amount of respirable coal mine dust deposited on the filter is determined by accurately measuring the frequency change. By combining the mass of dust and the known volume of air that was drawn through the filter during the period sampled yields a measurement of the respirable dust concentration.

While the capabilities of the TEOM method have been applied to a variety of particle monitoring applications, the first instrument designed specifically for mine use based on this technology was

a machine-mounted continuous respirable dust monitor (MMCRDM). In-mine testing of the prototype MMCRDM in the late 1990s demonstrated the capability of the TEOM system to produce dust measurements in a mining environment. However, because instrument accuracy could not be determined by in-mine testing and questions about the comparability of fixed-site versus personal sampling, NIOSH decided to discontinue final development of the MMCRDM.

In 1999, at the urging of labor and industry, NIOSH, in conjunction with MSHA, funded the development of a personal dust monitor (PDM) based on the TEOM technology used in the MMCRDM. The ability to miniaturize the TEOM dust sensor without compromising its performance made it possible in 2000 to develop the first PDM capable of directly measuring in real-time and displaying the concentration of respirable coal mine dust. The PDM–2, as it was called, was a two-piece unit consisting of a belt-mounted dust monitor battery/pump pack with a display and the TEOM dust sensor that was attached to the lapel like the standard sampling device in use today. Although laboratory and in-mine tests showed the PDM–2 to be dependable and capable of accurately measuring the amount of dust that accumulated on the filter, concern was expressed by miners about the size of the instrument. Specifically, miners believed that since they were already required to carry a cap-lamp battery and a self-contained self rescuer on their belt, there was no room for a separate dust monitor battery/pump pack. They also indicated that the TEOM dust sensor was too bulky, heavy and interfered with work activity. As a result of these concerns, further efforts to refine the PDM–2 were suspended by NIOSH.

In 2001, NIOSH contracted the development of a one-piece version of the PDM that would be less cumbersome to mine workers. Efforts to date have produced a belt-worn instrument (PDM–1) that contains the dust monitor and the miner's cap lamp battery in a single package. To improve wearer convenience and to simplify the monitor, the sample inlet for the instrument was moved from the traditional lapel location to the cap lamp of the hard hat. A pump mounted in the instrument transports the dust-laden air that enters the inlet to the instrument through a conductive silicone rubber tube that runs parallel to the lamp cord. Unlike the PDM–2 which employed a 10-mm Dorr-Oliver nylon cyclone used in the approved sampling device, the PDM–1 uses a Higgins-Dewell cyclone to separate the non-respirable dust. The redesigned cap-lamp battery pack contains all the components, including two separate batteries, to enable the instrument and cap lamp to be operated independently. To accommodate monitoring over an extended shift, the PDM–1 was designed to operate continuously for 12 hours.

The PDM–1 is designed to continuously measure dust levels on real-time basis and provide information on (1) the cumulative average dust exposure during the shift; (2) the current exposure level based on entire shift duration (projected end-of-shift exposure); and (3) the time-weighted average concentration (total mass of dust collect divided by the length of time the unit was operated) within 15 minutes after the end-of-shift. The unit is capable of being used either in a shift mode in which the instrument is programmed to operate for a specific shift length (*e.g.*, 8, 10, 12 hours) or in an engineering mode. When operated in the engineering mode, the miner could program periods during the shift to record dust levels during specific mining cycles or at specific dust-generation sources in the mine. The display on the instrument has various screens that show the (1) current time of day, (2) elapsed time since beginning of the shift, (3) total amount of dust accumulated on the filter since the start of sampling which is stored in an internal memory for analysis, (4) dust concentrations, and (5) a bar graph that shows the average dust concentration of the last 30 minutes. The PDM–1 is also capable of showing whether the instrument was bumped significantly or tipped beyond 90 degrees. This information will be stored along with information on the amount of dust that has accumulated on the filter and the concentration data which can be accessed with a personal computer at the end of the shift and analyzed. While the performance of the PDM–1 to accurately and precisely measure respirable coal mine dust in the mine environment and its durability under in-mine conditions has yet to be extensively evaluated, preliminary indications from the limited testing performed to date are that the PDM–1 has the potential to provide timely information on dust levels and miner exposure. Although MSHA has confidence in this technology, a final determination of the applicability and suitability of PDMs under the conditions of use being proposed is not expected until after completion of the scheduled laboratory and in-mine testing and evaluation at the end of 2003. Both NIOSH and MSHA recognize that to be accepted by the mining community, the PDM must reliably monitor respirable dust concentrations in the mine environment with sufficient accuracy to permit exposures to be effectively controlled on each shift.

Accordingly, as recommended by the Dust Advisory Committee and urged by the mining community, MSHA is encouraging deployment of personal continuous dust monitoring technology once verified as reliable under in-mine conditions by proposing a new standard for the use of such monitors as part of a comprehensive dust control program. As discussed under proposed § 70.220, operators would be permitted to use PDMs capable of continuously measuring and displaying dust levels during the shift in conjunction with engineering and administrative controls. Each miner would be required to wear such a device on each shift, unless the operator successfully demonstrated during verification sampling that the exposure of each miner working on the same shift is represented by sampling the DO and/or another occupation under administrative control. For additional specific details regarding the proposed application of PDM under this proposed rule refer to the discussion of § 70.220 in section IV of the preamble.

IV. Section-by-Section Discussion of Proposed Rule

A. Part 70

The following explains, section-by-section, each provision of the proposed rule. The text of the proposed rule is included at the end of the document.

Section 70.1 Scope

Under the proposed rule, the existing scope will remain the same. It sets forth mandatory health standards for each underground coal mine subject to the Federal Mine Safety and Health Act of 1977.

Section 70.2 Definitions

The technical terms that were developed for use in this part are defined in the proposed rule. These include ''citation threshold value,'' ''dust control parameters,'' and ''engineering or environmental controls.'' Some existing definitions of terms such as ''certified person'' and ''respirable dust'' have been modified to more clearly convey the intended meaning under the proposed rule. These and other modifications discussed below reflect changes resulting from the removal of existing paragraphs, the transfer of other paragraphs, and the

addition of new regulatory text. Other changes were made in response to previous commenters to make them consistent with the common usage of such terms. For example, under this new proposed rule, the Agency's definition of the term ''concentration'' has been changed to reflect the conventional definition. In doing so, it was necessary to include and define a new term ''equivalent concentration,'' which originally appeared within the proposed definition of the term ''concentration'' in the previous proposed rule.

This proposed rule also defines new terms to clarify the process of verifying the adequacy of the dust control parameters specified in a mine ventilation plan in controlling respirable dust in a mechanized mining unit. Specifically, MSHA provides definitions of ''critical value,'' ''protection factor,'' ''verification limits,'' and ''verification production level.'' Finally, the definition of ''normal production shift'' would be removed to be consistent with the proposed revocation of operator sampling requirements for purposes of determining compliance with the applicable dust standard.

The proposed rule also includes other terms like ''feasible'' for example, which have not been defined. The term as used applies to the suitability of the types of engineering or environmental controls required to control respirable dust under prescribed operating conditions. Since individual mine conditions would dictate the type of engineering or environmental controls to be considered as suitable candidates, MSHA has refrained from providing an explicit definition of this term. Instead, as noted in the discussion under section III.E. of this preamble, MSHA intends to follow the Federal Mine Safety and Health Review Commission case law as to what constitutes a feasible control for enforcement purposes. The Agency further notes in that discussion that the final determination of whether a particular operator has implemented all feasible engineering or environmental controls would be made by the Administrator for Coal Mine Safety and Health. That determination would be based on the best available information and on the combined experience and engineering judgement of an MSHA expert panel.

The following explains the new and revised definitions of terms that are used in the proposed rule. Please closely examine the context of the term as used in each proposed section.

Administrative Control

''Administrative control'' would mean a work practice intended to reduce an individual miner's exposure to respirable dust at the assigned job position or occupation by altering the way in which the assigned work is performed. Examples include rotation of miners to areas having lower concentrations of respirable dust, altering the way in which specific tasks are performed, rescheduling of tasks, and modifying work practices to reduce exposure. An ''administrative control'' must be (1) capable of being objectively reviewed and monitored to confirm that it has been properly implemented, (2) clearly understood by the affected miners for the controls to be effective, and (3) applied consistently over time.

Approved Sampling Device

''Approved sampling device'' would mean a sampling device approved by the Secretary and the Secretary of Health and Human Services under part 74 (Coal Mine Dust Personal Sampler Units) of this title; or approved by the Secretary when it has been demonstrated that a respirable dust concentration measurement can be converted to a concentration measurement equivalent to that obtained with an approved sampling device. Under the proposed rule, MSHA will continue to use sampling devices approved by NIOSH pursuant to existing 30 CFR part 74. To accommodate the adoption of advanced sampling devices in the future such as continuous respirable dust monitors, the proposed rule would permit the Secretary to approve and use any technologically advanced sampling device that should become available in the future but could not be approved under the regulatory requirements of 30 CFR part 74.

Therefore, under the proposed rule, any newly developed sampling instrument would be considered an approved device pursuant to this definition when the Secretary demonstrates that the respirable dust concentration measured by the new instrument can be converted to a concentration measurement equivalent to that obtained by a device approved under 30 CFR part 74 of this title.

To encourage greater innovation in sampler design without compromising accuracy, comments are specifically solicited on this approach of approving sampling devices. MSHA also solicits comments on an alternative approach based on the International Standards Organization (ISO) definition of respirable dust.

Certified Person

The existing definition would be modified by removing references to existing §§ 70.202 and 70.203. The provision requiring the use of a certified person to conduct sampling is being transferred to revised § 70.201. Existing § 70.203 which requires approved sampling devices to be maintained and calibrated by a certified person will be retained and redesignated as § 70.202.

Citation Threshold Value (CTV)

''Citation threshold value'' would mean the lowest acceptable equivalent dust concentration measurement demonstrating that the applicable dust standard has been exceeded at a high level of confidence and at which MSHA would cite an operator for a violation of §§ 70.100 or 70.101 under proposed § 70.218. Since MSHA would be assuming responsibility for all compliance sampling under this proposed rule, a determination of noncompliance would be based solely on the results of single-shift samples collected by MSHA. Appendix C explains how each critical value listed in Table 70–1 was derived. Each CTV is calculated to ensure that a citation will be issued only when a single-shift sample demonstrates noncompliance with at least 95 percent confidence.

Concentration

The existing definition would be modified by replacing the term ''substance'' with ''respirable dust'' to more clearly convey the meaning under the proposed rule.

Control Filter

''Control filter'' would mean an unexposed or clean filter cassette of the same design and material as the exposed filter cassette used for sampling that is pre- and post-weighed on the same day as the exposed filters. Its use is intended to eliminate the potential for any bias that may be associated with day-to-day changes in laboratory conditions or introduced during storage and handling of the filter capsules. The control filter is used to adjust the resulting weight gain obtained on each exposed filter capsule. That is, any change in the weight of the control filter will be subtracted from the change in weight of each exposed filter.

Critical Value

''Critical value'' would mean the maximum acceptable equivalent dust concentration measurement demonstrating that the applicable verification limit has been met at a high level of confidence. Appendix A

explains how each critical value listed in Table 70–1 was derived.

Designated Area (DA)

The existing definitions would be modified to certify that the Secretary may identify DAs which is consistent with existing procedures that have been in effect since 1980. Once identified, the location of these DAs and the respirable dust control measures to be used at the dust generating sources for these locations must be contained in the operator's approved mine ventilation plan as provided for under § 75.371(t) of this title. However, the operator would not be required to sample these areas under the proposed rule. MSHA is also proposing to transfer the requirement for identifying each DA as specified in existing § 70.208(e) to revised § 70.2.

Dust Control Parameters

''Dust control parameters'' would mean the respirable dust control provisions specified in an approved mine ventilation plan, including specific engineering or environmental controls, maintenance procedures, and other measures designed to control respirable dust levels in the working environment. These may also include, if approved by MSHA, supplementary controls such as powered air-purifying respirators and administrative controls. These measures are required for the protection of miners from excessive levels of respirable dust and must be in use on every production shift.

Engineering or Environmental Controls

''Engineering or environmental controls'' would mean methods that are designed to control the quantity of respirable dust that is released into the work environment by affecting the rate of generation or by suppressing it at the source of generation, or by diluting, capturing or diverting the generated dust. Examples include improved cutting tools, deep-cutting, water-spray delivery systems and orientation, air quantities and velocities, dust collectors, and passive barriers. Throughout the proposed rule, the terms ''engineering'' and ''environmental'' controls are used interchangeably.

Equivalent Concentration

''Equivalent concentration'' would mean the concentration of respirable dust, as measured by an approved sampling device, converted to an 8-hour equivalent concentration as measured by a Mining Research Establishment (MRE) sampler. This conversion is normally accomplished in two steps, unless powered air-purifying respirators (PAPRs) are used, and then an additional adjustment is made to account for the expected workplace level of respiratory protection being provided the wearer. In the first steps, the concentration measurement is multiplied by a constant factor prescribed by the Secretary specifically for the approved sampling device. In the second step, that result is then multiplied by t/480, where t is the sampling time in minutes if longer than eight hours, to make it equivalent in dosage to the concentration as measured by an MRE sampler on an 8-hour work shift. Since verification sampling will be conducted over the course of a full production shift of the MMU only, and not over the miner's entire work shift which includes travel to and from the MMU, except when employing personal continuous dust monitors (PCDM), t will also be equal to the length of a full production shift. If the full production shift is eight hours or less, then t must equal 480 minutes.

In cases where PAPRs are used, the equivalent concentration measurement obtained following step two is adjusted further to account for the expected workplace level of respiratory protection being provided the wearer. This is accomplished by dividing the equivalent concentration by the protection factor specified in the approved ventilation plan for the mechanized mining unit under a PAPR protection program. The result represents a surrogate measure of the respirable dust concentration to which the miner is exposed while wearing the PAPR.

The current U.S. coal mine applicable dust standard is based on epidemiologic studies of British coal miners. In these studies, miners routinely worked 8-hour shifts and their respirable dust exposures were assessed based on 8-hour measurements using an instrument known as the MRE instrument. Work shifts in U.S. coal mines now frequently exceed eight hours. Therefore, to provide the intended level of protection to miners working longer than eight hours, it is necessary to convert dust concentration measurements to equivalent, 8-hour values as measured by the MRE instrument.

The first step in the conversion from ''concentration'' to ''equivalent concentration'' is intended to make the measurement equivalent to the concentration measured by an MRE instrument. This instrument was designed to selectively collect airborne dust in a way that would approximate the deposition of inhaled particles in the lung. Because the MRE instrument was large and cumbersome, other more portable samplers were developed for use in U.S. coal mines. Currently approved sampling devices use a 10–mm nylon cyclone to separate the respirable fraction of airborne dust, instead of the four horizontal plates used in the MRE instrument. Such differences in instrument design lead to systematic differences in the amount of dust collected. Since 1980, measurements made using the currently approved cyclone-based devices operating at a flow rate of 2.0 liters per minute (lpm) were multiplied by the constant factor of 1.38 prescribed by the Secretary for the approved sampling device used. Application of this factor compensates for the difference in dust collection characteristics and makes the measurements equivalent to what would be obtained using an MRE instrument.

Similarly, the second step in the conversion from ''concentration'' to ''equivalent concentration'' is intended to compensate for differences between current conditions and conditions under which the existing applicable dust standards were developed. Specifically, it is designed to ensure that miners working shifts longer than eight hours will be afforded the same level of protection as miners working an 8-hour shift. MSHA developed the existing standards from 8-hour shift exposure measurements. Therefore, MSHA will adjust the measured concentration to be equivalent, in its effect on cumulative exposure, to a concentration over an 8-hour exposure period. This is accomplished by multiplying the concentration measurement by t/480, where t is the sampling time (*i.e.,* length of the sampled shift) in minutes.

The formula for an equivalent concentration is:

$$\text{equivalent concentration } (\text{mg/m}^3) = 1.38 \times \left(\frac{\text{accumulated dust (mg)}}{\text{t} \times \text{airflow rate}} \right) \times \frac{\text{t}}{480\ \text{min}}$$

where t = sampling time in minutes and airflow rate = 0.002 m^3/min). The product of t and the airflow rate is the total volume of air from which dust is accumulated on the filter.

The following example is meant to illustrate the effect of the second step in the conversion, multiplication by t/480, which adjusts for the full length of the sampled shift. Suppose a DO sample is collected over a 9-hour shift and that the amount of dust accumulated during the shift is 1.5 mg. If the concentration were not adjusted to an 8-hour equivalent concentration, the MRE-equivalent concentration would be calculated as 1.92 mg/m^3. Under the proposed definition of ''equivalent concentration,'' this quantity is then multiplied by 540/480, yielding an equivalent concentration measurement of 2.16 mg/m^3. Let us suppose now that this concentration measurement was for a longwall occupation under a PAPR protection program with an applicable protection factor of 2. Therefore, the concentration measurement of 2.16 mg/m^3 is divided by 2, which yields 1.08 mg/m^3, the equivalent concentration to which the wearer of the PAPR is exposed.

This adjustment does not change the daily limit on the accumulated dose of respirable coal mine dust as intended by the existing exposure limit for coal mine dust. Since the current limit was based on the assumption that exposure occurs over an 8-hour shift, it corresponds to a daily cumulative dose of respirable coal mine dust of $8 \times 2.0 = 16$ mg-hr/m^3 as measured by the MRE instrument. The proposed definition of equivalent concentration will maintain this same MRE-equivalent 16 mg-hr/m^3 daily limit, regardless of the length of the working shift being sampled.

To continue the example, the exposure accumulated during the sampled working shift is the same, whether over 8 hours at an average of 2.16 mg/m^3 or over 9 hours at an average of 1.92 mg/m^3. In either case, the MRE-equivalent exposure accumulated during the sampled shift is 17.3 mg-hr/m^3, which exceeds the intended limit of 16 mg-hr/m^3. Under the definition of ''equivalent concentration'' provided here, this will be reflected by the fact that, when more than 16 mg-hr/m^3 (MRE-equivalent exposure) is accumulated over the course of the particular shift sampled, the equivalent concentration will exceed 2.0 mg/m^3, regardless of the shift's length.

Similarly, using a currently approved sampler, the plan verification limit for respirable quartz dust (*i.e.*, 0.1 mg/m^3) will be exceeded when the total amount of quartz dust amassed on a filter during the full production shift exceeds 0.07 mg, regardless of the shift's length. For example, if 0.08 mg of quartz dust were accumulated over the course of a 12-hour shift, then the equivalent concentration of respirable quartz dust would be calculated as:

$$1.38 \times \frac{0.08 \text{ mg}}{720 \text{ min} \times 0.002 \text{ m}^3/\text{min}} \times \frac{720 \text{ min}}{480 \text{ min}} = 0.115 \text{ mg/m}^3,$$

This is exactly the same value of the equivalent concentration that would be obtained if 0.08 mg of quartz dust were accumulated on an 8-hour shift.

MSHA originally proposed a different but mathematically equivalent method of adjusting concentrations to an 8-hour equivalent and solicited comments on the proposed method. The proposed method would have defined ''concentration'' to mean what is here defined as ''equivalent concentration.'' Instead of making an explicit adjustment to the concentration, using the factor of t/480 as in the present definition, the proposed rule would have substituted 480 for the actual sampling time in the definition of respirable dust concentration. The proposed definition of ''equivalent concentration'' is meant to both preserve the ordinary definition of ''concentration'' and to clarify the adjustment to an 8-hour equivalent.

MSHA believes that the proposed adjustment to an ''8-hour equivalent concentration'' is necessary to protect miners, who normally work nontraditional or extended shifts, from excessive exposures. A miner working for ten hours at an average concentration of 2.0 mg/m^3 will inhale and retain more respirable coal mine dust as a result of that specific shift than a miner working for eight hours at the same average concentration. By comparing the adjusted concentration to the concentration limit originally intended for miners working an 8-hour shift, the same cumulative exposure limit is applied on individual shifts for all miners.

It should be noted that the American Conference of Governmental Industrial Hygienist (ACGIH) approach of reducing the permissible concentration to compensate for the extension of a shift beyond eight hours is similar in its effect to the approach taken here of adjusting the equivalent concentration upwards and comparing it to a fixed limit. MSHA makes similar adjustments for extended work shifts in the enforcement of exposure limits in metal and nonmetal mines under 30 CFR 56.5001 and 57.5001. Taking into account the reduced recovery time that results from an extended work shift would have led to a numerically greater and more protective adjustment, but this would also have introduced additional complexities in the calculation of equivalent concentration measurements. The Secretary believes that the method proposed strikes a reasonable balance between no adjustment at all, and a far more complex adjustment that would attempt to model clearance, deposition, and retention mechanisms.

Material Produced

''Material produced'' would mean the amount of coal and/or any other substance(s) extracted by a mechanized mining unit during a production shift. In order to properly assess the effectiveness of the ventilation plan requirements for respirable dust control and for subsequent monitoring purposes, MSHA proposes to require that the operator record and make available records of the amount of material produced by each mechanized mining unit each shift under a new paragraph (h) of § 75.370.

Mechanized Mining Unit (MMU)

The existing definition would be modified by deleting the reference to § 70.207(e) (Bimonthly sampling; mechanized mining units), and replacing it with proposed § 70.206(d); and by transferring the requirements for identifying each MMU specified in existing §§ 70.207(f)(1) and (f)(2), to revised § 70.2.

MRE

''MRE'' would mean Mining Research Establishment of the National Coal Board, London, England.

Personal Continuous Dust Monitor (PCDM)

''Personal continuous dust monitor'' would mean a type of approved

instrument capable of accurately measuring the concentration of respirable dust on a continuous basis during an entire shift and displaying in real-time the measured dust exposure information. To meet the definition of ''approved device,'' the Secretary must demonstrate that the respirable dust concentration measured by such an instrument can be converted to a concentration measurement equivalent to that obtained by a device approved under 30 CFR part 74 of this title. Comments are solicited on the practice of tying the performance of new sampler designs to the currently approved sampling device.

The PCDM must be capable of displaying (1) the cumulative average dust exposure during the shift; (2) the current exposure level based on entire shift duration (projected end-of-shift exposure); and (3) the time-weighted average concentration (total mass of dust collect divided by the length of time the unit was operated) within 15 minutes after the end-of-shift. The entire unit must comply with MSHA intrinsic safety regulations and pass tests for electromagnetic interference for emissions using ANSI C95.1–1982 and 47 CFR part 15 and for immunity/susceptibility using IEC 61000–4. Since work shifts longer than 8 hours are common in mining, the PCDM must have sufficient battery capacity to operate continuously for up to 12 hours. To ensure that air monitoring results are sufficiently accurate across the relevant range of exposure levels, the PCDM must meet an accuracy criterion of ±25% of a reference value determined using the currently approved sampling device (P/N 45243) with 95% confidence.

The Agency solicits comments on how continuous dust monitors could be applied to limit exposure of coal miners to respirable coal mine dust. Specifically, comments are solicited on the proposed performance, accuracy, and approval requirements for personal continuous dust monitoring devices, and whether less stringent requirements should be imposed on devices designed for surveillance and not for compliance purposes. What would be an acceptable level of accuracy of such a device if used for surveillance purposes (*i.e.*, identifying dust-generating sources and magnitude of dust concentrations), for compliance determinations, or for control enhancement purposes (*i.e.*, provide a means to take corrective measures in response to instrument readings by adjusting specific controls)? Comments are also solicited on the performance requirements for continuous dust monitors used primarily for surveillance purposes to prevent an individual miner from being overexposed on a particular shift and whether such devices need to be first approved by MSHA for use in underground mines.

Powered Air-Purifying Respirator (PAPR)

''Powered air-purifying respirator'' (PAPR) would mean a type of air-purifying respirator that uses a blower to force ambient air through air-purifying elements to the inlet covering (a visor), which provides a partial seal with the face, to deliver filtered air to the miner's breathing area. This category of respirator must be approved by the National Institute for Occupational Safety and Health under 42 CFR part 84 and by MSHA under 30 CFR part 18; and, offer head and face protection in compliance with 30 CFR 75.1720(a) and (d) of this title. The reasons for excluding other types of approved respirators are discussed in section III.D.4. of the preamble.

Protection Factor

''Protection factor'' (PF) would be a measure of the expected degree of workplace respiratory protection that would be provided to the wearer by a properly functioning PAPR when correctly worn and used. The PF expresses PAPR performance as the ratio of the respirable dust concentration outside the respirator facepiece to the concentration inside the facepiece. It reflects the effectiveness of a respirator used in conjunction with a good respirator protection program. For example, a PF of 4 means that the respirator is expected to reduce the concentration of respirable dust actually breathed to one fourth of the concentration outside the respirator.

Factors such as air velocity at the working face and raising of the visor during the shift significantly impact the effectiveness of a PAPR. Therefore, such factors should be taken into account when estimating the degree of respiratory protection a PAPR provides in the workplace. Although NIOSH has recommended that loose-fitting hood or helmet PAPRs should be assigned a PF of 25, the environmental conditions observed in the studies used in NIOSH's estimation of an assigned protection factor (APF) are not consistent with those found in underground coal mines, where high air velocities for methane and dust control are common.

Under this proposal, the PF that would be assigned to PAPRs authorized for a particular MMU depends on the air velocity that will be maintained at the working face. The applicable PF would be included in a written PAPR protection program, which must be approved by the district manager before it can be implemented. Based on the available technical information and sound engineering judgement, MSHA would permit a PF ranging from 2 to a maximum of 4 to be assigned to a particular MMU, depending on air velocity.

If, according to the ventilation plan, the minimum air velocity to be maintained in the headgate of a longwall MMU ventilated head-to-tail is less than 400 feet per minute (fpm), then PAPRs used in the MMU would be assigned a PF equal to 4. If the minimum air velocity to be maintained in the location specified in the plan exceeds 800 fpm, then the assigned PF would be 2. If the minimum air velocity specified in the plan falls between 400 fpm and 800 fpm, then PAPRs used in the MMU would be assigned a corresponding PF falling between 2 and 4.

Because there is a lack of data on the performance of PAPRs under actual air-velocity conditions ranging between 400 and 800 fpm, MSHA is proposing an interpolation formula [$2 \times (800/\text{air velocity})$] for determining the PF to be assigned to a MMU when the specified air velocity to be maintained falls in that range. For example, if the minimum air velocity to be maintained in the headgate is 550 fpm, then the assigned PF would be calculated as: $2 \times (800\text{fpm}/550\text{fpm}) = 2.9$. A reasonable alternative interpolation formula, 6—(air velocity/200), would yield somewhat higher protection factors for velocities between 400 fpm and 800 fpm. However, given the absence of supporting data, MSHA selected the proposed interpolation formula because it yields a more conservative PF.

Comments are invited on the proposed method of establishing the applicable PF and on the interpolation formula proposed for specified air velocities ranging between 400 fpm and 800 fpm. Data are requested in support of any recommendations that different protection factors should be assigned to MMUs authorized to use PAPRs.

Quartz

The existing definition would be modified by specifying the analytical method that MSHA has been using since 1983 to determine the quartz content of respirable dust samples. The reason for this modification is to standardize the analytical procedure, thereby enabling other certified laboratories to produce quartz determinations compared to those made by MSHA. Also, to accommodate the adoption of improved

or other quartz analytical techniques in the future, the definition of ''quartz'' has been expanded in the proposed rule to provide MSHA the flexibility to use alternative analytical techniques once these techniques have been demonstrated to provide quartz measurements that are equivalent to the currently used analytical method.

Respirable Dust

The existing definition has been modified by transferring the requirement for what constitutes an approved sampling device to the proposed new definition of the term ''approved sampling device'' above.

Verification Limits

''Verification limits'' would mean the maximum equivalent dust concentration for which the dust control parameters, specified in the ventilation plan for a particular MMU, have been verified as effective in maintaining dust levels during the entire production shift. Under the proposed rule, MSHA will require mine operators to address both respirable coal mine dust exposure and the potential for exposure to quartz when designing the dust control parameters specified in a mine ventilation plan by proposing two separate respirable dust limits—2.0 mg/m^3 for respirable coal mine dust and 100 μg/m^3 for respirable quartz dust for verification sampling.

The Dust Advisory Committee recognized that a significant quartz exposure hazard continues to exist in coal mines, especially for operations such as roof bolting. Based on recent MSHA data (April 23, 2002), 298 or (58 percent) of the 517 producing underground coal mines are operating on a reduced applicable dust standard due to the presence of high quartz levels in the working environment. This data also shows that 65 percent of the more than 470 roof bolters and 27 percent of the MMUs required to be sampled bimonthly by mine operators must comply with a reduced dust standard. The number of reduced standards in effect indicates that quartz exposure remains a significant health risk for miners.

Under the current program, miners can be exposed to excessive quartz levels during the period of time necessary to establish the applicable dust standard that would apply to a particular MMU. For example, consider a recent situation where an MSHA dust sample of a roof bolter was 0.9 mg/m^3, which complied with the applicable dust standard of 1.3 mg/m^3. However, the results of quartz analysis indicated that the actual concentration of quartz dust in the mine environment at the time of sampling exceeded 270 μg/m^3, or more than two and a half times the permissible level of 100 μg/m^3. The only action that MSHA could take in this particular situation is to initiate the process of establishing a new applicable dust standard, which, on average, can take at least one month or longer. During this period, the existing applicable dust standard remains in effect.

Under the proposed rule, MSHA would require operators to incorporate dust control parameters in mine ventilation plans that are designed to effectively control exposure to both respirable coal mine dust and quartz dust. To ensure the adequacy of the operator's dust control strategy, MSHA would determine the mass of quartz contained in each verification sample and express the concentration of quartz in the mine air as an airborne concentration and not as a percentage as has been the long-standing practice.

MSHA believes that by requiring operators to anticipate exposure to quartz dust in the initial design of the dust control parameters, especially at those operations with a quartz exposure history, and by adopting the new procedures for setting a reduced dust standard as outlined in section III.B., the level and quality of miner health protection in the workplace will be significantly enhanced.

Verification Production Level (VPL)

''Verification production level (VPL)'' would mean the tenth highest production level recorded in the most recent 30 production shifts. It is an estimate of the 67th production percentile within a MMU. Under the proposed rule, the VPL is the minimum production level at which the operator must demonstrate the adequacy of the plan parameters in controlling respirable dust. To enable the operator to establish the VPL required under proposed § 75.371(f), the operator would be required to begin maintaining records of the amount of material produced by each MMU during each shift in accordance with proposed § 75.370(h) of this title.

If records for 30 production shifts are not available to establish a VPL, as in the case of a new MMU, the operator would use the minimum production actually achieved on any shift used to verify the adequacy of the plan parameters as the VPL. For example, assume an operator initiates verification sampling at a longwall MMU. If the dust concentration measurements obtained on the first shift exceed either 1.85 mg/m^3 for respirable coal mine dust or 93 μg/m^3 for quartz dust but not the verification limits, the operator would need to sample at least two more shifts according to Table 70–1 to verify the adequacy of the plan parameters, provided that no sample exceeds 1.93 mg/m^3 for respirable coal mine dust or 97 μg/m^3 for quartz dust. If the highest production level was achieved on the third shift sampled and the dust concentration measurements obtained on that shift were low enough according to Table 70–1 to verify the plan parameters on a single shift, the operator would establish a VPL equal to the production achieved on that shift. If, on the other hand, the dust concentration measurements obtained on the third shift with the highest production level were not low enough to verify the plan parameters on a single shift and a determination of the plan's adequacy was based on these three shifts, the operator's VPL would be the minimum production achieved during verification sampling. In any case, the VPL would become part of the operator's ventilation plan.

Working Face

''Working face'' would mean any place in a coal mine in which work of extracting coal from its natural deposit in the earth is performed during the mining cycle.

Sections 70.100 Through 70.101

Respirable Dust Standards

Section 70.100 Respirable Dust Standards When Quartz Is Not Present

MSHA is proposing no substantive changes in existing § 70.100(a) and (b), except for removing the reference to § 70.206 (Approved sampling devices; equivalent concentrations) from existing paragraphs (a) and (b) and replacing it with revised § 70.2. The requirements contained in revised § 70.2 are similar to the previous standard in § 70.206. The proposed rule retains the applicable dust standard of 2.0 mg/m^3 in existing paragraph (a) and the intake air standard for respirable dust of 1.0 mg/m^3 in existing paragraph (b), which have been in effect since 1972.

Section 70.101 Respirable Dust Standard When Quartz Is Present

MSHA is proposing to retain the existing formula (10 divided by the concentration of quartz, expressed as a percentage) for reducing the applicable dust standard below 2.0 mg/m^3 in proportion to the percentage of quartz when the quartz content of the respirable dust in the mine atmosphere exceeds 5.0 percent. However, the Agency is proposing to change the

procedures for determining the average quartz percentage used to calculate the applicable dust standard. Only the results of MSHA samples would be used to establish the applicable dust standard. The quartz results of the three most recent valid MSHA samples would be averaged and the resultant percentage would be used to set the new applicable dust standard. However, if an entity is already on a reduced standard when these revised procedures become effective, a new applicable dust standard will be established by averaging the results of the first two MSHA samples taken under the revised procedures with the quartz percentage associated with the reduced standard in effect. If fewer than two MSHA samples are taken, the existing applicable dust standard will continue to remain effect.

Application of the revised procedures will result in the setting of reduced standards that will (1) more accurately represent the quartz percentage of the respirable dust in the environment at the time of sampling; (2) reflect the dynamics of the mining process and the changing geologic conditions of the mine strata; and (3) continue to protect miners over multiple shifts.

Under the proposed rule, MSHA would also begin reporting the quartz content to the nearest tenth of a percent, instead of the current practice of truncating results to the nearest full percent. This is more protective for the miner because it will permit MSHA to also set reduced standards at such levels as 1.1 mg/m^3, 1.4 mg/m^3, 1.6 mg/m^3, 1.8 mg/m^3, and 1.9 mg/m^3. Setting these particular standards was not mathematically possible using the above formula due to the practice of truncating the average quartz percentage.

Section 70.201 Sampling; General and Technical Requirements

MSHA is proposing to modify the general requirements for operator sampling under existing § 70.201. The proposed rule would remove existing paragraph (d), revise and redesignate (b) as (c) and existing (c) as (g), revise paragraph (a), and add new (b), (d), (e), (f), (h), and (i).

To minimize repetition and to streamline the proposed requirements, paragraph (a) would be modified by removing the reference to part 74 approval (Coal Mine Dust Personal Sampler Units), and replacing it with ''approved sampling device,'' as defined under revised § 70.2. Respirable dust sampling under this proposed rule could also be conducted with sampling devices that can give a continuous readout of dust concentrations provided that the measured concentration can be converted to an equivalent concentration as measured with another sampling device approved under part 74 of this title.

Proposed new paragraph (b) would retain the requirements in existing § 70.202(a) and (b) that sampling required under this part be conducted by an individual certified by MSHA and the manner by which a person would be certified. Therefore, existing § 70.202(a), (b), and (c) would be removed.

While the sampling device would continue to be worn or carried to and from the MMU as required by existing § 70.201(b), proposed § 70.201(c), the existing requirement that sampling devices be operated portal-to-portal and for a period no longer than eight hours would be removed. Instead, since the objective is to assess the adequacy of the dust control parameters in effect in each MMU under proposed § 70.206 and § 70.215, except when using a personal continuous dust monitor (PCDM) under proposed § 70.220, the sampling device would be operated only during the period that the production crew spends in the MMU. That is, under proposed § 70.206 the sampling device would (1) be turned ''ON'' when the production crew arrives at the MMU, regardless if any actual mining is taking place; (2) remain operational during the entire shift that the production crew remains in the MMU, regardless of the number of hours worked; and (3) be turned ''OFF'' at the end of the shift as the production crew exits the MMU.

On the other hand, if using a PCDM under proposed § 70.220, the sampling device would be operated portal-to-portal and would remain operational during the entire work shift or for 12 hours, whichever time is less, to ensure that the miner's entire work shift is controlled. Because the use of a PCDM will permit the operator to make adjustments in administrative controls, without MSHA approval, at anytime during the work shift, the duration of sampling is not limited to the time period the production crew spends in the MMU as discussed in the previous paragraph but, instead, must be carried out over the entire work shift to ensure that each miner using a PCDM was not personally overexposed. Simply stated, the PCDM would be turned ''ON'' when the miner enters the mine and remain operational while traveling to the MMU, during the entire time period spent working in the MMU, and while traveling back to the mine entrance, at which time the device would be turned ''OFF.'' Since most non-traditional work shifts in underground coal mines are less than 12 hours in length, the PCDM currently under development is being designed with sufficient battery capacity for one 12-hr work shift of operation.

It should be pointed out that the duration of MSHA sample collection will continue to be limited to 480 minutes. The sampling device will be operated portal-to-portal and remain operational during the entire shift or for 8 hours, whichever time is less.

Consistent with accepted industrial hygiene practice, proposed paragraph (d) will require the operator to use control filters when verifying the adequacy of the plan parameters under proposed § 70.206 or § 70.220(c). A control filter is an unexposed filter of the same design as the filter cassette used for sampling, that is pre- and post-weighted on the same day as the filter cassettes used for verification sampling. MSHA first began using control filters in its enforcement program in May 1998 and continues this practice today. The reason for requiring their use by operators is to improve the accuracy in making weight-gain measurements of the exposed filter cassettes by eliminating the effect of differences in pre- and post-exposure laboratory conditions, or changes introduced during storage and handling of the filter cassettes. The control filter will be used to adjust the weight gain obtained on each exposed filter by subtracting any change in the weight of the control filter from the change in weight of each exposed filter. This is especially important since the filter cassettes to be used by operators will be pre- and post-weighed to the nearest microgram (0.001 mg). The other modification to the procedures for processing operator samples will be to discontinue the practice of truncating (to 0.1 mg) the recorded weights used in calculating dust concentrations. This means that Mine Safety Appliances Company (MSA), which upgraded its weighing equipment in 1996 and uses the same balance as MSHA's Coal Dust Processing Laboratory, will be permitted to follow MSHA and use all significant digits associated with the weighing capability of the balance (0.001 mg) when pre-weighing operator dust cassettes. These changes will enhance the proposed process of verifying the adequacy of plan parameters. This will also eliminate the need for operators to sample multiple shifts in order to obtain sufficient dust mass on the collection filter for quartz analysis. Since the use of a control filter adjusts for differences that may exist in laboratory conditions on the days of pre- and post-weighing, it is no longer necessary to pre- and post-weigh the filter cassettes in the same laboratory. To ensure the precision and accuracy of the pre-weight of filters

used by the operator and federal mine personnel, MSHA will institute a program to monitor the daily production of filter cassettes weighed to the nearest microgram (µg) by the manufacturer, MSA. The program will conform to MIL-STD–105D, which defines the criteria currently used to monitor the quality of pre-weighed filters used in the current operator bi-monthly sampling program.

Since the control filter will be used to adjust the resulting weight gain obtained on each exposed filter cassette, the control filter must have the same pre-weight date as the filter cassettes to be used for sampling on the same shift. The pre-weight date is noted on the dust data card. Failure to follow these instructions will be cause for voiding the sampling results. Only one control filter will be required for each MMU per shift sampled. To prevent exposure to the mine environment, the plugs attached to the inlet and outlet side of the cassette must not be removed. Also, it is important that the control filter be exposed to the same time, temperature, and handling conditions as the ones that are used for sampling, *i.e.*, carry the control filter in a shirt or coverall pocket while underground. While the control filter can be carried by any miner assigned to the MMU being sampled, it would be preferable if that miner performed the job of the DO. Finally, the control filter cassette must be kept together with the exposed samples after sampling and treated in the same manner as the exposed filters prior to being transmitted to MSHA. For processing purposes, the dust data card for the control filter must be marked with a large capital ''C'' for ''CONTROL'' in the middle of the card and enter a ''9'' in the ''Type of Sample'' box. The remaining items on the dust data card must be completed in the same manner as under the previous operator bimonthly sampling program. These procedures are identical to the ones followed by MSHA.

To ensure that the plan parameters are designed to control respirable dust and are suitable to the conditions and mining system at the mine as required under § 75.370(a) of this title, the proposed paragraph (e) prescribes minimum mining activity that must be ongoing during sampling, as well as the operating parameters for use of the engineering controls specified in the plan. Therefore, when sampling under proposed § 70.206, § 70.215 or § 70.220(c), respirable dust samples must be collected on a production shift during which the amount of material produced by the MMU is at least equal to or exceeds the verification production level (VPL) as determined in accordance with § 70.2. If the VPL is not achieved, the samples for that shift will be voided by MSHA. However, any sample that exceeds either verification limit or the applicable dust standard by any amount would be used to determine the equivalent concentration for that occupation, regardless of production. Also, if the MMU being sampled under proposed § 70.215 is authorized to use PAPRs under special circumstances (see § 70.212) and those circumstances prevent the operator from achieving the VPL, the sample(s) for that shift will be used to determine the equivalent concentration for the affected occupations.

In addition to minimum production activity, limits must also be set on how much the specified engineering control parameters can deviate during sampling from the quantities specified in the ventilation plan. Failure to meet either criterion will undermine miner confidence in the ability of the approved plan parameters to effectively control respirable dust under the conditions at the MMU. Accordingly, paragraph (e) requires each operator to use only the engineering controls and other measures specified in the plan. Recognizing that engineering parameters such as air quantity and velocity and water pressure are subject to measurement error and can vary because they cannot be easily controlled with absolute precision, proposed § 70.201(e) would permit the measured levels to be up to 115 percent of the minimum quantities specified in the plan.

Since miners play an important role in the implementation and maintenance of the approved plan parameters, MSHA recognizes the need for miners to have full confidence in the sampling process used to approve and evaluate the continued adequacy of the plan parameters. Therefore, consistent with the underlying purposes of the Mine Act, proposed paragraph (f) would require the operator to provide affected miners and their representatives with an opportunity to observe any sampling required by this proposed rule. In addition, the operator would be required to give prior notice to miners and their representatives of the dates and times when the operator intends to conduct sampling. If the exposure of individual miners is monitored on a daily basis using a PCDM, the operator would be exempt from this requirement since all affected miners would already be aware that they were being monitored on a continuous basis. To make miner participation more effective, it is important that miners and their representatives are knowledgeable in those features of the sampling program specified in the proposed rule. This will enable them to make sound and knowledgeable judgements on the conduct of operator sampling under the proposed rule.

While section 103(f) of the Mine Act requires the operator to compensate representatives of miners who accompany MSHA personnel conducting inspections, it would not apply to operator sampling as proposed, unless conducted on the same shift that MSHA chooses to monitor operator sampling. Therefore, unless accompanying MSHA personnel, section 103(f) would not authorize ''walkaround pay'' for time spent by a representative of miners observing the operator conducting sampling required by this part. MSHA believes that providing the representative of miners with an opportunity to accompany MSHA personnel monitoring operator sampling required by this part with no loss of pay is consistent with section 103(f) of the Mine Act. Under the guidance of the Interpretive Bulletin (43 FR 17546, April 25, 1978), walkaround rights arise when: (1) An ''inspection'' is made for the purposes set forth in section 103(a), and (2) the inspector is physically present at the mine to observe or monitor safety and health conditions as part of direct safety and health enforcement activity.

MSHA sampling required by this part would be unannounced and conducted to determine if the operator is in full compliance with both the operating conditions and sampling requirements of this part, as well as with all other health and safety standards. Consequently, the representative of miners would have the right to accompany the MSHA personnel with no loss of pay for the time during which the representative exercises this right.

Existing paragraph (c) which requires the operator to submit, when requested by the district manager, the date and time when sampling required by this part will begin would be redesignated as paragraph (g). This requirement enables MSHA to monitor operator sampling on a case-by-case basis to verify compliance with both the operating conditions and sampling requirements of this part.

The requirement that operators take corrective action during the time for abatement fixed in a citation for violation of §§ 70.100 or 70.101 specified in existing paragraph (d) of § 70.201 would be transferred to proposed § 70.218(b)(2). The requirement that the operator sample each production shift until five valid samples are taken under existing

paragraph (d) would be removed since MSHA is proposing to revoke operator sampling requirements under existing §§ 70.207 and 70.208, and assume full responsibility for all compliance sampling.

Section 70.202 Approved Sampling Devices; Maintenance and Calibration

In an effort to consolidate the requirements that address maintenance and calibration procedures of approved sampling devices, MSHA is proposing in § 70.202(a) through (e) to retain the requirements in existing § 70.203(a) and (b) and § 70.204(a) through (e), with minor changes. These standards require the sampling device be maintained as approved and calibrated only by a certified person in accordance with MSHA Informational Report IR 1240 (1996).[8] If using a PCDM under proposed § 70.220, the device would be calibrated to the manufacturer's specifications. The process of certifying an individual for maintenance and calibration would remain unchanged. It would continue to require an individual to successfully complete the applicable MSHA examination. Scheduling information for MSHA training courses and examinations would be available from MSHA District Offices.

These standards require approved sampling devices to be calibrated at a flowrate of 2.0 liters of air per minute. They also establish the flowrate and testing and examination requirements for approved sampling devices. Careful examination and testing of sampling devices would continue to be required immediately prior to the start of a shift during which samples would be collected for purposes of this proposed rule. This would include testing the battery voltage and examining all external components of the sampling devices to be used. Any necessary external maintenance to assure the sampling devices are clean and in proper working condition should be performed at this time by a certified person. Temporary certification of persons provided under existing § 70.203(b) would not be retained under the proposal.

If using a PCDM in accordance with § 70.220, the operator under proposed § 70.202(f) would be exempt from the examination requirements of paragraphs (d)(1) through (d)(5) of this section. Instead, the operator would be required to follow the examination procedures recommended by the manufacturer or prescribed by MSHA and NIOSH for the particular device.

Section 70.203 Approved Sampling Devices; Operation; Air Flowrate

Proposed § 70.203(a) through (c) retains the operation and flowrate requirements for approved sampling devices in existing § 70.205(a) through (d), with minor changes. Since MSHA has defined an approved sampling device in revised § 70.2 to mean a device approved in accordance with part 74 of this title, proposed paragraph (a) excludes reference to part 74. Similarly, for purposes of simplification, reference to § 70.202 (Certified person; sampling) would be removed and, replaced by certified person as defined in revised § 70.2.

MSHA believes that the two on-shift examinations of sampling devices under proposed paragraphs (b)(1) and (b)(2), which are identical to the examinations required under existing § 70.205(b) and (c), continue to be an important part of a reasonable and prudent sampling program. The first examination would be made by a certified person during the second hour after the sampling devices are placed in operation. This examination would assure that each sampling device is operating properly and at the proper flowrate. If the proper flowrate is not maintained, necessary adjustments in the flowrate would be made at this time by the person certified to collect samples. The second examination would be made during the last hour of operation of the sampling devices. If the proper flowrate is not maintained, the certified person is required to make a notation on the dust data card for that sample stating that the proper flowrate was not maintained. Because it is unclear where on the dust data card such a notation should be made, proposed paragraph (b) would require all notations regarding failure to maintain proper flowrate or other events occurring during sampling that may impact the validity of the sample to be made on the back of the dust data card.

If using a PCDM under proposed § 70.220, the operator would not be required to examine the device during the second and last hour of operation as required under paragraph (b) of this section. Instead, the operator would be required to follow the procedures recommended by the manufacturer or prescribed by MSHA and NIOSH to assure that the PCDM is operating properly and at the proper flowrate.

Section 70.204 Demonstrating the Adequacy of the Dust Control Parameters Specified in a Ventilation Plan; Verification Sampling

Existing § 75.370(a)(1) of this title requires the operator to develop and follow a mine ventilation plan that is designed to control methane and respirable dust. It further requires the plan to be suitable to the conditions and mining systems at the mine. Accordingly, a properly-designed mine ventilation plan continues to be the most reliable means for ensuring that the work environment in each MMU is free of excessive concentrations of respirable dust.

MSHA recognizes that the operator has the legal responsibility for developing a ventilation plan that is designed to control respirable dust. Consequently, the operator has the obligation to demonstrate that the dust control parameters specified in the plan will effectively control respirable dust as required by § 75.370(a)(1). Therefore, within 12 months after the effective date of this rule, each operator of an underground coal mine must have an approved ventilation plan in which the dust control parameters specified for each MMU have been verified to be adequate in controlling respirable dust. Proposed §§ 70.205 through 70.208 set forth the specific steps an operator must follow to verify the adequacy of the plan parameters. To demonstrate adequacy, the operator would be required to collect valid respirable dust samples in accordance with proposed § 70.206 or § 70.220(c) if using a PCDM. Approval of the plan parameters for a particular MMU would be granted when these samples, called verification samples, demonstrate at a high level of confidence, in accordance with the limits specified in Table 70–1, the adequacy of the plan parameters in maintaining the equivalent concentration of respirable dust coal mine dust and quartz dust at or below the verification limits of 2.0 mg/m^3 and 100 $\mu g/m^3$, respectively.

Section 70.205 Verification Sampling; When Required; Time for Completing

Proposed § 70.205 specifies the various ways in which the process of verifying the adequacy of the dust control parameters for a MMU would be initiated. The operator would trigger the process by submitting a new ventilation plan under § 75.370. This process would also be initiated if the district manager requires the operator to amend the plan parameters in a previously approved ventilation plan after determining, based on dust sampling results or other

[8] On September 3, 1998, MSHA published a proposed rule in the **Federal Register** (63 FR 47123) requesting public comment on our intention to update the incorporation-by-reference in title 30 of the Code of Federal Regulations, Sections 70.204, 71.204, and 90.204. The Agency allowed 60 days for public comment and received no comments, no requests for an extension of the comment period, and no requests for a public hearing. On August 10, 1999 the final rule was published and became effective on October 12, 1999 (64 FR 43283).

evidence, that the dust control parameters in effect are no longer suitable to the current conditions at a particular MMU.

Once the dust control parameters for a MMU have been verified as adequate, it would not be necessary to reverify the plan parameters as part of the MSHA six-month review under § 75.370(g), unless the district manager determines these parameters are unsuitable for the current conditions at the MMU. However, the operator may be required to make changes to the parameters based on (1) results of the MSHA six-month review, (2) excessive dust concentrations measured by either MSHA or operator monitoring samples, or (3) a new reduced applicable dust standard which is less than the highest respirable coal mine dust concentration that was previously used to verify the adequacy of the plan parameters. For example, if an operator was cited for exceeding the applicable dust standard when the approved plan parameters were being met or exceeded, the district manager may have cause to question the adequacy of the previously-approved dust control parameters.

Also, depending on sampling results and production records, if the production exceeds the VPL specified in the plan, the district manager may require the operator to verify the plan parameters at the higher production level. For example, suppose the VPL is 10,000 tons and all five concentration measurements taken during MSHA sampling exceed the applicable dust standard on a shift for which the production is 12,000 tons. Then, if the production records indicate that the operator has exceeded the VPL on more than 33 percent of all production shifts during the previous six months, that evidence would demonstrate that the VPL specified in the plan is no longer valid. The district manager would then require the operator to verify the plan parameters under current operating conditions.

Under the proposed rule, the operator would be required to verify the adequacy of the dust control parameters for each MMU within 45 calendar days after obtaining provisional approval from the district manager. This should be ample time for an operator to demonstrate the adequacy of the plan parameters, even when starting up a new MMU, such as a longwall panel. Should an operator experience difficulty in establishing the desired VPL or encounter other unexpected breakdowns or unforseen circumstances affecting the operational status of a MMU after obtaining provisional approval, the district manager may grant an operator an extension of up to 30 days to complete verification sampling. Before receiving provisional approval, the operator may be required to modify the plan parameters if the district manager determines that the particular parameters are inadequate or unsuitable for the current conditions in the MMU. If provisional approval is not granted, the operator may not operate the affected MMU.

Under the proposed rule, the adequacy of all previously approved dust control parameters would need to be verified by the operator within 12 months after the final rule becomes effective. Before submitting these plan parameters to the district manager for review and approval to commence verification sampling, proposed paragraph (b) would require the operator to provide additional information. The additional information is described under revised § 75.371(f) of this proposed rule. The operator will be permitted to operate a MMU under the previously approved dust control parameters until the amended plan parameters are either provisionally approved or denied.

To minimize delays in the verification process, MSHA will develop and issue appropriate compliance guides and provide adequate training on the new rule prior to its implementation. MSHA will also be available to provide guidance to individual mine operators once the rule becomes effective. The Agency intends to make every effort to ensure an orderly and efficient transfer from the previous plan approval process to the new process of validating the adequacy of dust control parameters for each MMU prior to implementation.

Section 70.206 Verification Sampling; Procedures for Sampling

This proposed section establishes the sampling procedures that each operator would follow when conducting verification sampling. Described are the specific occupations and areas to be monitored in a MMU, and the operation and placement of each sampling device during sampling. The specific operating conditions under which these occupations and areas would be sampled are discussed under § 70.201. These will be covered again for the benefit of the reader.

Proposed paragraph (a) would require the operator to sample specific occupations assigned to a MMU. These occupations were selected because, based on MSHA experience over the past 20 years, miners required to work in those occupations are likely to be exposed to the greatest respirable dust concentration and, consequently, would be at significant risk of overexposure. Therefore, the operator would be required to sample the environment of: (1) The DO in accordance with proposed paragraphs (d)(1) through (d)(10), which are identical to existing § 70.207(e)(1) through (e)(10); (2) the roof bolter operator(s) (occupation codes—012, 014 or 046); (3) the longwall jack setters (occupation code—041); and (4) any other occupation that the district manager may designate for sampling after reviewing the operator's plan parameters.

Unless otherwise directed by the district manager, when an operator samples a longwall MMU, the DO sample required by this part would be collected by placing the sampling device on the miner who works nearest the return air-side of the longwall working face. Since 1987, this work location has been assigned the 060 occupation code by MSHA for sampling and tracking purposes in accordance with existing § 70.207(e)(7). Therefore, when sampling the 060 DO, the sampling device would remain at all times with the miner working nearest the return air-side of the longwall face. If individual miners rotate out of the DO position during sampling, as is the common practice at some operations, the sampling device must be transferred to and worn by the new miner rotated into the DO position. For example, if all other miners are working upwind of the tailgate-side longwall operator, the miner performing that particular job becomes the DO and wears the sampling device since that individual is working nearest the return air-side of the longwall face. However, if during the shift being sampled another miner, such as the face mechanic, travels past the tailgate-side longwall operator toward the return air-side, the face mechanic would then become the DO and must wear the sampling device for the period of time that individual works nearest the return air-side of the longwall face. When the face mechanic returns upwind of the longwall operator, the sampling device must then be transferred back to the longwall operator, as that individual will now be the miner working nearest the return air-side.

This is compatible to sampling any other DO, whether it is the 036 DO (continuous miner operator) or the 044 DO (tailgate-side longwall operator). The sampling device must remain at all times in the environment of the DO and not with the individual miner, regardless of how many miners work in that location during the shift. Sampling the DO in this manner preserves the long-standing high-risk occupation

sampling concept which the Agency adopted in 1970.

Under these procedures the sampling device must remain in the environment of the miner who works nearest the return air-side of the longwall working face. However, in certain circumstances, MSHA may not require transfer of the sampling device if the amount of time a particular miner spends inby or downwind of the DO is known to be infrequent and of short duration, limited to 20 minutes or less. However, transfer of the sampling device is required if the same miner travels inby the DO routinely during the shift.

There are other ways to reduce the number of times that a sampling device needs to be transferred from one miner to another during a shift. This depends on the particular mining practices of the operator. By fully utilizing the operational capabilities designed into currently-employed longwall equipment or altering the mining cycle, the need for miners to work routinely inby the shearer can and should be minimized, thereby reducing the number of necessary pump transfers, and the potential for miners to be overexposed to respirable dust. Another approach has been used successfully at longwall MMUs employing a type of water-spray system called ''shearer-clearer.'' This involves limiting the movement of miners to a certain region or distance inby of the shearer. In some instances this distance can reach 40 feet inby if samples indicate dust levels are similar to the levels in the environment of the tailgate-side shearer operator (Occupation code 044).

If a properly designed shearer-clearer system is installed and maintained, it is very effective in confining the shearer-generated dust to the face for some distance downwind of the shearer and prevents migration to the walkway where miners are located. Therefore, miners who are required to spend time inby the shearer can be protected from exposure to excessive dust levels if their work is limited to this particular area. This area, however, is normally established through sampling on a mine-by-mine basis. The area can vary depending on the quantities and velocities of air delivered to the longwall face, type of cut sequence, water flow rates and spray pressures, and tonnage produced.

If any of these approaches are not suitable or if the miner working furthest downwind refuses to wear the sampling device for any reason, the proposed rule provides for the placement of the sampling device in a specified location on the return side within 48 inches of the corner of the longwall face, which MSHA has designated as the 061 DO. Placing the sampling device at this location is comparable to placing the sampling device on the continuous mining machine within 36 inches inby the normal work position of the machine operator. It should be noted, however, that since dust concentrations at this location are typically the highest, no longwall MMUs are currently submitting bimonthly samples taken at the 061 DO.

The proposed approach, which involves sampling the ''high risk occupation,'' currently referred to as the DO, is not new and has been in use since inception of the mandated sampling program in 1970. This sampling approach is designed to monitor the mine atmosphere with the greatest concentration of respirable dust exposure, in the areas where miners are working during their shift, to prevent excess exposure of miners to respirable coal mine dust. The goal has never been to measure the exposure of an individual miner for the duration of a shift, but rather to determine if the mine atmosphere in the active workings is free of excessive concentrations of respirable dust in order to protect each miner required to work in that environment.

Based on the various dust generating sources and the manner in which the face is ventilated, the return air-side of a longwall face is the area on a longwall MMU with the greatest concentration of respirable dust. Accordingly, since miners are required to work in this area, operators are required to maintain the mine atmosphere in this area or location in compliance with the applicable dust standard on each shift. By doing so, it can be concluded that other miners in less risky occupations are protected from excessive dust concentrations. While these measurements will not show a particular miner's dust exposure, the results will indicate if the air that miners are breathing is in compliance with the applicable dust standard. The objective of the proposed sampling scheme is to control the concentration of respirable dust in the workplace. The method of sampling the DO on a longwall MMU was determined to be reasonable and consistent with the Mine Act in *American Mining Congress* v. *Marshall,* 671 Fed 12151 (10th Cir. 1982). MSHA believes that the method of sampling being proposed will effectively serve the health protection goal of achieving and maintaining good air quality in each MMU. Therefore, the long-standing practice of sampling the DO in each longwall MMU or any other DO would be continued under the proposed rule.

Since the objective is to verify the adequacy of the dust control parameters in effect at a MMU, proposed paragraph (b) would require sampling devices to be turned ''ON'' when the production crew arrives at the MMU to be sampled, regardless if any actual mining is taking place, and not at the portal as required in existing § 70.201(b) for bimonthly sampling. The operator would continue to examine each sampling device at least twice during the sampling shift in accordance with proposed § 70.203(b)(1) and (2). Each sampling device would remain operational during the entire shift that the production crew remains in the MMU, regardless of the number of hours worked. The sampling devices would be turned ''OFF'' at the end of the shift as the production crew, assigned to the occupation(s) being sampled, exits the MMU to travel back to the mine portal.

Each operator would be required to use one control filter for each shift of sampling as required by proposed § 70.201(d). As explained earlier, the control filter will be used to adjust the weight gain obtained on each exposed filter by subtracting any change in the weight of the control filter from the change in weight of each exposed filter. Its use in accordance with § 70.201(d) will enhance the decision-making process involving the approval or denial of the dust control parameters by the district manager.

To qualify as a valid sample for verification purposes, the amount of material produced by the MMU during the shift being sampled must equal or exceed the VPL as required by proposed § 70.201(e). If the VPL is not achieved, the sample(s) will be voided by MSHA. However, any sample that exceeds either verification limit or the applicable dust standard by any amount would be used to determine the equivalent concentration for that occupation, regardless of production.

Proposed § 70.201(e) also requires the operator to utilize only the dust control parameters that were provisionally approved by the district manager. Recognizing that engineering parameters such as air quantity and velocity and water pressure are subject to measurement error and cannot easily be controlled with absolute precision, MSHA would allow the measured levels to be up to 115% of the quantities specified in the plan.

If a measured level exceeds the corresponding quantity specified in the plan by more than 15 percent, the operator would have the option to either (1) adjust the engineering parameter(s) to what is specified in the plan before beginning verification sampling or (2)

make no adjustment to the parameter(s) prior to verification sampling. Under the second option, final approval of the plan parameters would be contingent on the operator incorporating in the plan the maximum quantities of parameters measured during verification sampling. If verification samples were collected on a shift when a plan parameter exceeded 115 percent of the quantity specified in the plan, then (assuming none of the verification samples exceeded the critical values) that parameter quantity, as measured, would be incorporated into the plan parameters ultimately approved by the district manager.

If an operator chooses to sample multiple shifts, they would not have to be consecutive shifts as under the previous bimonthly sampling program. The operator would be required to submit for processing all samples collected by the operator, regardless of the operating conditions under which verification sampling was conducted.

The number of shifts that the operator would need to sample to verify the adequacy of the plan parameters depends on two factors: First, the actual operating conditions in effect during the shift being sampled; and, second, the individual sample results. As discussed earlier, for a respirable dust sample to be valid for verification purposes, the amount of material produced by the MMU must equal or exceed the VPL, and the dust control parameters must be at levels not exceeding 115 percent of the quantities specified in the plan. Therefore, the number of shifts depends largely on how quickly and consistently the operator would be able to achieve these operating conditions. The operator may need to sample several shifts before the production level on any single shift qualifies for verification purposes. The operator could verify the adequacy of the plan parameters based on this single shift—but only if all sample results are at or below the critical values listed in Table 70–1 that correspond to the number of shifts sampled. This would demonstrate the adequacy of the plan parameters at a high level of confidence. If any of the sample results exceed the appropriate critical value, then the operator would need to collect verification samples taken on one to three additional shifts, depending on the concentrations measured on those shifts. Since these additional shifts would also need to meet the production criteria, and use only the dust control parameters specified in the plan, some operators would need to sample a total of more than four shifts.

Assuming that the operator makes no special effort to meet the VPL during verification sampling, there is a 67-percent probability that a randomly selected production shift would not meet the VPL. Consequently, if the operator made no special effort to achieve the desired production, there would be a 13-percent chance the operator would need to sample more than five shifts and a 1.7-percent chance the operator would have to sample more than 10 shifts.[9] On the other hand, again assuming no special production effort, there would be a 98-percent chance the operator would need 10 or fewer shifts and a 70-percent chance that the operator would need to sample three or fewer shifts.[10] This assumes that the sample results for each shift do not exceed the critical value corresponding to the number of shifts sampled. If the operator should make a concerted effort to achieve the VPL on the sampled shifts and meet the other criteria, then sampling of fewer shifts would be needed to verify the adequacy of the dust control parameters.

Section 70.207 Approval of Dust Control Parameters by District Manager; Revocation of Approval

This proposed section establishes the criteria or ''critical values'' that the district manager would use to determine whether the operator's dust control parameters should be approved or denied. These critical values, which differ according to the number of shifts sampled by the operator, are listed in Table 70–1. Appendix A explains how the critical values were derived. When verification sample results do not exceed the applicable critical values, the district manager can be confident that the dust control parameters in use during verification sampling successfully prevented overexposures at the sampled locations.

The district manager would approve the operator's plan parameters when the amount of material produced is at or above the VPL, the parameters and other measures in place during verification sampling do not exceed 115% of the quantities specified in the plan, and no equivalent concentration measurement exceeds the applicable critical values corresponding to the number of shifts sampled.

[9] Assuming no special production effort, the probability of needing more than n shifts to be sampled before meeting the minimum production level required to verify the plan: $P(X>n)= (.667)^n$; for example, the probability of more than 10 shifts being needed, $P(X>) 10) = (.667)^{10} = 1.7$ percent.

[10] Assuming no special production effort, the probability of needing n or fewer shifts to be sampled before meeting the minimum production level required to verify a plan: $P(X\leq n)=1-P(X>n)$; for example, the probability of 10 or fewer shifts being needed, $(1-(.667)^{10}) = 98$ percent.

TABLE 70–1.—CRITICAL VALUES FOR DETERMINING COMPLIANCE WITH VERIFICATION LIMITS.

[The result of each verification sample collected must be less than or equal to the applicable critical values.]

Number of shifts meeting criteria for verification sampling	Critical value for coal mine dust (mg/m³)	Critical value for quartz dust (μg/m³)
1	1.71	87
2	1.85	93
3	1.93	97
4 or more	2.0	100

The proposed criteria would allow the district manager to base approvals on a reasonably small number of sampled shifts, while maintaining a high level of confidence that approved dust control parameters adequately prevent excessive dust concentrations on individual shifts.

The following two examples illustrate how the district manager would apply the proposed criteria or ''critical values'' to determine if the operator's plan parameters for a MMU should be approved.

Example 1: Suppose valid verification samples were taken on two shifts. According to Table 70–1, the district manager would approve the operator's dust control parameters if all coal mine dust and quartz measurements obtained on the two shifts were less than 1.85 mg/m³ and 93 μg/m³, respectively. On the other hand, if one roof bolter sample indicated a quartz concentration of 95 μg/m³, then the district manager would not approve the operator's plan parameters based on these two shifts alone. Instead, at least one additional shift of sampling would be needed. Valid verification samples from only one additional shift would be sufficient if none of the coal mine dust measurements on that shift exceeded 1.93 mg/m³, and none of the quartz measurements exceeded 97 μg/m³.

Example 2: Suppose valid verification samples were taken on four or more shifts. The district manager would approve the operator's plan parameters as proposed if no measurement taken over those four or more shifts exceeded 2.0 mg/m³ of coal mine dust or 100 μg/m³ of quartz dust.

The district manager may revoke approval of the dust control provisions if either MSHA samples or operator samples collected in accordance with proposed § 70.215 indicate that miners are being overexposed to respirable coal mine dust.

Section 70.208 Follow-up Action When Either Verification Limit Is Exceeded

This proposed section would require the operator to take certain actions when a verification sample exceeds either the respirable coal mine dust or quartz verification limit. The operator

would be required to stop verification sampling, provide approved respiratory equipment, identify the cause of the high dust concentration, and take corrective action to prevent miners from being overexposed on subsequent shifts.

When the operator receives notification from MSHA that a verification sample exceeded either verification limit, the operator must stop sampling and immediately make approved respiratory equipment available to affected miners in accordance with § 70.300. The use of respiratory equipment should be encouraged until the operator determines the cause of the overexposure and takes corrective measures. If deficiencies are identified in the operator's dust control program, appropriate corrections must be made under proposed paragraph (b) to lower dust concentrations in the work environment of the affected occupation or location to a level no greater than the applicable verification limits.

MSHA recognizes that, given the rigorous nature of the verification test conditions, such as requiring higher production levels to be maintained and the application of stringent approval criteria, some failures will occur. If some attempts prove to be less than successful, it would not necessarily be due to the lack of good faith effort on the part of the operator, but could be due to the inability to predict accurately the effectiveness of particular dust control parameters under the proposed test conditions. For example, assume the VPL proposed is significantly higher than that which has been recorded during previous sampling inspections. In this instance, it would be difficult to predict in advance that the proposed dust control parameters would be effective unless the VPL was more representative of the previous production levels. Therefore, MSHA is proposing not to cite the operator when samples exceed the verification limits. However, an operator would be cited under proposed paragraph (b) of this section for failure to take action required to address the cause of the excessive dust levels once notified of the results of verification sampling. This is consistent with the Dust Advisory Committee's recommendation that:

> MSHA should not issue citations for violation of the applicable dust standard based on operator verification sampling. Operator inaction to protect miners where dust values are in excess of the PEL should be citable by MSHA.''

The operator would also be required under proposed paragraph (c) to document the corrective actions taken and submit this information to the district manager within five days of receiving MSHA notification that one or both of the verification limits were exceeded. The documentation must describe the specific corrective measures taken and the manner that these measures would be used to prevent overexposures on subsequent shifts, including the proposed changes in dust control parameters. The operator would be encouraged to seek technical assistance from the district manager to help in determining what additional measures are reasonably likely to help in meeting the verification limits.

The district manager would notify the operator and the representative of miners if the proposed revisions to the plan are provisionally approved and whether the operator should either resume or initiate verification sampling in accordance with § 70.206. The district manager may require the operator to make additional changes to the plan parameters based on the results of verification sampling before the operator begins the verification sampling process over again. If no additional changes are required by the district manager, the operator would be instructed to resume the verification process by continuing the sampling from the point at which it was stopped.

The district manager would determine whether the operator should either resume verification sampling or start plan verification anew on a case-by-case basis. MSHA would not necessarily require the operator to revise the plan parameters nor require the verification process to start over again because a valid sample exceeded the verification limit by a small amount, such as 0.05 mg/m^3, unless the district manager no longer felt confident in the ability of the plan parameters to effectively control respirable dust under the proposed operating conditions. The decision to resume sampling to verify the adequacy of the current plan parameters or start over again with totally revised plan parameters would be based on the information the operator provides regarding the cause of any excessive dust concentration measurements and the steps taken to prevent similar occurrences in the future. For example, suppose the concentration measurements are excessive due to a deviation in the operator's established operating procedures. It should be possible for the operator to prevent this from occurring in the future without requiring changes in the dust control parameters. If the district manager finds this to be the case, and concurs with the operator's proposed action to prevent similar occurrences, the operator would be directed to resume verification sampling. However, if the plan parameters are found to be inadequate for the proposed operating conditions and the operator was notified to upgrade the parameters, the operator would be instructed to start the verification process over again.

Section 70.209 Use of Supplementary Control Measures; Types and Conditions for Use; Request for Approval

This proposed section would require the operator to take certain actions when verification samples exceed either verification limit after the operator implemented all feasible engineering or environmental controls. It would permit an operator to use approved powered air-purifying respirators (PAPRs), administrative controls, or a combination of both, after MSHA has determined that further reduction of dust levels cannot be reasonably achieved using accepted engineering controls. The decision-making process for determining whether feasible engineering controls should be augmented by supplementary controls (personal protective equipment and/or work practice controls) to maintain the personal work environment of the affected miners at a safe exposure level will consider the various factors involved in each specific situation. Some of the factors to be taken into account include: (1) The severity and magnitude of the exposure; (2) number of affected miners, their job location and assignment; (3) types and location of dust-generation sources; (4) range of effectiveness and reliability of the implemented engineering controls; (5) availability, suitability, reliability, and cost of other feasible engineering controls; (6) operational conditions such as the method of mining, mining height, etc.; (7) compliance history; (8) effectiveness and reliability of supplementary control measures; (9) concerns of individual miners and their representatives; and (10) ability to measure and ensure the adequacy of exposure control.

Section 202(h) of the Mine Act does not prohibit the use of PAPRs and administrative controls under the specific circumstances set forth in the proposed rule. These measures would be used only as supplementary controls and not as a substitute or replacement for engineering control measures in the active workings. The use of these supplementary control measures under the conditions of use set forth in the proposed rule will enhance the level of health protection for miners by preventing overexposures on all shifts.

The combination of engineering and supplementary controls will provide reliable and effective exposure control when used in accordance with the approved plan provisions.

Consistent with the Mine Act and the Dust Advisory Committee's recommendation, engineering controls continue to be recognized as the primary means to control exposure to respirable dust under this proposed rule. Therefore, if verification samples for a MMU continue to exceed either verification limit after implementing all feasible engineering controls, including such measures as required by the district manager, the operator must continue to use these control measures to reduce the concentration of respirable dust as low as possible.

MSHA believes that it is feasible to control respirable dust to an acceptable level as required by § 75.370(a)(1) at most non-longwall operations using available engineering controls. Currently, over 90 percent of the approximately 720 continuous miner operations employ extended cut techniques and, therefore, are being operated remotely. As a result, the continuous miner operator, the occupation normally identified as the DO, is no longer required to work near the face area where material is being extracted and respirable dust generated. Likewise, roof bolting machines, a major generator of respirable quartz dust on continuous miner MMUs, are now required to be equipped with suitable drill dust controls. Under § 72.630 of this title, drill dust must be controlled by either permissible dust collectors, by water, water with a wetting agent, by ventilation, or by any other method approved by MSHA. However, the Agency also recognizes that some non-longwall MMUs continue to have difficulty maintaining consistent compliance with reduced standards even at production levels that are significantly lower than the proposed VPL because of the high quartz content of the adjacent roof rock, which is drilled to install roof bolts, or of the coal seam being mined.

With regard to mining operations employing the longwall mining method, MSHA recognizes that technological advances have boosted longwall production to record levels. According to MSHA data, the average production reported by operators during bimonthly sampling of longwall MMUs has increased over 6 fold between 1980 and 2002, from 890 to 5500 tons/shift. Unfortunately, as discussed in section III.D. of the preamble, dust control technology has not kept pace, rendering available, acceptable controls less effective, which increases the miner's risk of being overexposed on any given shift. Given the state of longwall dust control technology, the engineering controls currently available may not be effective in achieving and maintaining continuous compliance at certain locations along the longwall face such as downwind of the longwall operator (occupation code—044) at some high-production longwall MMUs. If the operator believes that all feasible engineering controls have been installed, maintained, and operated as specified in the ventilation plan, the operator may submit a written request to MSHA's Administrator for Coal Mine Safety and Health, asking for authorization to augment the implemented engineering controls with supplementary controls to maintain the personal work environment of the affected miners at a safe exposure level and to achieve compliance with the verification limits and §§ 70.100 and 70.101. If such a request is made, a copy must be provided to the representative of miners and posted on the mine bulletin board in accordance with proposed § 70.217(b)(3) at the time it is submitted to MSHA.

When the Administrator receives such a request, guidance would be immediately solicited from a panel of experts specifically established to address such matters. Members of this panel would have extensive knowledge in respirable dust control and would represent the following organizations within MSHA: Technical Support, Division of Health, the MSHA District having jurisdiction over the mine making the request, and another MSHA District. In some cases, MSHA may solicit advice from NIOSH, an Agency with significant experience in dust control. As part of their deliberations and on a case-by-case basis, the expert panel may visit the mine to observe various controls in operation. This panel will also consider all comments MSHA receives from the representative of miners, as well as individual miners, and provide copies of these comments to the operator upon request. Any recommendations reached by this panel would be based on the (1) review of all the facts gathered, (2) consideration of the various factors involved in each specific situation as outlined above, (3) their combined practical and technical experience in dust control, and (4) sound engineering judgement.

Recognizing the urgency of such a request, the Administrator would either approve or deny the operator's request within 30 calendar days or as soon as practical after receiving the request. If approval is denied, the operator will be notified in writing of the specific reasons for disapproval. If approval is granted, the operator would be permitted to use either PAPRs approved by NIOSH under 42 CFR 84 and by MSHA under part 18 of this title, administrative controls, or a combination of both, as supplementary controls to protect those miners assigned to occupations that continue to exceed either verification limit, provided the operator meets the conditions specified in §§ 70.210 and 70.211 or §§ 70.213 and 70.214 of this part.

If the affected occupation involves the 060 occupation, the operator would also be informed that the DO would be changed from the 060 to the 044 occupation, or another occupation designated by the district manager depending on how the particular longwall MMU is ventilated. While it may be difficult to lower the dust levels to the applicable dust standard in the environment of some miners working on the longwall face under certain operating conditions, MSHA believes that, using available engineering controls, an acceptable work environment can be provided for the tailgate-side longwall operator (Occupation code—044) and other miners on a continuing basis. Therefore, unless demonstrated otherwise through verification sampling, the operator would be required to maintain the environment of the new 044 DO at or below the verification limits or below the applicable dust standard using engineering controls. This should have a significant effect on the quality of the mine atmosphere downwind of the 044 DO where miners, wearing PAPRs or under administrative controls, are required to work.

Under the proposed rule, the operator would be permitted to continue to use supplementary controls to reduce dust exposure of individual miners assigned to specific occupations until such time when other feasible engineering controls become available and are implemented or until the district manager revokes the operator's approval to use supplementary controls for failure to comply with the requirements of proposed § 70.211(b) or § 70.214(b).

As discussed above, MSHA will continue to require that all feasible engineering controls be installed. While the proposed rule provides for expanded use of supplementary controls, such control measures should only be used as an interim method of protection since their effectiveness remains secondary to that of engineering controls.

Section 70.210 Through 70.212

Use of Powered Air-Purifying Respirators (PAPRs)

These sections would establish the requirements for using PAPRs as a supplementary control to maintain the personal work environment of the affected miners at a safe exposure level when MSHA has determined that further reduction in respirable dust concentrations cannot be achieved using all feasible engineering or environmental controls or under special circumstances.

Section 70.210 Powered Air-Purifying Respirators (PAPRs); Requirements for Approval

If the operator chooses to use PAPRs as a supplementary control measure, the operator must submit a revision to the ventilation plan to the district manager within five days of receipt of MSHA's written approval in accordance with proposed § 70.209(b). The proposed revision would specify the feasible engineering controls that are capable of (1) reducing the concentration of respirable dust as low as achievable in every occupational environment where a PAPR is required to be worn, and (2) maintaining other occupational environments in the MMU at or below the verification limits. The proposed revision must reflect the engineering controls that were in use at the time that the determination was made by MSHA to permit the use of supplementary controls.

In addition to specifying all feasible engineering controls to be used, proposed paragraph (a)(2) would require the operator to develop a written PAPR protection program which meets the requirements of § 72.710 and incorporates the following information: (1) The protection factor as determined in accordance with proposed § 70.2 that would be assigned to the affected MMU; and (2) the specific occupation(s), work locations or tasks where PAPRs must be worn by the affected miners. A model PAPR protection program to guide the operator in developing a mine-specific program that complies with the requirements of this section is described in Appendix B. The district manager may require the operator to modify the PAPR protection program before granting provisional approval of the proposed plan revision.

Also, consistent with the NIOSH Criteria Document and section 101(a)(7) of the Mine Act, proposed paragraph (a)(3) would require the operator to post warning signs with the statement ''RESPIRATORY PROTECTION REQUIRED IN THIS AREA'' in locations where PAPRs must be worn. Since the presence of excessive dust concentrations is not readily discernible, MSHA believes that the use of warning signs is necessary to protect miners. The posting of warning signs is an appropriate vehicle to inform or remind miners, regardless of their familiarity with the workplace environment, that they are entering a high dust area where the use of PAPRs is mandatory. The Agency recognizes that § 75.370(e) requires that operators instruct persons affected by a revision to the ventilation plan prior to implementation. Section 75.370(f)(3) also requires approved revisions to be posted on the mine bulletin board for the period that the plan is in effect. MSHA is soliciting comments on whether it should require the posting of warning signs when PAPRs must be worn, or should it be optional and left to the discretion of the operator.

Proposed paragraph (b) requires the operator to verify, in accordance with proposed § 70.206(b) through (e), the adequacy of the revised plan parameters, incorporating the use of PAPRs, within 30 calendar days of obtaining provisional approval from the district manager. Accordingly, the operator would be required to collect verification samples in the environment of (1) the occupation(s) where PAPRs must be worn by miners assigned to work in those job positions, (2) the DO, and/or (3) other occupation(s) that may be designated by the district manager.

Section 70.211 Powered Air-Purifying Respirators (PAPRs); Approval and Conditions for Continued Use; Revocation of Approval

This proposed section establishes the criteria that the district manager would use to determine whether the operator's proposed plan revision incorporating the use of PAPRs should be approved. As previously discussed under proposed § 70.207, approval of the proposed revision would depend on the results of verification sampling and the operating conditions in effect for each sample.

The district manager would approve the operator's revised plan when: (1) The amount of material produced is at or above the VPL, the parameters and other measures in place during verification sampling do not exceed 115% of the quantities specified in the plan, and no equivalent concentration measurement exceeds the critical values listed in Table 70–1 that correspond to the number of shifts sampled; and (2) the revision incorporates the dust control parameters used during verification sampling.

To account for the expected workplace level of respiratory protection provided the wearer of the PAPR, the equivalent concentration measurement must be adjusted further in accordance with § 70.2. This requires the equivalent concentration to be divided by the protection factor (PF) specified in the PAPR protection program for the particular mechanized mining unit (MMU). The PF represents the minimum reduction in dust concentration that a respirator would be expected to provide. In the absence of a direct measure of the dust concentration inside the PAPR (in the miner's personal work environment) while under the conditions of the workplace, the adjusted equivalent concentration represents a surrogate measure of the respirable dust concentration inside the PAPR facepiece to which the wearer is exposed. Since the PFs assigned to MMUs under this proposed rule incorporate a margin of safety, the resulting equivalent concentration measurement represents a conservative estimate of the dust concentration in the miner's breathing zone.

For example, assume that a MMU, which was assigned a PF = 3, was sampled one shift and the concentration measurement for the sampled occupation under a PAPR protection program is 3.54 mg/m3 for respirable coal mine dust and 174 $\mu g/m^3$ for respirable quartz dust. Under the definition of ''equivalent concentration,'' these measurements are divided by 3, which yields an equivalent concentration of 1.18 mg/m^3 [3.54 $mg/m^3/3$] for respirable coal mine dust and 58 $\mu g/m^3$ [174 $\mu g/m^3/3$] for respirable quartz dust to which the miner assigned to that occupation is exposed. If no other valid equivalent concentration measurement obtained on one shift exceeds 1.71 mg/m^3 or 87 $\mu g/m^3$ according to Table 70–1, the district manager would approve the revised plan incorporating the use of PAPRs.

MSHA believes that this strategy provides far more health protection to miners than is available under current regulations, which only requires operators to make available approved respiratory equipment to miners when exposed to excessive dust concentrations. There is no requirement that miners actually wear the respirator when issued. Under the proposed rule, not only must PAPRs be worn at all times but must also conform to specific requirements consistent with an acceptable respiratory protection program.

Proposed paragraph (b) establishes the requirements for the continued use of

PAPRs as a supplementary control. To continue to use PAPRs and operate under the same conditions that were in effect during verification sampling, the operator would be required to comply with the approved revised plan parameters on each production shift, in particular, the provisions of the PAPR protection plan. MSHA believes that the effectiveness of a PAPR is dependent upon proper training and continued maintenance, which are critical elements of an acceptable PAPR protection program. Necessary maintenance includes examining the PAPR for defects prior to use, charging the batteries properly, and appropriate replacement of parts including, but not limited to, the filter elements, visors, batteries, blowers, and face seals.

In addition, the operator would be required to ensure that no occupation where PAPRs must be worn by the miners required to work in those particular job positions, the DO and other occupations in the affected MMU, are exposed to an equivalent concentration of respirable coal mine dust that exceeds the applicable dust standard.

Finally, since the use of PAPRs as a supplementary control is not intended to be permanent and their use is being permitted until feasible engineering controls become available, proposed paragraph (b)(3) would require the operator to continue to seek and implement additional improvements when they become available. To ensure conformance with these requirements, MSHA will review the operator's approved plan parameters, including the operator's compliance history, every 6 months to determine if the operator is using all feasible engineering controls and if the plan parameters continue to be suitable to the current operating conditions. If MSHA determines that other acceptable controls have become available which would be suitable to the particular MMU, MSHA would notify the operator and the representative of miners of its findings.

MSHA approval to use PAPRs as a supplementary control may be revoked if the operator failed to meet the requirements of proposed paragraphs (b)(1), (2) and (3) of this section. If the operator's plan provisions are revoked, the operator would be required to submit a revision to the plan parameters for the affected MMU that would include a VPL at which compliance with the applicable dust standard would be achieved.

Section 70.212 Powered Air-Purifying Respirators (PAPRs); Conditions for Use under Special Circumstances

Section 70.212 sets forth the special circumstances under which an operator would be permitted to use, on an intermittent basis, PAPRs to protect individual miners from excessive dust concentrations and for compliance purposes. Such use is only permitted after the plan parameters have been verified without the use of supplementary controls and additional remedial actions will not be practical or feasible because of the intermittent nature and duration of a special condition.

Because of the dynamic nature of mining, it is not uncommon for a MMU to occasionally encounter operating conditions which directly impact the ability of the previously verified plan parameters to effectively control respirable dust. This is especially true when the particular condition encountered varies from the operating conditions under which the adequacy of the plan parameters was originally demonstrated. It is not because an operator may have failed to adequately take such conditions into account when designing the plan parameters, but because the proposed verification process requires the adequacy of the plan parameters to be demonstrated only under typical operating conditions. For example, encountering a significant rock band in the coal seam containing a high percentage of quartz would be considered a unusual circumstance since its occurrence is not routine. While this may have occurred in the past and may occur again, the operator cannot predict with certainty when this condition might reoccur. Because of the unpredictable nature of such an occurrence, it may not be practical to factor this into the design of the plan parameters.

While the Mine Act and implementing regulations intend for the working environment to be free of excessive dust at all times, MSHA recognizes that it may not be practical or feasible to implement additional engineering controls whenever these unusual conditions occur, especially when they occur intermittently for a brief period of time. Even if the operator makes a concerted effort to implement additional engineering controls, it may require an extended period of time to complete and verify the effectiveness of the adjustments, during which time some miners may not be adequately protected from excessive dust.

Before MSHA will grant authorization to use PAPRs for compliance purposes, the operator must show that the particular condition or situation is atypical, occurs only occasionally, and is beyond the control of the operator. Increased production levels which exceed the VPL and any other situations which are more routine and therefore under the operator's control would not be characterized as unusual conditions. However, because of the difficulty in maintaining proper ventilation along a longwall face, during start-up, MSHA will consider and encourage the use of PAPRs at longwall MMUs until the first gob fall. The types of evidence MSHA would consider when the unusual condition encountered involves cutting rock occasionally, would include information on quartz levels, the duration and frequency of reduced standards, and/or on the reject rate for a particular MMU.

MSHA anticipates questions regarding what constitutes special circumstances under this proposed section. It is not possible or appropriate to set forth all circumstances which might be covered by this proposed rule. Each request will be considered by the district manager on a case-by-case basis. The district manager will rely on past in-mine experience and the information provided by the operator in determining whether the special circumstances under which the applicant is seeking authority to use PAPRs, occurs intermittently and is the best way to protect the affected miners during such periods. The Agency specifically solicits comments on these issues, especially, with regard to what other special circumstances in mining may necessitate the immediate use of PAPRs.

Under proposed paragraph (a), an operator can file a written request seeking MSHA approval to use PAPRs under special circumstances: (1) When submitting a ventilation plan under § 75.370 of this title, (2) when required to verify a previously approved ventilation plan that was revised in accordance with § 75.370(f), or (3) after the district manager approves the plan parameters based on the results of operator verification samples. To the extent possible, the operator must submit a written request prior to encountering special circumstances to assure prompt review, and revision to the ventilation plan. A copy of the request must be provided to the representative of miners at the time of submittal and posted on the mine bulletin board to alert the miners working in the affected MMU. The district manager will consider all comments and, if requested, provide copies of these comments to the operator.

In addition to showing that the particular circumstances necessitating use of PAPRs occur occasionally and are beyond the control of the operator, proposed paragraph (b) requires the operator to revise the previously approved plan provisions to incorporate the provisions proposed in § 70.210(a)(1), (2) and (3).

Once approval is granted by the district manager, proposed paragraph (c)(1) through (3) sets out the requirements for the use of PAPRs. The operator will be required to notify, in writing or by electronic means, the district manager and the representative of miners within 24 hours of determining that current operating conditions necessitate use of PAPRs. This would enable MSHA to follow-up with an in-mine visit to verify the operating conditions under which PAPRs are being used and whether the operator is in full compliance with the letter of approval and with the provisions of proposed § 70.211(b)(1) and (2). It is the responsibility of mine management to ensure that PAPRs are worn for all required periods and to see that the conditions stipulated in the plan, which are necessary to protect miner health, are followed.

When PAPRs are used during MSHA compliance sampling, the determination of compliance with the applicable dust standard will be made in accordance with proposed § 70.218(a). For occupations under a PAPR protection program, compliance would be assumed if the equivalent concentration measurement, as determined in accordance with § 70.2 and as discussed under § 70.211, is less than the citation threshold value (CTV) listed in Table 70–2 that corresponds to the applicable dust standard in effect.

Unusual operating circumstances do not normally last for an extended period of time. Therefore, use of PAPRs for compliance purposes is limited to 30 consecutive days. The district manager may revoke the operator's authority to use PAPRs under special circumstances for failure to comply with this requirement. If the operator exceeds this time period or if respirable dust samples taken by either the operator or MSHA indicate miners are being overexposed, the operator must revise and verify the adequacy of the proposed plan parameters under the prevailing operating conditions. Comments are specifically requested on this issue.

Permitting the use of PAPRs to supplement existing engineering controls to protect individual miners under special circumstances as proposed is consistent with the intent of the Mine Act and is in the best interest for miner health.

Section 70.213 through 70.214

Use of Administrative Controls

These sections would establish the requirements for using administrative controls as a supplementary control to maintain the personal work environment of the affected miners at a safe exposure level when MSHA has determined that further reduction in respirable dust concentrations cannot be achieved using all feasible engineering or environmental controls.

Section 70.213 Administrative Controls; Requirements for Approval

If the operator chooses to use administrative controls as a supplementary control measure, this proposed section would require the operator to submit a revision to the plan parameters to the district manager within five days of receipt of MSHA's written approval in accordance with proposed § 70.209(b). The proposed revision would specify the engineering controls that are capable of maintaining the environment of any occupation under administrative controls and the DO or another occupation designated by the district manager at or below the verification limits.

In addition to specifying all feasible engineering controls to be used, proposed paragraph (a)(2) would require the operator to include a detailed description of each specific administrative control to be implemented. Because the effectiveness of administrative controls is based on adherence to strict time periods, work schedules, and or other administrative controls, the revision must explain how the operator would verify compliance with the prescribed administrative control. The district manager may require the operator to modify the administrative controls before granting provisional approval of the proposed plan revision incorporating the use of such measures as a supplementary control.

Proposed paragraph (b) would require the operator to verify, in accordance with proposed § 70.206(b) through (e), the adequacy of the revised plan parameters incorporating the use of administrative controls within 30 calendar days of obtaining provisional approval from the district manager. Accordingly, respirable dust samples would be collected in the environment of (1) The occupation(s) under administrative controls, (2) the DO, and (3) other occupation(s) that may be designated by the district manager.

Section 70.214 Administrative Controls; Approval and Conditions for Continued Use; Revocation of Approval

This proposed section establishes the criteria that the district manager would use to determine whether to approve the operator's proposed revision to the plan parameters incorporating the use of administrative controls as a supplementary control. As previously discussed under proposed § 70.207, approval of the proposed revisions would depend on the results of verification sampling and the operating conditions in effect during the time each sample is collected. The district manager would approve the revisions if (1) no valid equivalent concentration measurement exceeds the critical values listed in Table 70–1 that correspond to the number of shifts sampled, and (2) the revision incorporates the dust control parameters and administrative controls that were in effect during verification sampling. For the district manager to approve the revised plan parameters for a MMU based on only one shift of sampling, no valid concentration measurement can exceed 1.71 mg/m^3 for respirable coal mine dust or 87 $\mu g/m^3$ for respirable quartz.

Proposed paragraph (b) establishes the requirements for the continued use of administrative controls as a supplementary control. To continue to use administrative controls and operate under the same conditions that were in effect during verification sampling, the operator would be required to comply with the approved revised plan on each production shift, and particularly with the prescribed administrative controls. Since miners must actively comply for administrative controls to be effective in reducing dust exposure, the operator must train the affected miners to follow prescribed administrative controls and require their cooperation for them to be effective.

In addition, the operator would be required to ensure that no occupation is exposed to concentrations of respirable dust that exceed the applicable dust standard. MSHA will evaluate the effectiveness of the dust control parameters and the operator's performance in complying with all provisions of the approved plan.

Since the use of administrative controls as a supplementary control is not intended to be permanent and their use could be permitted only until feasible engineering controls become available, proposed paragraph (b)(3) would require the operator to continue to seek and implement additional improvements when they become available. To ensure compliance with

these requirements, MSHA will review the operator's approved plan parameters, including the operator's compliance history, every 6 months to determine if the operator is using all feasible engineering controls and if the plan parameters continue to be suitable to the current operating conditions. If the district manager determines that other controls have become available which would be suitable to the particular MMU, the district manager would notify the operator and the representative of miners of such findings.

MSHA approval to use administrative controls as a supplementary control may be revoked if the operator fails to meet the requirements of proposed paragraphs (b)(1), (2) and (3) of this section. If the operator's plan provisions are revoked, the operator would be required to submit a revision to the plan parameters for the affected MMU that would include a VPL at which compliance with the applicable dust standard would be achieved.

Section 70.215 Quarterly Evaluation of Approved Plan Parameters

Because conditions in an underground mine are constantly changing, the effectiveness of previously approved dust control parameters for a particular MMU may change. Consequently, plan parameters may later be inadequate in preventing overexposures on individual shifts and adjustments may be necessary to continually comply with the applicable dust standard. Therefore, in addition to ensuring compliance with the plan parameters under existing § 75.362(a)(2), the operator also has the responsibility to ensure that the plan parameters continue to be effective in controlling respirable dust as required by § 75.370(a), and to upgrade the plan parameters when deemed appropriate. This is necessary to prevent overexposures on individual shifts and, in the long run, the occurrence of coal workers' pneumoconiosis and silicosis in miners.

The importance of assessing the continued adequacy of plan parameters and the role of operators in that process was recognized by the Dust Advisory Committee:

> MSHA should develop specific performance requirements for operator sampling relative to documentation of continued adequacy of the plan parameters. (MSHA, 1996)

To accomplish this, proposed § 70.215, would require an operator to implement a 3-month interval (quarterly) sampling program at MMUs where the continued adequacy of the approved plan parameters is in question and miners are at risk of being overexposed as indicated by MSHA-collected respirable dust samples used to audit operator compliance with applicable standards. Therefore, rather than require all operators to sample quarterly, the quarterly monitoring requirement is triggered when airborne dust concentrations, as measured under MSHA's sampling program, exceed the applicable dust standard. This risk-based approach is more performance-oriented and minimizes unnecessary sampling. The purpose of operator quarterly sampling would be to monitor the adequacy and suitability of the approved dust control parameters under prevailing conditions.

Since operators have the responsibility for providing a workplace that is free of excessive dust, all operators are encouraged to design and implement a monitoring program suitable to their specific mine to ensure that the applicable dust standard is not exceeded. MSHA believes that operators have a number of incentives to monitor the quality of the air in each MMU on a regular basis to ensure they can (1) assess the effectiveness of their dust control parameters or need for adjustments to continually comply with the applicable dust standard and (2) avoid citations and penalties during MSHA sampling inspections.

Under the proposed rule, the sampling process would begin with the determination by the district manager of the particular MMUs which would be regularly sampled at the mine. In determining which MMUs at a mine should be sampled periodically, the district manager would, under the proposed rule, first review the results of respirable dust samples after each sampling inspection of a MMU. If a valid equivalent concentration measurement for any occupation exceeds the applicable dust standard by at least 0.1 mg/m^3, quarterly sampling would be required.

The proposal also provides for the suspension of quarterly sampling when all respirable dust samples submitted by the operator in accordance with this section, together with samples taken by MSHA during at least four consecutive quarters, demonstrated continuing compliance with the applicable dust standard. To ensure that the proper MMUs are exempted from quarterly sampling when miners are no longer at risk of being overexposed, each operator- and MSHA-collected sample must be at or below the applicable dust standard.

Under paragraph (a), the operator would begin quarterly sampling during the next full 3-month period following MSHA notification of the designation of a MMU for sampling. The proposed rule provides a schedule for quarterly sampling. For example, during the period January 1 through March 31, operators would be required to sample each designated MMU in producing status. When there is a change in the operational status of the particular MMU that affects operator monitoring, proposed § 70.219(a) requires the operator to report such status change to the district manager. Suppose, for example, a MMU has been in nonproducing status for 75 calendar days during the current quarterly sampling period, the operator would still be expected to satisfy the sampling requirements because there would be sufficient time remaining in the current period to sample the required one shift. Failure to submit the required number of valid respirable dust samples within a given quarterly period would constitute a violation of this provision. Operators would be encouraged to conduct the required sampling at the beginning of each quarterly sampling period. All samples submitted by the operator would be processed by MSHA.

To provide consistency and uniformity among operator-collected samples for purposes of monitoring plan effectiveness, the proposed monitoring program would require the operator to sample selected occupations in accordance with proposed § 70.206(b), (d) and (e) for one shift. Also, since the objective of quarterly sampling is to evaluate the continued adequacy of the approved plan parameters under the prevailing conditions, each sample must be collected under the operating conditions specified in proposed § 70.201(e) which specifies that the amount of material produced must equal or exceed the VPL, unless sampling in accordance with proposed § 70.220(d). Only the dust control parameters listed in the approved ventilation plan, at levels not exceeding 115 percent of the specified quantities, are to be in place during sampling. As in verification sampling, if the operator fails to attain the VPL on the shift sampled, all samples for that shift will be voided by MSHA. However, if any sample, regardless of production, is found to exceed the applicable dust standard by any amount, it would be used by MSHA to determine the equivalent concentration for that occupation. Also, if the MMU being sampled is authorized to use PAPRs under special circumstances (proposed

§ 70.212) and those circumstances prevent the MMU from achieving the VPL, all samples for that shift would be used to determine the equivalent concentration for the affected occupations.

Since these samples are for evaluation purposes, the operator would not be required to use a control filter in accordance with proposed § 70.201(d). The district manager may require the operator to reverify the adequacy of the plan parameters for a particular MMU based on these results and other compliance data if the data indicates that the parameters are no longer effective in maintaining compliance. If, on the other hand, the operator or MSHA is prevented from confirming the suitability of the approved dust control parameters to the current operating conditions because of repeated submission of invalid samples, reverification of the plan parameters would be required by the district manager.

Under proposed paragraph (c), when a valid equivalent concentration measurement exceeds the applicable dust standard by at least 0.1 mg/m^3, the operator must make approved respirators available to the affected miners in accordance with § 70.300, unless the occupations are under a PAPR protection program. The operator must determine the cause and correct the identified deficiency to reduce the concentration of respirable dust to within the applicable dust standard and avoid future overexposures. This requires the operator to review the dust control parameters and to determine what factors may have contributed to the overexposures. As discussed elsewhere in the preamble, if the sampled occupation is under an approved PAPR program, each valid concentration measurement would be adjusted in accordance with § 70.2. The equivalent concentration would be compared to the applicable dust standard. For example, assume the reported equivalent concentration of a sample is 2.56 mg/m^3 and the MMU is assigned a protection factor of 4. Then the equivalent concentration measurement, adjusted for the use of a PAPR, is 0.64 mg/m^3 [2.56 mg/m^3/4 = 0.64 mg/m^3].

Additionally, since the presence of excessive dust poses a significant health hazard to miners, proposed paragraph (c)(3) would require excessive dust conditions to be recorded in the same manner, but with some exceptions, as the hazards recorded under § 75.363(b) of this title. The record would include: (1) The date the sample was taken; (2) the location in mine and the occupation where the excessive dust condition occurred; (3) the equivalent concentration measurement of each sample collected; (4) the specific action taken to reduce the concentration of respirable dust to within the applicable dust standard. MSHA will be providing the operator with a respirable dust sample data report that contains much of the same information required under this paragraph. In order to reduce the operator's paperwork burden, the MSHA respirable dust sample data report could serve as this record, provided the operator includes the specific corrective action taken, certifies its accuracy and completeness, and retains the record for at least 12 months at a surface location as required by § 75.363(c) and (d). The dust record does not need to be countersigned, provided that the mine official certifying the record is aware of the monitoring results and directed or supervised the implementation of the corrective actions. These records provide notice to mine management that excessive dust conditions are recurring, the locations in the mine, and the effectiveness of the various corrective actions. For example, if an excessive dust condition occurs repeatedly and the same corrective action is taken, the corrective action may not be effective. Posting the record on the mine bulletin board will alert all affected miners of the particular dust hazards to which they have been exposed and the specific corrective action(s) being taken by the operator to reduce the dust concentration in the work environment to within the applicable dust standard to prevent similar occurrences in the future. The requirement to inform miners is necessary to assure miners that the operator is making efforts to provide a safe and healthful work environment. This is a new requirement and the Agency solicits comments on the proposed approach to require that excessive dust conditions and the corrective action taken be recorded, certified and retained as currently required for other hazards under § 75.363.

If the results of quarterly sampling indicate that the approved plan parameters are no longer adequate to control respirable dust under the prevailing operating conditions, the operator must revise the plan parameters and submit the proposed revision to the district manager for review and approval. For example, if any valid equivalent concentration measurement meets or exceeds the citation threshold value (CTV) listed in Table 70–2 that corresponds to the applicable dust standard in effect, the plan parameters would need to be upgraded and verified under current conditions. Because the results indicate that miners are being overexposed, MSHA will conduct follow-up sampling whenever an operator's quarterly sample meets or exceeds the CTV and the plan parameters are not revised by the operator.

Under proposed paragraph (e), the results of operator quarterly sampling will not be used to determine compliance with the applicable dust standard. If any sample result exceeds the CTV, the operator would not be cited for a violation as would be the case if MSHA sampled. The operator would, however, be required to take corrective action. Failure to take such action to reduce the respirable dust concentration within the applicable dust standard would be citable under this section.

MSHA requests comments on the appropriateness of the criteria used to trigger operator monitoring of plan effectiveness and proposed frequency, especially with regard to the 3-month interval, that maximize the protection of miners' health. Also, whether a more performance-oriented requirement should be imposed on operators, requiring them to monitor at the frequency needed to assure, with reasonable accuracy, the continued adequacy of the approved plan parameters in preventing overexposures on individual shifts.

Section 70.216 Respirable Dust Samples; Transmission by Operator

MSHA is proposing no substantive changes to existing § 70.210, except for removing reference to § 70.202 (Certified person; sampling) from existing paragraph (c) to eliminate repetition since revised § 70.201 specifies that all sampling required under this part must be conducted by a certified person, and redesignating it as § 70.216. Existing paragraph § 70.210(e) would be removed since all samples submitted by the operator under this part would be processed by MSHA. The proposed rule, like the existing rule, requires all respirable dust samples collected in accordance with this part to be transmitted to MSHA within 24 hours after the end of the sampling shift in containers provided by the manufacturer of the filter cassette. The need to verify the adequacy of the dust control parameters for a particular MMU in the shortest possible time requires that samples be promptly transmitted to MSHA for analysis.

Each sample transmitted by the operator must be accompanied by a

properly completed dust data card. All dust data cards submitted must be signed by a person certified to collect samples and must include that person's certification number. By signing the card, that person certifies that the sample was collected in accordance with the requirements of this part.

To maintain program integrity, all samples collected by an operator would be considered by this proposed rule to fulfill the sampling requirements of this part. Samples to be used by operators for other purposes would have to be identified in writing or by electronic mail to the district manager, by each filter cassette identification number, prior to their intended use.

Operators that use PCDMs under proposed § 70.220 are exempt from the requirements of this section, except when transmitting samples for quartz analysis required by proposed § 70.220(c).

Information To Be Posted on the Mine Bulletin Board

Section 70.217 Respirable Dust Samples; Report to Operator; and Posting

Under the proposed rule, existing § 70.210 would be revised and redesignated as § 70.217. It specifies the type of sampling and other related information the operator would post on the mine bulletin board. The proposed posting requirements are intended to serve in the best interest of miners without being overly burdensome to operators. The continuation of posting requirements is intended to promote miner awareness of process of verifying the adequacy of the dust control parameters for each MMU specified in the mine ventilation plan and of the respirable dust conditions in the mine. This is consistent with the statutory intent that miners play a role in preventing unhealthy conditions and practices where they work. This approach is consistent with the recommendations of the Dust Advisory Committee regarding miner participation in the sampling process.

Paragraph (a)(1) through (6) of the proposed rule retains the existing requirement regarding the types of data MSHA would report on samples submitted by the operator. The results of all MSHA sampling would be reported to the operator. The data report would include the identification of the MMU or DA in the mine where each sample was collected; the equivalent concentration of respirable dust for each valid sample; the occupation code, where applicable; and the reason for voiding any sample. In addition to providing data on individual samples, the Agency would also furnish information on the dust control parameters that were in effect during MSHA sampling by providing a copy of completed MSHA Form 2000–86 (Revised), *Respirable Dust Sampling and Monitoring Data*.

Paragraph (b)(1) of the proposed rule retains the existing requirement that the operator post on the mine bulletin board the respirable dust sample data report provided by MSHA. The operator must post the end-of-shift exposure information if using a PCDM in accordance with § 70.220. The results of all respirable dust samples collected by federal mine personnel that MSHA would provide under revised paragraph (a) must be posted. Additionally, the operator would post a copy of MSHA Form 2000–86 for each MMU sampled by federal mine personnel. This requirement would ensure that miners and their representative(s) are provided information concerning the quality of the mine air where they work and the dust control parameters under which MSHA sampling was conducted.

MSHA recognizes the importance of input from the miners and their representatives in the plan approval process. To assure miners understand the verification process, proposed paragraph (b)(3) would require the posting of all written notifications received from the district manager pertaining to verifying the adequacy of the dust control parameters under this part. This includes all correspondence submitted in accordance with proposed §§ 70.209 and 70.212. The district manager would be available to discuss with the representative of miners as well as individual miners all aspects of the plan parameter verification process.

Proposed paragraph (c) specifies the length of time the information provided under paragraph (b) would be posted on the mine bulletin board. Results of operator verification sampling and all written notifications received from the district manager that pertain to the plan verification procedures could be removed immediately following notification of approval of the plan parameters for a particular MMU. Correspondence required under proposed § 70.212(c)(1) regarding the occurrence of special circumstances requiring the use of PAPRs must remain posted for the period of time that PAPRs are in use. The respirable dust sample data report provided by MSHA on operator sampling in accordance with proposed § 70.215 and MSHA sampling results, including the information specified in proposed paragraph (b)(2) of this section, must be posted for at least 31 calendar days following receipt. If using a PCDM, the end-of-shift exposure data along with the information specified in paragraph (b)(2) must be posted for at least 7 calendar days following the end of the sampling shift.

Section 70.218 Violation of Respirable Dust Standard; Issuance of Citation; Action Required by Operator; and Termination of Citation

Proposed § 70.218 addresses the circumstances under which MSHA would issue a citation for excessive dust and establishes the specific actions that an operator would be required to take within the time for abatement fixed in the notice. It also sets forth the conditions under which MSHA would terminate such citations.

Under proposed paragraph (a), the operator would be cited for a violation of either § 70.100(a) and (b), or § 70.101 when a valid equivalent concentration measurement for any occupation sampled by MSHA exceeds the citation threshold value (CTV) listed in Table 70–2 that corresponds to the applicable dust standard in effect. As discussed in section III.A.4. of the preamble, these measurements will be based on single-shift samples collected with approved sampling devices that will be operated portal-to-portal. The devices will remain operational, during the entire shift or for 8 hours, whichever time is less, as has been the long-standing practice.

The CTVs and an explanation of how they were derived was originally published in **Federal Register** notice of February 3, 1998 (63 FR 5687), entitled ''Coal Mine Respirable Dust Standard Noncompliance Determinations.'' As explained in that notice and in Appendix C of the current notice of proposed rulemaking, each CTV was calculated so that citations would be issued only when a single-shift measurement demonstrates noncompliance at least at a 95 percent confidence level. Under this proposed rule, MSHA would issue no more than one citation based on the result of single shift samples from the same MMU, unless separate citations are warranted for occupations exposed to different dust-generating sources. The following examples illustrate how MSHA would apply the CTVs to make noncompliance determinations. Suppose that a measurement of 2.41 mg/m^3 is obtained for the DO, and measurements of 2.34, 1.54, 2.00, and 1.56 mg/m^3, are obtained for four other occupations exposed to the same dust-generating source as the DO during a single shift on a MMU required to comply with an applicable dust standard of 2.0 mg/m^3. Because at

least one measurement exceeds the 2.33-mg/m^3, CTV (the citation value for a 2.0-mg/m^3 standard), a citation would be issued for exceeding the applicable dust standard on the shift sampled. Even though two individual measurements (2.41 and 2.34 mg/m^3) exceeded the CTV, one of which is the DO, only one citation would be issued. The DO would be identified in the narrative of the citation as the affected working environment, because all occupations were exposed to the same dust-generating source. Since MSHA would assume responsibility for all compliance sampling under this proposed rule, these five occupations would be resampled by federal mine personnel during abatement sampling to verify that the condition causing the excessive dust levels has been corrected if the district manager concluded that a revised plan was not necessary.

Suppose that in the previous example the 2.34-mg/m^3 measurement was obtained for a roof bolter, and the MMU was being ventilated using a double-split ventilation system. This means that the roof bolter, working on a separate split of air from that of the continuous miner, is exposed to a different dust generating source than the DO. Therefore, the roof bolter may not be adequately protected by dust controls implemented for the DO. Consequently, two citations would be issued. Since MSHA samples would be used, all dust control parameters and mining activity would be documented on MSHA Form 2000–86. This information would be reviewed by MSHA along with the sample results to determine if the dust control parameters specified in the approved ventilation plan would need to be upgraded.

MSHA believes that, because of the large ''margin of error'' separating each CTV from the corresponding applicable dust standard, use of the CTV table would provide ample protection against erroneous citations, a concern raised by previous commenters. This matter was fully explored in the analysis published in Appendix C of the February 3, 1998 notice (63 FR 5703–5709). That analysis showed that for exceptionally well-controlled environments, the probability that any given citation is erroneous will be substantially less than 5 percent. The analysis also showed that this probability is even smaller in environments that are not well controlled. Therefore, any citation issued under this proposed rule in accordance with the CTV table would be much more likely the result of excessive dust concentration rather than measurement error. With regard to the risk of erroneous failures to cite, MSHA concluded that ''the probability of erroneously failing to cite a case of noncompliance at a given sampling location is less than 50 percent when the applicable dust standard is exceeded on a significant proportion of shifts at that location'' (63 FR 5709).

Furthermore, noncompliance determinations based on the results of single-shift samples would reduce the chances for failure to cite cases of noncompliance. According to the inspector sampling inspections of MMUs conducted between August and December 2001, only 14 MMUs were found to be in violation of the applicable dust standard. These MMUs were cited under the more recent enforcement policy of averaging measurements taken over multiple shifts, compared to 260 MMUs that would have been citable using single-shift measurements in combination with the CTV table. This clearly demonstrates that the proposed enforcement strategy would not compromise miners' health, instead it would have identified 246 additional instances of overexposure. Otherwise, these overexposures would continue to go undetected under the current policy of measurement averaging.

MSHA has also carefully considered suggestions from previous commenters that the Agency cite for noncompliance whenever any single-shift measurement exceeded the applicable dust standard as this would provide greater health protection to the miner. However, MSHA rejected these suggestions because an enforcement action might not be sustained at this level of confidence. The likelihood that a particular measurement exceeds the applicable dust standard, but not the CTV, due to measurement error, can actually exceed the likelihood that the measurement exceeds the standard due to excessive dust concentration. A thorough technical discussion of this issue is provided at 63 FR 5709–5712 (Appendix D of the **Federal Register** notice cited above).

MSHA has concluded that using single-shift measurements for noncompliance determinations in accordance with the CTV table neither increases nor decreases the applicable dust standard. Operators would continue to be required to maintain compliance with the applicable dust standard at all times. Also, the operator's dust control parameters must be verified as adequate to maintain dust concentrations at or below the applicable dust standard on all shifts, not merely at or below the CTV.

As explained in the notice regarding single-shift measurements of respirable coal mine dust published in today's **Federal Register**, the Mine Act requires MSHA to regulate exposures on each shift. Since MSHA does not track the number of shifts each miner works over a lifetime, MSHA must, protect miners by limiting their exposure on each shift. Furthermore, as explained in Parts VI and VII of today's notice, eliminating overexposures on individual shifts is beneficial to miners' health. For miners working where there is a pattern of recurrent overexposures on individual shifts, eliminating such overexposures is expected over a working lifetime, to significantly reduce the risk of CWP. Therefore, the Secretary has concluded that equivalent dust concentrations should be maintained below the applicable dust standard on each and every shift.

If an operator receives a citation for exceeding the applicable dust standard, proposed paragraphs (b)(1) through (4) would require the operator to take specific actions to immediately protect miners and to prevent them from being overexposed on subsequent shifts within the time period fixed in the citation. First, the operator would continue to make available approved respiratory equipment to affected miners in accordance with existing § 70.300 and encourage their use until the overexposure condition is corrected, unless the cited occupation is already under a PAPR protection program. The operator would then review the dust control parameters in effect to determine the cause of the excessive dust concentration and correct any deficiencies identified to reduce the equivalent concentration to within the applicable dust standard. If the corrective action the operator takes indicates that the dust control parameters originally approved for the MMU may no longer be adequate for the current conditions, the operator should revise the plan parameters.

Since MSHA would be assuming responsibility for all compliance sampling, proposed paragraph (a)(4) would require the operator to notify the district manager in writing or by electronic means, of what those corrective measures are within 24 hours after implementation. This would enable the district manager to determine whether MSHA should schedule sampling to assess the adequacy of the operator's corrective actions or whether to require the operator to initiate verification sampling. This determination would be based on (1) the review of the information the operator provides; (2) the latest MSHA inspection report documenting the measured quantities of the dust control

parameters that were in use and other conditions that were in effect at the time of sampling that resulted in MSHA issuing a citation for excessive dust; and (3) the operator's prior performance in complying with the plan parameters.

If the district manager concludes that the corrective measures taken are sufficient to achieve and maintain compliance, MSHA would conduct sampling to determine if the operator's actions were effective to gain compliance. For example, if the operator believes that the overexposure was caused by improperly following work practices, the proper course of action would be to review these work practices with the affected miners rather than require the operator to revise the plan. Since there would be no need to change the plan parameters, MSHA would initiate abatement sampling in this particular case. Like compliance sampling, federal mine personnel would sample five different occupations including the occupation originally cited for the entire shift or for 8 hours, whichever time is less. However, if this problem should recur, the district manager would inform the operator that the plan parameters are no longer adequate to provide the required level of health protection and require the operator to initiate verification sampling.

If, on the other hand, the district manager determines that dust control parameters may not maintain respirable dust levels at or below the applicable dust standard and requires the operator to upgrade the dust control portion of the mine ventilation plan, the operator would be required to initiate the plan verification process under proposed § 70.206.

Under proposed paragraph (c), an excessive dust citation would be terminated when the results of all valid respirable dust samples collected by MSHA were at or below the applicable dust standard. The subsequent action form would clearly and fully describe the action taken to abate the violation. If compliance was demonstrated, the operator may be required to revise the plan parameters depending on the type of corrective action taken to abate the violation. This would include, at a minimum, the actual dust control parameters that were in effect when MSHA sampled the MMU. If MSHA samples indicate continued noncompliance, then MSHA may proceed to revoke approval of the dust control provisions of the ventilation plan. The operator may be required to initiate the verification sampling if the district manager determines that the dust control parameters originally approved are no longer adequate to maintain respirable dust levels at or below the applicable dust standard under current operating conditions at the MMU.

If, instead of MSHA conducting sampling to determine whether the operator's actions were effective to gain compliance, the operator initiates verification sampling under proposed § 70.206, MSHA would terminate a citation for excessive dust after the revised plan parameters were verified by the operator to be adequate for the current mining conditions.

Reporting of Changes in Operation Status

Section 70.219 Status Change Reports

The proposed rule would retain the existing provision of § 70.220, which would be redesignated as § 70.119, with some revision. Not only would the operator continue reporting to the district manager changes in the operational status of a mine, MMU, or DA that affect the respirable dust sampling requirements of this part, but also when such status changes could potentially affect compliance sampling which will be conducted by MSHA. This would enable MSHA to carry out its sampling responsibilities more effectively and efficiently by avoiding unnecessary mine visits. Status changes would be reported either in writing or by electronic mail within three working days after the status change occurred.

Use of Personal Continuous Dust Monitors (PCDM) to Monitor Exposure

Section 70.220 Personal Continuous Dust Monitor (PCDM)

MSHA has long recognized that continuous monitoring of the work environment offers the potential to improve miner health protection. The current system of monitoring concentrations of respirable dust to which miners are exposed relies on periodic sampling and on corrective actions taken after the delay in obtaining the sampling results. Continuous monitoring, on the other hand, would allow mine operators and miners to be aware of the actual dust conditions on a real-time basis. This would provide mine personnel with current information on the performance and condition of the dust control parameters. Early indications of deteriorating conditions, when the dust levels approach the applicable dust standard, would enable mine personnel to take appropriate corrective measures, thus averting possible overexposure. The health benefits of continuous monitoring were also recognized by the Task Group and the Dust Advisory Committee both of which recommended accelerated development, field testing, and immediate deployment of such monitors once verified as reliable.

While such a monitor is not yet commercially available, significant progress has been made to advance the state of personal continuous monitoring technology, especially since MSHA published its proposed rule on plan verification on July 7, 2000. According to NIOSH, a one-piece personal dust monitor (called ''PDM–1'' for short) would be available for in-mine use by the end of 2003. This device is designed to provide continuously-measured exposure information in real-time during the shift, projected end-of-shift average concentration, and the time-weighted average dust concentration reading within 15 minutes after the end-of-shift.

Therefore, as recommended by the Dust Advisory Committee and urged by the mining community, MSHA is proposing a new standard under § 70.220 to encourage deployment of the PDM–1 or other approved PCDMs by permitting operators to use this technology in conjunction with engineering and administrative controls as part of a comprehensive dust control program to prevent overexposures on individual shifts.

Proposed paragraph (b) would permit the operator to use administrative controls without obtaining approval from the Administrator for Coal Mine Safety and Health under proposed § 70.209. The operator would be required to include in the proposed plan, the specific administrative controls to be used, how each would be employed and by whom, and the method for ensuring that such controls are complied with on each shift. In addition, the operator would be required to identify the miners or specific occupations to be monitored on each shift using PCDMs and to implement procedures to ensure that no miner will be exposed during any shift to dust concentrations in excess of the applicable dust standard.

Since the device is designed to display continuous real-time dust concentrations, the operator would be expected to develop written procedures for the proper use of this type of dust monitor. Key to the successful employment of this technology is the proper application of its capability to supply timely information on dust levels and miner exposure during the shift. The ability to be aware of the dust levels to which miners are exposed in real time would require the operator to develop specific guidelines regarding

the frequency with which the exposure measurements will be read and the types of action to be taken and by whom. The operator would need to specify how and by whom will the end-of-shift measurements be recorded and certified. The operator should also detail the role of the miner in this process. To ensure the continued reliability of the information supplied by the instrument, the operator must follow the calibration and maintenance procedures prescribed by the manufacturer. MSHA technical assistance would be available to assist any operator who elects to use this technology in developing an effective and reliable exposure monitoring program.

Proposed paragraph (c) would require the operator to demonstrate, as prescribed by proposed § 70.204, the adequacy of the proposed plan in controlling respirable dust by monitoring each miner's exposure under the operating conditions specified in proposed § 70.201(e). Since the objective is to verify the effectiveness of the operator's respirable dust control program, the PCDM would remain with a miner portal-to-portal and be operational for the entire shift or for 12 hours, whichever time is less to reflect maximum length of an extended shift.

Since the device is not designed to assess the quartz exposure of individual miners, the operator would be required to collect separate samples for quartz analysis. Samples would be collected in the same way as for individual miners assigned to the occupations identified in proposed § 70.206(a). Additionally, in accordance with proposed § 70.201(d), the operator would be required to use a control filter when collecting samples for quartz analysis. As discussed under proposed § 70.201(d), the weight gain of each exposed filter cassette will be adjusted by subtracting the weight gain or loss of the control filter cassette. These samples would be transmitted to MSHA in accordance with proposed § 70.216. Also, the end-of-shift exposure information for each miner along with production data must be posted on the mine bulletin board for 7 calendar days following completion of the shift.

As previously discussed under proposed § 70.207, approval of the operator's plan incorporating the use of PCDMs would depend on the results of verification sampling and the operating conditions in effect for each shift monitored. The district manager would approve the plan if (1) no valid equivalent concentration measurement exceeds the critical values listed in Table 70–1 that correspond to the number of shifts monitored, and (2) it incorporates the parameters that were in effect during verification sampling.

When approval is granted by the district manager, the operator would be required to monitor the exposure of each miner on a MMU on every shift under the prevailing conditions, unless the operator demonstrated during verification sampling that the exposure of each miner working on the same shift is represented by sampling only the DO and/or another occupation specified in § 70.206(a). If approved by the district manager, the operator would be permitted to conduct representative personal monitoring. Each PCDM would be operated portal-to-portal and remain operational the entire shift or for 12 hours, whichever time is less.

The end-of-shift exposure measurements would not be used by MSHA to cite an operator for exceeding the applicable dust standard. Instead, the operator would be required to take the actions required by proposed § 70.215(c), (d) and (e) whenever a valid end-of-shift measurement exceeds the applicable dust standard by at least 0.10 mg/m^3. Violations of either § 70.100(a) or § 70.101 would be cited when a valid sample taken by MSHA met or exceeded the citation threshold value (CTV) listed in Table 70–2 that corresponds to the applicable dust standard in effect. When cited, the operator would be required to take the actions required by § 70.218(b). The district manager will consider the citation abated if the operator meets the requirements of proposed § 70.218(c).

Comments are solicited on the proposed monitoring approach and other alternative approaches using PCDMs to limit exposure of miners to respirable coal mine dust. Specifically, under what conditions should MSHA permit its use as part of the approved ventilation plan without requiring the adequacy of the operator's proposed exposure control program to be verified? If implementation of this technology is permitted as an alternative to plan verification, what specific provisions should be included in the ventilation plan to ensure that miners will not be overexposed on any particular shift? Should all miners be required to wear PCDMs or only specific occupations and, if so, which occupations? How frequently should PCDMs be used (*e.g.*, every shift, *etc.*)? Should the end-of-shift measurements be used by MSHA to enforce compliance with the applicable dust standard? Is it appropriate to use PCDMs only in the face areas or in outby areas as well? Is there an alternative to a continuous monitoring program that could provide equivalent protection? Should there be an alternative approach tailored to small mines? If so, what should it consist of (*e.g.*, monitor one shift each week)?

Since the PCDMs is capable of supplying timely information on dust levels, how should engineering and administrative decisions be based on readings of the PDM? For example, should a PCDMs reading trigger an immediate check of the dust control parameters or adjustments to operating conditions, such as the amount of air being delivered to the working faces? Who should be responsible for deciding on the proper course of action to be taken based on a PCDMs reading (*e.g.*, miner being monitored, section foreman, *etc.*)? Who should be empowered to make the determination to remove an individual so that their end-of-shift exposure is not above the applicable dust standard?

B. Part 75

Section 75.370 Mine Ventilation Plan; Submission and Approval

This proposed rule would amend § 75.370 by adding a new paragraph (h) that reflects the proposed change in § 70.2 and paragraph (d) of § 70.201 of this part. Under proposed paragraph (h), the operator would be required to record and maintain records of the total amount of material produced each production shift by each MMU during the previous six-month period, which would be made available for inspection by authorized representatives of the Secretary and the miners' representative. This is the same type of production information that the operator is currently reporting on the dust data card accompanying each bimonthly sample and which is subsequently posted by MSHA on the Internet. Paragraph (h) would not require an operator to record and maintain other information such as recovery and reject rate, inherent moisture of the product, sulfur content or other variables associated with each production level.

These production records are essential to demonstrate the adequacy of the dust control parameters in controlling respirable dust as required by § 75.370(a)(1) of this title. The records are needed to establish the verification production level (VPL), in accordance with revised § 70.2, under proposed § 75.371(f), and to confirm that the 30-shift period on which the VPL is based represents typical production conditions for the MMU. Additionally, MSHA and the miners' representative need these records to monitor changes in production levels as it directly impacts the continued effectiveness of the plan's dust control

provisions. Finally, because verification and subsequent quarterly monitoring of the adequacy of plan parameters is conditioned on the VPL, these records are necessary to determine if the VPL used in approving the operator's dust control parameters for a particular MMU continues to reflect typical production levels at the MMU.

The proposed rule would permit production records for each MMU to be maintained in any form utilized by the operator to measure the total amount of material produced, provided the method is the same as that used to establish the VPL under proposed § 75.371(f). For example: number of loaded shuttle cars, feet of advance, raw tonnage, or number of longwall passes would each be an acceptable method of recording production—provided the same method was consistently used.

Section 75.371 Mine Ventilation Plan; Contents

The proposed rule would revise paragraphs (f) and (t). Existing paragraph (f) would be revised to require the dust control provisions of the ventilation plan to include any specific work practices used to minimize the dust exposure of individual miners assigned to specific occupations, information on the location of the roof bolter(s) during the mining cycle for each continuous miner section, and the cut sequence for each longwall mining section. Also, the dust control provisions of every ventilation plan would be required to include the length of each normal production shift and the verification production level (VPL) as determined in accordance with revised § 70.2. This information would enable MSHA to more effectively assess the suitability of the operators's proposed plan parameters before determining whether or not to grant provisional approval. For example, the dust control parameters may be less protective if verified over an 8-hr shift when the length of the production shift is 9 hours. Also, since MSHA recognizes the critical role of miners in the implementation of the plan parameters at each MMU, this is intended to provide more information to miners concerning the specific conditions under which the adequacy of the plan parameters for each MMU was demonstrated. With this information, the miner will be able to bring problems to the attention of mine management or to request an inspection by MSHA under § 103(g) of the Act if operating conditions no longer reflect those in effect during verification sampling and there is concern about the dust conditions at a particular MMU.

Although a VPL and shift length for each MMU would be included in the ventilation plan, the operator would not be cited if the total amount of material produced or the length of the actual production shift is not as specified in the plan. MSHA considers these to be plan design criteria, not minimum plan parameters that must be in effect on every shift. MSHA would expect production on a MMU to exceed the VPL on about 33 percent of all production shifts. If the district manager determines that an operator's actual production exceeds the VPL on more than 33 percent of the production shifts over a six-month period, or the shift length no longer reflects the conditions under which the approved plan parameters were originally verified, and operator or MSHA samples exceed the applicable dust standard, the district manager may require that the adequacy of the plan parameters be verified under different operating conditions of production or shift length.

Since MSHA is proposing to revoke existing §§ 70.207 and 70.208, which require bimonthly sampling by mine operators, existing paragraph (t) would be revised to remove the provision that mine operators identify in the ventilation plan the locations where samples for designated areas (DA) would be collected, including the specific location of each sampling requirement, and the reference to § 70.208. However, to ensure that the mine atmosphere where miners normally work or travel is continuously maintained in compliance, proposed paragraph (t) would continue to require mine operators to identify in the mine ventilation plan the location of each DA, defined in revised § 70.2, and the particular dust control measures that would be used at the dust generating sources for these locations. These locations would continue to be sampled by MSHA personnel as discussed earlier (see Background Section) to monitor operator compliance with the applicable dust standard and to assess the adequacy of the operator's dust control measures at these locations.

C. Part 90

To maintain consistency with the proposed revisions to part 70, subpart A of this proposed rule also contains new definitions of identical terms. Included are definitions of new terms such as ''approved sampling device,'' ''citation threshold value,'' ''equivalent concentration,'' ''MRE,'' and ''quartz.''

Subpart B of the proposed rule would be revised by changing the procedures for determining the average quartz percentage used to calculate the applicable dust standard. These are identical to the procedures proposed under § 70.101. The proposed rule also clarifies the application of specific transfer and pay-protection provisions under special circumstances that reflect long-standing MSHA policy in effect since the rule became effective on December 5, 1980.

The proposed rule substantially revises the existing operator sampling requirements under Subpart C of part 90. Consistent with the proposed amendment to part 70, the proposed rule would revoke existing provisions concerning operator bimonthly and abatement sampling of part 90 miners. Consequently, §§ 90.201(d) and 90.208 would be removed. While MSHA would be assuming responsibility for all enforcement-based monitoring of part 90 miners in underground coal mines, operators would continue to play a vital role in assessing the quality of the mine atmosphere in positions to which new or transferred miners are assigned to work.

As under existing § 90.207, which has been revised and redesignated as § 90.204, the operator employing part 90 miners would be required to collect five valid samples within a prescribed time period for purposes of verifying the suitability of a new or transferred part 90 miner's assigned work position. To ensure that the part 90 miner is not personally overexposed, the duration of sampling would no longer be limited to 480 minutes, but would be carried out over the miner's entire work shift, regardless of the number of hours worked.

Another significant change is how the results of operator-submitted samples would be analyzed by MSHA and the type of action required based on those results. MSHA would abandon its long-standing practice of relying on averaged results to make compliance decisions. Because averaging can obscure specific instances of overexposures by diluting sample results taken over multiple shifts, each valid sample would be compared with the applicable dust standard. Therefore, to be confident that a part 90 miner is placed in an atmosphere which actually meets the applicable dust standard, all five valid samples must be at or below the standard. If the result of any sample exceeds the standard by at least 0.1 mg/m^3, the operator would be required to take corrective action and take an additional five valid samples for the affected part 90 miner.

Since the primary purpose for taking these samples is to assess the suitability of the part 90 miner's working environment, these samples would not

be used by MSHA to cite the operator for noncompliance with the applicable dust standard. As discussed below, only MSHA-collected samples would be used for that purpose. However, an operator would be cited for failure to take appropriate corrective action to place the affected part 90 miner in an atmosphere that meets the applicable dust standard within the specified time period.

Since MSHA would assume responsibility for compliance and abatement sampling, the proposed rule sets forth new procedures for determining noncompliance with the applicable dust standard; the specific actions that an operator would be required to take within the time for abatement fixed in a citation; and the conditions under which MSHA would terminate a citation for a violation of the standard. Under the proposed rule, citations for violations of §§ 90.100 or 90.101 would be issued only when a valid single-shift sample demonstrates noncompliance with at least 95-percent confidence. MSHA would consider a violation for excessive dust to be abated and terminate the citation when the result of a valid single-shift sample is at or below the applicable dust standard.

Although existing subpart D has been revised to reflect MSHA sampling of part 90 miners, the specific requirements are essentially the same. It now states that when approving an operator's dust control plan, the district manager would consider the results of MSHA sampling for compliance or abatement purposes. It also indicates that MSHA would, through compliance and abatement sampling, monitor the continued effectiveness of the operator's dust control measures. Finally, throughout Part 90, ''shall'' has been replaced by ''must.''

For ease of review, MSHA is republishing the entire regulatory text of subparts A, B, C and D of Part 90 as it will appear in the Code of Federal Regulations.

Sections 90.1 through 90.3

Scope, Definitions, and Part 90 Option

Section 90.1 Scope

This section would remain unchanged.

Section 90.2 Definitions

The proposed rule includes definitions virtually identical to corresponding definitions in proposed Part 70 for terms such as ''approved sampling device,'' ''citation threshold value,'' ''equivalent concentration,'' and ''MRE.'' Accordingly, as in Part 70, some existing definitions of terms such as ''certified person,'' ''concentration,'' ''mechanized mining unit,'' and ''respirable dust'' have been modified either to more clearly convey the intended meaning under the proposed rule, to reflect the conventional definition or to be consistent with the definition of identical terms in proposed Part 70 of this title. Most of the other definitions remain unchanged under the proposed rule. No discussion is included below if a definition would not change under the proposed rule.

Approved Sampling Device

''Approved sampling device'' would mean a sampling device approved by the Secretary and the Secretary of Health and Human Services under part 74 (Coal Mine Dust Personal Sampler Units) of this title; or approved by the Secretary when it has been demonstrated that a respirable dust concentration measurement can be converted to a concentration measurement equivalent to that obtained with an approved sampling device. Under the proposed rule, respirable dust sampling for Part 90 miners would continue to be collected using sampling devices approved by NIOSH pursuant to existing 30 CFR part 74. Also, to accommodate the adoption of advanced sampling technology in the future such as continuous respirable dust monitors, the proposed rule would permit the Secretary to approve and use any technologically advanced sampling devices that should become available in the future but could not be approved under the regulatory requirements of 30 CFR part 74.

Therefore, under the proposed rule, any newly developed sampling instrument would be considered an approved device pursuant to this definition when the Secretary demonstrates that the respirable dust concentration measured by the new instrument can be converted to a concentration measurement equivalent to that obtained by a device approved under 30 CFR part 74 of this title.

Certified Person

The existing definition would be modified by removing references to existing §§ 90.202 and 90.203. The provision requiring the use of a certified person to conduct sampling as required by this part is being transferred to revised § 90.201. Existing § 90.203 which requires approved sampling devices to be maintained and calibrated by a certified person would be retained and redesignated as § 90.202.

Citation Threshold Value (CTV)

''Citation threshold value'' would mean the lowest acceptable equivalent dust concentration measurement demonstrating that the applicable dust standard has been exceeded at a high level of confidence and at which MSHA would cite an operator for a violation of §§ 90.100 or 90.101 under proposed § 90.207. Since MSHA would be assuming responsibility for compliance sampling under the proposed rule or sampling currently being carried out by operators under existing § 90.208(a), a determination of noncompliance would be based solely on the results of single shift samples collected by MSHA in accordance with proposed § 72.500 of this title. Appendix C explains how each critical value listed in proposed Table 70.2 was derived. Each CTV is calculated to ensure that citations will be issued only when a single-shift measurement demonstrates noncompliance with at least 95 percent confidence.

Concentration

The existing definition would be modified by replacing the term ''substance'' with ''respirable dust'' to more clearly convey the meaning under the proposed rule.

Equivalent Concentration

''Equivalent concentration'' would mean the concentration of respirable dust, as measured by an approved sampling device, converted to an 8-hour equivalent concentration as measured by a Mining Research Establishment (MRE) sampler. This conversion is accomplished in two steps. First, the concentration measurement is multiplied by a constant factor prescribed by the Secretary specifically for the approved sampling device. The result is then multiplied by $t/480$, where t is the sampling time in minutes if longer than eight hours, to make it equivalent in dosage to the concentration as measured by an MRE sampler on an 8-hour work shift. Since sampling will be conducted over the course of the Part 90 miner's entire work shift, which includes travel to and from the assigned work position, t will also be equal to the length of the entire work shift of the miner being sampled. If the length of the Part 90 miner's work shift is eight hours or less, then t must equal 480 minutes.

The current U.S. coal mine applicable dust standard is based on epidemiologic studies of British coal miners. In these studies, miners routinely worked 8-hour shifts, and their respirable dust exposures were assessed based on 8-

hour measurements using a sampling device known as the MRE instrument. Work shifts in U.S. coal mines now frequently exceed eight hours. According to a recent survey of MSHA District Offices conducted in August of 2002, approximately 48 percent of underground mines work 9-hour shifts or longer. Therefore, to provide the intended level of protection to miners working longer than eight hours, it is necessary to convert coal mine dust concentration measurements to equivalent 8-hour values as measured by the MRE instrument.

The first step in the conversion from ''concentration'' to ''equivalent concentration'' is intended to make the measurement equivalent to the concentration measured by an MRE instrument. This instrument was designed to selectively collect airborne dust in a way that would approximate the deposition of inhaled particles in the lung. Because the MRE instrument was large and cumbersome, other, more portable samplers were developed for use in U.S. coal mines. Currently approved sampling devices use a 10-mm nylon cyclone to separate the respirable fraction of airborne dust, instead of the four horizontal plates used in the MRE sampler. Such differences in sampler design lead to systematic differences in the amount of dust collected. Since 1980, measurements made using the currently approved cyclone-based devices operating at a flow rate of 2.0 liters per minute (lpm) were multiplied by the constant factor of 1.38 prescribed by the Secretary for the approved sampling device used. Application of this factor compensates for the difference in dust collection characteristics and makes the measurements equivalent to what would be obtained using an MRE instrument.

Similarly, the second step in the conversion from ''concentration'' to ''equivalent concentration'' is intended to compensate for differences between current conditions and conditions under which the existing applicable dust standard was developed. Specifically, it is designed to ensure that miners working shifts longer than eight hours will be afforded the same level of protection as miners working an 8-hour shift. MSHA developed the existing standard from 8-hour shift exposure measurements. Therefore, MSHA will adjust the measured concentration to be equivalent, in its effect on cumulative exposure, to a concentration over an eight-hour exposure period. This is accomplished by multiplying the concentration measurement by *t/480,* where *t* is the sampling time (*i.e.,* length of the work shift) in minutes.

The formula for an equivalent concentration is:

$$\text{equivalent concentration } (\text{mg/m}^3) = 1.38 \times \left(\frac{\text{accumulated dust (mg)}}{t \times \text{airflow rate}} \right) \times \frac{t}{480\,\text{min}}$$

where *t* = sampling time in minutes (which will be the Part 90 miner's entire work shift) and airflow rate = 0.002 m^3/min). The product of *t* and the airflow rate is the total volume of air from which dust is accumulated on the filter.

The following example is meant to illustrate the effect of the second step in the conversion, multiplication by *t/480,* which adjusts for the full length of the work shift. In this example, it is assumed that the first step in the conversion, multiplication by 1.38 for equivalency with an MRE sampler, has already been performed.

Suppose a Part 90 miner sample is collected over a 9-hour work shift. Suppose that the amount of dust accumulated during the shift is 0.77 mg. If the concentration were not adjusted to an 8-hour equivalent concentration, the MRE-equivalent concentration would be calculated as 0.98 mg/m^3. Under the definition of ''equivalent concentration,'' this quantity is then multiplied by 540/480, yielding an equivalent concentration measurement of 1.10 mg/m^3.

This adjustment does not change the daily limit on the accumulated dose of respirable coal mine dust as intended by the existing exposure limit for coal mine dust. Since the current limit was based on an assumption that exposure occurs over an 8-hour shift, it corresponds to a daily cumulative dose of respirable coal mine dust of $8 \times 1.0 = 8$ mg-hr/m^3 as measured by the MRE instrument. The proposed definition of equivalent concentration will maintain this same MRE-equivalent 8 mg-hr/m^3 daily limit, regardless of the length of the working shift being sampled.

To continue the example, the exposure accumulated during the Part 90 miner's entire work shift is the same, whether over eight hours at an average of 1.10 mg/m^3 or over nine hours at an average of 0.98 mg/m^3. In either case, the MRE-equivalent exposure accumulated during the entire work shift is 8.8 mg-hr/m^3, which exceeds the intended limit of 8 mg-hr/m^3. Under the proposed definition of ''equivalent concentration'' provided here, this will be reflected by the fact that, when more than 8 mg-hr/m^3 (MRE-equivalent exposure) is accumulated over the course of the particular shift sampled, the equivalent concentration will exceed 1.0 mg/m^3, regardless of the shift's length.

MSHA originally proposed a different, but mathematically equivalent, method of adjusting concentrations to an 8-hour equivalent and solicited comments on the proposed method. The proposed method would have defined ''concentration'' to mean what is here defined as ''equivalent concentration.'' Instead of making an explicit adjustment to the concentration, using the factor of *t/480* as in the present definition, the earlier proposed rule would have substituted 480 for the actual sampling time in the definition of respirable dust concentration. The proposed definition of ''equivalent concentration'' is meant to both preserve the ordinary definition of ''concentration'' and to clarify the adjustment to an 8-hour equivalent.

MSHA believes that the proposed adjustment to an ''8-hour equivalent concentration'' is necessary to protect Part 90 miners from excessive exposures who normally work nontraditional or extended shifts. For example, a Part 90 miner working for ten hours at an average concentration of 1.0 mg/m^3 will inhale and retain more respirable coal mine dust as a result of that specific shift than a miner working for eight hours at the same average concentration. By comparing the adjusted concentration to the concentration limit originally intended for Part 90 miners working an 8-hour shift, the same cumulative exposure limit is applied on individual shifts for all Part 90 miners.

It should be noted that the ACGIH approach of reducing the permissible concentration to compensate for the extension of a shift beyond eight hours is similar in its effect to the approach taken here of adjusting the equivalent concentration upwards and comparing it to a fixed limit. MSHA makes similar adjustments for extended work shifts in the enforcement of exposure limits in metal and nonmetal mines under 30 CFR 56.5001 and 57.5001. Taking into account the reduced recovery time that results from an extended work shift

would have led to a numerically greater and more protective adjustment, but this would also have introduced additional complexities in the calculation of equivalent concentration measurements. The Secretary believes that the method chosen strikes a reasonable balance between no adjustment at all, and a far more complex adjustment that would attempt to model clearance, deposition, and retention mechanisms.

Mechanized Mining Unit (MMU)

The existing definition would be modified by removing the reference to § 70.207(e) (Bimonthly sampling; mechanized mining units), which will be deleted, and replaced with proposed § 70.206(d); and transfers the requirements for identifying each MMU specified in existing §§ 70.207(f)(1) and (f)(2), to revised § 70.2.

MRE

''MRE'' would mean Mining Research Establishment of the National Coal Board, London, England. This is a new definition which has been included to be consistent with revised § 70.2.

Quartz

The existing definition would be modified by specifying the analytical method that MSHA has been using since 1983 to determine the quartz content of respirable dust samples. The reason for this modification is to standardize the analytical procedure, thereby enabling other certified laboratories to reproduce quartz determinations made by MSHA. Also, to accommodate the adoption of improved or other quartz analytical techniques in the future, the definition of ''quartz'' has been expanded in the proposed rule to provide MSHA the flexibility to use alternative analytical techniques once these techniques have been demonstrated to provide quartz measurements that are equivalent to those obtained under current analytical method.

Respirable Dust

The existing definition has been modified by transferring the requirement regarding what constitutes an approved sampling device to the proposed new definition of the term ''approved sampling device'' above.

Transfer

The existing definition has been modified by clarifying when a change in work assignment would not constitute a transfer under proposed Part 90. MSHA recognizes that there may be circumstances which are beyond the control of the operator, such as equipment malfunction, that may interrupt work being performed by a Part 90 miner in his or her regular work assignment, necessitating the assignment of the Part 90 miner to another job temporarily. For example, if the Part 90 miner is regularly assigned as a shuttle car operator in a MMU and the continuous mining machine breaks down, that Part 90 miner could be temporarily assigned to work in a different position and location in the mine. Consistent with MSHA's longstanding policy, such a change in duties would not constitute a transfer under Part 90 if the assignment does not last more than one shift. If such an assignment lasts longer than one shift, the operator would be required to notify the district manager in writing. This notice would list the temporary duties and the reasons for the assignment. Also, to demonstrate compliance with the applicable dust standard, the operator would be required to collect five valid samples from the newly assigned work position under proposed § 90.204(a)(2). The 1.0-mg/m^3 standard remains in effect even if the operator is unable to collect the required number of samples because of the short duration of the temporary assignment.

Section 90.3 Part 90 Option; Notice of Eligibility; Exercise of Option

This section remains the same, with the exception of paragraphs (d) and (e) which have been revised to reflect the new address for mailing of the Exercise of Option Form or written request to re-exercise the option to work in a low-dust area of the mine.

Sections 90.100 Through 90.104

Dust Standards, Rights of Part 90 Miners

Section 90.100 Respirable Dust Standard When Quartz Is Not Present

MSHA is proposing no substantive changes in existing § 90.100, except for revising the section heading to correspond with the heading of proposed § 70.100, which is identical, and removing the reference to § 90.206 (Approved sampling devices; equivalent concentrations) and replacing it with § 90.2. The requirements contained in revised § 90.2 are similar to the standard in existing § 90.206. The proposed rule retains the applicable dust standard of 1.0 mg/m^3.

Section 90.101 Respirable Dust Standard When Quartz Is Present

The proposed rule would revise the section heading to correspond with the heading of proposed § 70.101, which is identical. MSHA would retain the existing formula (10 divided by the concentration of quartz, expressed as a percentage) for reducing the applicable dust standard below 1.0 mg/m^3 in proportion to the percentage of quartz when the quartz content of respirable dust in the mine atmosphere exceeds 10 percent, instead of 5 percent as contained in existing § 90.101. Since the maximum standard for a Part 90 miner is 1.0 mg/m^3, the quartz content must exceed 10 percent to cause a reduction in the applicable dust standard.

The Agency would change the procedures for determining the average quartz percentage used to calculate the applicable dust standard. Only the results of MSHA samples would be used to establish the applicable dust standard. The quartz results of the three most recent valid MSHA samples would be averaged and the resultant percentage used to set the new applicable dust standard. However, if the Part 90 miner is already assigned to an area of the mine under a reduced standard below 1.0 mg/m ^{3} when these revised procedures become effective, a new applicable dust standard would be established by averaging the results of the first two MSHA samples taken after the effective date with the quartz percentage associated with the applicable dust standard in effect. If fewer than two MSHA samples are taken, the existing standard would continue to remain in effect.

Application of the revised procedures will result in the setting of reduced standards in a timely manner that (1) more accurately represent the quartz percentage of respirable dust in the environment of the Part 90 miner at the time of sampling; (2) reflect the dynamics of the mining process and the changing geologic conditions of the mine strata; and (3) continue to protect Part 90 miners over multiple shifts.

Under the proposed rule, MSHA would also report the quartz percentage to the nearest tenth of a percent, instead of truncating the results to the nearest full percentage as has been the longstanding practice. While this change will have no impact on the setting of applicable dust standards below 1.0 mg/m^3, it will be more protective for other miners because it permits the setting of reduced standards at such levels as 1.1 mg/m^3, 1.4 mg/m^3, 1.6 mg/m^3, 1.8 mg/m^3, and 1.9 mg/m^3. Setting these particular standards currently is not mathematically possible using the above formula due to the practice of truncating the average quartz percentage. Another change involves removing the reference to § 90.206 (Approved sampling devices; equivalent concentrations) and replacing it with § 90.2. The requirements contained in revised § 90.2 are similar to the standard

in existing § 90.206. Also revised under the proposed rule is the example illustrating how a reduced standard is established when respirable dust associated with a Part 90 miner contains more than 10 percent quartz under the proposed revised dust-standard setting procedures.

Section 90.102 Transfer; Notice

MSHA is proposing no substantive changes in existing § 90.102, except to clarify in the regulatory text the application of the transfer provision in paragraph (a) when a Part 90 miner is assigned to a different shift. To conform with MSHA's long-standing policy, the proposed rule permits assigning a Part 90 miner to a different shift under certain circumstances without violating paragraph (a) of § 90.102(a). Unlike the pay protection afforded Part 90 miners by § 90.103(b) which would be applied ''*[w]henever* a Part 90 miner is transferred * * *'' (emphasis added), the job and shift protections provided by existing § 90.102(a) apply ''whenever a Part 90 miner is transferred in order to meet the respirable applicable dust standard * * *'' (emphasis added). The intent to limit the scope of job and shift protections under paragraph (a) of this section and the purpose of doing so were explained as follows in the preamble to the existing Part 90 rules:

> The operator may transfer a Part 90 miner without regard to these job and shift limitations if the respirable dust concentrations in the position of the Part 90 miner complies with the applicable dust standard, but circumstances require changes in job assignments at the mine. Reductions in workforce or changes in operational methods at the mine may be the most likely situations which would affect job assignments. Any such transferred Part 90 miner would still be protected by all other provisions under this part. (45 FR 80761)
>
> In instances where operators need to reassign employees to accommodate unforseen situations and unexpected mine and market conditions, MSHA believes that some leeway should be provided to assist operators in placement of a Part 90 miner. (45 FR 80766)

These explanations show that MSHA did not intend the provisions of existing paragraph (a) to apply when a Part 90 miner is working in a position that meets the applicable dust standard and, for legitimate business reasons, the operator assigns the miner to a new job or shift.[11] On the other hand, when the reasons for changing a Part 90 miner's shift or job involve maintaining compliance with the applicable dust standard, then the provisions of paragraph (a) apply and the miner is entitled to job and shift protections, unless these protections are waived in accordance with this standard. MSHA will continue to carefully scrutinize any changes in job or shift assignments for a Part 90 miner to determine whether paragraph (a) of § 90.102 applies because the change constitutes a transfer to meet the applicable dust standard and, if not, to determine if the change in the Part 90 miner's job or shift assignment was due in any part to action which could be characterized as improper under the Mine Act.

Section 90.103 Compensation

The proposed rule would redesignate existing paragraphs (c) through (f) as (d) through (g) and add new paragraph (c). Proposed new paragraph (c) clarifies MSHA's longstanding policy of not applying the Part 90 miner compensation provisions of existing paragraphs (a) and (b) of this section in situations where, after initial compliance with the applicable dust standard by the operator, the Part 90 miner on his or her own initiative applies for and accepts another job in a work area with an average respirable dust concentration at or below 1.0 mg/m3.[12] Under these circumstances, the miner has not waived Part 90 status.[13] Therefore, the issue being addressed by proposed paragraph (c) is how the Part 90 wage provisions of existing paragraphs (a) and (b), which would be retained under the proposed rule, should be interpreted when a Part 90 miner initiates and accepts a job change. For the following reasons, MSHA believes that the compensations provisions of Part 90 may be read to provide no compensation protection for a Part 90 miner under these circumstances.

Existing § 90.103, which would be retained in its entirety under the proposed rule, protects a miner from any immediate reduction in hourly wage as a result of exercising the option. Where no transfer of the miner occurs after the option is exercised, paragraph (a) prescribes:

> The operator must compensate each Part 90 miner at not less than the regular rate of pay received by that miner immediately before exercising the option under § 90.3.

Existing § 90.103(b) addresses compensation protection for a Part 90 miner when there is a transfer of the miner. It prescribes:

> Whenever a Part 90 miner is transferred, the operator must compensate the miner at not less than the regular rate of pay received by that miner immediately before the transfer.

As defined by proposed § 90.2, a transfer, ''by the operator'' would include, but is not limited to, an operator-initiated job reassignment in order to meet the applicable dust standard or a reassignment due to a realignment or reduction in the workforce. However, a miner-initiated job change does not necessarily constitute a transfer for purposes of compensation under § 90.103(b). Accordingly, the compensation provision of § 90.103(b) may be interpreted as not applicable to a job change initiated by a Part 90 miner.

The above interpretations of §§ 90.103(a) and (b) are also consistent with statutory language. Section 101(a)(7) of the Mine Act addresses several specific matters relative to mandatory health and safety standards promulgated by MSHA and in relevant part provides:

> * * * Where appropriate, the mandatory standard shall provide that where a determination is made that a miner may suffer material impairment of health or functional capacity by reason of exposure to the hazard covered by such mandatory standard, that miner shall be removed from such exposure and reassigned. Any miner transferred *as a result of such exposure* shall continue to receive compensation for such work at no less than the regular rate of pay for miners in the classification such miner held immediately prior to his transfer. * * * (emphasis supplied)

Thus, section 101(a)(7) supports an interpretation that the compensation provisions of §§ 90.103(a) and (b) do not apply where a Part 90 miner initiates a job change for reasons of job preference and that § 90.103(b) is limited to job changes which are ''a result of'' exposure to respirable coal mine dust.

Accordingly when there is a Part 90 miner-initiated job change, the compensation provisions of §§ 90.103(a) and (b) would not be applicable in the Part 90 miner's new job and the miner would be paid whatever the new job usually pays. Thus, for example: A miner exercised the Part 90 option when his or her job paid $10 per hour. If the

[11] As noted above, however, the other protections provided by Part 90 would apply. For example, on the new shift or in the new job there could be no reduction in the miner's pay and compliance would have to be maintained with the applicable dust standard and the sampling requirements.

[12] At mines where a job bidding procedure is in effect, use of the bidding procedure is not dispositive of whether a job change is initiated by the miner. The job bidding procedure is applicable to all job changes, including operator-initiated changes. Thus, factors relating to the intent and actions of the miner and the operator must be evaluated.

[13] Existing §§ 90.104(a)(2) and (3) provide for waiver of Part 90 miner status when the miner applies for and accepts or retains a position known by the miner to exceed the applicable dust standard.

operator keeps the Part 90 miner in the same work position because compliance with the applicable dust standard is maintained, or if the operator transfers the miner to a new work position to achieve compliance, then the Part 90 miner cannot be paid less than the $10 per hour received immediately before exercising the option. If, then, the miner was to initiate and accept a change in work assignment to a job which paid $8.50 per hour, no pay protection would accompany the part 90 miner to the new position and the miner would receive $8.50 per hour.

The remainder of Part 90 provisions, however, would continue to apply to the Part 90 miner in the new work position. As noted earlier, a miner-initiated job change to a position which is at or below the applicable dust standard for a Part 90 miner does not constitute a waiver of Part 90 rights. Thus, in the new job the miner retains Part 90 status and all other requirements of Part 90 continue in effect, including the operator's obligations to continuously maintain the applicable dust standard and to give MSHA notice whenever the miner's work assignment changes last longer than one shift.

For purposes of consistency, redesignated paragraphs (e) and (g) have been revised to read as follows: ''* * * under paragraphs (a), (b) and (d) * * *'' and ''* * * in paragraphs (a), (b), (d), and (e) * * *,'' respectively.

Section 90.104 Waiver of Rights; Re-exercise of Option

The proposed rule would retain the existing provisions of § 90.104, with some minor revisions for purposes of simplification. In paragraph (a)(2), ''exceeds the applicable dust standard'' would replace the statement beginning with ''* * * has an average respirable dust concentration * * *'' Paragraph (a)(3) would be revised by replacing the statement beginning with ''* * * average respirable dust concentration * * *'' with ''existing work position exceeds the applicable dust standard.'' Lastly, the section heading for § 90.3(e) has been removed from existing paragraphs (b) and (c).

Sections 90.201 through 90.207

Sampling Procedures

Section 90.201 Sampling; General Requirements

MSHA is proposing to modify the general requirements for operator sampling of new or transferred Part 90 miners under existing § 90.201. Since MSHA would be responsible for collecting samples to determine if an operator has abated a noncompliant condition, the proposed rule would remove existing paragraph (d). The proposed rule would also revise and redesignate existing paragraphs (b) as (c), (c) as (f), and (e) as (d), revise paragraph (a), and add new paragraph (b).

Revised paragraph (a) specifies the purpose of operator sampling under this proposed rule. While MSHA would be assuming responsibility for most of the sampling currently being carried out by the operator, revised paragraph (a) would continue to require operators to conduct sampling to verify that the working environment of a new or transferred Part 90 miner complies with §§ 90.100 or 90.101 as required by existing § 90.207, which has been redesignated as § 90.204. Also, to minimize repetition and maintain consistency with virtually identical provisions in proposed amendments to Part 70, paragraph (a) would be modified by removing the reference to Part 74 approval (Coal Mine Dust Personal Sampler Units), and replacing it with ''approved sampling device,'' as defined under revised § 90.2.

Proposed new paragraph (b) would retain the requirements in existing §§ 90.202(a) and (b) that sampling required under this part be conducted by an individual certified by MSHA and the manner by which a person would be certified. Therefore, existing § 90.202(a), (b), and (c) would be removed.

Since the objective of operator sampling proposed under this part is to verify that the assigned position of a new or transferred Part 90 miner complies with the applicable dust standard, the sampling device would continue to be worn by each Part 90 miner as required by existing § 90.201(b). However, under redesignated paragraph (c), the requirement that sampling devices ''remain operational during the entire shift or for 8 hours, whichever time is less'' would be removed. Instead, the sampling device would be operated portal-to-portal and be operational during the Part 90 miner's entire work shift, regardless of the number of hours worked, to ensure that the sampled Part 90 miner is not personally overexposed. That is, the sampling device would be turned ''ON'' when the Part 90 miner enters the mine and remain operational while traveling to the assigned work position, while performing normal work duties, and while traveling back to the mine entrance, at which time the device would be turned ''OFF.'' It should be pointed out that the duration of MSHA sample collection will continue to be limited to 480 minutes as has been the longstanding practice. Simply stated, the sampling device would be operated portal-to-portal and remain operational during the entire shift or for 8 hours, whichever time is less. The Agency solicits comments on the duration of MSHA sampling under the proposed rule.

Unless otherwise directed by the district manager, the respirable dust samples will continue to be collected by placing the sampling device on the Part 90 miner; on the piece of equipment which the Part 90 miner operates within 36 inches of the normal working position; or at a location that represents the maximum concentration of dust to which the Part 90 miner is exposed.

Under redesignated paragraph (f), not only would the operator be required to submit the date but also the time when sampling required by this part would begin when requested by the district manager. This is necessary since operators may choose to sample any shift on the date provided to MSHA. Knowing the time of the scheduled sampling will enable MSHA to monitor operator sampling on a case-by-case basis to verify compliance with both the operating conditions and sampling requirements of this part.

Finally, the requirement that operators take corrective action during the time for abatement fixed in a citation for violation of §§ 90.100 or 90.101 specified in existing paragraph (d) of § 90.201 would be transferred to proposed § 90.207(b)(2). The requirement that the operator sample the affected Part 90 miner until five valid samples are taken under existing paragraph (d) would be removed since MSHA is proposing to revoke operator sampling requirements under existing § 90.208.

Section 90.202 Approved Sampling Devices; Maintenance and Calibration

In an effort to consolidate the requirements that address maintenance and calibration procedures of approved sampling devices, MSHA is proposing in § 90.202(a) through (e) to retain the requirements in existing § 90.203(a) and (b) and § 90.204(a) through (e), with minor changes. These standards require the sampling device be maintained as approved and calibrated only by a certified person in accordance with MSHA Informational Report IR 1240 (1996). The process of certifying an individual for maintenance and calibration would remain unchanged. It would continue to require an individual to successfully complete the applicable MSHA examination. Scheduling information for MSHA training courses and examinations would be available from MSHA District Offices.

These standards require approved sampling devices to be calibrated at a flowrate of 2.0 liters of air per minute. They also establish the flowrate and testing and examination requirements for approved sampling devices. Careful examination and testing of sampling devices would continue to be required immediately prior to the start of a shift during which samples would be collected for purposes of this proposed rule. This would include testing the battery voltage and examining all external components of the sampling devices to be used. Any necessary external maintenance to assure the sampling devices are clean and in proper working condition should be performed at this time by a certified person. Temporary certification of persons provided under existing § 90.203(c) would not be retained under the proposal.

Section 90.203 Approved Sampling Devices; Operation; Air Flowrate

Proposed §§ 90.203(a) through (c) retains the operation and flowrate requirements for approved sampling devices in existing §§ 90.205(a) through (d), with minor changes. Since MSHA has defined an approved sampling device in revised § 90.2 to mean a device approved in accordance with part 74 of this title, proposed paragraph (a) excludes reference to part 74. Similarly, for purposes of simplification, reference to § 90.202 (Certified person; sampling) would be removed and, wherever used, it would be replaced by certified person as defined in revised § 90.2.

MSHA believes that the two on-shift examinations of sampling devices under proposed paragraphs (b)(1) and (b)(2), which are identical to the examinations required under existing § 90.205(b) and (c), continue to be an important part of a reasonable and prudent sampling program. The first examination would be made by a certified person during the second hour after the sampling devices are placed in operation. This examination would assure that each sampling device is operating properly and at the proper flowrate. If the proper flowrate is not maintained, necessary adjustments in the flowrate would be made at this time by the person certified to collect samples. The second examination would be made during the last hour of operation of the sampling devices. If the proper flowrate is not maintained, the certified person is required to make a notation on the dust data card for that sample stating that the proper flowrate was not maintained. Because it is unclear where on the dust data card such a notation should be made, proposed paragraph (c) would require all notations regarding failure to maintain proper flowrate or other events occurring during sampling that may impact the validity of the sample to be made on the back of the dust data card.

Section 90.204 Respirable Dust Sampling

This section, previously titled ''Compliance sampling'' under existing § 90.207, would be modified under the proposed rule and redesignated as § 90.204. Since the operator sampling requirement under existing § 90.208(a) would be revoked, the proposed rule would remove existing paragraph (b) and redesignate paragraph (a)(3) as (a)(2). The proposed rule would also add new paragraphs (b) and (c).

Consistent with the proposed operator sampling requirements contained in revised Part 70, MSHA would also be assuming responsibility for all sampling for compliance and abatement purposes. This sampling is currently being carried out by the operator under existing §§ 90.201(d) and 90.208(a). However, the proposed rule would continue to retain the existing provisions of § 90.207, with major changes under redesignated § 90.204. The objective of this provision is to maintain operator responsibility for verifying the suitability of the atmosphere in the position to which a new or transferred Part 90 miner would be assigned to work. This would assure that any new or existing Part 90 miner would be placed in an atmosphere which meets the applicable dust standard.

Therefore, to determine if a new Part 90 miner is working in an area of the mine where the dust concentration during each shift does not exceed 1.0 mg/m^3, the operator would be required to collect five valid samples within 15 calendar days after being notified by MSHA that a Part 90 miner is employed at the mine in accordance with proposed § 90.201. The operator would also be required to collect five valid samples under proposed paragraph (a)(2) to verify the suitability of a work position to which a Part 90 miner was transferred under § 90.102. Valid samples are defined in the proposed rule as respirable dust samples collected and submitted as required by this part, and not voided by MSHA. Voided or invalid samples would not satisfy the sampling requirements and operators would be required to collect and submit additional samples. In addition, all samples required by this part would be required to be taken while the Part 90 miner is performing normal work duties. Failure to take the required number of valid samples under proposed § 90.204 would constitute a violation. Consequently, it would be advantageous to collect and submit the samples required early during the specified 15-day period.

While the proposed rule continues the operator requirement to collect five valid samples, the results would no longer be averaged to determine whether the applicable dust standard is being continuously maintained. Instead, consistent with proposed § 72.500 of this title, each of the five valid sample will be compared to the applicable dust standard individually. Under this evaluation procedure, if all five samples are at or below the applicable dust standard, MSHA is confident that the Part 90 miner is being placed in an atmosphere which actually meets the standard. However, if any valid sample exceeds the applicable dust standard by at least 0.1 mg/m^3, the operator would be required to immediately take corrective action and take an additional five valid samples from the environment of the affected Part 90 miner within 15 days following receipt of notification from MSHA. The proposed rule permits the operator to meet the applicable dust standard in either of two ways: (1) By implementing control measures to lower the dust concentration in the Part 90 miners's existing assigned position; or (2) by transferring the Part 90 miner to another area of the mine that meets the standard.

Since these samples are used to verify the suitability of the assigned work position, no operator samples will be used to make determinations as to compliance with the applicable dust standard under §§ 90.100 or 90.101 of this part. Therefore, if any of the additional samples collected under proposed paragraph (b)(2) of this section exceed the applicable dust standard by at least 0.1 mg/m^3, the operator would be cited for failure to take corrective action under proposed paragraph (c) of this section.

Section 90.205 Respirable Dust Samples; Transmission by Operator

MSHA is proposing no substantive changes to existing § 90.209, except for removing reference to § 90.202 (Certified person; sampling) from existing paragraph (c) to eliminate repetition since revised § 90.201 specifies that all sampling required under this part must be conducted by a certified person, and redesignating it as § 90.205. Existing paragraph § 90.209(e) would be removed since all samples submitted by the operator under this part would be processed by MSHA. The proposed rule, like the existing rule, would require each Part 90 miner sample collected by

the operator to be transmitted to MSHA within 24 hours after the end of the sampling shift in containers provided by the manufacturer of the filter cassette. The need to verify the suitability of the Part 90 miner's assigned work position in the shortest possible time requires that samples be sent promptly to MSHA for analysis.

Each transmitted sample must be accompanied by a properly completed dust data card. All dust data cards submitted must be signed by a person certified to collect samples and must include that person's certification number. By signing the card, that person certifies that the sample was collected in accordance with the requirements of this part.

To maintain program integrity, all samples transmitted by an operator would be considered by this proposed rule to fulfill the sampling requirements of this part. However, if operators wish to collect samples for other purposes, they would need to notify the district manager in writing or by electronic means prior to the intended sampling shift and identify each filter cassette to be used by its identification number. This prior notification is not required if non-approved sampling devices and filter cassettes are used by an operator for non-regulatory purposes.

Section 90.206 Respirable Dust Samples; Report to Operator and Part 90 Miners

Under the proposed rule, reporting provisions of existing § 90.210 would be revised and redesignated as § 90.206. It specifies the type of sampling data and other related information the operator would be provided by MSHA on each Part 90 miner sampled by the operator or by MSHA. The Agency believes that the proposed reporting requirements are in the best interest of the Part 90 miner. These provisions promote miner awareness of the respirable dust conditions in the Part 90 miner's working environment by making available current information on the results of all sampling-related activities. This is consistent with the statutory intent that miners play a role in preventing unhealthy conditions and practices where they work. This approach is also consistent with the recommendations of the Advisory Committee regarding miner participation in the sampling process.

In proposed paragraph (a), the phrase ''The Secretary shall provide the operator'' has been replaced with ''MSHA will provide.'' Paragraphs (a)(1) through (6) of the proposed rule retains the existing requirement regarding the types of data MSHA would be reporting on samples submitted by the operator, except for paragraph (a)(4) which would be removed since averaging of multiple valid samples would no longer be permitted under the proposed rule. Also, since MSHA would undertake sampling for compliance purposes, currently performed by the operator under existing § 90.208, the results of MSHA samples would also be reported to the operator. The data report would include the location within the mine from which each Part 90 miner sample was collected; the equivalent concentration of respirable dust for each valid sample; the occupation code, and the reason for voiding any sample. In addition to providing data on individual samples, under proposed paragraph (7), the Agency would also furnish information on the dust control measures that were being used in the work position of the sampled Part 90 miner by providing a copy of completed MSHA Form 2000–86 (Revised).

Paragraph (b) of the proposed rule retains the existing provision of requiring the operator to provide a copy of the sample data report to the affected Part 90 miner but, for privacy reasons, prohibits the operator from posting the original or a copy of this report on the mine bulletin report.

Section 90.207 Violation of Respirable Dust Standard; Issuance of Citation; Action Required by Operator; and Termination of Citation

Proposed § 90.207 is a new requirement that addresses the circumstances under which MSHA would issue a citation for violation of the applicable dust standard. It also establishes the specific actions that an operator would be required to take within the time for abatement fixed in the citation. This proposed section also sets forth the conditions under which MSHA would terminate such citations.

Under proposed paragraph (a), the operator would be cited for a violation of § 90.100 or § 90.101 when the equivalent concentration of a valid Part 90 miner sample collected by MSHA meets or exceeds the citation threshold value (CTV) listed in Table 70–2 of this title that corresponds to the applicable dust standard in effect. As discussed in section III.A.4. of the preamble, these measurements will be based on single-shift samples collected with approved sampling devices that will be operated portal-to-portal. The devices will remain operational during the entire shift or for 8 hours, whichever time is less, as has been the long-standing practice.

The CTVs and an explanation of how they were derived was originally published in **Federal Register** notice of Feb. 3, 1998 (63 FR 5687), entitled ''Coal Mine Respirable Dust Standard Noncompliance Determinations.'' As explained in that notice and in Appendix C of the current notice of proposed rulemaking, each CTV was calculated so that citations would be issued only when a single-shift measurement demonstrates noncompliance at least at a 95 percent confidence level.

The following example illustrates how MSHA would apply the CTVs to make noncompliance determinations. Suppose that a measurement of 1.27 mg/m^3 is obtained for a Part 90 miner under a 1.0-mg/m^3 standard. Because the measurement meets or exceeds the CTV of 1.26 mg/m^3 (the citation value for a 1.0-mg/m^3 standard), a citation would be issued for exceeding the applicable dust standard on the shift sampled. The Part 90 miner's work position would be identified in the narrative of the citation as the affected working environment.

MSHA believes that, because of the large ''margin of error'' separating each CTV from the corresponding applicable dust standard, use of the CTV table would provide ample protection against erroneous citations. This matter was fully explored in the analysis published in Appendix C of the February 3, 1998 notice (63 FR 5703–5709). That analysis showed that for exceptionally well-controlled environments, the probability that any given citation is erroneous will be substantially less than 5 percent. The analysis also showed that this probability is even smaller in environments that are not well controlled. Therefore, citations issued in accordance with the CTV table would be much more likely the result of an excessive dust concentration rather than a measurement error. With regard to the risk of erroneous failures to cite, MSHA concluded that ''the probability of erroneously failing to cite a case of noncompliance at a given sampling location is less than 50 percent when the applicable dust standard is exceeded on a significant proportion of shifts at that location'' (63 FR 5709 above).

MSHA has also concluded that using single-shift measurements for noncompliance determinations in accordance with the CTV table neither raises or lowers the applicable dust standard. Operators would continue to be required under § 90.100 or § 90.101 to continuously maintain compliance with the applicable dust standard, not merely at or below the CTV.

As explained in the notice regarding single-shift measurements of respirable coal mine dust published elsewhere in today's **Federal Register**, the Mine Act requires MSHA to regulate exposures on

each shift individually. Since MSHA does not track the number of shifts each miner works over a lifetime, MSHA must, as a matter of practical necessity, protect miners by limiting their exposure on each shift. Furthermore, as explained in Sections VI and VII of the present notice, eliminating overexposures on individual shifts is beneficial to miners' health. For miners working where there is a pattern of recurrent overexposures on individual shifts, eliminating such overexposures is expected, over a working lifetime, to significantly reduce the risk of pneumoconiosis. Therefore, the Secretary has concluded that equivalent dust concentrations should be maintained at or below the applicable dust standard on each and every shift.

If an operator is cited for a violation of the applicable dust standard, proposed paragraphs (b)(1), (b)(2), (b)(2)(i) and (b)(2)(ii) would require the operator to take specific actions within the time for abatement fixed in the citation. First, in order to provide immediate health protection, the operator would be required to make available approved respiratory equipment to the affected Part 90 miner that complies with existing § 70.300. The operator would then determine the cause of the excessive dust concentration and take appropriate corrective action to gain compliance. As under the current Part 90 rule, the proposed rule would permit the operator to achieve compliance in either of two ways: (1) By implementing control measures to reduce the dust levels in the Part 90 miner's work position; or (2) by transferring the affected Part 90 miner to work in another location at the mine where the concentration of respirable dust does not exceed the standard. Any Part 90 miner who is transferred to another position would continue to remain a Part 90 miner at the new position, even if the job is at a surface mine.

If the operator chooses to lower dust levels in the Part 90 miner's assigned work position, proposed paragraph (b)(2)(i) would require the operator to notify the district manager in writing or by electronic means within 24 hours after implementing the control measures. Since MSHA would be assuming responsibility for compliance and abatement sampling under this proposed rule, this notice would enable MSHA to schedule and conduct follow-up sampling to determine whether the operator's corrective action(s) was effective to gain compliance.

The requirement of proposed paragraph (b)(2(i) would not apply if the corrective action involved transferring the Part 90 miner to another work position to achieve compliance. Instead, the operator would be required to comply with § 90.102(c) by giving the district manager written notice of the transfer and the date on which it is to be effective before such a transfer would be allowed to occur. This is necessary so that MSHA could (1) update its computerized management information system to permit the processing of the five operator samples taken from the Part 90 miner's new work position as required by proposed paragraph (b)(3) of this section and (2) schedule and conduct follow-up sampling for abatement purposes.

After complying with § 90.102(c), the operator would be required to sample the affected Part 90 miner until five valid samples were collected and submitted within the abatement period fixed in the citation. As discussed under proposed § 90.204, the purpose for taking these samples is to verify the suitability of the particular working environment in which the Part 90 miner was placed. Therefore, MSHA does not intend to take enforcement action based on the results of operator samples, only for failure to take corrective action under proposed paragraph (b)(2) of this section. Under this proposed rule, only valid samples collected by MSHA would be used to abate a violation of § 90.100 or § 90.101.

In order to determine if the operator abated the excessive dust violation, MSHA would collect one valid sample from the affected Part 90 miner's position while he or she is performing normal work duties. As discussed under § 90.201, the duration of MSHA sample collection would continue to be limited to 480 minutes as has been the long-standing practice. If the MSHA abatement sample exceeds the applicable dust standard but is less than the appropriate CTV, MSHA may sample additional shifts to confirm the adequacy of the operator's corrective action. MSHA would consider a violation of the applicable dust standard to be abated and terminate the citation when the result of a valid MSHA sample is at or below the applicable dust standard. The subsequent action form would clearly and fully describe the action taken to abate the violation. If the violation was abated by reducing the dust levels in the Part 90 miner's work position, proposed paragraph (c)(1) would require the operator to submit a respirable dust control plan to the district manager for approval in accordance with § 90.300 of this part, which has been retained under this proposed rule. A dust control plan would not be required to be submitted if compliance was achieved by transferring the Part 90 miner to another work position at the mine.

Section 90.208 Status Change Reports

The proposed rule retains the existing provision of § 90.220, which would be redesignated as § 90.208, with some revision. It would require the operator to report in writing or by electronic means any change in status of a Part 90 miner that affects sampling to a designated MSHA District office within three working days after a status change has occurred. Knowing the status of every Part 90 miner will enable the Agency to carry out its sampling and monitoring of operator sampling activities in the most efficient and responsible manner. The operator would be in violation of § 90.208 when the operator fails to comply with the sampling requirements of this part or MSHA was unable to carry out its sampling of a particular Part 90 miner for compliance purposes due to the unavailability of the Part 90 miner that was not reported by the operator as required.

Sections 90.300 and 90.301

Respirable Dust Control Plans

Section 90.300 Respirable Dust Control Plan; Filing Requirements; Contents

The proposed rule retains the existing provisions of § 90.300, which sets forth in detail when a dust control plan must be filed and the information that the operator must include in the plan. Although the language of part of paragraph (a) of the proposed rule differs from that of the existing section, the specific requirements are essentially the same. This change was made in the proposed rule for clarity and consistency with virtually identical provisions in existing § 71.300 of this title.

If an operator abates the violation by implementing control measures that lower the dust in the Part 90 miner's work position, proposed paragraph (a) requires the operator to prepare a respirable dust control plan applicable to the Part 90 miner in the position identified in the citation. Each plan must be designed to continuously maintain the respirable dust level, in the Part 90 miner's assigned work position, at or below the applicable dust standard. This plan must be submitted to the district manager for approval within 15 days after the citation is terminated. A copy of the approved plan must be provided to the affected Part 90 miner. However, the operator is prohibited from posting the original or

a copy of the plan on the mine bulletin board.

If, on the other hand, the operator abates a violation of the applicable dust standard by transferring the part 90 miner to another position at the mine, the operator is not required to submit a dust control plan to the district manager for approval.

As under existing paragraph (b), the operator would be required to include details on the control measures that were implemented to reduce the dust and abate the violation, as well as any other provisions required by the district manager. The plan must also include the specific time, place and manner that the control measures would be used. Failure to do so would constitute a violation of this section.

Section 90.301 Respirable Dust Control Plan; Approval by District Manager; Copy to Part 90 Miner

The proposed rule retains the existing provisions of § 90.301, which specifies the criteria MSHA would use to approve the operator's dust control plan. Since MSHA would assume sampling of Part 90 miners for compliance purposes, the following phrase was inserted towards the end of paragraph (a): * * * ''the results of MSHA sampling and.'' Also, the proposed rule would add the word ''continuously'' to paragraph (a)(1) for consistency with § 90.300(a), and replace the phrase ''MSHA may take respirable dust samples to determine whether'' in paragraph (b) with ''MSHA will monitor the continued effectiveness of'' to reflect MSHA's assumption of sampling for compliance purposes.

V. Health Effects

A. Introduction

For as long as miners have taken coal from the ground, many have suffered respiratory problems due to their occupational exposures to respirable coal mine dust. Long-term retention of coal mine dust in the lung causes chronic lung diseases including coal workers' pneumoconiosis (CWP), silicosis, and chronic obstructive pulmonary disease (COPD) (*e.g.*, chronic bronchitis, emphysema, and airways obstruction). Coal workers' pneumoconiosis occurs in two stages: simple and complicated pneumoconiosis. Simple CWP is categorized into three levels of severity: 1, 2, and 3. Miners with simple CWP, especially the more advanced categories, have a substantially increased risk of developing complicated pneumoconiosis (more typically known as progressive massive fibrosis (PMF)). Progressive massive fibrosis can cause significant loss of lung function and give rise to respiratory symptoms (*e.g.*, breathlessness, wheezing), and lead to disability and premature mortality. Overall, coal miners are at risk of increased morbidity and premature mortality arising from all of the chronic diseases associated with coal mine dust exposure.

Elimination or reduction of coal mine dust exposure is the only effective way to prevent or minimize occupational lung disease among coal miners. However, routine screening affords the potential to prevent further development of disease among those, who despite dust control measures, still develop CWP. Pursuant to 42 CFR part 37, the National Institute for Occupational Safety and Health (NIOSH) operates a program for underground coal miners designed to detect early CWP. This screening program for CWP is termed the Coal Workers' X-ray Surveillance Program (CWXSP).

In 1998, MSHA estimated that there were approximately 45,000 underground coal miners and 39,000 surface coal miners (Mattos, 1999). A small percentage of the mining involved anthracite coal, the highest rank coal, while most involved bituminous coal which is a medium rank coal.

There are complementary data sources, described below, which provide estimates of the prevalence of occupational respiratory disease among coal miners. Together these data demonstrate the progress over the last thirty years in the reduction of occupational respiratory disease among coal miners, as well as the need for further action to reduce occupational lung disease.

In accordance with 30 CFR part 50, both surface and underground coal mine operators must report any known cases of occupational illnesses to MSHA. Under this requirement, mine operators reported 224 cases of coal workers' pneumoconiosis in 1998 (Mattos, 1999). Of these, 138 cases occurred among coal miners who worked underground, while the remaining 86 cases occurred among surface coal miners (Mattos, 1999). There were also 14 cases of silicosis, eight in underground mines, reported to MSHA in 1998 in accordance with 30 CFR part 50 (Mattos, 1999).

In the 1990s, MSHA conducted a one-time medical screening and surveillance program in various regions of the country. This program was designed to help more coal miners, especially surface coal miners, learn whether or not they had CWP, and to provide a more accurate estimate of the prevalence of simple CWP and PMF among these coal miners. Through this special program, MSHA tried to minimize obstacles that may prevent some miners from participating in respiratory diagnostic procedures. Nine geographical groups of miners were encouraged to participate in this x-ray program that was independent of the CWXSP (MSHA, Internal Chart, 1999). The study groups included eight active surface coal mining communities in Pennsylvania, Kentucky and West Virginia, as well as Poteau, Oklahoma and Gillette, Wyoming. A ninth group included underground miners in Kentucky. The process was designed to encourage miner participation by providing for a greater degree of anonymity than may be available under the NIOSH x-ray program. Across the eight surface groups surveyed, the prevalence rate of CWP among participants was 5.6% (130/2,305). The CWP prevalence rate among the participating underground Kentucky miners was 9.2% (37/404).

Due to the different outreach initiatives number and type of participants in these various subgroups, relative to the population of today's coal miners, these data may not be representative of the overall prevalence of CWP among today's coal miners.

The Secretary of Labor's Advisory Committee on the Elimination of Pneumoconiosis Among Coal Workers (Dust Advisory Committee, 1996) recommended that the CWXSP for pneumoconiosis include surface coal miners and independent contractors and that it increase underground coal miners' participation to at least 85 percent. In response, MSHA and NIOSH implemented the Miners' Choice Health Screening Program (Miners' Choice) in October 1999. The Miners' Choice program and Coal Workers' X-Ray Surveillance Program (CWXSP) identify cases of simple and complicated pneumoconiosis, including coal workers' pneumoconiosis and silicosis—hereafter referred to as ''CWP.'' All of the Miners'' Choice x-rays were processed using the same procedures and criteria used in the CWXSP in accordance with the requirements of 42 CFR part 37.

MSHA and NIOSH are conducting preliminary analyses of the first three years of the Miners' Choice program. These data and analyses are being handled, conducted, and reported pursuant to the DOL's and DHHS's respective Information Quality

Guidelines.[14] Preliminary analyses of these data are expected in Spring 2003. The analyses will be made available to commenters through the MSHA and NIOSH Web sites, *http://www.msha.gov* and *http://www.cdc.gov/niosh/homepage.html,* respectively.

As of the end of fiscal year 2002, more than 19,500 active coal miners from 20 states voluntarily participated in Miners' Choice. The overall CWP prevalence rate for radiographic categories of simple CWP categories 1, 2, 3, and PMF combined was 2.8% (546/19,517) among miners examined in Miners' Choice during the 2000–2002 period. This is similar to the CWP prevalence rate of 2.25% for initial participants in the Miners' Choice Program reported in the 2000 NPRM (65 FR 42100). Among Miners' Choice participants, the CWP prevalence rate was higher among underground coal miners at 3.8% (356/9,265), than it was for surface coal miners, 1.8% (188/10,184). The CWP prevalence rate for independent contractors was 2.9% (2/68). These findings show that CWP continues to occur among coal miners working under the current program to control respirable coal mine dust, including quartz.

Coal miners with simple CWP, particularly the advanced categories, are much more likely to develop life-threatening complicated CWP (*i.e.*, progressive massive fibrosis, or PMF), than those with category 0 (ILO profusion categories of 0/0 or 0/1) (Cochrane, 1962; Hurley *et al.*, 1987; Hurley and Jacobsen, 1986; Hurley and Maclaren, 1987; Jacobsen, *et al.*, 1971; McLintock, *et al.*, 1971; and Morfeld, *et al.*, 1992). In addition, epidemiological studies have shown that even among miners with category 0, those with a CWP profusion category suggesting pneumoconiosis (*i.e.*, 0/1) are at increased risk of developing PMF compared to miners with a CWP profusion category of 0/0 (Hodous and Attfield, 1990 and McLintock, *et al.*, 1971).

Several studies provide consistent information relevant to this issue. In a study of miners who participated in round six (1990–1995) of the Coal Workers' X-Ray Surveillance Program (CWXSP), Althouse *et al.* (1998) found an average prevalence rate of 2.2% for simple CWP category 1 and higher among the 8,210 miners who reported beginning work in underground coal mines in 1973 or later. Miners who reported other prior dusty work were excluded from the analysis. Althouse *et al.* (1998) also report an overall decline in the CWP prevalence rates between 1970 and 1995. While this result is encouraging, it also demonstrates that pneumoconiosis is still occurring among miners who have worked only under the current applicable dust standard, and for less than a full working lifetime. The Althouse *et al.* (1998) study did not include estimates of exposure concentration, but the prevalence rates were shown to increase with tenure in mining (up to 22 years). In an earlier study, NIOSH compared the observed prevalences of CWP among miners who participated in rounds 3 and 4 of the CWXSP with the predicted prevalences from the epidemiological study by Attfield and Morring (1992b) (NIOSH 1995, Appendix L). That analysis included coal miners in the CWXSP who had started work between 1969 and 1986 and who had worked 10 or more years; exposure concentrations were estimated at or below the current standard. NIOSH found that the observed and predicted prevalences were similar, thus supporting the validity of the predictions from that epidemiological study. The findings from the Attfield and Morring (1992b) study are consistent with the findings from other epidemiological studies, including Attfield and Seixas (1995). Comparing the effect of miners' exposures received either before or after 1970, Attfield and Seixas (1995) found that exposure during both time periods contributed to the development of pneumoconiosis.

In addition, the epidemiological studies are relevant to predicting the risks of occupational respiratory diseases among miners working today because the cumulative exposures of miners working at the current standard of 2.0 mg/m^3 for a full 45-year working lifetime are well within the range of the data examined in these studies (Attfield and Seixas, 1995; Attfield and Morring 1992a,b; Attfield and Hodous, 1992; Seixas et al. 1992, 1993). Thus, risk estimates based on these studies do not require extrapolation beyond the range of the data. These epidemiological studies included quantitative estimates of miners' exposures to respirable coal mine dust and found statistically significant relationships between cumulative exposure and prevalence of pneumoconiosis or COPD. Despite several differences in the surveillance and epidemiological studies (*e.g.,* exposure estimation and tenure, x-ray readers, miner participation rates, and mines), the observed prevalence rates from the surveillance studies confirm the predicted prevalences from the epidemiological studies.

The Mine Act of 1977 states:

> ''* * * in promulgating mandatory [health] standards which must adequately assure on the basis of the best available evidence that no miner will suffer material impairment of health or functional capacity even if such miner has regular exposure to the hazards dealt with by such standards for the period of his working life.'' Mine Act 101(a)(6)(A).

Findings from the CWXSP indicate an overall decline in the prevalence of CWP from 11% in the 1970s to 2.8% in the sixth round of CWXSP (1992–1996) (NIOSH, Work-Related Lung Disease Surveillance Report, Table 2–11, 1999). Even so, Miners' Choice, CWXSP, and MSHA's one-time medical surveillance programs in the 1990s consistently show prevalence of CWP to be at levels that cause concern. If patterns of overexposure to respirable coal mine dust remain unchanged for these coal miners, the prevalence of CWP would continue to increase, as their cumulative exposure to respirable coal mine dust increases over their coal mining careers.

Both MSHA and NIOSH (Re-opening notice for the Determination of Respirable Coal Mine Dust published elsewhere in today's **Federal Register**; Criteria Document, 1995) find the current program for preventing overexposures to respirable coal mine dust is not sufficient to adequately prevent overexposures to respirable coal mine dust and protect the health of the coal miners.

B. Hazard Identification

1. Agent: Coal

Coal is a fossil fuel derived from partial degradation of vegetation. Through its combustion, energy is produced which makes coal a valuable global commodity. It has been estimated that over one-third of the world uses energy provided by coal (Manahan, 1994). Approximately 1,800 underground and surface coal mines are in operation in the United States annually producing slightly over a billion short tons of coal (Mattos, 1999).

Coal may be classified on the basis of its type, grade, and rank. The type of coal is based upon the plant material (*e.g.,* lignin, cellulose) from which it originated. The grade of coal refers to its chemical purity. Although coal is largely carbon, it may also contain other elements such as hydrogen, oxygen,

[14] Specifically, the information is maintained in a confidential manner, all methodologies for data processing are transparent, and all available records were included. This information is reliable and accurate, and is presented in a clear and objective manner, as required by the Department of Labor's Information Quality Guidelines and the Department of Health and Human Services' Guidelines for Ensuring the Quality of Information Disseminated to the Public.

nitrogen, and sulfur. ''Hard'' coal refers to coal with a higher carbon content (*i.e.,* 90–95%) than ''soft'' coal (*i.e.,* 65–75%). Coal rank relates to geologic age, indexed by its fixed carbon content, down to 65%, and then by its heating value. Volatile matter varies inversely with the fixed carbon value. The most commonly described coal ranks include lignite (low rank), bituminous coal (medium rank), and anthracite (high rank) (Manahan, 1994).

2. Physical State: Coal Mine Dust

Aerosols are a suspension of solid or liquid particles in air (Mercer, 1973); they may be dusts which are solid particles suspended in the air. Coal dust may be freshly generated or may be re-suspended from surfaces on which it is deposited in mines. As discussed below, coal mine dust may be inhaled by miners, depending upon the particle size.

Coal mine dust is a heterogenous mixture, signifying that all coal particles do not have the same chemical composition. The particles are influenced by the type, grade, and rank of coal from which they were generated (Manahan, 1994). Irrespective of differences in coal characteristics, these dusts are water-insoluble, which is important biologically and physiologically. Unlike soluble dusts which may readily pass into the respiratory system and be cleared via the circulatory system, insoluble dusts may remain in the lungs for prolonged periods of time. Thus, a variety of cellular responses may result that could eventually lead to lung disease.

3. Biological Respirable Coal Mine Dust

The principal route of occupational exposure to respirable coal mine dust occurs via inhalation. As a miner breathes, coal mine dust enters the nose and/or mouth and may pass into the mid airways (*e.g.,* bronchi, terminal bronchioles) and lower airways (*e.g.,* respiratory bronchioles, alveolar ducts).

Coal mine dust has a size distribution that is estimated to range between 1 and 100 micrometers (μm) (1 μm = 10^{-6} m) (Silverman, *et al.,* 1971). The size of coal particles is critical in determining the level of the respiratory tract at which deposition and retention occur (American Conference of Governmental Industrial Hygienists, 1999; American Industrial Hygiene Association, 1997).

Particles that are greater than 10 μm are largely filtered in the nasal passages. However, it has long been known that some particles greater than 10 μm in size, can be inhaled, and that some of these particles can reach the alveoli of the lungs (Lippman and Albert, 1969). According to the British National Coal Board, ''particles as large as 20 microns (*i.e.,* micrometers (μm)) mean diameter may be deposited, although most 'lung dust' lies in the range below 10 microns diameters'' (Goddard, *et al.*, 1973). Particles less than 10 μm in size easily move throughout the respiratory tract. As particle size decreases from 10 to 5 μm, however, there is greater penetration into the mid and lower regions of the lung. Particles that are approximately 1–2 μm are the most likely to be deposited in the lung (American Conference of Governmental Industrial Hygienists, 1999; Mercer, 1973). During mouth breathing, there may be a slight upward shift in the particle deposition curve such that 2–3 μm-sized particles are the most likely to be deposited in the respiratory tract (Heyder, *et al.,* 1986). Irrespective of nasal or mouth breathing, the potential respiratory tract penetration of particles less than 10 μm in size is important because particles in the respirable size range deposit in the deep lung where clearance is much slower.

For the purposes of this rule, ''respirable dust'' is defined as dust collected with a sampling device approved by the Secretary of Labor and the Secretary of the Department of Health and Human Services (DHHS) in accordance with 30 CFR Part 74 (Coal Mine Dust Personal Sampler Units). In practice, the coal mine dust personal sampler unit has been used in the U.S. The particles collected with an approved sampler approximate that portion of the dust which may be deposited in the lung (West, 1990; 1992). It does not, however, indicate pulmonary retention (*i.e.,* those particles remaining in the lung). For those particles that are deposited in the lung, clearance mechanisms normally operate to assist in their removal. For example, within the thoracic (tracheal-bronchial) region of the lung, cilia (*i.e.,* hairlike projections) line the airways and are covered by a thin layer of mucus. They assist in particle clearance by beating rhythmically to project particles toward the throat where they may be swallowed, coughed, sneezed, or expectorated. This rhythmic beating action is effective in removing particles fairly quickly (*i.e.,* hours or days). Within the alveolar region of the lung, particles may be engulfed by pulmonary macrophages. These large ''wandering cells'' may remove particles via the blood or lymphatics. This process, unlike the movement of the cilia is much slower (*i.e.,* months or years). Thus, some particles, particularly those that are insoluble, may remain in the alveolar region for long periods of time, despite the fact that pulmonary clearance is not impaired. It is the pulmonary retention of coal mine dust which may be the impetus for respiratory disease.

It is also important to note that silica may be present in the coal seam, within dirt bands in the coal seam, and in rock above and below coal seams. Of the silica found in coal mines, quartz is the form which is found. Thus, quartz may become airborne during coal removal operations (Manahan, 1994). Miners may inhale dust that is a mixture of quartz and coal. MSHA is concerned with the inhalation of quartz since it may be deposited in the lungs of miners and produce silicosis. This is a restrictive lung disease which is characterized by a stiffening of the lungs (West, 1990; 1992). Silicosis has been seen in coal miners (*e.g.,* surface miners, drillers, roofbolters) (Balaan, *et al,* 1993). Silicosis may develop acutely (*i.e.,* 6 months to 2 years) following intense exposure to high levels of respirable crystalline quartz. Silicosis has also been observed in coal miners following chronic exposure (*i.e.,* 15 years or more), but may be accelerated (*i.e.,* 7–10 years) in some cases (Balaan, *et al,* 1993). Silicosis is irreversible and may lead to other illnesses and premature mortality. People with silicosis have increased risk of pulmonary tuberculosis infection and an increased risk of lung cancer (Althouse, *et al.,* 1995; International Agency for Research on Cancer, 1997). MSHA's current standard of 2.0 mg/m^3 for respirable coal dust requires that quartz levels in the respirable coal mine dust be 5% or lower. Otherwise, the 2.0 mg/m^3 respirable coal dust exposure limit does not apply and must be adjusted downward for percentage of quartz. If respirable coal mine dust contains more than 5% quartz, then the following formula is applied (30 CFR 70.101; 30 CFR 71.101).

Respirable dust standard (mg/m^3)= {(10)/(% Quartz)}

The intent of this formula, as prescribed by the Secretary of Health, Education, and Welfare in 1971, whenever the respirable coal mine dust in the mine atmosphere of the active workings contains more than five percent quartz, is to maintain miner exposures to quartz below 0.1 mg/m^3 (100 μg/m^3).[15]

[15] The applicable dust standard for intake air in § 70.100(b) and for miners who have exercised rights under Part 90 regulations in § 90.100 is 1.0 mg/m^3. Those standards are also lowered if the quartz content of the respirable coal mine dust

Continued

C. Health-Related Effects of Respirable Coal Mine Dust

1. Description of Major Health Effects

Consistently, epidemiological studies have demonstrated miners to be at risk of developing respiratory symptoms, a loss of lung function, and lung disease as a consequence of occupational exposure to respirable coal mine dust. As noted previously, risk factors include type(s) of dust, dust concentration, duration of exposure, age of the miner (often measured as age at time of medical examination), and coal rank.

a. Simple Coal Workers' Pneumoconiosis (Simple CWP) and Progressive Massive Fibrosis (PMF)

In earlier stages of pneumoconiosis the term, ''simple coal workers' pneumoconiosis'' (simple CWP), has been used, while in more advanced stages, the terms ''complicated CWP'' and PMF have been used interchangeably. Simple CWP and PMF involve the lung parenchyma and are produced by deposition and retention of respirable coal dust in the lung.

To determine if a miner has simple CWP or PMF, chest x-rays are taken and classified by a certified radiologist or reader. Opacities (both irregular and rounded) are identified on chest films and then classified using a scale of 0 through 3 (*e.g.,* simple CWP category 1), where higher category values indicate increasing concentration of opacities. In some instances, two category values may be given. For example, simple CWP category 2/3 signifies that the reader decided the film was category 2, but suspected that it might have been category 3. The International Labour Office (ILO) has provided a full description of the criteria for these classifications (ILO, 1980).

Studies have shown that the prevalences of both small rounded and small irregular opacities increase with increasing coal mine dust exposure (Amandus *et al.,* 1976; Cockcroft *et al.,* 1983; Collins *et al.,* 1988). Miners with small opacities (rounded and/or irregular) on their chest x-rays were more likely to report chronic cough and phlegm, and breathlessness, than miners without small opacities (category 0/0) (Collins *et al.,* 1988). This effect was more common among miners with predominately small rounded opacities (Collins *et al.,* 1988; Rae *et al.,* 1971). Small irregular opacities have been associated with impaired lung function (Amandus *et al.,* 1976; Cockcroft *et al.,* 1982b,c; Collins *et al.,* 1988). The pattern of lung function impairment reported by Collins *et al.* (1988) was consistent with that typically associated with dust exposure in coal miners, and was distinctly different from the pattern observed among smokers.

Because simple CWP represents an early stage of a progressive disease, miners who have had a chest x-ray classified as ILO category 1 or greater are more likely than those with a clear x-ray (category 0) to progress to the more severe stages of the disease, including the complicated form, PMF (categories A, B, or C) (Cochrane, 1962; Jacobsen, *et al.,* 1971; McLintock, *et al.,* 1971; Morfeld *et al.,* 1992; Balaan, *et al.,* 1993). In addition, miners with simple CWP were found to have an increased risk of dying from pneumoconiosis (as the underlying or a contributing cause on the death certificate), and this risk tended to increase with increasing radiographic category (Kuempel *et al.,* 1995).

Progressive massive fibrosis (PMF) is associated with decreased lung function and increased premature mortality (Rasmussen, *et al.,* 1968; Atuhaire, *et al.,* 1985; Miller and Jacobsen, 1985; Attfield and Wagner, 1992). Progressive massive fibrosis is also associated with increases in respiratory symptoms such as chest tightness, cough, and shortness of breath. Miners with PMF also have an increased risk of acquiring infections and pulmonary tuberculosis (Petsonk and Attfield, 1994; Yi and Zhang, 1996). Finally, miners with PMF have an increased risk of right-side heart failure (*i.e.,* cor pulmonale) (Cotes and Steel, 1987).

b. Other Health Effects

During a medical examination, a miner may be questioned by his/her physician about symptoms such as cough, phlegm production, chest tightness, shortness of breath, and wheezing. Occupational physicians may also conduct pulmonary function tests using spirometry or plethysmography. Pulmonary performance may be assessed via repeated measurements of lung volumes and capacities, such as the forced expiratory volume in one second (FEV1), vital capacity (VC), forced vital capacity (FVC), residual volume (RV), and total lung capacity (TLC) (West, 1990; 1992). Changes in lung volumes and capacities may indicate a loss of the integrity of the lung (*i.e.,* respiratory system). More importantly, they can provide information for diagnosis of diseases affecting the airways and/or elasticity of the lung (*i.e.,* obstructive vs. restrictive lung disease)(West, 1990; 1992).

The term, chronic obstructive pulmonary disease (COPD), refers to three disease processes that are often difficult to properly diagnose and differentiate: Chronic bronchitis, emphysema, and asthma (Coggon and Taylor, 1998; Garshick, *et al.,* 1996; West, 1990; 1992). As indicated by several studies, the exposure of miners to respirable coal mine dust places them at increased risk of developing COPD. Furthermore, COPD may occur in miners with or without the presence of simple CWP or PMF.

COPD is characterized by airflow limitations, and thus there is a loss of pulmonary function. As in simple CWP or PMF, a miner with COPD may have a variety of respiratory symptoms (*e.g.,* shortness of breath, cough, sputum production, and wheezing) and may be at increased risk of acquiring infections. COPD is associated with increased premature mortality (Hansen, *et al.,* 1999; Meijers, *et al.,* 1997).

Briefly, in chronic bronchitis and in asthma, there is excess mucous secretion in the mid to lower airways (West, 1990; 1992). In contrast, emphysema is characterized by dilatation (enlargement) of alveoli that are distal to the terminal bronchioles, which leads to poor gas exchange (*i.e.,* poor transfer of oxygen and carbon dioxide). Additionally, there is a breakdown of the interstitium between the alveoli. These pathological changes may be confirmed upon autopsy. With asthma, the airflow limitations may be partially or completely reversible, while they are only partially reversible with chronic bronchitis and emphysema.

The Mine Safety and Health Administration (MSHA) and the NIOSH recognize that respiratory symptoms, loss of lung function, and COPD may impair the ability of a miner to perform his/her job and may diminish his/her quality of life (65 FR 49215). Additionally, miners having such health effects are at increased risk of morbidity (*e.g.,* from cardio-pulmonary disease, infections) and premature mortality.

2. Toxicological Literature

To better understand the human health effects of exposure to respirable coal mine dust and to more fully characterize the associated risks, it is important to consider data that have been obtained in animal based toxicological studies. To date, sub-acute studies (a study with a duration of 30 days, or less, in which multiple exposures of the same agent are given) and chronic studies (a study with a duration of more than 3-months, in which multiple exposures of same agent are given) attempted to mimic miners'

exceeds 5 percent. However, no effect occurs until the quartz content exceeds 10 percent.

exposures. Inhalation was generally the route of exposure, although several studies have also employed instillation techniques (*i.e.,* a method which places a known quantity of dust into the trachea or bronchi).

Most recent toxicological studies have been short-term studies, largely focusing on ''lung overload'' (Sipes, 1996; Oberdorster, 1995; Morrow, 1988, 1992; Witschi, 1990), species-dependent lung responses (Nikula, *et al.,* 1997a,b; Mauderly, 1996; Lewis, *et al.,* 1989; Moorman, *et al.,* 1975), and particle size-dependent lung inflammation (Soutar, *et al.,* 1997). The data have shown that pulmonary clearance of particles may become impaired, potentially leading to inflammatory and other cellular responses in the lung. Although overloading has not been demonstrated in humans, the finding of reduced lung clearance among retired U.S. coal miners (Freedman and Robinson, 1988) is consistent with this possibility.

The data from Moorman, *et al.* (1975), Lewis, *et al.* (1989), and Nikula, *et al.* (1997a,b) are noteworthy for several reasons. First, these groups of investigators conducted chronic inhalation toxicity studies (*i.e.,* chronic bioassays). This is important since miners' exposures also occur via inhalation, and over a working lifetime. Secondly, the investigators used an exposure concentration of 2.0 mg/m^3 in their bioassays. As noted above, this is the current MSHA standard for respirable coal mine dust. Thirdly, the exposures involved nonhuman primates, whose responses are thought to closely mimic those of man. Some of the key findings of these studies included: deposition of coal dust in the animals' lungs, retention of coal dust in alveolar tissue, altered lung defense mechanisms, reduced pulmonary airflows, and hyperinflation of the lungs. One of the shortcomings of these studies is that complete dose-response relationships were not developed. However, at higher exposure concentrations, greater effects may be expected which is a basic tenet of toxicology. Thus, at exposure concentrations above 2.0 mg/m^3, MSHA and NIOSH believe that more severe obstructive lung disease may occur (65 FR 42078).

3. Epidemiological Literature

Epidemiological studies have consistently demonstrated the serious health effects of exposure to high levels of respirable coal mine dust (*i.e.,* above 2.0 mg/m^3) over a working lifetime. Table V–2 lists epidemiological studies since 1986 whose results will be discussed on the basis of the type of observed health effect. Studies completed even earlier including the early work of Cochrane (1962), McLintock, *et al.* (1971), and Jacobsen, *et al.* (1971) demonstrated the adverse health effects (*e.g.,* simple CWP, PMF) of respirable coal mine dust in British coal miners.

Both early and recent studies have shown that the lung is the major target organ (*i.e.,* organ in which toxic effects occur) when exposure to respirable coal mine dust occurs. As seen in Table V–2, numerous studies of miners have been conducted. Recent U.S. studies were conducted using data from one or more of the first four rounds of the National Study of Coal Workers' Pneumoconiosis (NSCWP), and have provided extensive data on miners' health. Many of these studies demonstrated that miners are at increased risk of multiple, concurrent respiratory ailments (Attfield and Seixas, 1995; Kuempel, *et al.,* 1997; Meijers, *et al.,* 1997; Seixas, *et al.*, 1992) .

TABLE V–2.—RESPIRABLE COAL MINE DUST EPIDEMIOLOGICAL STUDIES, BY REPORTED OUTCOMES FROM 1986 TO PRESENT

Studies	Reported outcomes
Meijers, *et al.*, 1997	PMF, SCWP, COPD, LLF
Bourgkard, *et al.*, 1998	PMF, SCWP, LLF, RS
Kuempel, *et al.*, 1997*	
Maclaren, *et al.*, 1989	
Kuempel, *et al.*, 1995*	PMF, SCWP, COPD
Love, *et al.*, 1997	PMF, SCWP, LLF
Love, *et al.*, 1992	
Althouse, *et al.*, 1998*	PMF, SCWP
Attfield and Morring,1992b*	
Attfield and Seixas, 1995*	
Goodwin and Attfield, 1998*	
Hodous and Attfield, 1990*	
Hurley and Jacobsen, 1986	
Hurley and Maclaren, 1987; 1988	
Hurley, *et al.*, 1987	
Morfeld, *et al.*, 1997	
Starzynski, *et al.*, 1996	
Yi and Zhang, 1996	
Collins, *et al.*, 1988	SCWP, COPD, LLF, RS
Morfeld, *et al.*, 1997	SCWP
Cockcroft and Andersson, 1987	SCWP, COPD, LLF
Wang, *et al.*, 1997	
Leigh, *et al.*, 1994	COPD, LLF, RS
Marine, *et al.*, 1988	
Seixas, *et al.*, 1993	
Soutar and Hurley, 1986	
Attfield and Hodous, 1992*	LLF, RS
Carta, *et al.*, 1996	
Henneberger and Attfield,1997*	
Henneberger and Attfield,1996*	
Lewis, *et al.*, 1996	
Seixas, *et al.*, 1992*	

TABLE V–2.—RESPIRABLE COAL MINE DUST EPIDEMIOLOGICAL STUDIES, BY REPORTED OUTCOMES FROM 1986 TO PRESENT—Continued

Studies	Reported outcomes
Hansen, *et al.*, ... Weiss, *et al.*, 1995	1999 LLF

COPD: Chronic obstructive pulmonary disease.
SCWP: Simple coal workers' pneumoconiosis.
LLF: Loss of lung function.
PMF: Progressive massive fibrosis.
RS: Respiratory symptoms.
* Studies of U.S. Miners Who Participated in the National Study of Coal Workers' Pneumoconiosis (NSCWP).

a. Simple Coal Workers' Pneumoconiosis (Simple CWP) and Progressive Massive Fibrosis (PMF)

Studies following Cochrane (1962) and McLintock *et al.* (1971) have confirmed that the risk of PMF increases with increasing category of simple CWP (Hurley and Jacobsen, 1986; Hurley, *et al.*, 1987; Hurley and Maclaren, 1988; Hodous and Attfield, 1990). However, the risk of PMF was greater than previously predicted among miners with simple CWP category 1 or without simple CWP (*i.e.*, category 0) (Hurley, *et al.*, 1987). The risk of PMF increased with increasing cumulative exposure, regardless of the initial category of simple CWP (Hurley, *et al.*, 1987), indicating that reducing dust exposures is a more effective means of reducing the risk of PMF than reliance on detection of simple CWP.

Attfield and Seixas (1995) have demonstrated a relationship between cumulative exposure to respirable coal mine dust and predicted prevalence of pneumoconiosis (*i.e.*, simple CWP, PMF). Two strengths of this study include the quantitative description of exposure-response among both miners and ex-miners (who had worked approximately 13–40 years in mining) and the fact that these data represent recent conditions experienced by miners in the U.S. They studied a group of approximately 3,194 men who worked in underground bituminous coal mines. The U.S. miners and ex-miners had participated in Round 1 (1970–1972) or Round 2 (1972–1975) of the NSCWP and were examined again in Round 4 (1985–1988). The study population excludes 86 miners for whom there was missing exposure data or unreadable x-rays. Chest x-rays were read to determine the number of cases of simple CWP and PMF. Attfield and Sexias (1995) used two or three B readers to identify the profusion of radiographic opacities based on the ILO classification scheme. The most inclusive category defined in their paper was CPW 1+ which includes simple CWP categories 1, 2, and 3, as well as PMF. Dust exposure estimates were generated from measurements of dust concentrations as well as from work history. A logistic (or logit) regression model was used to estimate prevalence of simple CWP and PMF. In this statistical analysis, proportions are transformed to natural logarithmic values, *i.e.*, $y = \ln [p/(1-p)]$, before a linear model is fit to the data (Armitage, 1977). The logistic model assumes that the data have a binomial distribution (*e.g.*, presence or absence of PMF) for a given set of covariate values (*e.g.*, age, coal rank, dust exposure, pack-years of smoking). Using logistic modeling, relationships were developed between cumulative dust exposure and prevalence of simple CWP (category 1+, category 2+) and PMF. These relationships were the key strengths of the Attfield and Seixas study and serve as the basis for the quantitative risk assessment (QRA) of this rule.

The recent paper of Kuempel, *et al.* (1997) has provided a detailed discussion and quantitative presentation of excess risks associated with respirable coal dust exposures. Their study was based upon results from previous studies of some 9,000 underground coal miners who participated in the NSCWP (Attfield and Morring, 1992b; Attfield and Seixas, 1995). Kuempel, *et al.* estimated excess (exposure-attributable) prevalence of simple CWP and PMF (*i.e.*, number of cases of disease present in a population at a specified time, divided by the number of persons in the population at that specified time). Point estimates of excess risk of PMF ranged from 1/1000 to 167/1000 among miners exposed at the current MSHA standard for respirable coal mine dust. These estimates were based upon dust exposure that occurred over a miner's working lifetime (*e.g.*, 8 hours per day, 5 days a week, 50 weeks per year, over a period of 45 years). Actual occupational lifetime exposure may be more, due to extended work shifts and work weeks. The point estimates of PMF presented by Kuempel, *et al.* (1997) were related to coal rank, where higher estimates (*e.g.*, 167/1000) were obtained for high-rank coal (anthracite coal) and somewhat lower estimates were obtained for medium/low rank bituminous coal (*e.g.*, 21/1000). Within each coal rank, the estimates of simple CWP cases were at least twice as high as those for PMF (*e.g.*, 167/1000 PMF vs. 380/1000 simple CWP≥1).

The data of Attfield and Seixas (1995) and Kuempel, *et al.* (1995; 1997) were consistent with previous data of Attfield and Morring (1992b) who reported relationships between estimated dust exposure and predicted prevalence of simple CWP or PMF. They also noted that exposure-response relationships were steeper for higher ranks of coal such as anthracite, and concluded that the risks for anthracite miners appeared to be greater than for miners exposed to lower rank coal dust. Attfield and Morring (1992b) used similar methods as described above (*i.e.*, logistic modeling), but included miners from Round 1 of the NSCWP (1969–1971); thus representing an earlier time point in the NSCWP when the respirable coal mine dust concentrations were much higher than they are today.

Recently, Goodwin and Attfield (1998) reported that there were concerns regarding methodological inconsistencies across surveys given during the four rounds of the NSCWP. In particular, they noted the discordance in classification of simple CWP and PMF among readers of chest films. Despite potential discordance, Goodwin and Attfield (1998) have confirmed previous findings of a decline in simple CWP prevalence from 1969 to 1988. Yet, these analyses also demonstrated that simple CWP has not been eliminated. The Round 4 prevalence rates were 3.9 percent for simple CWP category 1 and higher, and 0.9 percent for category 2 and higher. This illustrates the need for continued efforts to reduce dust exposures.

Given the current system for monitoring exposures and identifying overexposures in the U.S., miners are at increased risk of developing simple

CWP and PMF from a working lifetime exposure to respirable coal mine dust (Althouse *et al.* 1998, Attfield and Seixas, 1995; Attfield and Morring, 1992b; Goodwin and Attfield, 1998; Kuempel, *et al.* 1997, 1995). Whenever overexposures (*i.e.*, excursions above the applicable dust standard) occur, the long-term mean exposure of miners may be increased, thereby causing an upward shift on the exposure-response curve. Such a shift then places these overexposed coal miners at increased risk of developing and dying prematurely from simple CWP and PMF.

The Attfield and Seixas epidemiological study (1995) is the most appropriate to use in estimating the benefit of reduction of overexposures. The authors applied scientific rigor to the collection, categorization, and analyses of the radiographic evidence for the group of 3,194 underground bituminous coal miners who participated in Round 4, 1985–1988, of the National Study of Coal Workers' Pneumoconiosis (NSCWP). Radiologic evidence was carefully collected and analyzed by multiple independent, NIOSH certified B readers to identify stages of simple CWP and PMF. In the targeted population of 5,557 miners, the participating miners (3,280) were similar to the non-participants (2,277) with regard to age at the first medical examination and prevalence of simple CWP category 1 or greater. The non-participants had worked slightly longer, yet had lower prevalence of simple CWP category 2 or greater, than the participants. This study describes the differences among current miners and ex-miners (health-related or job-related) in the relationships between the estimated cumulative exposure to respirable coal mine dust and prevalence of simple CWP category 1 or greater. Such data and relationships were not available in other U.S. studies and non-U.S. studies.

A potential limitation in the U.S. studies is the possible bias in the exposure data, which has been the subject of several studies (Boden and Gold, 1984; Seixas *et al.*, 1991; Attfield and Hearl, 1996). An advantage of the Attfield and Seixas 1995 study (and the earlier studies based on the same data set) is that the larger mines included in these epidemiological studies were shown to have exposure data with relatively small bias (Attfield and Hearl, 1996). Another limitation in exposure data used in the U.S. studies is that the airborne dust concentrations used to estimate individual miners' cumulative exposures to respirable coal mine dust were based on average concentrations within job category (these average values were combined with data of each individual miner's duration employed in a given job). The earlier U.S. exposure-response studies of miners participating in the first medical survey of the NSCWP (Attfield and Morring, 1992b; Attfield and Hodous, 1992; Kuempel, *et al.*, 1995) relied primarily on exposure measurements from a dust sampling survey during 1968–1969 to estimate miners' exposures before 1970 (Attfield and Morring, 1992a). An advantage of the Attfield and Seixas 1995 study is that, in addition to the pre-1970 exposure estimates, more detailed exposure data were available to estimate miners' exposures from 1970 to 1987, during which the mean airborne concentrations were stratified by mine, job, and year (Seixas, *et al.*, 1991).

The most complete exposure data available are those for coal miners in the United Kingdom (Hurley, *et al.*, 1987; Hurley and Maclaren, 1987; Soutar and Hurley, 1986; Marine, *et al.*, 1988; Maclaren, *et al.*, 1989). These studies include medical examinations and individual estimates of exposure for more than 50,000 miners for up to 30 years. The U.S. studies are consistent with these U.K. studies in demonstrating the risks of developing occupational respiratory diseases from exposure to respirable coal mine dust. These risks increase with increasing exposure concentration and duration, and with exposure to dust of higher ranked coal. The QRA and associated benefits for this rulemaking were based on the Attfield and Seixas (1995) study because, in addition to the advantages described above, it best represents the recent conditions experienced by miners in the U.S. The QRA, Significance of Risk discussion, and Benefits estimates follow in Sections VI, VII, and IV (a)(2), respectively. The international studies provide an important basis for comparison with the U.S. findings, and several of the recent international studies are described in detail here.

Bourgkard, *et al.*, (1998) conducted a 4-year study of a group of French coal miners who were employed in underground and surface mines. The investigators examined the prognostic role of cumulative dust exposure, smoking patterns, respiratory symptoms, lung CT scans, and lung function indices for chest x-ray worsening and evolution to simple CWP and PMF. Bourgkard, *et al.*, (1998), through selection of a younger worker population (*i.e.*, 35–48 years old at start of study), attempted to focus on the early stages of simple CWP. In essence, they hoped to identify those miners who needed to be relocated to less dusty workplaces or who needed to be clinically monitored. Bourgkard, *et al.* (1998) found a significant association between cumulative dust exposure and what was termed chest x-ray ''worsening'' (*i.e.*, increase in reader-designated category signifying progression of simple CWP). In addition, they found that miners with pneumoconiosis, wheezing, decreased lung function, and high cumulative dust exposure at the first medical examination were those most likely to show worsening on their chest x-rays four years later.

Love, *et al.* (1997, 1992) reported on occupational exposures and the health of British opencast (*i.e.*, surface or strip) coal miners. They studied a group of approximately 1,200 miners who were employed at sites in England, Scotland, and Wales. The mean age of the men was 41; many had worked in the mining industry since the 1970s. To determine dust exposure levels, full-shift personal samples were collected. Most were respirable dust samples which were collected using Casella cyclones according to the procedures described by the British Health and Safety Executive (HSE). Thus exposure determinations would be comparable to exposure determinations obtained in U.S. surface coal mines since both measure respirable dust according to the British Medical Research Council (BMRC) criteria.

These investigators found a doubling in the relative risk of developing profusion of simple CWP category 0/1 for every 10 years of work in the dustiest jobs in surface mines. These respirable coal dust exposures were under 1 mg/m^3. Love, *et al.* (1992, 1997), like other investigators, emphasized the need for monitoring and controlling exposures to respirable coal mine dust, particularly in high risk operations (*e.g.*, drillers, drivers of bulldozers).

Meijers, *et al.* (1997) studied Dutch coal miners who were examined between 1952 and 1963, and who were followed until the end of 1991. They reported an increased risk of mortality from simple CWP and PMF among miners who had generally worked underground for 20 or more years. Their conclusions were based upon dramatic increases in standardized mortality ratios (SMRs). There were several limitations in this study, however.

Morfeld, *et al.* (1997) published a recent paper that investigated the risk of developing simple CWP in German miners and addressed the occupational exposure limit for respirable coal dust in Germany. Their study included

approximately 5,800 miners who worked underground from the late 1970s to mid-1980s. Morfeld, *et al.* observed increases in relative risks (RRs) of developing early x-ray changes, category 0/1, that were exposure-dependent. Relative risks (RRs) increased with higher dust concentrations.

Starzynski, *et al.* (1996) conducted a mortality study on a group of 11,224 Polish males diagnosed with silicosis, simple CWP, or PMF between 1970 and 1985. This cohort was subdivided by occupation into four subcohorts: Coal miners (63%); employees of underground work enterprises (8%) (*i.e.*,drift cutting and shaft construction jobs); metallurgical industry and iron, and nonferrous foundry workers (16%); and refractory materials, china, ceramics and quarry workers (13%). The investigators found that coal miners had a slight, statistically significant excess overall mortality (*i.e.*, all causes) as indicated by a standardized mortality ratio (SMR) of 105 (with a 95% confidence interval (C.I.) of 100–110). Also, excess of deaths from diseases of the respiratory system among coal miners was nearly four times that of the referent population (SMR of 383 with a 95% C.I. of 345–424). The study of Starzynski, *et al.* (1996) agrees with others that there is premature mortality among coal miners from simple CWP and PMF. Unfortunately, there is little or no information presented on miner work history, exposure assessment (*e.g.*, respirable coal mine dust, silica), and mine environment (*e.g.*, coal rank(s), underground vs. surface mining).

Yi and Zhang (1996) conducted a study to measure the progression from simple CWP to PMF or death among a cohort of 2,738 miners with simple CWP who were employed at the Huai-Bei coal mine in China. Relative risks (*i.e.*, RRs) were calculated for progression from simple CWP category 1 to simple CWP category 3 and for progression from simple CWP category 3 to death. Their results demonstrated that miners with simple CWP category 1 are at risk of developing simple CWP category 2 and simple CWP category 3 (*e.g.*, RRs of 1.101 and 2.360, respectively). They also found that miners with PMF had a decreased life expectancy. Other risk factors for development of PMF included long-term work underground, and drilling. This study was limited by a lack of exposure assessment, estimation of miner smoking histories, and use of a radiological classification system that differs from that of the ILO.

Hurley and Maclaren (1987) studied British coal miners who were examined between 1953 and 1978, over 5-year intervals. They have shown that exposure to respirable coal dust increases the risks of developing simple CWP and of progressing to PMF. As seen in their data analysis, these responses were dependent upon dust concentration and coal rank. That is, greater responses were seen at higher dust concentrations and with higher rank coal (*i.e.*, increasing percent carbon). The investigators also noted that estimated risks were unaffected by changes in the proportion of miners with simple CWP who transferred jobs. The authors concluded that ''limiting exposure to respirable coal dust is the only reliable way of limiting the risks of radiological changes to miners.''

b. Other Health Effects

As noted in Table V–2, there were 21 studies in which the loss of lung function (LLF) was examined in coal miners. Fourteen of these studies also included an evaluation of respiratory symptoms (RS) in the miners. There were nine studies describing chronic obstructive pulmonary disease (COPD) in miners.

Henneberger and Attfield (1997; 1996), Kuempel, *et al.* (1997), Seixas, *et al.* (1993), Attfield and Hodous (1992), and Seixas, *et al.* (1992) evaluated data from pulmonary function tests and standardized questionnaires to miners in the NSCWP. A common finding in their studies was an increase in respiratory symptoms such as cough, shortness of breath, and wheezing. The symptoms were dependent upon the dust concentration to which the miners had been exposed, with more pronounced symptoms occurring after long-term exposures to higher exposure levels. These studies also demonstrated that a loss of lung function occurred among miners.

Attfield and Hodous (1992) studied U.S. miners who had spent 18 years underground (on average) and who participated in Round 1 (1969–1971) of the NSCWP. They observed that greater reductions in pulmonary function were associated with exposure to higher ranks of coal (*i.e.*, anthracite vs. bituminous vs. lignite). Using linear regression models, Kuempel *et al.*, (1997) predicted the excess (exposure attributable) prevalence of lung function decrements among miners with cumulative exposures to respirable coal mine dust of 2 mg/m^3 for 45 years (*i.e.*, 90 mg–yr/m^3). The excess prevalence estimated were 315 and 139 cases per thousand for forced expiratory volume in one second (FEV_1) of <80% and <65% of predicted normal values, respectively, among never-smoking miners (a sub-group of 977 NSCWP participants studied in Seixas *et al.*, 1993). Such reductions in FEV_1 are clinically significant; FEV_1 <80% (of predicted normal values) is a measure that is used to determine ventilatory defects (American Thoracic Society, 1991). Three recent studies found impaired FEV_1 to be a predictor of increased pre-mature mortality (Weiss, *et al.*, 1995; Meijers, *et al.*, 1997; Hansen *et al.*, 1999).

Seixas, *et al.* (1993) conducted an analysis of 977 underground coal miners who began working in or after 1970 and were participants of both NSCWP Round 2 (1972–1975) and Round 4 (1985–1988). They found a rapid loss of lung function in miners and further declines in lung function with continuing exposure to coal mine dust. Collectively these studies have shown that the prevalence of decreased lung function was proportional to cumulative exposure. That is, with exposure to higher coal dust levels over a working lifetime, there were more miners who experienced a loss of lung function. Also, the types of respiratory symptoms and patterns of pulmonary function decrements observed by both Attfield and Hodous (1992) Seixas, *et al.* (1992;1993) are characteristic of COPD.

The U.S. findings on respiratory symptoms and loss of lung function in miners have agreed with those of previous British studies by Marine, *et al.* (1988) and Soutar and Hurley (1986). Marine, *et al.* (1988) analyzed data from British coal miners and focused their attention on respiratory conditions other than simple CWP and PMF. In particular, they examined the Forced Expiratory Volume in one second (FEV_1) among smoking and nonsmoking miners and, on the basis of reported respiratory symptoms, identified those miners with bronchitis. Using these data, logistic regression models were used to estimate the prevalence of chronic bronchitis and loss of lung function. Marine, *et al.* concluded that both exposure to respirable coal mine dust and smoking independently cause decrements in lung function; their contributions to COPD appeared to be additive in coal miners.

Soutar and Hurley (1986) examined the relationship between dust exposure and lung function in British coal miners and ex-miners. The men who were studied were employed in coal mines in the 1950s and were followed up and examined 22 years later. These miners and ex-miners were categorized as smokers, ex-smokers, or nonsmokers. The Forced Expiratory Volume in one second (FEV_1), the Forced Vital Capacity (FVC), and the FEV_1/FVC ratios decreased in all study groups and these reductions in lung function were

inversely proportional to dust exposure. Thus, Soutar and Hurley concluded that exposure to respirable coal mine dust can cause severe respiratory impairment, even without the presence of simple CWP or PMF. They speculated that the pathology of coal dust-induced lung disease differs from that induced by smoking.

Centrivacinar emphysema in coal miners has been associated with the amount of dust retained in their lungs at the end of life and with their dust exposures during life and the years worked underground (Ruckley *et al.*, 1984; Leigh *et al.*, 1983, 1994). Emphysema in coal miners has also been associated with pathological measurements of pneumoconiosis (Cockcroft *et al.*, 1982a), and with lung function decrements and irregular opacities on chest x-rays (Cockcroft *et al.* 1982b,c; Cockcroft and Andersson, 1987).

Recent studies from China (Wang, *et al.*, 1997) and the European community (Bourgkard, *et al.*, 1998; Carta, *et al.*, 1996; Lewis, S., *et al.*, 1996) have also supported the British and U.S. findings which demonstrated the correlation between occupational exposure to coal dust and respiratory symptoms and loss of lung function in miners.

Wang, *et al.* (1997) examined lung function in underground coal miners and other workers from several factories in Chongqing, China. For their study, information was obtained on exposure duration, results of radiographic tests, and smoking history. Pulmonary function tests were performed, providing the Forced Expiratory Volume in one second (FEV_1), the Forced Vital Capacity (FVC), and FEV_1/FVC data. Additionally, the diffusing capacity for carbon monoxide (DL_{CO}) was measured. This is an indicator of diffusion impairment at the ''blood-gas barrier'' which may occur, for example, when this barrier becomes thickened (West, 1990; 1992). Wang, *et al.* (1997) found that there was impairment of pulmonary function among the coal miners and they had evidence of obstructive disease. Like other studies, such effects were observed among coal miners even in the absence of simple CWP. Pulmonary function was further decreased when simple CWP was present. This study did not provide exposure measurements and there was no consideration of exposure-response relationships. Also, silica exposures and their potential effects were not examined in the underground coal miners.

As noted above, Bourgkard, *et al.* (1998) was interested in the earlier stages of simple CWP (*i.e.*, Categories 0/1 and 1/0) and the prognostic role of cumulative dust exposure, smoking patterns, respiratory symptoms, lung CT scans, and lung function indices for chest x-ray worsening and evolution to simple CWP category 1/1 or higher. Over a 4-year period, they studied French coal miners who were employed in underground and surface mines. Bourgkard, *et al.* (1998) found that, at the first medical examination, the ratio of the Forced Expiratory Volume in one second (FEV_1) to the Forced Vital Capacity (FVC) (*i.e.*, FEV_1/FVC) and other airflows determined from a forced expiration (West, 1990; 1992) were lower among miners who later developed simple CWP category 1/1 or higher. These miners also experienced more wheezing at the first medical examination. Thus, the results of their study suggested that lung function changes may serve as an early indicator of miners who are at increased risk of developing simple CWP and PMF and who should be monitored more closely.

Carta, *et al.* (1996) have examined the role of dust exposure on the prevalence of respiratory symptoms and loss of lung function in a group of young Italian coal miners (*i.e.*, mean age at hire 28.9 years, mean age at first survey 31.2 years). These miners worked underground and were exposed to lignite (*i.e.*, low rank coal) which had a 5–7% sulfur content. They were followed for a period of 11 years, from 1983 and 1993. Carta, *et al.* (1996) found few abnormalities on miner chest x-rays taken throughout the 11-year study. However, there was an increased prevalence of respiratory symptoms and loss of lung function. This was particularly noteworthy since dust exposures were often below 1.0 mg/m^3; the cumulative dust exposure for the whole cohort was 6.7 mg-yr/m^3 after the first survey. Thus, Carta, *et al.* (1996) demonstrated that miners experience respiratory effects of exposure to dust generated from a lower rank coal and at lower concentrations. They have recommended yearly measurements of lung function for miners.

Lewis, *et al.* (1996) studied a group of British miners, many of whom entered the coal industry in the 1970s. Based upon chest x-rays, the miners had no evidence of simple CWP or PMF. The objective of this study was to determine whether coal mining (*i.e.*, exposure to respirable coal mine dust) is an independent risk factor for impairment of lung function. Lewis, *et al.* (1996) found that there was a loss of lung function in miners (smokers and nonsmokers), particularly among miners who were under approximately 55 years of age. For miners who smoked, there was a greater loss of lung function than in nonsmoking miners with the same level of exposure to respirable coal mine dust. Above age 55, the loss of lung function was similar for miners and their controls, although all smokers continued to exhibit a greater loss of lung function than nonsmokers. Lewis, *et al.* (1996) concluded that the deficits in lung function may occur in the absence of simple CWP and PMF, and independent from the effects of smoking.

There have been two recent mortality studies that have demonstrated a relationship between exposure to respirable coal mine dust and development of COPD. This association was reported by Kuempel, *et al.* (1995) in the U.S., and by Meijers, *et al.* (1997) in the Netherlands. These two groups of investigators have reported that occupationally-induced COPD (*e.g.*, chronic bronchitis, emphysema) can occur in miners, with *or without* the presence of simple CWP or PMF. They also found that the risk of premature mortality from COPD was elevated among miners and could be separated from the effects of smoking and age.

Kuempel, *et al.* (1995) found an increase in relative risk (RR) of premature mortality from COPD among U.S. coal miners who participated in the NSCWP from 1969 through 1971. In their data analysis, the exposure-response relationship was evaluated using the Cox proportional hazards model. This model assumes that the hazard ratio between nonexposed and exposed groups does not significantly change with time. When fitting a curve to the data (*e.g.*, log-linear), cumulative exposure was expressed as a categorical or continuous variable. Due to model limitations (*e.g.*, less statistical power, influence of category scheme, use of lowest exposure group for comparisons vs. use of non-exposed group), Kuempel, *et al.*, (1995) believed that the exposure data should be expressed as a continuous variable. If, for example, the cumulative exposure was 90 mg-yr/m^3 (*i.e.*, 2 mg/m^3 for 45 years), then the relative risk of mortality from chronic bronchitis or emphysema was 7.67. Kuempel, *et al.* (1995) also showed that relative risk decreased with lower cumulative exposures (*i.e.*, below 90 mg-yr/m^3) and increased with higher cumulative exposures (*i.e.*, above 90 mg-yr/m^3). Thus, these investigators demonstrated a statistically significant exposure-response relationship for COPD.

Meijers, *et al.* (1997) have shown, among Dutch miners, reductions in lung volumes and capacities are good predictors of the increased risk of

premature mortality from COPD. For example, a diminished forced expiratory volume in one second (FEV_1) or a diminished ratio of the FEV_1 to the forced vital capacity [16] (FVC) (*i.e.*, FEV_1/FVC) upon medical examination was associated with a significantly increased standardized mortality ratio (SMR) for COPD (322 and 212, respectively). In other words, miners with diminished lung capacity based on FEV_1 were two to three times more likely to die prematurely due to COPD than miners who had normal lung function. In contrast, SMRs for COPD were not significantly increased in miners with normal lung volumes and capacities. These data support prior conclusions of Seixas, *et al.* (1992, 1993) and Attfield and Hodous (1992) based on morbidity studies.

VI. Quantitative Risk Assessment

Having reviewed the reported health effects associated with exposure to respirable coal mine dust, MSHA has evaluated the evidence to determine whether the current regulatory strategy can be improved. The criteria for this evaluation are established by section 101(a)(6)(A) (30 U.S.C. 811(a)(6)(A)) of the Mine Act, which states that:

> The Secretary, in promulgating mandatory standards dealing with toxic materials or harmful physical agents under this subsection, shall set standards which most adequately assure on the basis of the best available evidence that no miner will suffer material impairment of health or functional capacity even if such miner has regular exposure to the hazards dealt with by such standard for the period of his working life.

Based on Court interpretations of similar language under the Occupational Safety and Health Act, there are three questions that must be addressed: (1) Whether health effects associated with the current pattern of overexposures on individual shifts constitute a material impairment to miner health or functional capacity; (2) whether the current pattern of overexposures on individual shifts places miners at a significant risk of incurring any of these material impairments; and (3) whether the proposed rules will substantially reduce those risks.

The statutory criteria for evaluating the health effects evidence do not require absolute certainty. Under section 101(a)(6)(A) of the Mine Act, MSHA is required to proceed according to the ''best available evidence'' (30 U.S.C. 811(a)(6)(A)). Furthermore, the need to evaluate risk does not mean that an agency is placed into a ''mathematical straightjacket.'' In *Industrial Union Department, AFL–CIO* v. *American Petroleum Institute (448 U.S.),* otherwise known as the ''Benzene'' decision, the court ruled that:

> So long as they are supported by a body of reputable scientific thought, the Agency is free to use conservative assumptions in interpreting the data * * * risking error on the side of overprotection rather than underprotection. (448 U.S. 607, 100 S.Ct 2844 (1980) at 656)

As explained earlier, MSHA's objective in strengthening the requirements for verifying the effectiveness of dust control plans, and in enforcing effective plans through the new enforcement policy proposed, is to ensure that no miner is exposed to an excessive concentration of respirable dust on any individual shift (*i.e.*, a concentration in excess of the applicable dust standard). MSHA's samples, combined with the more frequent bimonthly operator samples reveal recent overexposures on individual shifts in many mines. Furthermore, these dust samples demonstrate that, in many mines, dust concentrations exceed the applicable dust standard on a substantial percentage of the production shifts. This pattern has persisted for many years; and, since the existing program permits individual shift excursions above the applicable dust standard, a similar pattern can be expected to continue over the working lifetime of affected miners—unless an effort is made to eliminate excessive exposures on individual shifts.

In this quantitative risk assessment (QRA), MSHA will demonstrate that reducing respirable coal mine dust concentrations to no more than the applicable dust standard on each and every shift would, over a 45-year occupational lifetime, significantly bring down the cumulative exposure to respirable coal mine dust, thereby significantly reducing the risk of both simple CWP and PMF among miners. This reduction in risk would result from reducing concentrations on just that percentage of shifts currently showing an excess.

MSHA has estimated health benefits of the two rules based on eliminating excessive exposures at only those MMUs and roofbolter designated areas (RB–DAs) currently exhibiting a pattern of recurrent overexposures on individual shifts. In the previous proposed rule, MSHA used operator sampling data from the year 1999 to identify and characterize such MMUs. In the current proposed rule, MSHA has updated the analysis to 2001, included MSHA DO sampling data in addition to operator data, and expanded the quantitative analysis to include the reduction in risk expected for certain miners not previously considered (*i.e.*, miners working in RB–DAs). As a result, MSHA believes it has now more comprehensively quantified the reduction in risk expected for the most highly exposed miners currently subject to recurrent overexposures.

By ''exhibiting a pattern of recurrent overexposures,'' MSHA means that, for the same DO or RB–DA, at least two valid MSHA or bimonthly operator samples have exceeded the applicable dust standard during a year. MMUs exhibiting such a pattern are highly likely to have experienced excessive exposures on at least six shifts during the year under consideration.[17]

Based on 2001 MSHA and operator data, there were 716 MMUs (out of 1,256 total) at which dust concentrations for the DO exceeded the applicable dust standard on at least two of the sampling shifts (MSHA, datafile: DO_2001.ZIP). MSHA considers these 716 MMUs, representing 57 percent of all MMUs and more than one-half of all underground coal miners working in production areas, to have exhibited a pattern of recurrent overexposures. Valid DO samples were collected on a total of 20,905 shifts at these 716 MMUs, and the applicable dust standard was exceeded on 4,028 of these shifts, or 19.3 percent. For this 19.3 percent, the mean excess above the standard, as measured for the DO only, was 1.04 mg/m^3.

These results are based on a large number of shifts (an average of nearly 30 at each of the 716 MMUs). Therefore, assuming representative operating conditions on these shifts, the results can be extrapolated to all production

[16] Forced vital capacity (FVC) is the total volume of gas that can be exhaled with a forced expiration after a full inspiration; The vital capacity measured with a FVC may be less than that measured with a slower exhalation (West, 1992).

[17] MSHA estimates a MMU average of 384 production shifts per year. At MMUs exhibiting a pattern of recurrent overexposures in 2001, valid DO samples were obtained on an average of about 30 of these 384 production shifts. If dust concentrations on two or more of the sampled shifts exceed the standard, then it follows, at a 95-percent confidence level, that the standard is exceeded on at least six shifts over the full year.

If a different definition of ''exhibiting a recurrent pattern of overexposures'' had been used in the QRA, the estimate of the reduction in risk and associated benefits would have been different. For example, if the criterion were that four or more bimonthly DO exposure measurements exceeded the applicable dust standard then overexposures would be expected, with 95% confidence, to occur on at least 20 shifts in a year of 384 shifts. Using more than two recorded overexposures as the criterion would arbitrarily reduce the population for which MSHA is estimating benefits and decrease the estimated number of prevented cases.

shifts, including those that were not sampled, at these same 716 MMUs. With 99-percent confidence, the overall percentage of production shifts on which the DO sample exceeded the standard was between 18.6 percent and 20.0 percent for 2001. At the same confidence level, again assuming representative operating conditions, the overall mean excess on noncompliant shifts at these MMUs was between 0.96 mg/m^3 and 1.11 mg/m^3. If, as some commenters on the earlier single sample proposed rule and the Dust Advisory Committee proceedings have alleged, operators tend to reduce production and/or increase dust controls on sampled shifts, then the true values could be higher than even the upper endpoints of these 99-percent confidence intervals.

The available data suggest that, unless changes are made to enforce the applicable dust standard on every shift, the same general pattern of overexposures observed in 2001 will persist into the future.[18] Therefore, MSHA concludes that without the proposed changes:

- More than half of all MMUs would continue to have a pattern of recurrent overexposures on individual shifts;
- At those MMUs with recurrent overexposures, full-shift average respirable dust concentrations for the DO would continue to exceed the applicable dust standards on about 20 percent of all production shifts;
- Among those shifts on which DO exposure exceeds the applicable dust standards, the mean excess for the DO would continue to be approximately 1 mg/m^3.

If all overexposures on individual shifts are eliminated, the reduction in total respirable coal mine dust inhaled by a miner over a working lifetime will depend on three factors: (1) The average volume of air inhaled on each shift that would otherwise have exceeded the applicable dust standard, (2) the degree of reduction in respirable dust concentration in the air inhaled on such shifts, and (3) the number of such shifts per working lifetime. While the inhaled dose (mg) could not be measured directly, it is biologically and quantitatively related to the accumulated exposure (*i.e.*, airborne concentration multiplied by duration, summed across jobs for each miner) used to predict CWP and PMF prevalences in the Attfield-Seixas models. If a miner inhales ten cubic meters of air on a shift (U.S. EPA, 1980), reducing the respirable coal mine dust concentration in that air by 1.04 mg/m^3 will result in 10.4 mg less dust inhaled on that shift alone. Assuming the miner works 240 shifts per year, then reducing inhaled respirable dust by an average of 10.4 mg on 19.3 percent of the shifts will reduce the total respirable coal mine dust inhaled by 482 mg per year, or nearly 22,000 mg over a 45-year working lifetime:

1.04 mg less respirable coal mine dust per m^3 of inhaled air
$\times$ 10 m^3 inhaled air per shift
$\times$ 46.32 affected shifts (*i.e.*, 19.3% of 240) per work year
$\times$ 45 work years per working lifetime
= 21,678 mg less respirable coal mine dust inhaled per working lifetime.

In Section V, the strengths and weaknesses of various epidemiological studies were presented, supporting the selection of Attfield and Seixas (1995) as the study that provides the best available estimate of material health impairment with respect to CWP. Two strengths of this study are its quantitative description of exposure-response among both miners and ex-miners (who had worked as miners for approximately 13–40 years) and the fact that it reflects recent conditions experienced by coal miners in the U.S. Using the exposure-response relationship it is possible to estimate the health impact of bringing dust concentrations down to or below the applicable dust standard on every shift. This is the only contemporary epidemiological study of CWP in U.S. miners providing such a relationship.

Attfield and Seixas (op cit) used two or three B readers to identify the profusion of opacities based on the ILO classification scheme.[19] The most inclusive category defined in their paper was CWP 1+, which include simple CWP categories 1, 2, and 3, as well as PMF. The second category CWP 2+, does not include simple CWP, category 1, but does include the more severe simple CWP categories, 2 and 3, as well as PMF. The third category used in their report was PMF, denoting any category (A, B, or C) of large opacities. The authors applied logistic regression models to the prevalence of CWP 1+, CWP 2+, and PMF as a function of accumulated coal mine dust exposure calculated for each miner included in the study. In the absence of data differentiating the inhalation rates of individual miners, the accumulated exposures in these models were expressed in units of mg-yr/m^3.

At the MMUs being considered (those exhibiting a pattern of recurrent overexposures), bringing dust concentrations down to no more than the applicable dust standard on each and every production shift would reduce DO exposures on the affected shifts by an average of 1.04 mg/m^3. Assuming this average reduction applies to only 19.3 percent of the shifts, the effect would be to reduce cumulative exposure, for each miner exposed at or above the DO level, by 0.20 mg-yr/m^3 over the course of a working year (*i.e.*, 19.3 percent of shifts in one year, times 1.04 mg/m^3 per shift). Therefore, over a 45-year working lifetime, the benefit to each affected miner would, on average, amount to a reduction in accumulated exposure of approximately 9.0 mg-yr/m^3 (*i.e.*, 45 years times 0.20 mg-yr/m^3 per year). If, as some miners have testified, operator dust samples submitted to MSHA tend to under-represent the frequency or magnitude (or both) of individual full-shift excursions above the applicable dust standard, then eliminating such excursions would provide a lifetime reduction of even greater than 9.0 mg-yr/m^3 for each affected miner.

The Attfield-Seixas models predict the prevalence of CWP 1+, CWP 2+, and PMF for miners who have accumulated a given amount of exposure, expressed in units of mg-yr/m^3, by the time they attain a specified age. Benefits of reducing cumulative exposure can be estimated by calculating the difference between predictions with and without the reduction. For example, suppose a miner at one of the MMUs under consideration begins work at age 20 and retires at age 65. At these MMUs, the mean DO concentration reported in 2001 was 1.15 mg/m^3; so, after 45 years, a miner exposed at this level can be expected to have accumulated a total exposure of nearly 52 mg-yr/m^3 (*i.e.*, 45 yr $\times$ 1.15 mg/m^3). By the year of retirement, such a miner is expected to accumulate, on average, 9.0 mg-yr/m^3 less exposure if individual shift excursions are eliminated. For 65-year-old miners, reducing an accumulated total dust exposure of 52 mg-yr/m^3 by 9.0 mg-yr/m^3 reduces the predicted prevalence of ''CWP 1+'' by more than 16 per thousand (see the entry for affected DO miners in Table VI–1).[20]

[18] Appendix VI.1 compares the pattern observed in 2001 to that in earlier years.

[19] If three readings were available, the median value was used. If two readings were available, the higher of the two ILO categories was recorded. Eighty radiographs were eliminated because only one reading was available.

[20] The Attfield-Seixas model predicts a higher prevalence of CWP, and consequently a greater risk reduction (35 per thousand DO miners at age 65), after 45 years of occupational exposure to coal mine dust in central Pennsylvania or southeastern West Virginia. (Attfield and Seixas attribute this effect to

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This result, however, applies only to DO miners at age 65. The Attfield-Seixas models provide different predictions for each year of age that a miner attains. The predicted benefit turns out to be smaller for younger miners and larger for older miners. This is partly because younger miners will have accumulated less exposure reduction as a result of today's final changes, and partly because the Attfield-Seixas models depend directly on age as well as on cumulative exposure. The health effects of recurrent overexposures can occur long after the overexposures occurred. Even after a miner retires and is no longer exposed to respirable coal mine dust, the additional risk attributable to an extra 9.0 mg-year/m^3, accumulated earlier, continues to increase with age. Consequently, the benefit to be gained from eliminating individual shift excursions also continues to increase after a miner is no longer exposed. For example, assuming no additional exposure after age 65, the predicted reduction in average prevalence of CWP 1+ increases from 16.6 per thousand at age 65 to 21.4 per thousand at age 70. Presumably, the increasingly greater predicted reduction in risk of disease after age 65 is due to the latent effects of the reduction in earlier exposure and the progressive nature of CWP.

To quantify benefits expected from eliminating overexposures on each and every shift, MSHA applied the Attfield-Seixas models to a hypothetical population of miners who, on average, begin working at age 20 and retire at age 65, assuming different lifetimes.[21] To show the range of potential reductions in risk depending on a miner's lifetime, Table VI–1 presents the risk reductions predicted at three different attained ages: 65, 73, and 80 years. The projected benefit increases with attained age. However, MSHA's best estimate of the benefit to exposed miners is expressed by the reduction in prevalence of disease predicted at age 73.[22]

Since not all underground coal miners are overexposed to dust with the same frequency or at the same level, Table VI–1 shows the risk reductions projected for three different categories of affected miners: (1) DO miners, (2) NDO miners who are faceworkers neither classified as a DO nor subject to a separate applicable dust standard applicable to a RB–DA, and (3) DA roofbolters. The reduction in risk predicted for each of these three categories will now be discussed in turn.

(1) *DO Miners.* As explained earlier, for DO miners the predicted lifetime exposure reduction accumulates at a rate of 0.20 mg/m^3 of reduced exposure per year during the 45 ''working years'' between 20 and 65, reaching a maximum of 9.0 mg-yr/m^3 upon retirement at age 65. Between ages 65 and 80, the accumulated reduction in dust exposure remains at an estimated average of 9.0 mg-yr/m^3, but (as also explained previously) the benefit in terms of both simple CWP and PMF risk continues to increase.

The first row of Table VI–1 presents the reductions in risk expected among affected DO miners who work at a MMU exhibiting a pattern of recurrent overexposures. For this group of miners, the calculation at an average lifetime of 73 years shows that bringing dust concentrations down to no more than the applicable dust standard on each shift would:

- Reduce the combined risk of simple CWP and PMF by 24.4 cases per 1000 affected DO miners; [23]
- Reduce the combined risk of simple CWP (category 2 and 3) and PMF by 15.5 cases per 1000 affected DO miners;
- Reduce the risk of PMF by 7.6 cases per 1000 affected DO miners.

When the dust concentration measured for the DO exceeds the applicable dust standard, measurements for at least some of the other miners in the same MMU may also exceed the standard on the same shift, though usually by a lesser amount. Furthermore, although the DO represents the occupation most likely to receive the highest exposure, one or more of these other miners may be exposed to even higher concentrations than the DO on some shifts. Therefore, the second category of affected miners addressed in Table VI–1 is the population of non-DO faceworkers other than those working in roofbolter DAs (who are addressed as a separate, third category).

(2) *NDO Miners.* This category covers all faceworkers other than the DO, except those roofbolters for which a separate DA applicable dust standard has been established. (Roofbolters *not* coming under a DA standard are included in the NDO category). To estimate how NDO miners (other than those subject to a DA standard) would be affected by the proposed rules, MSHA examined the results from all valid dust samples collected by MSHA in underground MMUs during 2001 (MSHA, data file: Insp2001.zip). Within each MMU, MSHA typically takes one sample on the DO and, on the same shift, four or more additional samples representing other occupations. In 2001, there was an average of 1.0 NDO measurement in excess of the standard on shifts for which the DO measurement exceeded the standard.[24] For NDO measurements that exceeded the standard on the same shift as a DO measurement, the mean excess above the standard was approximately 0.6 mg/m^3.[25]

Combining these results with the 19.3 percent rate of excessive exposures observed for the DO on individual shifts, it is reasonable to infer that, at the MMUs under consideration, an average of 1 other miner, in addition to the 1 classified as DO, is currently overexposed on at least 19 percent of all production shifts. In 2001, the mean of the highest dust concentration reported for any non-DO miner on sampled shifts was 1.08 mg/m^3. Over the course of each working year, the reduction in exposure expected for such miners as a result of implementing the proposed rules is 0.12 mg-yr/m^3 (*i.e.*, 19.3 percent of one year, times 0.6 mg/m^3).

To assess the reduction in risk expected from eliminating all single-shift exposures for these NDO miners, MSHA again applied the Attfield and Seixas models to miners who begin working at age 20 and retire at age 65, assuming lifetimes of 65, 73, and 80 years. This time, however, the resulting decrease in predicted prevalence was multiplied by 1.0/6 = 0.167, to reflect the fact that the assumed rate of overexposure applies, on average, to

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the type of coal mined in those geographic areas). However, few underground coal mines in central Pennsylvania or southeastern West Virginia are still operating. In fact, only about 29 of the 716 MMUs exhibiting a pattern of recurrent overexposures in 2001 were from those areas. Therefore, the risk assessment presented here, along with projected benefits of the rule, are based on the lower risks predicted for miners working outside central Pennsylvania and southeastern West Virginia.

[21] Appendix VI.2 contains a technical description of the Attfield-Seixas models and an explanation of how MSHA applied them to obtain the results shown in Table VI–1. The method used in applying the models differs slightly from that used in the previous proposed rule, and Appendix VI.2 also explains this difference. In addition, an EXCEL workbook entitled ''RiskRdxn.xlw'' showing the formulas used in the calculations has been placed into the public record for these proceedings.

[22] The expected lifetime for all American males, conditional on their having reached 20 years of age, is 73 years (calculated from U.S. Census, March 1997, Tables 18 and 119).

[23] ''Affected DO miners'' include all miners who work at MMUs with a pattern of recurrent overexposures and who are exposed to dust concentrations similar to the DO over a 45-year working lifetime.

[24] With 95-percent confidence, on shifts for which the DO measurement exceeds the standard, the mean number of other occupational measurements also exceeding the standard is at least 0.91.

[25] With 95-percent confidence, the mean excess is at least 0.59 mg/m^3.

about one-sixth of the faceworkers not classified as the DO.[26]

The second row of Table VI–1 contains the risk reductions for NDO miners expected as a result of eliminating all individual shift overexposures. Over an occupational lifetime, the average reduction in risk for simple CWP and PMF combined, and for PMF alone, increases with age. However, the risk reduction at each age is smaller for the affected NDOs than for the affected DOs. This is expected because the estimated probability that a NDO (other than a RB–DA) will, under current conditions, be overexposed on a given shift is only 16.7 percent of the corresponding probability for the DO. For the MMUs under consideration, the predicted reduction in risk for faceworkers other than the DO who live an expected lifetime of 73 years is: 2.3 fewer cases of ''CWP 1+'' per thousand affected NDO miners; 1.5 fewer cases of ''CWP 2+'' per thousand affected NDO miners; and 0.7 fewer cases of PMF per thousand affected NDO miners.

(3) *Roofbolter DA (RB–DA) Miners.* Because roofbolters are often exposed to higher quartz concentrations than other miners, the applicable dust standard for them is frequently different from the standard applicable to other miners working in the same MMU. Therefore, many roofbolters are classified as working in a ''roofbolter designated area'' (RB–DA). For purposes of this QRA, such roofbolters were excluded from the analysis of NDO miners presented above. Based on 2001 MSHA and operator data, 194 out of a total 659 RB–DAs met MSHA's criterion for exhibiting a pattern of recurrent overexposures—*i.e.*, dust concentrations exceeded the applicable dust standard on at least two of the sampled shifts (MSHA, datafile: RBDA2001.ZIP). Valid RB–DA samples were collected on a total of 3477 shifts at these 194 RB–DA MMUs, and the applicable dust standard was exceeded on 837 of these shifts, or 24.1 percent (95% confidence interval: 22.7 to 25.5). For this 24.1 percent, the mean excess above the standard, as measured for the RB–DA only, was 0.72 mg/m^3 (95-percent confidence interval: 0.64 to 0.80).

At these RB–DAs (*i.e.*, those exhibiting a pattern of recurrent overexposures), the mean concentration reported in 2001 was 0.94 mg/m^3; so, after 45 years, an RB–DA miner can be expected, if there is no change in current conditions, to have accumulated a total exposure of more than 42 mg-yr/m^3. By retirement at age 65, such a miner would be expected to accumulate, on average, 7.8 mg-yr/m^3 less exposure if overexposures on all individual shifts were eliminated. (45 years × 24.1% of 0.72 mg/m^3). The third row of Table VI–1 shows the estimated impact of the proposed rules on the risk predicted for RB–DA roofbolters. At age 73, reducing an accumulated total dust exposure of 42 mg-yr/m^3 by 7.8 mg-yr/m^3 reduces the predicted prevalence of ''CWP 1+'' by 19.6 per thousand, of ''CWP 2+'' by 12.1 per thousand, and of PMF by 6.0 per thousand.

TABLE VI–1.—BY AGE, AVERAGE REDUCTION IN CASES OF OCCUPATIONAL RESPIRATORY DISEASE EXPECTED TO RESULT FROM IMPLEMENTATION OF SINGLE SAMPLE AND PLAN VERIFICATION RULES

Type of miner	Reduction in cases of occupational respiratory disease per 1,000 affected miners								
	Simple CWP[a] (categories 1, 2 or 3) or PMF[b] (''CWP 1+'')			Simple CWP(categories 2 or 3) or PMF (''CWP 2+'')			PMF		
	Age			Age			Age		
	65	73	80	65	73	80	65	73	80
Affected Designated Occupation Miners[c] (DO)	16.6	24.4	30.6	6.3	15.5	28.0	2.8	7.6	16.1
Affected Non-Designated Occupation Miners[d] (NDO)	1.6	2.3	2.9	0.6	1.5	2.7	0.3	0.7	1.5
Affected Roof Bolter Designated Areas Miners[e] (RB–DA)	13.0	19.6	25.3	4.8	12.1	22.5	2.2	6.0	12.8

[a] Simple CWP: simple coal workers' pneumoconiosis.
[b] PMF: progressive massive fibrosis.
[c] Affected Designated Occupation (DO) Miners: includes all miners who work at the 57 percent of the Mechanized Mining Units under consideration and who are exposed to dust concentrations similar to the DO, over a 45-year occupational lifetime. Risk reduction estimates are based on reducing the mean dust concentration of 1.15 mg/m^3 (Std. Error = 0.018) observed in 2001 for DOs at the MMUs under consideration.
[d] Affected Non-Designated Occupation (NDO) Miners: includes all underground faceworkers under consideration who are not classified as the DO or a ''designated area roofbolter.'' Risk reduction estimates are based on reducing the mean dust concentration of 1.08 mg/m^3 (Std. Error = 0.011) observed in 2001 for the NDO sample showing the highest dust concentration on a given MSHA sampling day within a MMU.
[e] Affected Roofbolter Designated Area (RB–DA) Miners: includes all miners working as roofbolters in the 29.4 percent of RB–DAs exhibiting a pattern of recurrent overexposures. Risk reduction estimates are based on reducing the mean dust concentration of 0.94 mg/m^3 (Std. Error = 0.025) observed in 2001 for the RB–DAs under consideration.

MSHA acknowledges that the assumptions and data used in this QRA are subject to various caveats, but the Secretary believes that, on balance, MSHA's analysis probably underestimates the increased risk of material impairment attributable to individual shift overexposures accumulated over an occupational lifetime. Some previous commenters, however, have disagreed with this assessment or argued that some aspects of it ''need further consideration.'' The only commenter offering specific criticisms was the NMA, which submitted a critique by M.J Nicolich and J.F. Gamble (September, 2000) along with general comments from Richard Lawson. Nicolich and Gamble brought up four points that, in the NMA's view, cast doubt on our conclusions. These four points will be discussed in turn.

(1) According to Nicolich and Gamble, ''[t]he QRA has made some

[26] There are an estimated 6 NDO miners for each DO miner, and an average of 1.0 of these 6 miners is overexposed. This does not include roofbolters working in designated areas, who are treated as a separate group in the present analysis.

assumptions that have led to incorrect estimates of the percent of miners who would be at reduced risk on the new plan, and have misrepresented the degree of risk reduction among the miners who would have reduced risk.'' In support of this position, Nicolich and Gamble argued that (a) the sample data on which the QRA was based were not independent and (b) that the distribution of values by which concentrations exceeded the applicable dust standard was likely to be skewed and would, therefore, be better represented by its median than by its mean. They argued, further, that as a consequence of (a), the estimated ''number of workers that will have reduced risk will likely be too high and the degree of risk among these fewer workers will be under-estimated * * *'' and that, as a consequence of (b), ''the degree of risk reduction among the miners experiencing over-exposure will likely be too large (because of an overestimate of the intensity of the exposure of the over-exposed miners).''

Both parts of this argument are flawed. The discussion that Nicolich and Gamble offer in support of (a) has nothing to do with independence of sample data and provides no basis for concluding that MSHA has overestimated the percentage of miners expected to experience reduced risk if overexposures on individual shift are eliminated. It should also be noted that this part of their argument involves an apparent misunderstanding of how MSHA estimated the number of miners that would be affected by this rule. Contrary to Nicolich and Gamble's line of reasoning, the estimated percentage of shifts exceeding the applicable dust standard at MMUs exhibiting a pattern of recurrent overexposures was not used to estimate the size of the mining population at risk. It is true that the number of affected miners used in calculating benefits was estimated from the proportion of MMUs exhibiting a pattern of recurrent overexposures (see section IX.A.2. Benefits). However, this estimate would remain the same, regardless of the overexposure rate observed for MMUs defined as exhibiting a pattern. It is also true that if a more stringent criterion were used to define MMUs exhibiting a pattern, then fewer MMUs (and, therefore, fewer miners) would be included in the benefit estimates. The rule, however, applies to all MMUs, not just those defined as exhibiting a pattern of recurrent overexposures for purposes of the QRA. Therefore, adopting a more stringent criterion for recurrence would simply mean that additional miners benefitting from the rule would be left out of the benefit estimates.

Furthermore, the second part of their argument (b) is not relevant to the calculation of the accumulated effect of individual shift exposures, as modeled by the Attfield/Seixas model being employed. In support of their position, Nicolich and Gamble present the example of nine laborers who earn $10,000 per year and a boss who earns $100,000 per year and point out that the mean income ''is not a good measure of the 'typical value.' '' They then propose (based on no supporting data other than that of this example) that the median would be a better measure of the ''typical'' degree by which individual shift overexposures exceed the applicable dust standard.

Nicolich and Gamble fail to consider that the objective is not to estimate a ''typical'' degree of excess but, rather, to estimate the total degree of excess, accumulated over an occupational lifetime. The variable used in the Attfield/Seixas model is cumulative exposure, defined by the product of exposure duration and mean ''intensity'' (*i.e.*, dust concentration), not median intensity. In the example of nine laborers and a boss, the total annual payout is ten times *mean* salary, not median salary. Similarly, cumulative exposure is given by the product of exposure duration and *mean* intensity regardless of the shape of the statistical distribution of excess dust concentrations. Since MSHA's use of the mean value fully accords with the Attfield/Seixas model employed, the commenters have provided no basis for concluding that MSHA has overestimated the degree of risk reduction to be expected among miners experiencing individual shift overexposures.

(2) According to Nicolich and Gamble, ''[t]he Attfield and Seixas model does not take into account the over-exposures identified by MSHA.'' Based on this premise, they argue that ''the estimates of exposure in the model are less than actual exposure and the E–R [*i.e.*, exposure-response] slope is steeper than the actual slope.'' More specifically, they attempt to show that Attfield and Seixas should have estimated the mean concentration for face occupations to be 1.57 mg/m^3 rather than 1.46 mg/m^3. From this, they conclude that ''[t]he toxicity of coal mine dust is therefore over-estimated.''

This argument is based on the false premise that individual shift overexposures were not included in the data from which the Atffield/Seixas model was generated. Contrary to Nicolich and Gamble, however, neither MMUs with a pattern of recurrent overexposures nor individual shift overexposures *per se* were excluded from the data used by Attfield and Seixas. Therefore, contrary to their argument, the existence of such overexposures does not create a ''bias in exposure estimates'' that ''produces an overestimate in the toxicity of coal mine dust.'' Specifically, the value of 1.46 mg/m^3 used by Attfield and Seixas to represent the mean concentration for faceworkers already includes those measurements exceeding the applicable dust standard. Therefore, the corresponding value (1.57 mg/m^3) proposed by Nicolich and Gamble essentially double-counts those measurements.

(3) According to Nicolich and Gamble, ''[t]here is a background prevalence of CWP that is not related to coal mine dust exposure'' and ''prevalences that occur at zero exposure should be subtracted from the observed prevalence.'' Nicolich and Gamble failed to note that background prevalences have no bearing on the expected reductions in risk as calculated and presented in this risk assessment. All estimates of expected risk reduction in this QRA are based on calculating a difference between two estimated risks: with and without the elimination of individual shift overexposures accumulated over an occupational lifetime. Both of these estimated risks include the same background effect that is not attributable to coal mine dust exposure. Therefore, any background effect is canceled out when the difference is calculated. The estimated reduction in risk is, according to the Attfield/Seixas model, free of any background effect.[27]

(4) Nicolich and Gamble criticized the use of irregular opacities as indicating coal workers' pneumoconiosis. However, studies have shown that the prevalences of both small rounded and small irregular opacities increase with increasing years worked underground (Amandus *et al.*, 1976; Cockcroft *et al.*, 1983) and with increasing coal mine dust exposure (Collins *et al.*, 1988). The relationship between irregular opacities and coal mine dust exposure has been observed among both smokers and nonsmokers (Cockcroft *et al.*, 1983). Amandus *et al.* (1976) found that smoking, age, and years underground

[27] Although it is canceled by subtraction when estimating the effect of reducing cumulative exposure, the Attfield/Seixas model does, in fact, incorporate an age-dependent background effect. Therefore, since the model allows for a positive response at zero exposure, the slope of the exposure-response relationship is not artificially inflated.

were all significant predictors of irregular opacities. Irregular opacities were most common among miners who were older than 30, had bronchitis, and smoked, but exposure to coal mine dust was still a significant factor. Collins *et al.* (1988) found that the small irregular opacities were statistically significantly associated with both dust exposure and age in U.K. coal miners, but did not find a significant relationship with smoking. The exposure-response relationship was less steep for small irregular opacities than for small rounded opacities (Collins et al, 1988). Therefore, the use of combined opacities rather than rounded opacities only may actually dampen the exposure-response relationship for pneumoconiosis (*e.g.*, in Attfield and Seixas, 1995), which is in contrast to the Nicolich and Gamble comment that the inclusion of irregular opacities would over-estimate the risk of pneumoconiosis. Nonetheless, the use of combined opacities is supported by the fact that statistically significant exposure-response relationships have been observed for both types of small opacities (rounded and irregular) in coal miners, and both types have been associated with adverse health effects.

Miners with small rounded opacities on their chest x-rays were more likely to report symptoms of chronic bronchitis (cough and phlegm) than were miners without small opacities (category 0/0) (Rae *et al.*, 1971). In Collins *et al.* (1988), both small rounded and small irregular opacities were associated with symptoms of chronic cough and phlegm, and breathlessness, compared to miners with no opacities observable on chest x-ray. Small irregular opacities have been associated with impaired lung function (Amandus *et al.*, 1976; Cockcroft *et al.*, 1982b,c; Collins *et al.*, 1988). As Nicolich and Gamble state in their comments, the lung function impairment reported by Collins *et al.* (1988) was in addition to that attributable to dust exposure. However, Collins *et al.* (1988) found that the observed pattern of lung function abnormalities was distinctly different from the pattern observed among smokers. Specifically, the mean FEV1 and mean FVC were significantly lower among miners with small irregular opacities compared to those with no observable opacities (*i.e.*, chest x-ray category 0/0), and this is the pattern of lung function abnormality typically associated with dust exposure in coal miners (Collins *et al.*, 1988). In contrast, smokers generally had more severe reductions in FEV1 than in FVC (resulting in a reduction in the FEV1/FVC ratio). The authors suggest that the irregular opacities in coal miners may represent damage to the lungs that causes airways obstruction at different lung locations than that caused by cigarette smoke. Irregular opacities in coal miners may have also been associated with emphysema (Cockcroft *et al.*, 1982 b, c).

Because simple CWP represents an early stage of a progressive disease, miners who have had a chest x-ray classified as ILO category 1 or greater are more likely than those with a clear x-ray (category 0) to progress to the more severe stages of the disease, including the complicated form, PMF (categories A, B, or C) (Cochrane 1962; McLintock *et al.* 1971; Hurley *et al.* 1987; Morfeld *et al.*, 1992). PMF has been associated with impaired lung function, disability, and early death (Rasmussen *et al.*, 1968; Parkes *et al.*, 1983; Miller and Jacobsen, 1985), and miners with PMF qualify as totally disabled due to pneumoconiosis under the Department of Labor's Standards for Determining Coal Miners' Total Disability or Death Due to Pneumoconiosis under the criteria set forth at (20 CFR 718.304(a)). Miners with simple CWP were also found to have an increased risk of dying from pneumoconiosis (as the underlying or a contributing cause on the death certificate), and this risk tended to increase with increasing radiographic category (Kuempel *et al.*, 1995). Nicolich and Gamble are incorrect in stating that an implication of that study is ''no increased mortality associated with exposure''. Instead, Kuempel *et al.* (1995) showed a statistically significant exposure-response relationship for cumulative exposure to respirable coal mine dust and pneumoconiosis mortality.

After due consideration of the questions posed by Nicolich and Gamble, we have concluded that the development of CWP, as detected on chest x-ray as rounded and/or irregular opacities, poses a significant health risk to miners. Miners who have developed simple CWP have a materially altered risk status, which is a medically and scientifically reasonable measure of material impairment. Miners who have a chest x-ray with small opacities (rounded and/or irregular) are also more likely to report respiratory symptoms and/or to have lung function decrements. The use of radiographic evidence of pneumoconiosis (combined opacities), both by Attfield and Seixas (1995) and in MSHA's risk assessment, is appropriate for assessing the risk that coal miners will suffer material impairment of health or functional capacity as a result of their respirable dust exposures accumulated over a working lifetime.

Appendix VI.1 DO Overexposure Patterns

In 1998, MSHA attempted to enforce compliance on individual shifts. Therefore, to compare the 2001 pattern of excess exposures on individual shifts to that of previous years, MSHA examined the regular bimonthly DO sample data submitted by mine operators in the 10 years from 1990 through 1997 and 1999–2000. The same three parameters were considered as discussed above for 2001: (1) The percentage of MMUs exhibiting a pattern of recurrent overexposures, as indicated by at least two of the valid measurements being above the applicable dust standard in a given year; (2) for those and only those MMUs exhibiting recurrent overexposures, the overall percentage of production shifts on which the DO was overexposed, as estimated by the percentage of valid measurements above the applicable dust standard; and (3) for the MMUs identified as exhibiting recurrent overexposures, the mean excess above the applicable dust standard, as calculated for just those valid measurements that exceeded the applicable dust standard in a given year.

Although MSHA found minor differences between individual years, there was no statistically significant upward or downward trend in any of these three parameters over the 1990–1997 time period (see Table VI–2). Beginning in 1999, however, there was a significant and persistent decrease in the average excess above the applicable dust standard (Parameter #3) for MMUs exhibiting recurrent overexposures. MSHA attributes this decrease to two important changes in the Agency's inspection program, beginning near the end of 1998. These changes, which both resulted in increased MSHA personnel presence, were: (1) An increase in the frequency of MSHA dust sampling at underground coal mines; and (2) initiation of monthly spot inspections at mines that were experiencing difficulty in maintaining consistent compliance with the applicable dust standard.

TABLE VI–2.—PARAMETERS DESCRIBING OVEREXPOSURE TO RESPIRABLE COAL MINE DUST, BASED ON OPERATOR DO SAMPLES

1990–1997 1999–2000	Parameter #1 (Percent)	Parameter #2 (Percent)	Parameter #3 (mg/m^3)	
			1990–1997	1999–2000
Number of Years	10	10	8	2
Median	52.6	20.1	1.24	1.00
Mean (Std. Error)	51.0 (1.36)	20.5 (0.30)	1.26 (0.023)	1.00 0.07
2001	51.6	20.8	1.08	

Parameter #1: Percentage of MMUs exhibiting a pattern of recurrent overexposures.
Parameter #2: For those MMUs exhibiting a pattern of recurrent overexposures, the percentage of production shifts on which the DO was overexposed.
Parameter #3: for those MMUs exhibiting a pattern of recurrent overexposures, the mean excess above the applicable dust standard among valid DO measurements that exceeded the applicable dust standard.

Appendix VI.2 Application of the Attfield-Seixas Models

Attfield and Seixas (1995) provide separate logistic regression models for CWP1+, CWP2+, and PMF as a function of cumulative dust exposure (mg-yr/m^3). These models all have the following form:

$$\frac{p}{1-p} = e^{a_0 + a_1 \times age + a_2 \times exposure + a_3 \times rank \times exposure} \qquad \text{(Eq. 1)}$$

where p is the probability of disease at a specified age and cumulative exposure. The constant e is the base of the natural logarithms. The empirically estimated coefficients a_0 (the intercept), a_1, a_2, and a_3 differ for the three health effects considered and are presented in Table IV of Attfield and Seixas (op cit). The values for these coefficients are also shown in the Excel workbook (RiskRdxn.xlw) MSHA has placed into the public record as part of these proceedings. The coefficient (a_3) of ''rank'' refers to an additional effect of cumulative exposure to coal mine dust in central Pennsylvania or southeastern West Virginia, which the authors attribute to the rank of the coal mined in those areas. Since few mines in those areas are currently operating, MSHA did not employ this additional effect in its application of the Attfield-Seixas models (*i.e.,* MSHA assumed that the value of the indicator variable for ''rank'' is zero).

From equation 1, assuming exposure outside central Pennsylvania and southeastern West Virginia, it follows that the prevalence of disease, assuming continued exposure at current levels and approximate linearity of the exposure effect, is (per thousand miners):

$$P_y = 1000 \times \frac{y}{1+y}$$

$$\text{where } y = e^{a_0 + a_1 \times age + a_2 \times (\text{years of exposure}) \times (\text{current mean annual exposure})} \qquad \text{(Eq. 2)}$$

Similarly, the prevalence of disease, assuming reduced cumulative exposure attributable to implementation of the proposed rules is (per thousand miners):

$$P_x = 1000 \times \frac{x}{1+x}$$

$$\text{where } x = e^{a_0 + a_1 \times age + a_2 \times (\text{years of exposure}) \times (\text{reduced mean annual exposure})} \qquad \text{(Eq. 3)}$$

Note that the ''reduced mean annual exposure'' is the current mean annual exposure (based on 2001 data) reduced by eliminating overexposures on just that percentage of shifts for which overexposures have been shown to currently occur. MSHA then estimated the impact of eliminating all overexposures on individual shifts by calculating (for ages 65, 73, and 80) the differences:

$$\Delta = P_y - P_x \qquad \text{(Eq. 4)}$$

It is these differences that are presented in Table VI–1. The calculations for each specific entry are detailed in the EXCEL workbook, RiskRdxn.xlw, which has been placed into the public record.[28]

[28] The method used here provides an approximation of the expected risk reduction (Δ), assuming approximate linearity of the exposure-response relationship over the exposure range of interest. This differs from the method used in the

VII. Significance of Risk

The proposed single sample and plan verification rules prevent respirable coal mine dust overexposures by identifying them and then requiring corrective actions. As discussed in the Health Effects Section, CWP is a progressive disease that develops after many years of cumulative exposure to respirable coal mine dust, which may include quartz, and is associated with material impairment of health and pre-mature death (see Health Effects Section). The joint promulgation of the proposed single sample and plan verification rules would significantly reduce the risk of development of CWP over an occupational lifetime. The best available data were used to conduct the QRA.

(A) Through the ''Benzene decision,'' the U.S. Supreme Court provided further guidance on determining and interpreting the significance of risks.

> It is the Agency's responsibility to determine, in the first instance, what it considered to be a ''significant'' risk. Some risks are plainly unacceptable. If, for example, the odds are one in a billion that a person will die from cancer by taking a drink of chlorinated water, the risk clearly could not be considered significant. On the other hand, if the odds are one in a thousand that regular inhalation of gasoline vapors that are 2% benzene will be fatal, a reasonable person might well consider the risk significant and take appropriate steps to decrease or eliminate it. Although the Agency has no duty to calculate the exact probability of harm, it does have an obligation to find that a significant risk is present before it can characterize a place of employment as 'unsafe' (448 U.S. at 655).

The industry recognizes the health significance of maintaining exposures at or below the applicable dust standard. For example, at the August 16, 2000 public hearing, the National Mining Association's representative Mr. Watzman, stated ''* * * (MSHA,) we don't want to see any miner overexposed. Our objective has been and will always be to maintain dust levels below the applicable dust standard.'' The United Mine Workers of America's written comments echoed the importance of reducing overexposures, ''Miners'' exposure to unhealthy levels of coal mine dust leads to the disabling and life shortening ''black lung'' disease [CWP].''

The best estimates of reduction in risk for all categories of CWP, for miners who live to age 73, after a 45-year occupational exposure to respirable coal mine dust were: 2.3 per 1,000 affected non-designated occupation miners; 19.6 per 1,000 affected roofbolter designated areas miners; and, 24.4 per thousand affected designated occupation miners. These estimates quantitatively demonstrate MSHA's policy determination that there would be a significant reduction in risk of CWP as a consequence of the promulgation of these proposed rules.

(B) There are many elements that compile a QRA. For each element of a QRA, there may be multiple assumptions (*e.g.*, values of variables and sources of data) that could be applied. Various assumptions will differ in the extent to which they are less or more likely to occur (*i.e.*, be representative). Assumptions may also have relative degrees of impact on the risk estimate, either increasing or decreasing it. To the extent that miners experience conditions that differ from the assumptions in the QRA, their risk of developing CWP will consequently be higher or lower. A ''conservative'' assumption in the QRA is one that results in a higher estimate of risk than a less ''conservative'' assumption would. Estimated benefits (*i.e.*, the number of prevented cases of the outcome of concern, *e.g.*, CWP) are greater under QRA assumptions that are ''conservative'' in this sense.[29]

The discussion below identifies various elements of the QRA and how these choices may have affected the estimates in reduction of risk.

i. The quantitative risk estimates are contingent on the representativeness of the exposure data in describing the exposures experienced by miners on all shifts. Currently, both operator and MSHA samples [30], may be taken on production shifts that may not reflect production levels on the majority of non-sampled shifts.

Factors, such as mine ventilation and water sprays, mediate the amount of airborne respirable dust. Higher production is correlated with increased quantities of airborne respirable coal mine dust (Webster, *et al.*, 1990; Haney, *et al.*, 1993; O'Green, *et al.*, 1994). Some earlier commenters, in these proceedings and before the Dust Advisory Committee, have asserted that production is reduced and/or dust controls are increased on sampled shifts.

The estimates of risk reductions for affected miners are based on averages across those MMUs exhibiting a pattern of recurrent overexposures. In the QRA, the agency assumed representative operating conditions on those shifts sampled and extrapolated the results to all production shifts, including those that were not sampled. If there is diminished production and increased engineering controls on sampled shifts compared to the majority of non-sampled shifts, then this would mean that MSHA is underestimating the reduction(s) in risk to be expected from these proposed rules. (This is further discussed in the Benefits sections of the PREA and PV preamble).

ii. The QRA applies the traditional coal miner work schedule of 8-hours per day, 5-days per week, 48-weeks per year. Many of today's miners work longer hours per day, month, and year than the traditional work schedule. These longer work hours increase miners' cumulative exposure to respirable coal mine dust beyond what MSHA assumed in its risk estimates. Similarly, shorter work hours would decrease cumulative exposure below the values assumed in the QRA.

iii. In their comments on the 2000 proposed rules, the National Mining Association (NMA) criticized MSHA's use of a 45-year occupational lifetime, stating ''the work experience of the vast majority of miners is far less than 45 years.'' Irrespective of the specific duration of a working lifetime of an individual worker or cohort of workers, health standards are promulgated to protect all workers from adverse health outcomes due to occupational exposure for an occupational lifetime. Under the Mine Act standards are set to protect miners for up to a full working lifetime (101 (a)(6)(A) (30 U.S.C. 811(a)(6)(A)):

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previous proposed rule, where lower bounds on the risk reduction were calculated. The calculations in the previous proposed rule defined

$\Delta' = P_{y'} - P_{x'}$,

where $y' = y/x$ and $x' = e^{a_0 + a_1 \times age}$

The previous method results in lower values than those shown in Table VI–1. For example, for ''CWP 1+'' among affected DO miners at age 73, applying the previous method to 2001 operator and MSHA data would have resulted in a calculated risk reduction of 16.3 per thousand instead of the 24.4 per thousand presented in Table VI–1. MSHA believes the method used in the current proposed rule more accurately represents the reduction in risk that can be expected if all individual shift overexposures are eliminated.

[29] For example, in a hypothetical QRA there is a reduction in risk estimate for CWP of 2.4 per 1,000 affected miners, based on a relatively conservative assumption for a particular element (holding all other assumptions constant). A reduction in the risk estimate for CWP based on an equally likely although less conservative assumption is 1.0 per 1,000 affected miners, holding all other assumptions constant. Assuming that the population of affected miners is 20,000. The more conservative assumption would result in an estimated 48 (2.4/1,000 * 20,000) prevented cases of CWP compared to the less conservative assumption's 20 prevented cases of CWP.

[30] Valid MSHA samples require production to be at least 60 percent of the average production for the last 30 days. Valid operator bimonthly samples must be taken on a normal production shift (*i.e.*, a production shift during which the amount of material produced in a MMU is at least 50 percent of the average production reported for the last set of five valid samples) (30 CFR 70.100 (k)(1)).

The Secretary * * * shall set standards which most adequately assure on the basis of the best available evidence that *no* miner will suffer material impairment of health or functional capacity even if such miner has regular exposure to the hazards dealt with by such standard for the period of his working life. (emphasis added)

Similarly, the Occupational Safety and Health Act, Public Law 51–956 section 6(b)(5) states:

The Secretary, in promulgating standards dealing with toxic materials or harmful physical agents under this subsection, shall set the standard which most adequately assures, to the extent feasible, on the basis of the best available evidence, that no employee will suffer material impairment of health or functional capacity even if such employee has a regular exposure to the hazard dealt with by such a standard for the period of his working life. (emphasis added).

A 45-year ''working life'' (occupational lifetime) has conventionally been used in QRAs for occupational settings. For example, MSHA used a 45-year lifetime in its risk assessment for diesel particulate (66 FR 5526 and 66 FR 5706). Similarly, OSHA has used a working-life of 45 years in its QRAs to support health standards (see, for example, Benzene (52 FR 34460); Bloodborne Pathogens (65 FR 64004); Methylene Chloride (62 FR 1494); and 1,3-Butadiene, (61 FR 567467)). To the extent the proportion of miners' careers are shorter than 45 years, the actual benefits may be lower.

iv. Due to the progressive nature of CWP even after occupational exposure has stopped (see Health Effects Section), the best estimate of the occupational-lifetime benefit of preventing respirable coal mine dust overexposures is based on the expected lifetime for all American males, 73 years of age.[31] In the future, the extent to which coal miners have a greater life expectancy, the realized benefits would increase. For example, since females have a greater life expectancy than males, expected benefits will increase if the proportion of female miners increases substantially in the future.

v. Applicable dust standards for RB–DAs are determined separately from the applicable dust standard shared by DOs and NDOs, even though they are on the same MMU. Since RB–DAs are often exposed to higher quartz concentrations than other miners on the same MMU, frequently, the RB–DA's applicable dust standard is lower than that for other miners working on the same MMU. Therefore, RB–DAs have their own percentage that exhibit a pattern of recurrent overexposures. Roofbolter DA MSHA samples were defined as samples with entity code 900–0 through 999–9 and as a type 03 sample. Some MSHA RB–DA samples may have been incorrectly coded as a type 02 sample—an occasional problem with the data. Those incorrectly coded samples would not have been included in the QRA and therefore the number of RB–DAs with a pattern of recurrent overexposures may be underestimated.

vi. Although the effect cannot be readily quantified, these rules would also reduce the cumulative exposure to respirable coal mine dust for those miners working on MMUs currently not exhibiting patterns of recurrent overexposures for either DOs and/or RB–DAs. Thus, the health benefit for all miners is expected to be greater than estimated for the sub-populations of miners in the QRA.

MSHA has taken steps in the QRA to conduct a balanced analysis using available data. The data in the QRA have limitations, preventing MSHA from fully quantifying the frequency and average magnitude of overexposure of respirable coal mine dust for the entire population of underground coal miners whose cumulative exposure to respirable coal mine dust would be reduced due to the proposed rules. To the extent that MSHA has underestimated overexposure levels among underground coal miners, it has underestimated the reduction in risk for CWP and the number of prevented cases of CWP that would be realized through these proposed rules, over an occupational lifetime (For further discussion, see Benefits section of PREA and preamble).

VIII. Feasibility Issues

A. Technological Feasibility

MSHA believes that the plan verification rule would be technologically feasible for the mining industry. An agency must show that modern technology has at least conceived some industrial strategies or devices that are likely to be capable of meeting the standard, and which industry is generally capable of adopting. *American Iron and Steel Institute* v. *OSHA,* (AISI–II) 939 F.2d 975, 980 (D.C. Cir. 1991); *American Iron and Steel Institute* v. *OSHA,* (AISI–I) 577 F.2d 825 (3d Cir. 1978) at 832–835; and *Industrial Union Dep't., AFL–CIO* v. *Hodgson,* 499 F.2d 467,478 (D.C. Cir. 1974).

In designing the plan verification rule, MSHA has taken into account its experience and that of the operators to ensure that the rule provides additional protection from occupational exposure to respirable coal mine dust using current compliance technology (while encouraging technological improvements). For this reason, MSHA believes the proposed plan verification rule is technologically feasible. MSHA requires mine operators to utilize all feasible engineering or environmental controls, which are specified in the mine ventilation plan, to maintain concentrations of respirable dust in the work environment of MMUs at or below the applicable dust standard. Mine operators therefore would not be required to implement engineering or environmental controls that were not technologically feasible.

B. Economic Feasibility

MSHA believes that the proposed Plan verification rule would be economically feasible for the underground coal mining industry. The proposed Plan verification rule would result in net compliance cost savings of approximately $2.1 million yearly. (Although implementing the proposed Plan verification rule would cost about $4.5 million yearly, there would be offsetting yearly savings of about $3.8 million from reduced citations and the elimination of operator abatement sampling; $2.2 million from the elimination of operator bi-monthly sampling; $0.3 million resulting from a reduction in MSHA-ordered mine closures; and $0.3 million from reduced payout by operators for Black Lung cases). Underground coal operators would also obtain a yearly cost savings of approximately $3.0 million in reduced penalty costs associated with the reduction in operator citations arising from the proposed plan verification rule. The proposed plan verification rule would therefore provide a total yearly cost savings (including net reduced penalty costs) of $5.1 million to the underground coal mining industry.

IX. Preliminary Regulatory Economic Analysis

A. Costs and Benefits: Executive Order 12866

1. Compliance Costs

The proposed plan verification rule would impose a yearly net compliance cost savings to underground coal operators of about $2.1 million. Although implementing the proposed plan verification rule would cost about $4.5 million yearly, there would be offsetting yearly savings of $6.6 million. The cost savings consist of: $3.8 million due to reduced citations and the elimination of operator abatement

[31] Conditional on their having reached 20 years of age (calculated from: the U.S. Census March 1997, Table 18; U.S. Census March 1997, Table 11).

sampling; $2.2 million resulting from the elimination of bi-monthly sampling; $0.3 million resulting from a reduction in MSHA-ordered mine closures; and $0.3 million resulting from reduced Black Lung payouts by underground coal operators. These costs include net first year compliance costs of approximately $2.1 million.

2. Benefits

This benefits analysis is in support of the proposed single sample and plan verification rules, and updates information used in the single-shift sample (65 FR 42068) and plan verification proposed rules (65 FR 42122). It has been updated to include the revised QRA;[32] the reduction in the number of active mines (and miners); and more recent information on the DOL's Black Lung Compensation Program. As a result, MSHA believes it has more comprehensively quantified the expected reduction in risk of CWP and the associated benefits (*i.e.*, the number of prevented cases of CWP) for those miners currently subject to a pattern of recurrent overexposures to respirable coal mine dust.[33]

MSHA notes that the methodology will almost certainly lead to an underestimate of the number of MMUs with recurrent overexposures. This is due to the fact that the agency must rely on samples taken for 30 or fewer shifts each year for each MMU. MSHA estimates that each MMU averages 384 production shifts per year, so samples are taken for only about 8 percent of all shifts. An MMU exhibits a pattern of recurrent overexposure when valid samples at the MMU exceed the applicable dust standard on at least two shifts during a year. MSHA uses data for those MMUs exhibiting such a pattern to estimate miners' overexposures and the reduction in dust that would be inhaled by miners if dust levels were reduced to the exposure limit on every shift.

Due to the fact that only a small fraction of shifts are sampled, this approach will very likely underestimate the total number of shifts with excessive exposures. There is no straightforward way to determine the extent of the underestimate, but the following illustrates the likelihood of not identifying MMUs that experience excessive exposures. The table below shows the probability that an MMU will *not* exhibit a pattern of recurrent overexposures (*i.e.*, 2 or more overexposures on 30 randomly sampled shifts out of 384 working shifts in a year) when there are actually ''n'' noncompliant shifts during the year. For example, if an MMU exceeds the applicable standard on 25 shifts during a year, there is a 40 percent probability that fewer than two of the 30 samples for that MMU would be taken on those 25 shifts. Therefore, there is a good chance that such an MMU would not be identified as having a pattern of recurrent exposures. It should also be noted, however, that only 6.5 percent (*i.e.*, 25/384) of production shifts would, on average, be out of compliance at such an MMU. This is substantially below the average of 20 percent of shifts found out of compliance at MMUs MSHA has identified as exhibiting a recurrent pattern.

TABLE IX–2–1.—RELATIONSHIP BETWEEN THE NUMBER OF NONCOMPLIANT SHIFTS AND THE PROBABILITY OF NOT DETECTING A PATTERN OF RECURRENT OVEREXPOSURES FOR A SINGLE MMU

Number of noncompliant shifts [34]	Probability (%) of not being identified [35]
5	94.9
10	82.0
15	67.0
20	52.5
25	40.0
30	29.7
35	21.6
40	15.4
45	10.9
50	7.5
55	5.1
60	3.5
65	2.3
70	1.5
75	1.0
80	0.6
85	0.4
90	0.3
95	0.2
100	0.1

[34] Number of individual shift overexposures out of 384 shifts in a year.

[35] Probability (%) that an MMU will fail to display a pattern of recurrent overexposures, based on 30 sampled shifts, given ''n'' individual shift overexposures out of 384 shifts in a year.

Occupational exposure to excessive levels of respirable coal mine dust, which includes quartz in varying proportions, imposes significant health risks. These include the following adverse health outcomes: simple coal worker's pneumoconiosis (simple CWP), progressive massive fibrosis (PMF), silicosis, and chronic obstructive pulmonary disease (COPD) (*e.g.*, asthma, chronic bronchitis, emphysema) (See the *Health Effects,* section V., of the plan verification proposed rule and section VII of the single-shift sample proposed rule (65 FR 42068) for a more complete discussion). Cumulative exposure to respirable coal mine dust is the main determinant in the development of both simple CWP and PMF although other factors, such as the percentage of quartz in the respirable dust and the type of coal, also affect the risk of miners developing simple CWP and PMF (Jacobsen, *et al.*, 1977; Hurley, *et al.*, 1987; Kuempel, *et al.*, 1995; Attfield and Morring, 1992; Attfield and Seixas, 1995). The true magnitude of occupationally induced simple CWP and PMF among today's coal miners is unknown, although prevalence estimates are available from various surveillance systems. The overall prevalence rate of simple CWP, Categories 1, 2, 3, and PMF combined was 2.8 percent among all miners examined in the Miners' Choice program during FY 2000–2002 (see Health Effects discussion). The combined prevalence rate of simple CWP and PMF for underground coal miners was 3.8 percent during the same time period. Studies from the Coal Workers X-ray Surveillance Program (CWXSP) indicate a decline in the prevalence of CWP from 11 percent in the 1970s to 2.8 percent in the sixth round of CWXSP (1992–1996)(NIOSH, Table 2–11, 1999).

The proposed single sample and plan verification rules present MSHA's strengthened plan to meet the Mine Act's requirement that a miner's exposure to respirable coal mine dust be at or below the applicable dust standard on each and every shift.

The QRA estimates the reduction in risk for CWP as a result of reducing respirable coal mine dust concentrations over a miners' 45-year occupational lifetime to be no more than the applicable dust standard on just that percentage of shifts currently exhibiting a pattern of recurrent overexposures.[36] The term ''affected'' is used to identify those miners who work on a MMU or RB–DA where there is a recurrent

[32] The revised QRA is published in full in section IV.b of the 2003 single sample reopening notice and section VI of the 2003 plan verification NPRM. The revised QRA has been expanded to include quantitative estimates of the reduction in CWP for affected roofbolters working in designated areas (RB–DA).

[33] The pattern of recurrent overexposure is defined by a MMU having any combination of two or more samples in excess of the applicable dust standard within a one-year period.

[36] MMUs with a recurrent pattern of overexposure are defined as those MMUs with two or more of the DO samples exceeding the applicable dust standard. RB–DAs with a recurrent pattern of overexposure are defined as those with two or more RB–DA samples exceeding the applicable dust standard. (See the QRA section IV.b of the 2003 single sample reopening notice and section VI of the 2003 plan verification NPRM for details).

pattern of overexposure to respirable coal mine dust. There are three types of affected miners for whom reduction in risk estimates were calculated:

- *DOs:* Designated Occupation Miners.
- *NDOs:* Faceworkers neither classified as a DO nor subject to a separate applicable dust standard applicable to a Designated Area.
- *RB–DA:* Roofbolter Designated Area Miners.

Since DOs and NDOs share the same applicable dust standard, the definition of recurrent pattern of overexposure for DOs and NDOs is the same. It is determined by the pattern of recurrent overexposures observed for DOs. This pattern of recurrent overexposure is sometimes referred as the MMU's pattern of recurrent overexposures.

Applicable dust standards for RB–DAs are determined separately from the applicable dust standard shared by DOs and NDOs on the same MMU. Since RB–DAs are often exposed to higher quartz concentrations than other occupations (miners) on the same MMU, frequently, the RB–DA's applicable dust standard is more stringent (*i.e.*, a lower applicable dust standard) than that for other occupations working on the same MMU. A separate pattern of recurrent overexposure is defined for the RB–DAs.

To predict the benefits, MSHA applied its best estimate of reduction in risk of CWP for each type of affected miner (DO, NDO, and RB–DA) to estimated sub-populations of those affected miners.

The factors taken into account to estimate each of the sub-populations are:

- A recent snapshot of the number of active MMUs and RB–DAs. (MSHA, Table, May 14, 2002)
- The pattern of recurrent overexposures for affected MMUs and RB–DAs.
- The distribution of MMUs by mine size (*i.e.*, fewer than 20 employees; 20 to 500 employees; and, more than 500 employees) and the number of production shifts (*i.e.* 1, 2, or 3) (MSHA, Table, July 10, 2002 for DOs and NDOs; and MSHA, Table, September 4, 2002).
- The average number of miners on a shift for each category.
- One DO on each MMU.
- Six NDOs for each MMU.
- The number of RB–DAs on a shift, varied by mine size. (See Table IX–2–3 for specific numbers).

Since NDOs and the DO on the same MMU share the same pattern of recurrent overexposures (*i.e.*, 57.0 percent) and the same distribution of MMUs by mine size and number of production shifts, the estimates of affected populations of DOs and NDOs are both included in Table IX–2–2. The estimated sub-populations of affected miners working in DOs and NDOs are calculated as follows:

(1) The distribution of active MMU entities was determined by mine size and number of production shifts (MSHA, Table, July 10, 2002).

(2) The number of MMU entities that exhibited a pattern of overexposures for DOs (57.0 percent) was determined using operator and MSHA samples for respirable coal mine dust collected during the calendar year 2001 (MSHA data file: DO_2001.zip).

(3) MSHA estimated the number of DOs to have been affected by recurrent overexposures by simultaneously applying the percentage of MMUs found to have patterns of recurrent overexposure (57.0 percent) to the number and type of active MMU entities by mine size (833 active MMUs; MSHA, Table May 14, 2002) and the distribution of production shifts by mine size mentioned in steps (1) and (2). MSHA estimates there would be 475 affected active MMUs.

(4) The number of miners working in the DO position is proportional to the number of shifts each MMU is in production per day. The distribution of the number of affected MMU entities by production shifts (from step 3) is applied to the estimated number of DOs per MMU entity. Typically, there is one miner for each DO for each shift.

(5) Typically, six other miners operating as NDOs simultaneously work on the same MMU. Therefore, the number of affected NDOs is six times the number of affected DOs.

(6) Table IX–2–2 presents the estimated number of affected MMUs, DOs, and NDOs, by mine size and number of production shifts. The total number of affected DO and NDO miners is estimated to be 6,307.

Since RB–DAs and the combination of DOs and NDOs do not share the same pattern of recurrent overexposures, nor the distribution of MMUs by mine size, the estimates of affected populations of RB–DAs are presented in their own table (Table IX–2–3). The estimated sub-populations of affected miners working in the RB–DAs are calculated as follows:

(1) The distribution of active RB–DA entities was recently determined by mine size and number of production shifts (MSHA, Table September 4, 2002).

(2) The number of RB–DA entities that exhibit a pattern of overexposures (29.4 percent, 194/659 RB–DAs) was determined using operator and MSHA samples for respirable coal mine dust collected during the calendar year 2001 (MSHA data file: RB–DA2001.zip)

(3) MSHA estimated the number of RB–DA entities affected by recurrent overexposures by simultaneously applying the percentage of RB–DAs found to have patterns of recurrent overexposure (29.4 percent) to the number and type of active RB–DA entities by mine size (449 active RB–DAs; MSHA, Table May 14, 2002) and the distribution of production shifts by mine size mentioned in steps (1) and (2). MSHA estimates there would be 132 affected active RB–DAs.

(4) The number of miners working in an RB–DA entity is proportional to the number of shifts each RB–DA is in production per day. The distribution of the number of affected RB–DA entities by production shifts (determined in step 3) is applied to the estimated number of roofbolters per RB–DA entity. The typical number of miners per RB–DA varies by mine size. It is MSHA's experience that, on average, one roofbolter works within the RB–DA in coal mines with fewer than 20 employees, one and one half in coal mines with 20 to 500 employees, and two in coal mines with more than 500 employees.

(5) Table IX–2–3 presents the estimated number of affected RB–DAs and miners by mine size and number of production shifts. The total number of affected miners working within an RB–DA is estimated to be 368.

The total number of affected miners working within the specified DO, NDO, and RB–DA positions among the faceworkers in underground coal mines is estimated to be 6,675.

TABLE IX–2–2.—ESTIMATED NUMBER OF AFFECTED MECHANIZED MINING UNITS [a] (MMUS) AND AFFECTED UNDERGROUND COAL MINERS, BY PRODUCTION SHIFTS AND MINE SIZE

Number of production shifts	Mine size by number of employees									Totals			
	Less than 20 employees			20 to 500 employees			Greater than 500 employees			NMUs n=	DOS [b] n=	NDO [c] n=	Total affected miners on NMUs
	NMUs n=	DOS [b] n=	NDO [c] n=	NMUs n=	DOS [b] n=	NDO [c] n=	NMUs n=	DOS [b] n=	NDO [c] n=				
One	98	98	588	24	24	144	0	0	0	122	122	732	854
Two	16	32	192	264	528	3,168	0	0	0	280	560	3,360	3,920
Three	0	0	0	55	165	990	18	54	324	73	219	1,314	1,533
Totals ..	114	130	780	343	717	4,302	18	54	324	475	901	5,406	6,307

[a] Affected MMUs in production are estimated by applying the observed percentage of MMUs' production shifts by mine size (as of July 10, 2002) to the snapshot of active MMUs as of May 14, 2002, by mine size, and multiplied by 0.570 (since fifty-seven percent of MMUs have a pattern of recurrent overexposures) (MSHA Table, July 10, 2002; MSHA Table, May 14, 2002).
Where:
[b] DO = Designated Occupational Miners = (MMUs * 1 * production shifts).
[c] NDO = Non-designated Occupational Miners = (MMUs * 6 * production shifts).

TABLE IX–2–3.—ESTIMATED NUMBER OF AFFECTED ROOFBOLTER DESIGNATED AREAS (RB–DAS) AND AFFECTED UNDERGROUND COAL MINERS, BY PRODUCTION SHIFTS, AND MINE SIZE

Number of Affected RB–DAs [a]	Mine Size by Number of Employees						Totals	
	Less Than 20 Employees		20 to 500 Employees		Greater than 500 Employees		RB–DAs n=	Total miners on affected RB–DAs
Number of production shifts	RB–DAs n=	Miners n=	RB–DAs n=	Miners n=	RB–DAs n=	Miners n=		
1	22	22	6	9	0	0	28	31
2	5	10	83	249	0	0	88	259
3	0	0	12	54	4	24	16	78
Total	27	32	101	312	4	24	132	368
Number of Miners per RB–DA	1.0		1.5		2.0		.....	.....

[1] Affected Roofbolter Designated Areas (RB–DAs) in production are estimated by applying the observed percentage of RB–DAs' production shifts by mine size (as of September 4, 2002) to the snapshot of active RB–DAs as of May 14, 2002, by mine size, and multiplied by 0.294 (since 29.4 percent of RB–DAs have a pattern of recurrent overexposures) (MSHA Table, July 10, 2002; MSHA Table, May 14, 2002). The number of miners per RB–DA varies with mine size and is applied to the estimated number of RB–DAs and the number of production shifts to determine the total number of affected faceworkers.

The total number of cases of simple CWP categories 1, 2, 3 or PMF that would be prevented is determined by applying the estimated number of affected miners to our best estimates of reductions in risk. The estimates of reductions in risk for the three sub-populations of affected miners (24.4 per thousand DOs, 2.3 per thousand NDOs, and 19.6 per thousand RB–DAs) are applied to the respective estimates of affected sub-populations of faceworkers (901 DOs, 5,406 NDOs, and 368 RB–DAs).[37] Table IX–2–4 presents a summary of the estimated number of cases among groups of simple CWP and PMF that would be prevented among the affected miners working at the 57.0 percent of MMUs and the 29.4 percent of RB–DAs determined to exhibit a pattern of recurrent overexposures, by limiting their exposures to respirable coal mine dust to no more than the applicable dust standard on each and every shift. For all categories of simple CWP and PMF combined, MSHA estimates a minimum of 42 fewer cases among affected miners than would otherwise occur without the promulgation of the proposed single sample and plan verification rules. Thirteen of these cases would be the most severe form of coal miner's pneumoconiosis, PMF, and as such, these cases could be interpreted as prevented premature deaths due to occupational exposure to respirable coal mine dust. Since simple CWP is a progressive disease and predisposes the development of PMF, it is important that simple CWP also be prevented (Balaan, *et al.,* 1993).

The benefits that would accrue to coal miners exposed to respirable coal mine dust and to operators, and ultimately to society at large, are substantial and take a number of forms. These proposed rules would reduce a substantial health risk to underground coal miners, lowering the potential for illnesses and premature death and their attendant costs to miners, their employers, their families, and society.

These rules should realize a positive economic impact on the Department of Labor's (DOL's) Black Lung Program and relatedly on operators. The Black Lung Program compensates eligible miners and their survivors for benefits under the Black Lung Benefits Act. This program provides monthly payments and medical benefits (diagnostic and treatment) to miners who are determined to be totally disabled by black lung disease, including cases of PMF and simple CWP. In 1986, DOL's Employment Standards Administration

[37] See the *Quantitative Risk Assessment* (section VI. of the Plan Verification Notice of Proposed Rule Making in today's **Federal Register**) for details describing the methodology used to calculate the reduction of risk among the affected sub-populations and Table VI–1 for a summary of reduction in risk estimates.

reported that 12 percent of approved cases to receive benefits within the Black Lung Program were identified as cases of PMF based on chest radiographs, while 64 percent had simple CWP based on chest radiographs (ESA, 1986). For miners who stopped working in coal mines after 1969 and for whom DOL can establish that the miner worked for the same operator for at least one calendar year, and that miner had at least 125 working days in that year, that operator is financially responsible for the miner's black lung benefits payments. If a responsible operator cannot be identified for an eligible miner, benefits payments are made by the Black Lung Disability Trust Fund.

To the extent that the proposed single sample and plan verification rules reduce overexposures to respirable coal mine dust (which includes quartz), there should be fewer Black Lung Program cases. Therefore, over time, the associated financial outlay by responsible operators through either payments made into the Black Lung Disability Trust Fund, insurance premiums, or direct payments of black lung benefits should be lower than would otherwise occur. A decrease in black lung beneficiaries could help reduce the financial obligation of the Black Lung Program (see discussion in Chapter IV of the accompanying PREA for details: *http://www.msha.gov/FLEX.HTM).* In fiscal year 2000, 386 claims for Black Lung Benefits were accepted as new cases; 71 percent (273 cases) are the financial responsibility of coal operators (ESA, OWCP 2000 Annual Report).[38]

MSHA's quantitative estimate of benefits demonstrates and qualitative discussions punctuate that these proposed rules will have a significant positive impact on the health of the nation's coal miners when promulgated. Yet, due to the limitations in these data, MSHA believes its benefits estimates are likely to understate the number of cases of simple CWP and PMF that would be prevented over an occupational lifetime. As discussed in the significance of risk sections of the previously published single-shift sample (65 FR 42068) and plan verification (65 FR 42122) notices and as revised in the plan verification NPRM, the data used to estimate the average overexposure which will be prevented may not represent typical environmental conditions and the associated respirable coal mine dust exposure levels in underground coal mines.

The degree to which the exposure level of respirable coal mine dust on sampling shifts may not be representative of typical exposure levels is affected by the following factors:

(1) There exists a positive relationship between coal production and generation of respirable coal mine dust. While other factors may mediate the amount of airborne respirable dust, such as ventilation and water sprays, on average, higher production is correlated with increased quantities of airborne respirable coal mine dust (Webster, *et al.*, 1990; Haney, *et al.*, 1993; O'Green, *et al.*, 1994);

(2) Current sampling procedures permit sampling measurements to be taken at the mid-range of the distribution of the level of production—MSHA sampling measurements must be taken on shifts with production at least 60 percent of the average production during the last 30 days and the operator must have at least 50 percent of average production for the last valid set of five bimonthly samples for MSHA and operator samples, respectively;

(3) Miners have reported, and MSHA data have demonstrated lower levels of production on sampling shifts versus non-sampling shifts; [39]

(4) On some sampling shifts, miners have reported that more engineering controls may be engaged than on other shifts, thus reducing the measured amount of respirable coal mine dust;

(5) MSHA analyses have demonstrated, even when controlling for production, in mines with fewer than 125 employees, on continuous mining MMUs, respirable coal mine dust exposures were much higher during the unannounced Spot Inspection Program (SIP) sampling shifts than on shifts operators sampled—this is consistent with the effect of increasing engineering controls on shifts during which bimonthly samples are conducted compared to the level of use of engineering controls on shifts for which the operator does not expect sampling to be conducted, given the same production level;[40]

(6) Across mine size, designated area samples have had greater dust levels for shifts on which unannounced compliance sampling occurred compared to operator sampling shifts—in one study they differed by at least a factor of 40 percent in large mines and 100 percent in the smallest mines;[41]

(7) Existing MSHA technical information indicates that some reduction in production levels occurs during some sampling periods on longwalls (Denk, 1990);

(8) Longer work hours increase miners' cumulative exposure to respirable coal mine dust, which includes quartz, beyond what was assumed in our risk estimates (''Length of Shift'' survey, MSHA Office of Coal Mine Safety and Health); and

(9) Because of heavy, physical work, some miners may have higher breathing rates and inhale more respirable coal mine dust, including quartz, than other miners exposed to the same airborne dust concentrations.

Although the effects cannot readily be quantified, to the extent that these rules will also reduce the cumulative exposure to respirable coal mine dust among some miners working in those MMUs currently not exhibiting a pattern of overexposures, it is reasonable to expect an incremental benefit among that sub-population of coal miners. Likewise, to the extent that the cumulative exposure to respirable coal mine dust affects other adverse health outcomes, such as silicosis and chronic obstructive pulmonary disease, it is reasonable to expect a reduction in the number and/or severity of cases for these diseases among underground coal miners.

Further, MSHA firmly believes that non compliance determinations based on single-sample measurements will significantly improve working conditions for miners because overexposures will be more readily identified and appropriate corrective action will be taken to reduce respirable dust levels. This is because individual sample results will not be masked due to the averaging of multiple samples. The health effects of individual shift overexposures was addressed in *Consolidation Coal Company* versus *Secretary of Labor* 8 FMSHRC 890, (1986), *aff'd* 824 F. 2d 1071, (D.C. Cir. 1987). In that case, the Commission found that each episode of a miner's overexposure to respirable dust significantly and substantially contributes to the health hazard of contracting chronic bronchitis or coal workers pneumoconiosis, diseases of a fairly serious nature.

Since the proposed single sample rule would also apply to surface coal mines, it is reasonable to expect that the cumulative exposure of some surface coal miners would also be lowered, providing them with increased health protection.

As indicated elsewhere in this preamble, three significant studies have been published in the last 10 years that examined the current federal program to control respirable coal mine dust in U.S. mines. They include the MSHA Respirable Dust Task Group Report, NIOSH's Criteria Document on Occupational Exposure to Respirable

[38] The OWCP 2001 report is not representative of current trends because of recent changes to rules governing OWCP proceedings effective January 20, 2001 (Peed, September 12, 2002). Therefore, MSHA used information from the OWCP 2000 report.

[39] Mine Safety and Health Administration. ''Report of the Statistical Task Team of the Coal Mine Respirable Dust Task Group.'' September 1993.

[40] Mine Safety and Health Administration. ''Report of the Statistical Task Team of the Coal Mine Respirable Dust Task Group.'' September 1993.

[41] Mine Safety and Health Administration. ''Report of the Statistical Task Team of the Coal Mine Respirable Dust Task Group.'' September 1993. Pp. 211–212.

Coal Mine Dust, and the Report of the Secretary of Labor's Advisory Committee on the Elimination of Pneumoconiosis Among Coal Workers. The individuals that contributed to these reports represented a wide spectrum of society including health professionals, mine operators, miners and their representatives, academia, engineers, lawyers, physicians, and health and safety specialists. While recognizing that significant progress has been made to reduce respirable dust levels in coal mines, these reports all concluded that there are existing practices in the federal program that should be changed to provide miners with improved health protection. This rulemaking was initiated to address many of the recommendations outlined in those studies.

The primary benefit of the changes recommended by the authors of the various studies, and subsequently in this proposal, is to reduce occupational lung disease among coal miners by improving the existing federal program to control exposure to respirable coal mine dust and quartz. That benefit is addressed in detail in this section. There are, however, other significant intangible benefits that will result from these program improvements.

As stated in the report of the Advisory Committee, one of MSHA's primary objectives must be to restore the confidence of individual miners that the federal program to control respirable dust will protect their health. The testimony of miners and their representatives made during the deliberations of at least two of the study groups found that coal miners believe that MSHA and operator sampling results are not representative of the mine environment to which they are exposed during normal mining operations. Consequently, many miners believe that overexposures are not being identified and corrected. This belief is attributable to several factors including, MSHA's policy of accepting as valid samples that were taken at production levels significantly below normal; the use of dust control measures during sampling that are not incorporated in the approved ventilation plan; and the averaging of multiple-shift sample results which can mask individual overexposures and prevent action from being taken to correct the condition. All of these practices are addressed in this proposal and, therefore, should significantly improve miner confidence that MSHA and operator sampling results are typical of the operating conditions to which they are routinely exposed.

The requirement that operator sampling results be used by MSHA to make compliance determinations has been unfairly perceived by some as fundamentally flawed because operators allegedly have conflicting objective of avoiding citations and protecting miner health. This perception is difficult to address. As recommended by the Advisory Committee, this proposal eliminates the requirement that operator samples be used for compliance purposes. Operators will only be subject to enforcement action on their sample results if they fail to take action to correct any overexposure. Since only MSHA samples taken during unannounced inspections will be used to make compliance determinations, any real or perceived opportunity by mine operators to inappropriately impact sampling results will be eliminated or significantly reduced.

All of the studies recognized that significant improvements in preventing overexposure can occur if real-time continuous monitors were available. Such devices would allow exposure levels to be monitored during the production shift and action could be taken during the shift to prevent overexposure as miners approached the upper limit. This is in contrast to the current system that requires samples to be sent to a laboratory for analysis and, as a result, only allows for overexposures to be recorded rather than prevented. This proposal recognizes that the potential for the introduction of such continuous monitoring devices is likely in the near future. As a result, provisions are included for the use of such instruments in lieu of the current approved sampling devices. Accordingly, this proposal encourages the development and introduction of this new technology into coal mines to benefit miner health.

MSHA's belief that the projected 42 prevented cases of simple CWP and PMF over a 45-year working life likely understates the true number of cases of simple CWP and PMF is further supported by the fact that during the past few years, the Black Lung Benefits Program has been approving roughly 400 claims each year. Most of these claims come from individuals whose occupational exposure to respirable coal mine dust occurred under the current respirable coal mine dust program, including the 2.0 mg/m^3 standard, which began in 1972 (ESA, September 19, 2002). The observation that roughly 400 claims have been approved each year, for the past several years, supports MSHA's belief that the true lifetime occupational health benefits of the proposed rules are higher than MSHA has been able to quantify. Even assuming that over time, the number of new claims would decline in future years simply due to the continuing decline in the number of coal miners, MSHA expects that assuring future exposures are maintained below the applicable dust standard would reduce the number of new cases of CWP than would otherwise occur.

In addition to the cases of simple CWP and PMF that would be prevented among the miners working on affected MMUs and RB–DAs, other health benefits would also be realized because the cumulative exposure to respirable coal mine dust would be limited to no more than the applicable standard on each and every shift. Health benefits associated with a reduction in exposures to respirable coal mine dust would include a decrease in incidence of silicosis, asthma, chronic bronchitis, and emphysema.

All cases of simple CWP and PMF, which MSHA expects to be prevented through promulgation of the single sample and plan verification rules and attributable to eliminating individual shift overexposures, are not expected to materialize immediately after overexposures have been substantially reduced or eliminated. Because these diseases typically arise after many years of cumulative exposure, allowing for a period of latency, and the pre-existing occupational exposure histories of members of the current coal mining workforce, the beneficial effects of reducing exposures are expected to become evident only after a sufficient time has passed so that the reduction in cumulative exposure could have its effect. The total realized benefits would not be fully evident until after the youngest of today's underground coal miners retire. If the size of this workforce substantially changed in the future and the projected pattern of prevented overexposures remained the same, the number of cases of prevented simple CWP and PMF would need to be adjusted to account for the change.

Various data, assumptions and caveats were used to conduct the benefits analyses. Therefore, MSHA requests any information which would enable it to conduct more accurate analyses of the estimated health benefits of the single sample and plan verification rules, both individually, and in combination.

TABLE IX–2–4.—OVER A WORKING LIFETIME AMONG AFFECTED MINERS, ESTIMATED NUMBER OF CASES OF CWP[a] AND PMF[b] PREVENTED DUE TO THE IMPLEMENTATION OF SINGLE SAMPLE AND PLAN VERIFICATION

Type of miner	Affected miners, n=	Simple CWP categories 1, 2, 3 or PMF		Simple CWP categories 2 or 3 or PMF		PMF	
		Reduction in risk[c]	Prevented cases, n=	Reduction in risk	Prevented cases, n=	Reduction in risk	Prevented cases, n=
Affected Designated Occupational Miners[d]	901	24.4/1000	22.0	15.5/1000	14.0	7.6/1000	6.8
Affected Non-Designated Occupational Miners[e]	5,406	2.3/1000	12.4	1.5/1000	8.1	0.7/1000	3.18
Affected Roofbolters in Designated Areas[f]	368	19.6/1000	7.2	12.1/1000	4.5	6.0/1000	2.2
Total[g]	6,675	na	42	na	27	na	13

[a] Simple CWP: simple coal workers' pneumoconiosis.
[b] PMF: progressive massive fibrosis.
[c] Reduction in Risk per 1,000 affected miners, over a 45-year working lifetime, at age 73.
[d] Affected Designated Occupation (DO) Miners: includes all miners who work at the 57.0 percent of the Mechanized Mining Units under consideration and who are exposed to dust concentrations similar to the DO, over a 45-year occupational lifetime.
[e] Affected Non-Designated Occupation (NDO) Miners: includes all underground faceworkers under consideration who are not classified as the DO or a designated area roofbolter.
[f] Affected Roofbolter Designated Area (DA) Miners: includes all miners working as roofbolters in the 29.4 percent of roofbolter designated areas exhibiting a pattern of recurrent overexposures.
[g] The total miners affected (6,675) is a sub-population of the estimated number of underground coal miners (12,317) working at the mine face.

B. Regulatory Flexibility Certification and Regulatory Flexibility Analysis

MSHA has consulted with the Chief Counsel for Advocacy on this proposed rule and on the Agency's certification of no significant economic impact on a substantial number of small entities covered by this rule. Consistent with Agency practice, notes of any meetings with the Chief Counsel's office on these rules, or any written communications, will be placed in the rulemaking record.

Using both definitions of small mines, one with fewer than 20 employees and one with 500 or fewer employees, the estimated compliance costs of the proposed rule is either negative or substantially less than 1 percent of estimated coal revenues, well below the level suggesting that they might have a significant economic impact on a substantial number of small entities. Accordingly, MSHA has certified that this proposed rule would not have a significant economic impact on a substantial number of small entities that are covered by this proposed rule.

TABLE IX–3.—ESTIMATED YEARLY COSTS OF THE PROPOSED PLAN VERIFICATION RULE RELATIVE TO YEARLY REVENUES FOR UNDERGROUND COAL MINES

[dollars in thousands]

Mine size	PV rule net yearly costs[a]	Underground coal mine revenues[b]	Costs as percentage of revenues
< 20 emp.	($685)	$201,700	N/A
≤500 emp.	($2,535)	5,644,194	N/A

[a] Estimated yearly costs are composed of ''adjusted'' first year costs that have been annualized plus annual costs.
[b] Data for revenues derived from: U.S. Department of Labor, Mine Safety and Health Administration, 2000 PEIR data; and U.S. Department of Energy, Energy Information Administration, *Coal Industry Annual 2000,* January 2002, p. 206.

X. Other Statutory Requirements

A. Unfunded Mandates Reform Act of 1995

For purposes of the Unfunded Mandates Reform Act of 1995, this rule does not include any Federal mandate that may result in increased expenditures by State, local, and tribal governments, or increased expenditures by the private sector of more than $100 million.

B. Paperwork Reduction Act of 1995

The proposed plan verification rule contains information collections which are subject to review by the Office of Management and Budget (OMB) under the Paperwork Reduction Act of 1995 (PRA95). The proposed plan verification rule has first year only burden hours (those that occur only in the first year) and annual burden hours (which occur in the first year and every year thereafter).

In the First Year of the Plan Verification Proposed Rule

In the first year the proposed plan verification rule is in effect, there would be a *net* decrease of 34,929 burden hours and a related cost reduction of $704,474.

Table VII–2 in the PREA shows that with respect to first year-only burden hours and costs, there would be a net increase of 7,609 burden hours and related costs of $371,273. Table VII–2(a) in the PREA shows that with respect to every year that the proposed plan verification rule is in effect (including the first year), there would be a *net* decrease of 42,538 burden hours and a related cost reduction of $1,075,747.

In the Second Year of the Proposed Plan Verification Rule and for Every Year Thereafter

After the first year of the proposed plan verification rule, those burden hours and related costs occurring only in the first year would no longer occur, and what remains are only the annual burden hours and related costs.

Therefore, in the second year of the proposed plan verification rule and for every year thereafter, there would be a *net* decrease of 42,538 burden hours and a related cost reduction of $1,075,747.

We invite public comments and are particularly interested in comments which:

1. Evaluate whether the proposed collection of information (presented here and in Chapter 7 of the PREA for the proposed plan verification rule) is necessary for the proper performance of the functions of MSHA, including whether the information would have practical utility;

2. Evaluate the accuracy of our estimate of the burden of the proposed collection of information, including the validity of the methodology and assumptions used;

3. Enhance the quality, utility, and clarity of the information to be collected; and

4. Minimize the burden of the collection of information on respondents, including through the use of appropriate automated, electronic, mechanical, or other technological collection techniques or other forms of information technology, *e.g.*, permitting electronic submissions of responses.

We have submitted a copy of this proposed rule to OMB for its review and approval of these information collections. Interested persons are requested to send comments regarding this information collection, including suggestions for reducing this burden, if under 10 pages, by facsimile (202) 395–6974 to Attn: Desk Officer for MSHA; or by email to: *cathomas@omb.gov.* All comments may be sent by mail addressed to the Office of Information and Regulatory Affairs, OMB New Executive Office Building, 725 17th St., NW., Rm. 10235, Washington, DC 20503, Attn: Desk Officer for MSHA. Please send a copy of your comments to MSHA at the address listed in the **ADDRESSES** section of the preamble. Submit written comments on the information collection not later than June 4, 2003.

Our paperwork submission summarized above is explained in detail in Chapter 7 of the PREA. The PREA includes the estimated costs and assumptions for each proposed paperwork requirement related to the proposed plan verification rule. These paperwork requirements have been submitted to the Office of Management and Budget for review under section 3504(h) of the Paperwork Reduction Act of 1995. Respondents are not required to respond to any collection of information unless it displays a current valid OMB control number. The PREA is located on our Web site at *http://wwww.msha.gov/REGSINFO.HTM.*

C. National Environmental Policy Act

The National Environmental Policy Act (NEPA) of 1969 requires each Federal agency to consider the environmental effects of proposed actions and to prepare an Environmental Impact Statement on major actions significantly affecting the quality of the human environment. MSHA has reviewed the proposed standard in accordance with the requirements of the NEPA (42 U.S.C. 4321 *et seq.*), the regulation of the Council on Environmental Quality (40 CFR part 1500), and the Department of Labor's NEPA procedures (29 CFR part 11). As a result of this review, MSHA has preliminarily determined that this proposed standard will have no significant environmental impact.

Commenters are encouraged to submit their comments on this determination.

D. Executive Order 12630: Governmental Actions and Interference With Constitutionally Protected Property Rights

This proposed rule is not subject to Executive Order 12630, Governmental Actions and Interference with Constitutionally Protected Property Rights, because it does not involve implementation of a policy with takings implications.

E. Executive Order 12988: Civil Justice Reform

The Agency has reviewed Executive Order 12988, Civil Justice Reform, and determined that this rulemaking will not unduly burden the Federal court system. The regulation has been written so as to provide a clear legal standard for affected conduct, and has been reviewed carefully to eliminate drafting errors and ambiguities.

F. Executive Order 13045: Protection of Children From Environmental Health Risks and Safety Risks

In accordance with Executive Order 13045, protection of children from environmental health risks and safety risks, MSHA has evaluated the environmental health or safety effects of the proposed rule on children. The Agency has determined that this proposed rule would not have an adverse impact on children.

G. Executive Order 13175: Consultation and Coordination With Indian Tribal Governments

MSHA certifies that this proposed rule does not impose substantial direct compliance costs on Indian tribal governments.

H. Executive Order 13132: Federalism

MSHA has reviewed this rule in accordance with Executive Order 13132 regarding federalism, and has determined that it does not have ''federalism implications.'' The rule does not ''have substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government.''

I. Executive Order 13211: Energy

MSHA has reviewed this proposed rule in accordance with Executive Order 13211 regarding the energy effects of Federal regulations and has determined that this proposed rule does not have any adverse effects on energy supply, distribution, or use. Therefore, no reasonable alternatives to this action are necessary.

J. Executive Order 13272: Proper Consideration of Small Entities in Agency Rulemaking

In accordance with Executive Order 13272, MSHA has thoroughly reviewed the Plan Verification proposed rule to assess and take appropriate account of its potential impact on small businesses, small governmental jurisdictions, and small organizations. As discussed in Chapter V of the PREA, MSHA has determined that the proposed rule would not have a significant economic impact on a substantial number of small entities.

XI. Public Hearings

MSHA plans to hold public hearings on the proposed rule. The hearings will be held under Section 101 of the Federal Mine Safety and Health Act of 1977. The hearings will be held in the following cities:

(a) Evansville, Indiana;
(b) Charleston, West Virginia;
(c) Grand Junction, Colorado;
(d) Birmingham, Alabama;
(e) Lexington, Kentucky;
(f) Washington, Pennsylvania, and

The specific dates, times and facilities for the hearings will be announced by a separate notice in the **Federal Register**.

Appendix A—Derivation of the Critical Values

All measurements of respirable dust concentration are subject to potential sampling and analytical errors. Because of such errors, a measurement may fall slightly below the verification limit even when the true concentration of

respirable coal mine dust or respirable quartz dust does not. Therefore, to ensure that the verification limits have actually been met, it is necessary to provide for a margin of error in each measurement. The critical values provide this margin of error. MSHA can be confident that the verification limits have not been exceeded at the sampled locations. When valid measurements do not exceed the appropriate critical values listed in Table 70–1, corresponding to the number of shifts sampled.

To explain how the verification limits were derived, it is helpful to define some symbolic notation. Let X represent a measurement, and let μ represent the true value of whatever quantity is being measured *i.e.*, the full-shift average concentration, at a specific sampling location, of either respirable coal mine dust or respirable quartz dust. The difference between X and μ is the measurement error and is denoted by ε $X = \mu + \varepsilon$.

In accordance with standard statistical and industrial hygiene practice, ε (but not μ) is assumed to be normally distributed. Since the approved sampling and analytical methods for measuring concentrations of respirable coal mine dust and respirable quartz dust are both statistically unbiased, ε has a mean value of zero and a degree of variability represented by its standard deviation, denoted by σ_ε. The ratio of σ_ε to μ is called the measurement *coefficient of variation* (CV) due to sampling and analytical errors.[42] The CV relates entirely to variability due to measurement errors and not at all to variability in actual dust concentrations.

For respirable coal mine dust, the value of CV used in calculating critical values was chosen to be consistent with the value proposed at $\mu = 2.0$ mg/m^3 in the Notice of Final Policy published in the **Federal Register:** Coal Mine Respirable Dust Standard Noncompliance Determinations (63 FR 5700, February 3, 1998):

$$CV = \sqrt{(7\%)^2 + (5\%)^2 + (5\%)^2} = 10\%$$

The 7-percent term in this formula accounts for uncertainty due to potential weighing error, and the two 5-percent terms account for differences between individual cyclones and for variability in the exact volume of air pumped through the filter during a 480-minute shift.

For respirable quartz dust, the value of CV used in calculating critical values is:

$$CV = \sqrt{(5.3\%)^2 + (4.2\%)^2 + (5.6\%)^2} = 9\%$$

The 5.3-percent term in this formula accounts for imprecision in the Infrared (Infrared Spectrophotometer or IR) measurement of quartz mass deposited on the filter, the 4.2-percent term represents variability in air volume, and the final 5.6-percent term accounts for uncertainty due to variability between individual cyclones, given the size distribution of quartz dust encountered in mining environments (Bartley, November 1999).

Each critical value (c) was calculated to provide a confidence level of at least 95 percent that the dust control parameters specified in the ventilation plan were effective in preventing dust concentrations from exceeding the verification limits. Using a confidence coefficient of 1.645, based on the standard normal probability distribution, knowledge of the CV makes it possible to calculate a 1-tailed, 95-percent upper confidence limit (UCL) for μ, given a single measurement X. The UCL is $X \cdot (1 + 1.645 \cdot CV)$. When $X \leq c$, the UCL for μ is less than or equal to the verification limit. When $X > c$, the UCL for μ exceeds the verification limit.

For example, suppose $X = 1.71$ mg/m^3 respirable dust. Then the UCL for μ would be $1.71 \cdot (1 + (10\% \text{ of } 1.645)) = 1.99$ mg/m^3, which is less than the verification limit for respirable coal mine dust. If, however, $X = 1.72$ mg/m^3, then the UCL for μ would be $1.72 \cdot 1.1645$ mg/m^3, which slightly exceeds the verification limit. Similarly, for respirable quartz dust, the UCL for μ is $87 \cdot (1 + (9\% \text{ of } 1.645)) = 99.9$ μg/m^3 when $X = 87$ μg/m^3 and slightly above the verification limit of 100 μg/m^3 when $X = 88$ μg/m^3.

If more than one measurement is available, then the confidence coefficient changes to reflect multiplication of the tail probabilities for independent measurement errors. When n measurements are available, the objective is to calculate a critical value (c) such that if each of the n measurements is $\leq c$, then the 1-tailed 95-percent UCL for μ is $\leq$ the verification limit. Since the product of the n individual tail probabilities must equal 0.05, the appropriate 1-tail probability for each measurement individually is the nth root of 0.05.

For example, if n = 3, then the appropriate 1-tail probability for each measurement is the cube root of 0.05, or 0.3684. The standard normal confidence coefficient corresponding to this tail probability is 0.336. Therefore, when all three measurements have the same value (X), the UCL is $X \cdot (1 + 0.336 \cdot CV)$. Substituting the appropriate CV estimate, the UCL is $X \cdot 1.0336$ for respirable coal mine dust or $X \cdot 1.0302$ for respirable quartz dust. Consequently, to obtain the critical value, the verification limit is first divided by 1.0336 (coal mine dust) or 1.0302 (quartz dust) and then truncated to the desired number of decimal digits. This yields 1.93 mg/m^3 for coal mine dust and 97 μg/m^3 for respirable quartz dust.

The confidence coefficients used to establish critical values by this method are as follows:

n	Confidence coefficient
1	1.645
2	0.760
3	0.336
4	0.068

For $n > 4$, the confidence coefficient is less than 0.068. It should be noted that although the critical value calculated for $n \geq 4$ is slightly below the verification limit for both types of respirable dust, for simplicity it was set equal to the verification limit as a close approximation.

[42] In some publications, this ratio is called the relative standard deviation (RSD). It is sometimes also denoted by CV_{total}, where ''total'' refers to all sources of potential sampling and analytical error but does not cover variability in μ itself.

Appendix B—Model Powered Air-Purifying Respirator (PAPR) Program

Note: The following is an example of a Model PAPR Protection Program. Not all items contained in this example would be required for all mines. Additional items not included in this example might be required depending on the conditions at your mine.

1.0 Purpose

Wellington Mining Company and the Mine Safety and Health Administration (MSHA) have determined that, after installing all feasible engineering and environmental controls on the 002–0 MMU longwall mining section, miners working downwind of the shearer continue to be exposed to respirable coal mine dust concentrations in excess of the allowable standard during routine mining operations. As a result, Wellington Mining Company has been granted permission by MSHA to use powered air-purifying respirators to protect affected miners from overexposure to this respiratory hazard until such time as other feasible engineering controls become available.

During mining of development entries, Wellington Mining Company, for brief periods of time, intermittently encounters high quartz concentrations while mining through rock partings. The approved ventilation plan parameters likely will not prevent overexposure to some miners during these brief occurrences. Accordingly, MSHA has approved a revision to the ventilation plan to allow for the use of PAPRs, for a period not to exceed 30 days, when these unusual operating conditions occur.

The purpose of this PAPR Protection Program is to specify who is required to wear PAPRs and the conditions under which the respirators must be used. The miners, occupations, work location or tasks requiring PAPR use at Wellington Mining Company are listed in Section 4.0.

2.0 Scope and Application

This PAPR Protection Program is applicable to all miners who are required by the provisions of the approved ventilation plan to wear PAPRs. This includes supply and maintenance personnel, electrical crews or supervisors working in those areas, occupations or tasks designated in Wellington's PAPR Protection Program.

Miners participating in the PAPR Protection Program do so at no cost to them. The expense associated with training, providing and maintaining PAPRs will be borne by Wellington Mining Company.

3.0 Responsibilities

Program Administrator

The Program Administrator is the management official designated by Wellington Mining Company who is responsible for administering the PAPR Program. The duties of the Program Administrator include:

- Selection of the PAPR.
- Monitoring respirator use to ensure that PAPRs are used in accordance with this program.
- Arranging for and conducting training.
- Ensuring proper storage and maintenance of PAPRs.
- Evaluating the program.
- Updating the written programs as needed.

The Program Administrator for Wellington Mining Company is John Doe.

Mine Supervisors

Mine supervisors are responsible for ensuring that the PAPR Protection Program is implemented in their area(s) of responsibility. In addition to being knowledgeable about the program requirements for their own protection, mine supervisors must also ensure that the program is understood and followed by the miners under their supervision. Duties of the mine supervisor include:

- Ensuring that miners under their supervision have received appropriate training.
- Ensuring the availability of PAPRs and accessories.
- Being aware of miners, areas, occupations or tasks requiring the use of PAPRs.
- Enforcing the proper use of PAPRs when necessary.
- Ensuring that PAPRs are properly cleaned, maintained, and stored according to the PAPR Protection Program.
- Ensuring that PAPRs fit properly and do not cause discomfort.
- Coordinating with the Program Administrator on how to address respirable coal mine dust hazards or other concerns regarding the program.

Miners

Each miner has the responsibility to wear the PAPR when and where required and in the manner in which he or she was trained. Miners must also:

- Care for their PAPRs as instructed.
- Inform their mine supervisor if the PAPR is no longer operating properly.
- Inform their mine supervisor or the Program Administrator of any concerns they have regarding the program.

4.0 Program Elements

Selection Procedures

The Program Administrator will select the PAPRs to be used on site in accordance with all MSHA requirements. The Program Administrator will provide all miners who wear PAPRs with a copy of the manufacturer's instructions including the use, care, maintenance and storage of the PAPR.

- PAPRs utilized will be 3M model AS–600LBC, certified by the National Institute for Occupational Safety and Health (NIOSH) under 42 CFR part 84 and approved by MSHA under 30 CFR part 18 and will be used in accordance with the terms of certification and approval. The main PAPR filter will be the AS–140 HE or equivalent as approved by NIOSH.

PAPR Protection Factor

The minimum air velocity specified in the approved ventilation plan at the headgate of the MMU 002–0 longwall is 550 fpm. Accordingly, the assigned protection factor for the use of PAPRs is 2.9.

When PAPRs are required to be used while mining through rock partings on development entries, the air velocity is less than 400 fpm which results in an assigned protection factor of 4.0.

PAPR Use

PAPR protection is required as follows:

- For all miners who work or travel downwind of the shearer operator when material is being produced on the 002–0 MMU longwall section.
- For all miners who work or travel on the active production face or work or travel downwind of that face when it has been determined by mine management that unique operating conditions caused by mining through rock partings has or will occur.

General Use Procedures

- PAPRs assigned for the exclusive use of a miner will be identified by labeling the outside with the miner's full name.
- Miners will use PAPRs under conditions specified by the program, and in accordance with the training they have received on the use of the device. The PAPR will not be used in a manner for which it is not certified by NIOSH or approved by MSHA.
- All miners should examine the PAPR prior to each shift of use for a new main filter, integrity of the visor, and proper functioning of the battery and motor assembly.

Cleaning, Maintenance and Storage

Cleaning

PAPRs are to be regularly cleaned and disinfected at the designated PAPR cleaning station located in the lamproom. Units issued for the exclusive use of a miner shall be cleaned prior to use on the next shift. Those not assigned for the exclusive use of a miner will be cleaned and disinfected prior to the next shift of use or assignment to a different miner. All PAPRs will be cleaned by the lamproom attendant.

The following procedures are to be used when cleaning and disinfecting PAPRs:

PAPRs Issued for Exclusive Use

- Wipe the Helmet/Headband/Cradle assembly/Head seal/Temple seal/visor with a soft cloth dampened with a solution of mild soap and water.
- Vacuum the motor housing.
- Replace the main filter.
- Inspect all parts for damage or wear. Replace any parts that may affect the performance of the respirator.
- All components may be wiped with a soft cloth dampened with a solution of disinfectant and water.

PAPRs Not Issued for Exclusive Use

- Disassemble the motor housing assembly, the head harness assembly, the head seal assembly, the visor assembly, the main filter and the expander.
- Clean all parts by wiping them with a soft cloth dampened with a solution of mild soap and water. Wipe each component with a soft cloth dampened with disinfectant.
- Allow all parts to dry prior to reinstallation.
- Inspect all parts for damage or wear. Replace any parts that may affect the performance of the respirator.
- Replace the main filter with a new filter.

Note: The PAPR Program Administrator will ensure an adequate supply of appropriate cleaning and disinfection material at the cleaning station.

Maintenance

PAPRs are to be maintained at all times in order to ensure that they function properly and adequately protect the miner. Maintenance involves a thorough visual inspection for cleanliness, defects and operational function. Worn, damaged, defective, or exhausted parts will be replaced prior to use. No components will be replaced or repairs made beyond those recommended by the manufacturer. All routine maintenance will be performed by the lamproom attendant.

The following checklist will be used when inspecting PAPRs:

- Headgear
  - —Check that there are no dents or cracks in the headgear assembly
  - —Look closely at the faceseals. There should be no tears or loss of elasticity that could permit contaminated air to enter the headgear.
  - —Check that the headseal and temple seals are in good condition.
- Faceshield
  - —Check the faceshield for correct placement in the visor surround. Also look for scratches or other visual distortions that make it difficult to see through the faceshield.
- Blower Assembly
  - —Remove the blower from the headgear
  - —Examine the blower housing and replace it if cracked or damaged.
  - —Examine the inside of the blower intake manifold for accumulated dust. Clean as described above, if required.
- Power supply and motor
  - —Check operational function
  - —Examine for tears or damage to the wiring or cable jacket.
  - —Check for compliance with electrical permissibility requirements.
- PAPR battery packs will be placed on charge if not already indicating a full charge.

Storage

PAPRs will be stored in a clean, dry area, and in accordance with the manufacturer's recommendations. Clean/disinfected and inspected units will be placed in a sealed plastic bag and stored in the lamproom.

Defective PAPRs

PAPRs that have defective parts shall be removed from service immediately. If, during an examination or during the work shift, a miner discovers a defect in a PAPR, it should be brought to the attention of the supervisor. The supervisor will have the Program Administrator or delegate make immediate repairs or secure a replacement prior to the miner returning to the work area that requires PAPR use. With the approval of the supervisor, miners will be permitted to leave the work area to perform limited maintenance on their PAPR in a designated area that is free of respirable coal mine dust hazards. Situations when this will be permitted include: to wash their PAPR facepiece, to replace a filter, leaking hose or exhausted power supply (battery), or to repair a damaged/missing visor.

Training

The Program Administrator will provide training to PAPR users and their mine supervisors on the contents of the Wellington Mining Company's PAPR Protection Program, on the applicable portions of the mine's approved mine ventilation plan revisions, and on MSHA respiratory protection standards. Miners will be trained prior to using a PAPR in the active workings. Supervisors will also be trained prior to using a PAPR in the active workings or prior to supervising miners who must wear PAPRs.

The training course will cover these topics:

- The Wellington Mining Company's PAPR Protection Program
- Applicable MSHA standards
- Respirable coal mine dust (including quartz) hazards encountered at Wellington Mining Company's operations and their health effects.
- Limitations of PAPRs
- PAPR donning, doffing and user fit check

Miners will be retrained at least annually. Miners must demonstrate their understanding of the topics covered in the training through hands-on exercises. PAPR training will be documented by the Program Administrator.

5.0 Program Evaluation

The Program Administrator will conduct periodic evaluations of the active workings to ensure that the provisions of the program are being implemented. The evaluations will include regular consultations with miners who use PAPRs and their supervisors, site inspections, an examination of respirable coal mine dust sampling results, and a review of training records.

6.0 Documentation and Recordkeeping

A written copy of this program and the MSHA requirements will be posted on the mine bulletin board for the review by interested miners, and a copy will be kept in the Program Administrator's office.

Also maintained in the Program Administrator's office are copies of training records. Those records will be updated as new miners are trained, and as existing miners receive annual refresher training.

Appendix C—Citation Threshold Values (CTV)

I. Interpretation of the CTV Table

Each CTV was calculated to ensure that, if the CTV is met or exceeded, noncompliance with the applicable dust standard can be inferred with at least 95-percent confidence. It is assumed that whatever applicable dust standard happens to be in effect at the sampling location is binding, and that a citation is warranted whenever there is sufficient evidence that an established standard has been exceeded. The CTV table does not depend on how the applicable dust standard was established, or on any measurement uncertainties in the process of setting the applicable dust standard.

The CTV table provides criteria for testing a tentative, or presumptive, hypothesis that the true single-shift average dust concentration did not exceed the applicable dust standard (S) at each of the individual locations sampled during a particular shift. For purposes of this test, the mine atmosphere at each such location is presumed to be in compliance unless the corresponding single-shift measurement provides sufficient evidence to the contrary. The ''true single-shift average'' does *not* refer, in this context, to an average across different occupations, locations, or shifts. Instead, it refers entirely to the dust concentration at the specific location of the sampler unit, averaged over the course of the particular shift during which the measurement was obtained. The CTV table is *not* designed to estimate or test the average dust concentration across occupational locations, or within any zone or mine area, or in the air actually inhaled by any particular miner.

The CTV table ensures that noncompliance is cited only when there is a 95-percent level of confidence that the applicable dust standard has actually been exceeded. A single-shift measurement that does not exceed the applicable CTV value, does not necessarily imply probable compliance with the applicable dust standard—let alone compliance at a 95-percent confidence level. For example, a single-shift measurement of 2.14 mg/m^3 would not, according to the CTV table, indicate noncompliance with sufficient confidence to warrant a citation if S = 2.0 mg/m^3. This does not imply that the mine atmosphere was in compliance on the shift and at the location sampled. On the contrary, unless contradictory evidence were available, this measurement would indicate that the MMU was probably *out* of compliance. However, because there is a small chance that the measurement exceeded the standard only because of measurement error, a citation would not be issued. Additional measurements would be necessary to verify the apparent lack of adequate control measures. Similarly, a single-shift measurement of 1.92 mg/m^3 would not warrant citation; but, because of possible measurement error, neither would it warrant concluding that the mine atmosphere sampled was in compliance. To confirm that control measures are adequate, it would be necessary to obtain additional measurements.

Furthermore, even if a single-shift measurement were to demonstrate, at a high confidence level, that the mine atmosphere was in compliance at the sampling location on a given shift, additional measurements would be required to demonstrate compliance on each shift. For example, if S = 2.0 mg/m^3, then a valid measurement of 1.65 mg/m^3 would demonstrate compliance on the particular shift and at the particular location sampled. It would not, however, demonstrate compliance on other shifts or at other locations.

II. Derivation of the CTV Table

To understand how the CTVs are derived and justified, it is first necessary to distinguish between variability due to measurement error and variability due to actual differences in dust concentration. The variability observed among individual measurements obtained at different locations (or at different times) combines both: dust concentration measurements vary partly because of measurement error and partly because of genuine differences in the dust concentration being measured. This distinction, between measurement error and variation in the true dust concentration, can more easily be explained by first carefully defining some notational abbreviations.

One or more dust samples are collected in the same MMU or other mine area on a particular shift. Since it is necessary to distinguish between different samples in the same MMU, let X_i represent the MRE-equivalent dust concentration measurement obtained from the i^{th} sample. The quantity being measured is the true, single-shift average dust concentration at the i^{th} sampling location and is denoted by μ_i. Because of potential measurement errors, μ_i can never be known with complete certainty. A ''sample,'' ''measurement,'' or ''observation'' always refers to an instance of X_i rather than μ_i.

The overall measurement error associated with an individual measurement is nothing more than the difference between the measurement (X_i) and the quantity being measured (μ_i). Therefore, this error can be represented as

$\varepsilon_i = X_i - \mu_i$.

Equivalently, any measurement can be regarded as the true concentration in the atmosphere sampled, with a measurement error added on:

$X_i = \mu_i + \varepsilon_i$.

For two different measurements (X_1 and X_2), it follows that X_1 may differ from X_2 not only because of the combined effects of ε_1 and ε_2, but also because μ_1 differs from μ_2.

The probability distribution of X_i around μ_i depends only on the probability distribution of ε_i and should not be confused with the statistical distribution of μ_i itself, which arises from spatial and/or temporal variability in dust concentration. This variability (*i.e.*, among μ_i for different values of *I*) is not associated with inadequacies of the measurement system, but real variation in exposures due to the fact that contaminant generation rates vary greatly in time and contaminants are heterogeneously distributed in workplace air.

Since noncompliance determinations are made relative to individual sampling locations on individual shifts, derivation of the CTV table requires no assumptions or inferences about the spatial or temporal pattern of atmospheric dust concentrations—*i.e.*, the statistical distribution of μ_i. MSHA is not evaluating dust concentrations averaged across the various sampler locations. Therefore, the degree and pattern of variability observed among different measurements obtained during MSHA sampling are not used in establishing any CTV. Instead, the CTV for each applicable dust standard (S) is based entirely on the distribution of measurement errors (ε_i) expected for the maximum dust concentration in compliance with that standard—*i.e.*, a concentration equal to S itself.

If control filters are used to eliminate potential biases, then each ε_i arises from a combination of four weighing errors (pre- and post-exposure for both the control and exposed filter capsule) and a continuous summation of instantaneous measurement errors accumulated over the course of an eight-hour sample. Since the eight-hour period can be subdivided into an arbitrarily large number of sub-intervals, and some fraction of ε_i is associated with each sub-interval, ε_i can be represented as comprising the sum of an

arbitrarily large number of sub-interval errors. By the Central Limit Theorem, such a summation tends to be normally distributed, regardless of the distribution of sub-interval errors. This does not depend on the distribution of μ_i, which is generally represented as being lognormal.

Furthermore, each measurement made by MSHA personnel is based on the difference between pre- and post-exposure weights of a dust sample, as determined in the same laboratory, and adjusted by the weight gain or loss of the control filter capsule. Any systematic error or bias in the weighing process attributable to the laboratory is mathematically canceled out by subtraction. Furthermore, any bias that may be associated with day-to-day changes in laboratory conditions or introduced during storage and handling of the filter capsules is also mathematically canceled out. Elimination of the sources of systematic errors identified above, together with the fact that the concentration of respirable dust is defined by section 202(e) of the Mine Act to mean the average concentration of respirable dust measured by an approved sampler unit, implies that the measurements are unbiased. This means that ε_i is equally likely to be positive or negative and, on average, equal to zero.

Therefore, each ε_i is assumed to be normally distributed, with a mean value of zero and a degree of variability represented by its standard deviation

$$\sigma_i = \mu_i \cdot CV_{total}.$$

Since $X_i = \mu_i + \varepsilon_i$, it follows that for a given value of μ_i, X_i is normally distributed with expected value equal to μ_i and standard deviation equal to σ_i. CV_{total}, is the coefficient of variation in measurements corresponding to a given value of μ_i. CV_{total} relates entirely to variability due to measurement errors and not at all to variability in actual dust concentrations.

MSHA's procedure for citing noncompliance based on the CTV table consists of formally testing a presumption of compliance at every location sampled. Compliance with the applicable dust standard at the *ith* sampling location is expressed by the relation $\mu_i \leq S$. Max$\{\mu_i\}$ denotes the maximum dust concentration, among all of the sampling locations within a MMU. Therefore, if Max$\{\mu_i\} \leq S$, none of the sampler units in the MMU were exposed to excessive dust concentration. Since the burden of proof is on MSHA to demonstrate noncompliance, the hypothesis being tested (called the null hypothesis, or H_0,) is that the concentration at every location sampled is *in* compliance with the applicable dust standard. Equivalently, for a MMU the null hypothesis (H_0) is that max$\{\mu_i\} \leq S$. In other areas, where only one, full-shift measurement is made, the null hypothesis is simply that $\mu_i \leq S$.

The test consists of evaluating the likelihood of measurements obtained during an MSHA sample, under the assumption that H_0 is true. Since $X_i = \mu_i + \varepsilon_i$, X_i (or max$\{X_i\}$ in the case of a MMU) can exceed S even under that assumption. However, based on the normal distribution of measurement errors, it is possible to calculate the probability that a measurement error would be large enough to fully account for the measurement's exceeding the standard. The greater the amount by which X_i exceeds S, the less likely it is that this would be due to measurement error alone. If, under H_0, this probability is less than five percent, then H_0 can be rejected at a 95-percent confidence level and a citation is warranted. For a MMU, rejecting H_0 (and therefore issuing a citation) is equivalent to determining that $\mu_i > S$ for at least one value of *I*.

Each CTV listed was calculated to ensure that citations will be issued at a confidence level of at least 95 percent. As described in MSHA's February 1994 notice and explained further by Kogut [2], the tabled CTV corresponding to each S was calculated on the assumption that, at each sampling location:

$$CV_{total} \leq CV_{CTV} = \sqrt{\left(\frac{0.14\ mg/m^3}{\mu_i\ mg/m^3} \cdot 100\%\right)^2 + (5\%)^2 + (5\%)^2}$$

The MSHA and NIOSH joint finding establishes that for valid measurements made with an approved sampler unit, CV_{total} is in fact less than CV_{CTV} at all dust concentrations (μ_i).

The situation in which measurement error is most likely to cause an erroneous noncompliance determination is the hypothetical case of $\mu_i = S$ for either a single-shift sample measurement or for all of the measurements made in the same MMU. In that borderline situation—*i.e.*, the worst case consistent with H_0—the standard deviation is identical for all measurement errors. Therefore, the value of σ used in constructing the CTV table is the product of S and CV_{CTV} evaluated for a dust concentration equal to S:

$$\sigma = S \cdot \sqrt{\left(\frac{0.14}{S}\right)^2 + (.05)^2 + (.05)^2}$$

Assuming a normal distribution of measurement errors as explained above, it follows that the probability a single measurement would equal or exceed the critical value

$$c = S + 1.64 \cdot \sigma$$

is five percent under H_0 when $CV_{total} = CV_{CTV}$. The tabled CTV corresponding to S is derived by simply raising the critical value c up to the next exact multiple of 0.01 mg/m^3.

For example, at a dust concentration (μ_i) just meeting the applicable dust standard of S = 2 mg/m^3, CV_{CTV} is 9.95 percent. Therefore, the calculated value of c is 2.326 and the CTV is 2.33 mg/m^3. Any valid single-shift measurement at or above this CTV is unlikely to be this large simply because of measurement error. Therefore, any such measurement warrants a noncompliance citation.

The probability that a measurement exceeds the CTV is even smaller if $\mu_i < S$ for any *I*. Furthermore, to the extent that CV_{total} is actually less than CV_{CTV}, σ is actually less than $S \cdot CV_{CTV}$. This results in an even lower probability that the critical value would be exceeded under the null hypothesis. Consequently, if any single-shift measurement equals or exceeds c, then H_0 can be rejected at confidence level of at least 95-percent. Since rejection of H_0 implies that $\mu_i > S$ for at least one value of *I*, this warrants a noncompliance citation.

It should be noted that when each of several measurements is separately compared to the CTV table, the probability that at least one ε_i will be large enough to force $X_i \geq$ CTV when $\mu_i \leq S$ is greater than the probability when only a single comparison is made. For example (still assuming S = 2 mg/m^3), if CV_{total} is actually 6.6%, then the standard deviation of ε_i is 6.6% of 2.0 mg/m^3, or 0.132 mg/m^3, when $\mu_i = S$. Using properties of the normal

distribution, the probability that any single measurement would exceed the CTV in this borderline situation is calculated to be 0.0062. However, the probability that at least one of five such measurements results in a citation is $1 - (0.9938)^5 = 3.1$ percent. Therefore, the confidence level at which a citation can be issued, based on the maximum of five measurements made in the same MMU on a given shift, is 97%.

The constant 1.64 used in calculating the CTV is a 1-tailed 95-percent confidence coefficient and is derived from the standard normal probability distribution. Since the purpose of the CTV table is to provide criteria for determining that the true dust concentration strictly exceeds the applicable dust standard and such a determination can occur only when a single-shift measurement is sufficiently high, there is exactly zero probability of erroneously citing noncompliance when a measurement falls below the lower confidence limit. Consequently, the total probability of erroneously citing noncompliance equals the probability that a standard normal random variable exceeds 1.64, which is 5 percent.

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XII. Regulatory Text

List of Subjects

30 CFR Part 70

Coal, Mine safety and health, Underground coal mines, Respirable dust.

30 CFR Part 75

Coal, Mine safety and health, Underground coal mines, Ventilation.

30 CFR Part 90

Coal, Mine safety and health.

Dated: February 12, 2003.

Dave D. Lauriski,

Assistant Secretary of Labor for Mine Safety and Health.

Accordingly, MSHA proposes to amend Chapter I of Title 30 of the Code of Federal Regulations as follows:

PART 70—MANDATORY HEALTH STANDARDS—UNDERGROUND COAL MINES

1. The authority citation for part 70 is revised to read as follows:

Authority: 30 U.S.C. 811, 813(h), 957 and 961.

2. Subpart A is revised to read as follows:

Subpart A—General

Sec.
70.1 Scope.
70.2 Definitions.

§ 70.1 Scope and purpose.

This part sets forth mandatory health standards for each underground coal mine subject to the Federal Mine Safety and Health Act of 1977.

§ 70.2 Definitions.

Act. The Federal Mine Safety and Health Act of 1977, Public Law 91–173, as amended by Public Law 95–164, 30 U.S.C. 801 *et seq.*

Active workings. Any place in a coal mine where miners are normally required to work or travel.

Administrative controls. Methods of controlling the respirable dust exposure of an individual miner assigned to a specific work position or occupation by job rotation, altering the way in which the assigned work is performed, providing time periods away from dust-generating sources. These procedures must be:

(1) Capable of being reviewed to confirm their proper implementation,

(2) Clearly understood by the affected miners, and

(3) Applied consistently over time.

Approved sampling device. A sampling device of the constant-flow type:

(1) Approved by the Secretary and the Secretary of Health and Human Services under part 74 of this title; or

(2) Approved by the Secretary when it has been determined that the measured concentration of respirable dust can be converted to an equivalent concentration as measured with a sampling device approved under part 74 of this title.

Certified person. An individual certified by the Secretary to take respirable dust samples and/or to perform the maintenance and calibration of approved sampling devices.

Citation threshold value (CTV). The lowest equivalent concentration measurement demonstrating that the applicable dust standard has been exceeded at a confidence level of at least 95 percent.

Concentration. The amount of respirable dust contained per unit volume of air.

Control filter. An unexposed filter cassette of the same design and material as the filter cassette used for sampling that is pre- and post-weighed on the same day as the exposed filters.

Critical value. The highest equivalent concentration measurement demonstrating that the applicable verification limit has been met at a confidence level of at least 95 percent.

Designated area (DA). An area of a mine identified by the operator under § 75.371(t) of this title and approved by the district manager, or identified by the Secretary. Each DA is identified by a four-digit identification number assigned by MSHA.

Designated occupation (DO). The occupation or work location on a mechanized mining unit that has been determined by results of respirable dust samples to exhibit the greatest respirable dust concentration.

District manager. The manager of the Coal Mine Safety and Health District in which the mine is located.

Dust control parameters. Specific engineering or environmental controls, maintenance procedures, and other measures specified in the approved mine ventilation plan for controlling respirable dust in the mine atmosphere of the active workings.

Engineering or environmental controls. Methods of controlling the level of respirable dust by reducing the quantity released into the work environment, by diluting, capturing or diverting the generated dust.

Equivalent concentration. The concentration of respirable coal mine dust, as measured by an approved sampling device, converted to an MRE 8-hour equivalent as follows:

(1) Multiply the concentration measured by the approved sampling device by the constant factor prescribed by the Secretary for that device and then apply criteria in paragraphs (2) and (3) of this definition if applicable.

(2) If the sampled shift is longer than 8 hours, multiply the concentration obtained in paragraph (1) of this definition by $t/480$ where t is the length of the sampled work shift in minutes.

(3) If using PAPRs, divide the concentration obtained in paragraph (1) or (2) of this definition (whichever is applicable) by the protection factor assigned to the mechanized mining unit.

Material produced. Coal and/or any other substance(s) extracted by a mechanized mining unit during any production shift.

Mechanized mining unit (MMU). A set of mining equipment, including hand loading equipment, used for the production of material; or a specialized set which utilizes mining equipment other than specified in § 70.206(d) for the production of material. Each MMU is assigned a four-digit identification number by MSHA. The identification number is retained by the MMU regardless of where the unit relocates within the mine. When two sets of mining equipment are provided in a series of working places and only one production crew is employed at any given time on either set of mining equipment, the two sets of equipment are identified as a single MMU. When two or more sets of mining equipment are simultaneously engaged in the production of material within the same working section, each such mechanized mining unit is identified separately.

MRE. The Mining Research Establishment of the National Coal Board, London, England.

MRE instrument. A gravimetric dust sampler with a four channel horizontal elutriator developed by the MRE.

MSHA. The Mine Safety and Health Administration of the Department of Labor.

Personal continuous dust monitor (PCDM). An instrument that monitors the concentration of respirable dust on a continuous basis and displays in real-time the measured dust exposure information.

Powered air-purifying respirator (PAPR). A type of air-purifying respirator that uses a blower to force ambient air through the air-purifying elements to the inlet covering (a visor), which forms a partial seal with the face, to deliver filtered air into the miner's breathing area.

Protection factor (PF). A measure of the level of respiratory protection that would be expected in the workplace from a properly functioning PAPR when correctly worn and used. The protection factor is the ratio of the respirable dust concentration outside the respirator facepiece to the concentration inside the facepiece. For MMUs with average air velocity in the working face:

(1) <400 feet per minute (fpm), PF = 4;

(2) >800 fpm, PF = 2; and

(3) between 400 fpm and 800 fpm, the applicable PF is determined by the following formula: $2 \times$ (800 fpm/actual air velocity).

Production shift.

(1) With regard to a MMU, a shift during which material is produced; or

(2) With regard to a DA, a shift during which material is produced and routine day-to-day activities occur in the DA.

Quartz. Crystalline silicon dioxide (SiO_2) as measured by:

(1) MSHA's Analytical Method P–7: Infrared Determination of Quartz in Respirable Coal Mine Dust; or

(2) any method approved by MSHA as providing a measurement of quartz equivalent to that measured by Analytical Method P–7.

Respirable dust. Dust collected with an approved sampling device.

Secretary. The Secretary of Labor or delegate.

Valid sample. A respirable dust sample collected and submitted as required by this part, and not voided by MSHA.

Verification limits. 2.0 mg/m^3 of respirable coal mine dust and 100 μ g/m^3 of respirable quartz dust, each expressed as an equivalent concentration.

Verification production level (VPL). The tenth highest production level recorded in the most recent 30 production shifts; or, if fewer than 30 shifts of production data are available, the minimum production level attained on any shift used to verify the adequacy of the dust control parameters.

Working face. Any place in a coal mine in which work of extracting coal from its natural deposit in the earth is performed during the mining cycle.

3. Subpart B is revised to read as follows:

Subpart B—Dust Standards

Sec.

70.100 Respirable dust standards when quartz is not present.
70.101 Respirable dust standard when quartz is present.

§ 70.100 Respirable dust standard when quartz is not present.

(a) Each operator must continuously maintain the average concentration of respirable dust in the mine atmosphere during each shift to which each miner in the active workings of each mine is exposed at or below 2.0 milligrams per cubic meter of air (mg/m^3) as measured with an approved sampling device and in terms of an equivalent concentration determined in accordance with § 70.2.

(b) Each operator must continuously maintain the average concentration of respirable dust within 200 feet outby the working faces of each section in the intake airways at or below 1.0 mg/m^3 as measured with an approved sampling device and in terms of an equivalent concentration determined in accordance with § 70.2.

§ 70.101 Respirable dust standard when quartz is present.

When the respirable dust contains more than five percent quartz, as determined by the average of the most recent three MSHA samples, the operator must continuously maintain the average concentration of respirable dust in the mine atmosphere during each shift in the active workings of each mine, as measured with an approved sampling device and in terms of an equivalent concentration determined in accordance with § 70.2, at or below the applicable dust standard. The applicable dust standard is determined by dividing the average quartz percentage into the number 10.

Example: Assume a MMU or a DA is on a 2.0-mg/m^3 dust standard (5% or less). If the first MSHA sample contains 7.2% of quartz, and the required two subsequent samples contained 9.5% and 10.6%, respectively, the average quartz percentage would be 9.1% [(7.2% + 9.5% + 10.6%)/3 = 9.1%]. Therefore, the equivalent concentration of respirable dust in the mine atmosphere associated with that MMU or DA must, on each shift, be maintained at or below 1.1 mg/m^3 [10/9.1% = 1.1 mg/m^3].

4. Subpart C is revised to read as follows:

Subpart C—Sampling Procedures

Sec.

70.201 Sampling; general and technical requirements.
70.202 Approved sampling devices; maintenance and calibration.
70.203 Approved sampling devices; operation; air flowrate.
70.204 Demonstrating the adequacy of the dust control parameters specified in a mine ventilation plan; verification sampling.
70.205 Verification sampling; when required; time for completing.
70.206 Verification sampling; procedures for sampling.
70.207 Approval of dust control parameters by district manager; revocation of approval.
70.208 Follow-up action when either verification limit is exceeded.
70.209 Use of supplementary control measures; types and conditions for use; request for approval.
70.210 Powered air-purifying respirators (PAPRs); requirements for approval.
70.211 Powered air-purifying respirators (PAPRs); approval and conditions for continued use; revocation of approval.
70.212 Powered air-purifying respirators (PAPRs); conditions of use under special circumstances.
70.213 Administrative controls; requirements for approval.
70.214 Administrative controls; approval and conditions for continued use; revocation of approval.
70.215 Quarterly evaluation of approved plan parameters.
70.216 Respirable dust samples; transmission by operator.
70.217 Respirable dust samples; report to operator; and posting.
70.218 Violation of respirable dust standard; issuance of citation; action required by operator; and termination of citation.
70.219 Status change reports.
70.220 Personal continuous dust monitor (PCDM).

§ 70.201 Sampling; general and technical requirements.

(a) Each operator must conduct respirable dust sampling required by this part with an approved sampling device.

(b) Sampling must be performed by a certified person. To be certified, a person must pass the MSHA examination on sampling of respirable coal mine dust.

(c) Sampling devices must be worn or carried directly to and from the MMU to be sampled and must be operated in accordance with the requirements of this part.

(d) Except as provided in paragraph (h) of this section, one control filter must be used for each shift of sampling. Each control filter must have the same preweight date (noted on the dust data card) as the ones that are used for sampling; must remain plugged at all times; must be exposed to the same time, temperature, and handling conditions as the ones used for sampling; and must be kept with the exposed samples after sampling.

(e) Except as provided in paragraph (i) of this section, sampling must be conducted on a shift during which the amount of material produced by the MMU is at or above the verification production level (VPL), as defined in § 70.2, and using only the dust control parameters listed in the approved mine ventilation plan, at levels not exceeding 115 percent of the specified quantities.

(1) If the VPL is not achieved, the samples for that shift will be voided by MSHA. However, any sample, regardless of production, that exceeds either verification limit or applicable dust standard will be used to determine the equivalent concentration for that occupation.

(2) If the MMU being evaluated is authorized to use PAPRs under special circumstances (see § 70.212) and those circumstances prevent the operator from achieving the VPL, the sample(s) for that shift will be used to determine the equivalent concentration for the affected occupations.

(f) Each operator must provide affected miners and their representatives with an opportunity to observe respirable dust sampling required by this part and must give prior notice of the date and time of intended sampling to affected miners and their representatives. An operator is exempt from this requirement if using personal

continuous dust monitors in accordance with § 70.220.

(g) Upon request from the district manager, the operator must submit the date and time when any sampling required by this part will begin.

(h) Paragraph (d) of this section does not apply if sampling to conform with the requirements of § 70.215 or § 70.220(d).

(i) Paragraph (e) of this section does not apply if sampling to conform with the requirements of § 70.220(d).

§ 70.202 Approved sampling devices; maintenance and calibration.

(a) Sampling devices must be maintained as approved and calibrated by a certified person in accordance with MSHA Informational Report IR 1240 (1996) ''Calibration and Maintenance Procedures for Coal Mine Respirable Dust Samplers (supersedes IR 1121)'' or in accordance with the manufacturer's specifications if using a personal continuous dust monitor (PCDM) under § 70.220. To be certified, a person must pass the MSHA examination on maintenance and calibration for approved sampling devices.

(b) Sampling devices must be calibrated at the flowrate of 2.0 liters of air per minute, or at a different flowrate as prescribed by the Secretary and the Secretary of Health and Human Services for the particular device, before they are put into service and, thereafter, at time intervals prescribed by the manufacturer.

(c) If equipped with a flowmeter, a calibration mark must be placed on the flowmeter of each sampling device to indicate the proper position of the float when the sampler is operating at a flowrate of 2.0 liters of air per minute or other flowrate prescribed by the Secretary and the Secretary of Health and Human Services for the particular device. The standard to denote proper flow is when the lowest part of the float is lined up with the top of the calibration mark.

(d) Except as provided in paragraph (f) of this section, each sampling device must be tested and examined immediately before each sampling shift and necessary external maintenance must be performed by a certified person to assure that the sampling device is clean and in proper working condition. This testing and examination must include the following:

(1) Testing the voltage of each battery while under actual load to assure the battery is fully charged. The voltage for nickel cadmium cell batteries must not be lower than the product of the number of cells in the battery pack multiplied by 1.25. The voltage for other than nickel cadmium cell batteries must not be lower than the product of the number of cells in the battery pack multiplied by the manufacturer's nominal voltage per cell.

(2) Examination of all components of the cyclone to assure that they are clean and free of dust and dirt;

(3) Examination of the inner surface of the cyclone on the approved sampling device to assure that it is free of scoring;

(4) Examination of the external tubing on the approved sampling device to assure that it is clean and free of leaks, and;

(5) Examination of the clamping and positioning of the cyclone body, vortex finder and cassette to assure that they are rigid, in alignment, and firmly in contact.

(e) In accordance with 5 U.S.C. 552(a) and 1 CFR, part 51, MSHA Informational Report No. 1240 (1996) referenced in paragraph (a) of this section is incorporated-by-reference. Copies may be inspected or obtained without charge at each Coal Mine Safety and Health District office of MSHA.

(f) Paragraphs (d)(1) through (d)(5) of this section do not apply if using a PCDM. The operator must follow the examination procedures recommended by the manufacturer or prescribed by the Secretary and the Secretary of Health and Human Services for the particular device.

§ 70.203 Approved sampling devices; operation; air flowrate.

(a) Sampling devices must be operated at the flowrate of 2.0 liters of air per minute, or at a different flowrate as prescribed by the Secretary and the Secretary of Health and Human Services for the particular device.

(b) Except as provided in paragraphs (c) and (d) of this section, each sampling device must be examined each shift by a person certified to sample during:

(1) The second hour after being put into operation to assure that the sampling device is operating properly and at the proper flowrate. If the proper flowrate is not maintained, necessary adjustments must be made by the certified person.

(2) The last hour of operation to assure that the sampling device is operating properly and at the proper flowrate. If the proper flowrate is not maintained, the respirable dust sample must be transmitted to MSHA with a notation by the certified person on the back of the dust data card stating that the proper flowrate was not maintained. Also to be noted are any other events occurring during sampling that may affect the validity of the sample.

(c) Paragraph (b)(1) of this section will not apply if the approved sampling device is being operated in a breast or chamber of an anthracite coal mine where the full box mining method is used.

(d) Paragraphs (b)(1) and (2) of this section do not apply if using a personal continuous dust monitor in accordance with § 70.220. To assure that the personal dust monitor is operating properly and at the proper flowrate, the operator must follow the procedures recommended by the manufacturer or prescribed by the Secretary and the Secretary of Health and Human Services for the particular device.

§ 70.204 Demonstrating the adequacy of the dust control parameters specified in a mine ventilation plan; verification sampling.

As of _____ (Insert date which must be within 12 months of the effective date of this rule), each operator of an underground coal mine must have a ventilation plan in which the dust control parameters specified for each MMU have been verified through sampling to be adequate in controlling respirable dust as required by § 75.370(a)(1) of this title. To demonstrate that the plan parameters for each MMU are adequate, the operator must show, with a high level of confidence, that the equivalent concentration of respirable coal mine dust and respirable quartz dust can be maintained at or below the verification limits (2.0 mg/m^3 and 100 μg/m^3, respectively) as determined by meeting the critical values in Table 70–1.

§ 70.205 Verification sampling; when required; time for completing.

(a) The operator must, within 45 calendar days after obtaining provisional approval, verify the adequacy of the dust control parameters for each MMU when:

(1) Submitting a ventilation plan under § 75.370 for a newly established MMU.

(2) The district manager determines that the previously approved plan parameters are inadequate to control respirable dust under the prevailing operating conditions and requires the operator to revise the plan parameters.

(b) The district manager may, upon written request, grant the operator an extension of up to 30 calendar days to complete verification sampling.

(c) All previously approved ventilation plans must be revised in accordance with § 75.371(f) of this title and the adequacy of the dust control parameters verified by _____ (Insert date which must be within 12 months of the effective date of this rule.)

§ 70.206 Verification sampling; procedures for sampling.

(a) Each operator must sample the following occupations for each MMU:
(1) Designated occupation (DO);
(2) Roof bolter operator(s);
(3) Longwall jack setters; and
(4) Any other occupation designated by the district manager.

(b) Each sampling device must be turned ''ON'' upon arriving at the MMU to be sampled, must remain operational the entire period spent in the MMU, and must be turned ''OFF'' at the end of the shift as the device exits the MMU.

(c) Multiple-shift samples are not required to be collected on consecutive shifts. All samples collected during verification sampling must be submitted to MSHA.

(d) Unless otherwise directed by the district manager, the DO samples must be collected by placing the sampling device as follows:

(1) *Conventional section using cutting machine*—on the cutting machine operator or on the cutting machine within 36 inches inby the normal working position;

(2) *Conventional section shooting off the solid*—on the loading machine operator or on the loading machine within 36 inches inby the normal working position;

(3) *Continuous mining section other than auger-type*—on the continuous mining machine operator or on the continuous mining machine within 36 inches inby the normal working position;

(4) *Continuous mining machine; auger-type*—on the jacksetter who works nearest the working face on the return air-side of the continuous mining machine or at a location that represents the maximum concentration of dust to which the miner is exposed;

(5) *Scoop section using cutting machine*—on the cutting machine operator or on the cutting machine within 36 inches inby the normal working position;

(6) *Scoop section, shooting off the solid*—on the coal drill operator or on the coal drill within 36 inches inby the normal working position;

(7) *Longwall section*—on the miner who works nearest the return air-side of the longwall working face or along the working face on the return side within 48 inches of the corner;

(8) *Hand loading section with a cutting machine*—on the cutting machine operator or on the cutting machine within 36 inches inby the normal working position;

(9) *Hand loading section shooting off the solid*—on the hand loader exposed to the greatest dust concentration or at a location that represents the maximum concentration of dust to which the miner is exposed; and

(10) *Anthracite mine sections*—on the hand loader exposed to the greatest dust concentration or at a location that represents the maximum concentration of dust to which the miner is exposed.

(e) When sampling an occupation other than the DO, the sampling device must be placed on the miner assigned to that occupation, unless directed otherwise by the district manager.

§ 70.207 Approval of dust control parameters by district manager; revocation of approval.

(a) Approval of the dust control parameters specified in the ventilation plan will be granted when:

(1) No valid equivalent concentration measurement exceeds the critical values listed in Table 70–1 that correspond to the number of shifts sampled, and

(2) The specified dust control parameters incorporate the parameters used during verification sampling.

(b) MSHA approval may be revoked based on samples collected by MSHA or in accordance with § 70.215.

TABLE 70–1.—CRITICAL VALUES FOR DETERMINING COMPLIANCE WITH VERIFICATION LIMITS

If samples are submitted for	Critical values	
	Respirable coal mine dust	Respirable quartz dust
1 shift	1.71 mg/m^3	87 µg/m^3
2 shifts	1.85 mg/m^3	93 µg/m^3
3 shifts	1.93 mg/m^3	97 µg/m^3
4 or more shifts	2.0 mg/m^3	100 µg/m^3

§ 70.208 Follow-up action when either verification limit is exceeded.

If either verification limit is exceeded, the operator must:

(a) Stop sampling and make approved respiratory equipment available to affected miners in accordance with § 70.300;

(b) Determine the cause and take action to reduce the concentration of respirable dust to within the applicable verification limit; and

(c) Submit in writing, within 5 calendar days of receiving results of sampling, any proposed revision to the plan parameters to the district manager. The district manager will notify the operator in writing if the proposed revision is provisionally approved and whether to resume sampling from the point it was stopped or to begin sampling all over again. The district manager may require additional control measures before the operator may resume or initiate sampling in accordance with the requirements of § 70.206.

§ 70.209 Use of supplementary control measures; types and conditions for use; request for approval.

(a) If either verification limit is exceeded and the operator believes that the MMU is using all feasible engineering or environmental controls, the operator may request the Administrator for Coal Mine Safety and Health to approve the use of supplementary control measures to reduce exposure of individual miners assigned to work in the affected occupations to within the applicable verification limits. The operator must provide a copy of the submitted request to the representative of miners at the time of submittal. MSHA will consider all comments from the representative of miners and provide copies of these comments to the operator upon request.

(b) The Administrator will approve or deny the operator's request to use supplementary controls within 30 calendar days or as soon as practicable after its receipt by MSHA.

(1) If approval is denied, the operator will be notified in writing of specific reasons for disapproval.

(2) If approval is granted, the operator will be permitted to use either powered air-purifying respirators (PAPRs), approved by NIOSH under 42 CFR part 84 and by MSHA under part 18 of this title, administrative controls, or a combination of both, provided the requirements of §§ 70.210 and 70.211 or §§ 70.213 and 70.214 are met. The operator will be permitted to use these

supplementary controls until additional feasible engineering controls become available and are implemented or until the district manager revokes the approval.

(c) MSHA approval to use supplementary controls may be revoked for failure to comply with requirements of § 70.211(b) or § 70.214(b).

§ 70.210 Powered air-purifying respirators (PAPRs); requirements for approval.

(a) Within 5 calendar days of receiving MSHA approval to use supplementary controls, the operator must submit, in writing, a revision to the ventilation plan to the district manager. The proposed revision must include:

(1) Feasible engineering controls capable of:

(i) Reducing the concentration of respirable dust in every occupational environment where a PAPR is required as low as achievable; and

(ii) Maintaining other occupational environments at or below the verification limits.

(2) A written PAPR protection program which meets the requirements of § 72.710 and includes:

(i) The protection factor assigned to the MMU as determined in accordance with § 70.2; and

(ii) The specific occupation(s), work locations or tasks affected in the MMU. The district manager may require adjustments in the PAPR protection program.

(3) The location(s) in a MMU where warning signs with the statement ''RESPIRATORY PROTECTION REQUIRED IN THIS AREA'' will be posted.

(b) Within 30 calendar days of receiving provisional approval of the plan revision, the operator must verify, in accordance with § 70.206(b) through (e), the adequacy of the proposed revision by sampling the occupation(s) being affected by the PAPR protection program, the DO, and/or other occupation(s) designated by the district manager.

§ 70.211 Powered air-purifying respirators (PAPRs); approval and conditions for continued use; revocation of approval.

(a) MSHA approval of the proposed plan revision incorporating a PAPR protection program will be granted when:

(1) No valid equivalent concentration measurement exceeds the critical values listed in Table 70–1 to §70.207 that correspond to the number of shifts sampled; and

(2) The revision incorporates the dust control parameters used during verification sampling.

(b) MSHA may revoke approval to use supplementary controls for failure to:

(1) Comply with the plan requirements on each shift;

(2) Maintain the equivalent concentration of respirable coal mine dust for any occupation affected by a PAPR protection program and other occupations within the MMU at or below the applicable dust standard; and

(3) Implement other feasible engineering controls to reduce dust concentrations as low as achievable when such controls become available. The approved plan parameters will be reviewed every 6 months to assure that the operator is using all feasible engineering controls and that the plan parameters continue to be effective under current operating conditions.

§ 70.212 Powered air-purifying respirators (PAPRs); conditions of use under special circumstances.

(a) When unusual operating conditions are either encountered or anticipated, which are known to occur briefly and intermittently, and the operator has reason to believe that the approved plan parameters will not maintain all occupational environments in the MMU in compliance with § 70.100 or § 70.101, the operator may submit a written request to the district manager, along with a proposed revision to the plan parameters, for the use of PAPRs as a supplementary control measure to prevent individual miners from being overexposed and to comply with the applicable dust standard during such periods. The operator must provide a copy of the request to the representative of miners at the time of submittal. MSHA will consider all comments from the representative of miners and provide copies of these comments to the operator upon request.

(b) The district manager will approve the use of PAPRs on an intermittent basis as a result of the operational factors set forth in paragraph (a) of this section when the operator:

(1) Shows that the unusual conditions are atypical, intermittent and beyond the control of the operator; and

(2) Revises the previously approved dust control provisions of the ventilation plan to comply with requirements of § 70.210(a)(1), (2) and (3) when PAPRs are used.

(c) The operator also must:

(1) Notify the district manager and the representative of miners in writing or by electronic means within 24 hours of the occurrence of unusual conditions which requires the use of PAPRs;

(2) Comply with the requirements of § 70.211(b)(1) and (2); and

(3) Not use PAPRs for a period longer than 30 consecutive calender days;

(d) If PAPR use is to exceed 30 consecutive calendar days or if any equivalent concentration measurements indicate that miners are being overexposed, the operator must revise and verify the adequacy of the plan parameters under the prevailing operating conditions.

§ 70.213 Administrative controls; requirements for approval.

(a) Within 5 calendar days of receiving MSHA approval to use supplementary controls, the operator must submit, in writing, a revision to the ventilation plan to the district manager. The proposed revision must include:

(1) Feasible engineering controls capable of maintaining the environment of any occupation under administrative controls and other occupational environments at or below the verification limits; and

(2) The administrative controls to be implemented and the method for ensuring that the procedures for such controls are complied with on each shift. The district manager may require additional procedures in the plan revision.

(b) Within 30 calendar days of receiving provisional approval of the plan revision, the operator must verify, in accordance with § 70.206(b) through (e), the adequacy of the proposed revision by sampling the occupation(s) under administrative control, the DO, and/or other occupation(s) designated by the district manager.

§ 70.214 Administrative controls; approval and conditions for continued use; revocation of approval.

(a) MSHA will approve the proposed plan revision incorporating the use of administrative controls when:

(1) No valid equivalent concentration measurement exceeds the critical values listed in Table 70–1 that correspond to the number of shifts sampled; and

(2) The revision incorporates the dust control parameters used during verification sampling.

(b) MSHA may revoke approval to use supplementary controls for failure to:

(1) Comply with the plan requirements on each shift;

(2) Maintain the equivalent concentration of respirable coal mine dust for any occupation under administrative controls and other occupations in the MMU at or below the applicable dust standard; and

(3) Implement other feasible engineering controls to reduce dust concentrations as low as achievable when such controls become available. MSHA will review the approved plan

parameters every 6 months to assure that the operator is using all feasible environmental controls and that the plan parameters continue to be effective under current operating conditions.

§ 70.215 Quarterly evaluation of approved plan parameters.

(a) For those MMUs designated by MSHA, one valid respirable dust sample from the DO and the occupation(s) under supplementary controls must be submitted to MSHA on a quarterly basis. The occupations must be sampled in accordance with paragraphs (b), (d) and (e) of § 70.206.

(1) MSHA designates an MMU for sampling when any MSHA equivalent concentration measurement exceeds the applicable dust standard by at least 0.1 mg/m^3.

(2) Sampling is required until all MSHA and operator sample results remain at or below the applicable dust standard for at least four quarters.

(3) Sampling begins during the next quarterly period following MSHA designation of the MMU. The quarterly periods are:

(i) January 1–March 31

(ii) April 1–June 30

(iii) July 1–September 30

(iv) October 1–December 31.

(b) If any valid equivalent concentration measurement exceeds the applicable dust standard by 0.1 mg/m^3 or more , the operator must, make approved respiratory equipment available to affected miners in accordance with § 70.300, unless already under a PAPR protection program; and within 15 calender days after receipt of the respirable dust sample data report from MSHA:

(1) Determine the cause and take corrective action to reduce the equivalent concentration of respirable coal mine dust to within the applicable dust standard;

(2) Make a record of the reported excessive dust condition. The record must include the following:

(i) Date of sampling;

(ii) Location within the mine and the occupation where the sample was collected;

(iii) Measured dust concentration of each sample collected;

(iv) Corrective action being taken to reduce the concentration of respirable coal mine dust.

(c) If any valid equivalent concentration measurement exceeds the citation threshold value (CTV) listed in Table 70–2 that corresponds to the applicable dust standard, the district manager may require the operator to revise the plan parameters and verify their adequacy under the prevailing operating conditions.

(d) MSHA will cite an operator for failure to take corrective action to reduce the concentration of respirable dust in accordance with § 70.215(c)(1).

(e) Paragraph (a) of this section does not apply if using a personal continuous dust monitor under § 70.220.

§ 70.216 Respirable dust samples; transmission by operator.

(a) Within 24 hours after the end of the sampling shift, the operator must transmit, in containers provided by the manufacturer of the filter cassette, all samples collected to fulfill the requirements of this part, including the control filter cassettes if required to be used, to: Respirable Dust Processing Laboratory, Pittsburgh Safety and Health Technology Center, Cochrans Mill Road, Building 38, P.O. Box 18179, Pittsburgh, Pennsylvania 15236–0179, or to any other address designated by the district manager.

(b) The operator must not open or tamper with the seal of any filter cassette or alter the weight of any filter cassette before or after it is used.

(c) A person certified to take respirable dust samples must properly complete the dust data card for each filter cassette. The card must have an identification number identical to that on the cassette used to take the sample or used as a control filter and be submitted to MSHA with the sample. Each card must be signed by the certified person and must include that person's certification number. Samples with data cards not properly completed will be voided by MSHA.

(d) All samples submitted by the operator must be considered taken to fulfill the sampling requirement of this part, unless the sample has been identified in writing by the operator to the district manager, prior to the intended sampling shift, as a sample to be used for purposes other than required by this part.

(e) Paragraphs (a) through (d) of this section do not apply if using a PCDM under § 70.220, except when transmitting samples for quartz analysis along with the control filter cassette required by § 70.220(c).

§ 70.217 Respirable dust samples; report to operator; and posting.

(a) MSHA will provide the operator a report with the following data on all samples submitted in accordance with this part and samples collected by MSHA:

(1) The mine identification number;

(2) The location within the mine from which the samples were taken;

(3) The result of each sample taken in accordance with this part and by MSHA;

(4) The occupation code, where applicable;

(5) The reason for voiding any sample; and

(6) The engineering controls and their measured quantities, including other dust control parameters that were being used in the MMU when sampled by MSHA.

(b) The operator must post the following information on the mine bulletin board:

(1) The report of the results of all samples described in paragraph (a) of this section and the end-of-shift exposure data if using a personal continuous dust monitor (PCDM) under § 70.220.

(2) The engineering controls and their measured quantities, including other dust control parameters that were being used in the MMU when sampled by the operator or by MSHA.

(3) All written notifications from the district manager regarding any aspect of the verification procedures, including all correspondence submitted by the operator in accordance with §§ 70.209 and 70.212.

(c) The operator may remove all information pertaining to the verification process, such as sample results, the information specified in paragraph (b)(3) of this section, and written correspondence, after the district manager approves the dust control parameters specified in the ventilation plan. The notification required under § 70.212(c)(1) of the occurrence of special circumstances requiring the use of PAPRs must be posted no longer than 30 calendar days or until such time when it is no longer necessary to continue to use PAPRs, whichever time period is less.

(d) Results of samples collected by the operator in accordance with § 70.215 or by MSHA must be posted for at least 31 calendar days following receipt, including the information specified in paragraph (b)(2) of this section. If using a PCDM, the end-of-shift exposure data and information specified in paragraph (b)(2) of this section must be posted for at least 7 calendar days.

§ 70.218 Violation of respirable dust standard; issuance of citation; action required by operator; and termination of citation.

(a) If a valid equivalent concentration measurement for any occupation sampled by MSHA meets or exceeds the citation threshold value (CTV) listed in Table 70–2 that corresponds to the applicable dust standard in effect, the operator will be cited for a violation of § 70.100 or § 70.101.

(b) Upon receipt of a citation issued in accordance with paragraph (a) of this

section, the operator must take the following actions within the time for abatement fixed in the citation:

(1) Make respiratory equipment available to affected miners in accordance with § 70.300, unless already under a PAPR protection program;

(2) Determine the cause and take corrective action to reduce the equivalent concentration of respirable coal mine dust to within the applicable dust standard;

(3) Revise the plan parameters if the corrective action taken indicates that the dust control parameters originally approved for the MMU are inadequate for the current operating conditions; and

(4) Notify the district manager, in writing or by electronic means, within 24 hours after implementing corrective action(s).

(c) The citation will be terminated when:

(1) All valid equivalent concentration measurements of MSHA abatement samples are at or below the applicable dust standard. If compliance is demonstrated, the plan must incorporate the dust control parameters used during MSHA sampling; or,

(2) The revised plan parameters have been verified for the current operating conditions, if required by the district manager.

TABLE 70–2.—CITATION THRESHOLD VALUES (CTV) FOR CITING RESPIRABLE DUST VIOLATIONS BASED ON SINGLE-SHIFT MEASUREMENTS

Applicable dust standard (mg/m^3)	CTV (mg/m^3)
2.0	2.33
1.9	2.22
1.8	2.11
1.7	2.0
1.6	1.90
1.5	1.79
1.4	1.68
1.3	1.58
1.2	1.47
1.1	1.36
1.0	1.26
0.9	1.15
0.8	1.05
0.7	0.94
0.6	0.84
0.5	0.74
0.4	0.64
0.3	0.53
0.2	0.43

§ 70.219 Status change reports.

(a) If there is a change in operational status of the mine or a MMU that affects either the sampling requirements of this part or MSHA's ability to carry out its sampling responsibilities, the operator must report the change to the MSHA District Office or to any other MSHA office designated by the district manager. Status changes must be reported in writing within 3 working days after the change has occurred.

(b) Each specific operational status is defined as follows:

(1) Underground mine:

(i) Producing—has at least one MMU producing material.

(ii) Nonproducing—no material is being produced.

(iii) Abandoned—the work of all miners has been terminated and production activity has ceased.

(2) Mechanized mining unit:

(i) Producing—producing material from a working section.

(ii) Nonproducing—temporarily ceased production of material.

(iii) Abandoned—permanently ceased production of material.

§ 70.220 Personal continuous dust monitor (PCDM).

(a) An operator may implement a miner protection program based on the use of approved personal continuous dust monitors (PCDM) in conjunction with engineering and administrative controls specified in the ventilation plan.

(b) If PCDMs are to be used, the operator may include administrative controls in the proposed plan without obtaining approval from the Administrator for Coal Mine Safety and Health under § 70.209. The proposed plan must include:

(1) The engineering and administrative controls to be used and the method for ensuring that such controls are complied with each shift;

(2) The miners or occupations that will wear a PCDM each shift; and

(3) The procedures that ensure no miner will be exposed above the applicable dust standard in § 70.100(a) or § 70.101.

(c) The adequacy of the proposed plan in controlling exposure to respirable dust must be demonstrated as prescribed in § 70.204 by monitoring each miner's exposure. Each PCDM must be operated portal-to-portal and must remain operational the entire work shift or for 12 hours, whichever time is less. In addition, the operator must collect a respirable dust sample for quartz analysis from each occupation specified in paragraph (a) and in accordance with paragraphs (b), (d) and (e) of § 70.206. The district manager will approve the proposed plan in accordance with § 70.207(a).

(d) Following approval by the district manager, the exposure of each miner on a MMU must be monitored on every shift under the prevailing operating conditions, unless the operator demonstrated through verification sampling that the exposure of each miner working on the same shift is represented by sampling only the DO and/or another occupation(s) specified in § 70.206(a). Each PCDM must be operated portal-to-portal and must remain operational the entire shift or for 12 hours, whichever time is less.

(e) If any end-of-shift equivalent concentration measurement exceeds the applicable dust standard by 0.1 mg/m^3 or more, the requirements in paragraphs (c)(1) through (3), (d) and (e) of § 70.215 will apply.

PART 75—[AMENDED]

5. The authority citation for part 75 continues to read as follows:

Authority: 30 U.S.C. 811.

6. Section 75.370 of Subpart D is amended by adding paragraph (h) to read as follows:

§ 75.370 Mine ventilation plan; submission and approval.

* * * * *

(h) The operator must record the amount of material produced, as defined in § 70.2 of this title, by each MMU during each production shift, retain the records for six months, and make the records available to authorized representatives of the Secretary and the miners' representative.

7. Section 75.371 of Subpart D is amended by revising paragraphs (f) and (t) to read as follows:

§ 75.371 Mine ventilation plan; contents.

* * * * *

(f) Section and face ventilation systems used, including drawings illustrating how each system is used; and a description of each different dust suppression system used on equipment on working sections, including any specific work practices used to minimize the dust exposure of individual miners, along with information on the location of the roof bolter(s) during the mining cycle for each continuous miner section, and the cut sequence for each longwall mining section. For plans required to be verified pursuant to § 70.204 of this title, the length of each normal production shift and the verification production level (VPL), as determined in accordance with § 70.2 of this title, must be included for each working section.

* * * * *

(t) The location of each ''designated area,'' and the respirable dust controls

used at the dust generating sources for these locations.

* * * * *

8. Part 90 is revised to read as follows:

PART 90—MANDATORY HEALTH STANDARDS—COAL MINERS WHO HAVE EVIDENCE OF THE DEVELOPMENT OF PNEUMOCONIOSIS

Subpart A—General

Sec.

90.1 Scope.
90.2 Definitions.
90.3 Part 90 option; notice of eligibility; exercise of option.

Subpart B—Dust Standards, Rights of Part 90 Miners

90.100 Respirable dust standard when quartz is not present.
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Authority: 30 U.S.C. 811, 813(h).

Subpart A—General

§ 90.1 Scope.

This Part 90 establishes the option of miners who are employed at underground coal mines or at surface work areas of underground coal mines and who have evidence of the development of pneumoconiosis to work in an area of a mine where the average concentration of respirable dust in the mine atmosphere during each shift is continuously maintained at or below 1.0 milligrams per cubic meter of air. The proposed rule sets forth procedures for miners to exercise this option, and establishes the right of miners to retain their regular rate of pay and receive wage increases. The proposed rule also sets forth the operator's obligations, including respirable dust sampling for Part 90 miners. This Part 90 is promulgated pursuant to section 101 of the Act and supercedes section 203(b) of the Act.

§ 90.2 Definitions.

Act. The Federal Mine Safety and Health Act of 1977, Public Law 91–173, as amended by Public Law 95–164, 30 U.S.C. 801 *et seq.*

Active workings. Any place in a coal mine where miners are normally required to work or travel.

Approved sampling device. A sampling device of the constant-flow type:

(1) Approved by the Secretary and the Secretary of Health and Human Services under part 74 of this title; or

(2) Approved by the Secretary when it has been determined that the measured concentration of respirable dust can be converted to an equivalent concentration as measured with a sampling device approved under part 70 of this title.

Certified person. An individual certified by the Secretary to take respirable dust samples and/or to perform the maintenance and calibration of approved sampling devices.

Citation threshold value (CTV). The lowest equivalent concentration measurement demonstrating that the applicable dust standard has been exceeded at a confidence level of at least 95 percent.

Concentration. The amount of respirable dust contained per unit volume of air.

District manager. The manager of the Coal Mine Safety and Health District in which the mine is located.

Equivalent concentration. The concentration of respirable coal mine dust, as measured by an approved sampling device, converted to an MRE 8-hour equivalent as follows:

(1) Multiply the concentration measured by the approved sampling device by the constant factor prescribed by the Secretary for that device and then apply criteria in paragraph (2) of this definition if applicable.

(2) If the sampled shift is longer than 8 hours, multiply the concentration obtained in paragraph (1) of this definition by t/480 where t is the length of the sampled work shift in minutes.

Mechanized mining unit (MMU). A set of mining equipment, including hand loading equipment, used for the production of material; or a specialized set which utilizes mining equipment other than specified in § 70.206(d). Each MMU is assigned a four-digit identification number by MSHA. The identification number is retained by the MMU regardless of where the unit relocates within the mine. When two sets of mining equipment are provided in a series of working places and only one production crew is employed at any given time on either set of mining equipment, the two sets of equipment are identified as a single MMU. When two or more MMUs are simultaneously engaged in the production of material within the same working section, each such MMU is identified separately.

MRE. The Mining Research Establishment of the National Coal Board, London, England.

MRE instrument. A gravimetric dust sampler with a four channel horizontal elutriator developed by the MRE.

MSHA. The Mine Safety and Health Administration of the Department of Labor.

Normal work duties. Duties which the Part 90 miner performs on a routine day-to-day basis in his or her job classification at a mine.

Part 90 miner. A miner employed at an underground coal mine or at a surface work area of an underground coal mine who has exercised the option under the old section 203(b) program, or under § 90.3 of this part to work in an area of a mine where the average concentration of respirable dust in the mine atmosphere during each shift to which that miner is exposed is continuously maintained at or below 1.0 milligrams per cubic meter of air (mg/m^3), and who has not waived these rights.

Quartz. Crystalline silicon dioxide (SiO_2) as measured by:

(1) MSHA's Analytical Method P–7: Infrared Determination of Quartz in Respirable Coal Mine Dust; or

(2) Any method approved by MSHA as providing a measurement of quartz equivalent to that measured by Analytical Method P–7.

Respirable dust. Dust collected with an approved sampling device.

Secretary. The Secretary of Labor or a designee.

Surface work area of an underground coal mine. The surface areas of land and all structures, facilities, machinery, tools, equipment, shafts, slopes, excavations, and other property, real or personal, placed upon or above the surface of such land by any person, used in, or to be used in, or resulting from, the work of extracting bituminous coal, lignite, or anthracite from its natural deposits underground by any means or method, and the work of preparing extracted coal, and includes custom coal preparation facilities.

Transfer. (1) Any change in the work assignment of a Part 90 miner by the operator and includes—

(i) any change in occupation code of a Part 90 miner;

(ii) any movement of a Part 90 miner to or from a MMU; or

(iii) any assignment of a Part 90 miner to the same occupation in a different location at a mine.

(2) A change in work assignment that lasts no longer than one shift would not constitute a transfer under Part 90 if circumstances beyond the control of the operator interrupt work being performed by a Part 90 miner because of equipment malfunction or absenteeism, and necessitate the operator to temporarily assign the Part 90 miner to perform work duties outside of his or her regular work classification.

Underground coal mine. An area of land and all structures, facilities, machinery, tools, equipment, shafts, slopes, tunnels, excavations, and other property, real or personal, placed upon, under, or above the surface of such land by any person, used in, or to be used in, or resulting from the work of extracting in such area bituminous coal, lignite, or anthracite from its natural deposits in the earth by any means or method, and the work of preparing the coal so extracted.

Valid sample. A respirable dust sample collected and submitted as required by this part, and not voided by MSHA.

§ 90.3 Part 90 option; notice of eligibility; exercise of option.

(a) Any miner employed at an underground coal mine or at a surface work area of an underground coal mine who, in the judgment of the Secretary of Health and Human Services, has evidence of the development of pneumoconiosis based on a chest X-ray, read and classified in the manner prescribed by the Secretary of Health and Human Services, or based on other medical examinations must be afforded the option to work in an area of a mine where the average concentration of respirable dust in the mine atmosphere during each shift to which that miner is exposed is continuously maintained at or below 1.0 milligrams per cubic meter of air (mg/m^3). Each of these miners must be notified in writing of eligibility to exercise the option.

(b) Any miner who is a section 203(b) miner on January 31, 1981, must be a Part 90 miner on February 1, 1981, entitled to full rights under this part to retention of pay rate, future actual wage increases, and future work assignment shift and respirable dust protection.

(c) Any Part 90 miner who is transferred to a position at the same or another coal mine must remain a Part 90 miner entitled to full rights under this part at the new work assignment.

(d) The option to work in a low dust area of the mine may be exercised for the first time by any miner employed at an underground coal mine or at a surface work area of an underground coal mine who was eligible for the option under the old section 203(b) program, or is eligible for the option under this part by signing and dating the Exercise of Option Form and mailing the form to the Chief, Division of Health, Coal Mine Safety and Health, MSHA, 1100 Wilson Boulevard, Arlington, Virginia 22209.

(e) The option to work in a low dust area of the mine may be re-exercised by any miner employed at an underground coal mine or at a surface work area of an underground coal mine who exercised the option under the old section 203(b) program, or exercised the option under this part by sending a written request to the Chief, Division of Health, Coal Mine Safety and Health, MSHA, 1100 Wilson Boulevard, Arlington, Virginia 22209. The request should include the name and address of the mine and operator where the miner is employed.

(f) No operator shall require from a miner a copy of the medical information or notification of any chest X-ray evaluation received from the Secretary or Secretary of Health and Human Services.

Subpart B—Dust Standards, Rights of Part 90 Miners

§ 90.100 Respirable dust standard when quartz is not present.

After the 20th calendar day following receipt of notification from MSHA that a Part 90 miner is employed at the mine, the operator must continuously maintain the average concentration of respirable dust in the mine atmosphere during each shift to which the Part 90 miner in the active workings of the mine is exposed at or below 1.0 mg/m^3, as measured with an approved sampling device and in terms of an equivalent concentration determined in accordance with § 90.2.

§ 90.101 Respirable dust standard when quartz is present.

When the respirable dust in the mine atmosphere of the active workings to which a Part 90 miner is exposed contains more than 10 percent quartz, as determined by the average of the most recent three MSHA samples, the operator must continuously maintain the average concentration of respirable dust in the mine atmosphere during each shift to which a Part 90 miner is exposed at or below the applicable dust standard, as measured with an approved sampling device and in terms of an equivalent concentration determined in accordance with § 90.2. The applicable dust standard is determined by dividing the average quartz percentage into the number 10. The application of the formula must not result in an applicable dust standard in excess of 1.0 mg/m^3.

Example: Assume a Part 90 miner is on a 1.0-mg/m^3 applicable dust standard (10% quartz or less). If the first MSHA sample contains 12.2% of quartz, and the required two subsequent samples contained 14.6% and 10.4%, respectively, the average quartz percentage would be 12.4% [(12.2% + 14.6% + 10.4%)/3 = 12.4%]. Therefore, the average concentration of respirable dust in the mine atmosphere associated with that Part 90 miner must, on each shift, be maintained at or below 0.8 mg/m^3 [10/12.4% = 0.8 mg/m^3].

§ 90.102 Transfer; notice.

(a) Whenever a Part 90 miner is transferred in order to meet the applicable dust standard in §§ 90.100 or 90.101, the operator must transfer the miner to an existing position at the same coal mine on the same shift or shift rotation on which the miner was employed immediately before the transfer. The operator may transfer a Part 90 miner to a different coal mine, a newly-created position or a position on a different shift or shift rotation if the miner agrees in writing to the transfer. The requirements of this paragraph do not apply when a Part 90 miner's work position complies with the applicable dust standard but circumstances, such as reductions in workforce or changes in operational methods, require a change in the miner's job or shift assignment.

(b) On or before the 20th calendar day following receipt of notification from MSHA that a Part 90 miner is employed at the mine, the operator must give the district manager written notice of the occupation and, if applicable, the mechanized mining unit to which the Part 90 miner will be assigned on the 21st calendar day following receipt of the notification from MSHA.

(c) After the 20th calendar day following receipt of notification from MSHA that a Part 90 miner is employed at the mine, the operator must give the district manager written notice before any transfer of a Part 90 miner. This notice must include the scheduled date of the transfer.

§ 90.103 Compensation.

(a) The operator must compensate each Part 90 miner at not less than the regular rate of pay received by that

miner immediately before exercising the option under § 90.3.

(b) Whenever a Part 90 miner is transferred, the operator must compensate the miner at not less than the regular rate of pay received by that miner immediately before the transfer.

(c) Paragraphs (a) and (b) of this section do not apply when a Part 90 miner initiates and accepts a change in work assignment for reasons of job preference.

(d) The operator must compensate each miner who is a section 203(b) miner on January 31, 1981, at not less than the regular rate of pay that the miner is required to receive under section 203(b) of the Act immediately before the effective date of this part.

(e) In addition to the compensation required to be paid under paragraphs (a), (b) and (d) of this section, the operator must pay each Part 90 miner the actual wage increases that accrue to the classification to which the miner is assigned.

(f) If a miner is temporarily employed in an occupation other than his or her regular work classification for two months or more before exercising the option under § 90.3, the miner's regular rate of pay for purposes of paragraph (a) and (b) of this section is the higher of the temporary or regular rates of pay. If the temporary assignment is for less than two months, the operator may pay the Part 90 miner at his or her regular work classification rate regardless of the temporary wage rate.

(g) If a Part 90 miner is transferred, and the Secretary subsequently notifies the miner that notice of the miner's eligibility to exercise the Part 90 option was incorrect, the operator must retain the affected miner in the current position to which the miner is assigned and continue to pay the affected miner the applicable rate of pay provided in paragraphs (a), (b), (d) and (e) of this section, until:

(1) The affected miner and operator agree in writing to a position with pay at not less than the regular rate of pay for that occupation; or

(2) A position is available at the same coal mine in both the same occupation and on the same shift on which the miner was employed immediately before exercising the option under § 90.3 or under the old section 203(b) program.

(i) When such a position is available, the operator must offer the available position in writing to the affected miner with pay at not less than the regular rate of pay for that occupation.

(ii) If the affected miner accepts the available position in writing, the operator must implement the miner's reassignment upon notice of the miner's acceptance. If the miner does not accept the available position in writing, the miner may be reassigned and protections under this Part 90 shall not apply. Failure by the miner to act on the written offer of the available position within 15 days after notice of the offer is received from the operator shall operate as an election not to accept the available position.

§ 90.104 Waiver of rights; re-exercise of option.

(a) A Part 90 miner may waive his or her rights and be removed from MSHA's active list of miners who have rights under Part 90 by:

(1) Giving written notification to the Chief, Division of Health, Coal Mine Safety and Health, MSHA, that the miner waives all rights under this part;

(2) Applying for and accepting a position in an area of a mine which the miner knows exceeds the applicable dust standard; or

(3) Refusing to accept another position offered by the operator at the same coal mine that meets the requirements of §§ 90.100, 90.101 and 90.102(a) after dust sampling shows that the existing work position exceeds the applicable dust standard.

(b) If rights under this Part 90 are waived, the miner gives up all rights under this Part 90 until the miner re-exercises the option in accordance with § 90.3(e).

(c) If rights under this Part 90 are waived, the miner may re-exercise the option under this part in accordance with § 90.3(e) at any time.

Subpart C—Sampling Procedures

§ 90.201 Sampling; general requirements.

(a) Each operator must conduct respirable dust sampling required by this part with an approved sampling device to assure that the assigned work position of a new or transferred Part 90 miner meets §§ 90.100 or 90.101.

(b) Sampling must be performed by a certified person. To be certified, a person must pass the MSHA examination on sampling of respirable coal mine dust.

(c) The sampling device must be worn by each Part 90 miner, must be operated portal-to-portal, and must be operational during the Part 90 miner's entire work shift.

(d) Sampling required by this part must be conducted while the Part 90 miner is performing normal work duties.

(e) Unless otherwise directed by the district manager, the sampling device must be placed:

(1) On the Part 90 miner;

(2) On the piece of equipment which the Part 90 miner operates within 36 inches of the normal working position; or

(3) At a location that represents the maximum concentration of respirable dust to which the Part 90 miner is exposed.

(f) Upon request from the district manager, the operator must submit the date and time when sampling required by this part will begin.

§ 90.202 Approved sampling devices; maintenance and calibration.

(a) Sampling devices must be maintained as approved and calibrated by a certified person in accordance with MSHA Informational Report IR 1240 (1996) ''Calibration and Maintenance Procedures for Coal Mine Respirable Dust Samplers ''(supercedes IR 1121).'' To be certified, a person must pass the MSHA examination on maintenance and calibration for approved sampling devices.

(b) Sampling devices must be calibrated at the flowrate of 2.0 liters of air per minute, or at a different flowrate as prescribed by the Secretary and the Secretary of Health and Human Services for the particular device, before they are put into service and, thereafter, at time intervals prescribed by the manufacturer.

(c) If equipped with a flowmeter, a calibration mark must be placed on the flowmeter of each sampling device to indicate the proper position of the float when the sampler is operating at a flowrate of 2.0 liters of air per minute or other flowrate prescribed by the Secretary and the Secretary of Health and Human Services for the particular device. The standard to denote proper flow is when the lowest part of the float is lined up with the top of the calibration mark.

(d) Each sampling device must be tested and examined immediately before each sampling shift and necessary external maintenance must be performed by a certified person to assure that the sampling device is clean and in proper working condition. This testing and examination must include the following:

(1) Testing the voltage of each battery while under actual load to assure the battery is fully charged. The voltage for nickel cadmium cell batteries must not be lower than the product of the number of cells in the battery pack multiplied by 1.25. The voltage for other than nickel cadmium cell batteries must not be lower than the product of the number of cells in the battery pack multiplied by

the manufacturer's nominal voltage per cell value;

(2) Examination of all components of the cyclone to assure that they are clean and free of dust and dirt;

(3) Examination of the inner surface of the cyclone on the approved sampling device to assure that it is free of scoring;

(4) Examination of the external tubing on the approved sampling device to assure that it is clean and free of leaks; and

(5) Examination of the clamping and positioning of the cyclone body, vortex finder and cassette to assure that they are rigid, in alignment, and firmly in contact.

(e) In accordance with 5 U.S.C. 552(a) and 1 CFR, part 51, MSHA Informational Report No. 1240 (1996) referenced in paragraph (a) of this section is hereby incorporated-by-reference. Copies may be inspected or obtained at each Coal Mine Safety and Health office of MSHA.

§ 90.203 Approved sampling devices; operation; air flowrate.

(a) Sampling devices must be operated at the flowrate of 2.0 liters of air per minute, or at a different flowrate as prescribed by the Secretary and the Secretary of Health and Human Services for the particular device.

(b) Except as provided in paragraph (c) of this section each sampling device must be examined each shift by a person certified to sample during:

(1) The second hour after being put into operation to assure that the sampling device is operating properly and at the proper flowrate. If the proper flowrate is not maintained, necessary adjustments must be made by the certified person.

(2) The last hour of operation to assure that the sampling device is operating properly and at the proper flowrate. If the proper flowrate is not maintained, the respirable dust sample must be transmitted to MSHA with a notation by the certified person on the back of the dust data card stating that the proper flowrate was not maintained. Other events occurring during sampling that may affect the validity of the sample must also be noted on the back of the dust data card.

(c) Paragraph (b)(1) of this section will not apply if the sampling device is being operated in a breast or chamber of an anthracite coal mine where the full box mining method is used.

§ 90.204 Respirable dust sampling.

(a) The operator must collect five valid samples for each Part 90 miner within 15 calendar days after:

(1) The 20-day period specified for each Part 90 miner in § 90.100; and

(2) Implementing any transfer after the 20th calendar day following receipt of notification from MSHA that a part 90 miner is employed at the mine; and

(b) When any valid sample collected in accordance with either paragraph (a) or (b) of this section exceeds the applicable dust standard by at least 0.1 mg/m^3, the operator must, within 15 calendar days following receipt of notification from MSHA:

(1) Take corrective action by reducing the respirable dust level in the Part 90 miner's assigned work position or transferring the Part 90 miner to another work position that meets the applicable dust standard; and

(2) Sample the affected Part 90 miner until five valid samples are collected.

(c) When any valid sample taken in accordance with paragraph (b)(2) of this section exceeds the applicable dust standard by at least 0.1 mg/m^3, the operator will be cited for a violation of paragraph (b)(1) of this section.

§ 90.205 Respirable dust samples; transmission by operator.

(a) Within 24 hours after the end of the sampling shift, the operator must transmit, in containers provided by the manufacturer of the filter cassette, all samples collected to fulfill the requirements of this part to: Respirable Dust Processing Laboratory, Pittsburgh Safety and Health Technology Center, Cochrans Mill Road, Building 38, P.O. Box 18179, Pittsburgh, Pennsylvania 15236–0179, or to any other address designated by the district manager.

(b) The operator must not open or tamper with the seal of any filter cassette or alter the weight of any filter cassette before or after it is used.

(c) A person certified to take respirable dust samples must properly complete the dust data card for each filter cassette. The card must have an identification number identical to that on the cassette used to take the sample and be submitted to MSHA with the sample. Each card must be signed by the certified person and must include that person's certification number. Samples with data cards not properly completed will be voided by MSHA.

(d) All samples submitted by the operator must be considered taken to fulfill the sampling requirements of this part, unless the sample has been identified in writing by the operator to the district manager, prior to the intended sampling shift, as a sample to be used for purposes other than required by this part.

§ 90.206 Respirable dust samples; report to operator and Part 90 miner.

(a) MSHA will provide the operator a report with the following data on all samples submitted by the operator in accordance with this part and samples collected by MSHA:

(1) The mine identification number;

(2) The location within the mine from which the samples were taken;

(3) The results of each sample taken in accordance with this part and by MSHA;

(4) The occupation code;

(5) The reason for voiding any sample;

(6) The Social Security Number of the Part 90 miner; and

(7) The respirable dust control measures that were being used in the position of the Part 90 miner sampled by MSHA and their measured quantities;

(b) Upon receipt, the operator must provide a copy of this report to the Part 90 miner. The operator must not post the original or a copy of this report on the mine bulletin board.

§ 90.207 Violation of respirable dust standard; issuance of citation; action required by operator; and termination of citation.

(a) If a valid equivalent concentration measurement for any Part 90 miner sampled by MSHA meets or exceeds the citation threshold value (CTV) listed in Table 70–2 to §70.218 of this title that corresponds to the applicable dust standard in effect, the operator will be cited for a violation of § 90.100 or § 90.101.

(b) Upon receipt of a citation issued in accordance with paragraph (a) of this section, the operator must take the following action within the time for abatement fixed in the citation:

(1) Make approved respiratory protection equipment available to the affected Part 90 miner in accordance with § 70.300;

(2) Determine the cause and take corrective action to reduce the equivalent concentration of respirable coal mine dust to within the applicable dust standard. If the corrective action involves:

(i) Reducing the respirable dust level in the position of the Part 90 miner, the operator must notify the district manager, in writing or by electronic means, within 24 hours after implementing the control measures.

(ii) Transferring the Part 90 miner to another position at the mine to meet the applicable dust standard, the operator must comply with § 90.102(c) and then sample the affected miner until five valid samples are collected.

(c) The citation will be terminated when a valid equivalent concentration measurement taken by MSHA is at or below the applicable dust standard. If the violation was abated by:

(1) Reducing the respirable dust level in the working position of the Part 90 miner, the operator must submit a respirable dust control plan to the district manager for approval in accordance with § 90.300.

(2) Transferring the Part 90 miner to another position at the mine, a respirable dust control plan is not required to be submitted to the district manager for approval.

§ 90.208 Status change reports.

If there is a change in the status of the Part 90 miner that either affects the sampling requirements of this part or MSHA's ability to carry out its sampling responsibilities (such as entering a terminated, injured or ill status, or returning to work), the operator must report the change in the status of the Part 90 miner to the MSHA District Office or to any other MSHA office designated by the district manager. Status changes must be reported in writing within 3 working days after the status change has occurred.

Subpart D—Respirable Dust Control Plans

§ 90.300 Respirable dust control plan; filing requirements; contents.

(a) Within 15 calendar days after the termination date of a citation for violation of § 90.100 or § 90.101, the operator must submit to the district manager for approval a written respirable dust control plan applicable to the Part 90 miner in the position identified in the citation. The dust control plan and revisions thereof must be suitable to the conditions and the mining system of the coal mine and must be adequate to continuously maintain respirable dust within the permissible concentration for the Part 90 miner in the position identified in the citation.

(b) The dust control plan must contain the information described below and any additional provisions required by the district manager:

(1) The mine identification number assigned by MSHA, the operator's name, mine name, mine address, and mine telephone number and the name, address and telephone number of the principal officer in charge of health and safety at the mine;

(2) The name and Social Security number of the Part 90 miner and the position at the mine to which the plan applies;

(3) A detailed description of the specific dust control measures used to abate the violation of § 90.100 or § 90.101; and

(4) A detailed description of how each of the dust control measures described in response to paragraph (b)(3) of this section will continue to be used by the operator, including at least the specific time, place and manner the control measures will be used.

§ 90.301 Respirable dust control plan; approval by district manager; copy to Part 90 miner.

(a) The district manager will approve each dust control plan on a mine-by-mine basis. Additional measures may be required in plans by the district manager. When approving such plans, the district manager will consider the results of MSHA sampling and whether:

(1) The dust control measures specified in the plan would be likely to continuously maintain compliance with the applicable dust standard; and

(2) The operator's compliance with all plan provisions could be readily verified by MSHA.

(b) MSHA will conduct sampling to monitor the continued effectiveness of the approved plan provisions in maintaining compliance with the applicable dust standard.

(c) The operator must comply with all plan provisions upon notice from MSHA that the dust control plan is approved.

(d) The operator must provide a copy of the dust control plan required under this part to the Part 90 miner. The operator must not post the original or a copy of the plan on the mine bulletin board.

(e) The operator may review respirable dust control plans and submit proposed revisions to such plans to the district manager for approval.

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