Seixas, N.S., T.G. Robins, M.D. Attfield, and L.H. Moulton. *Exposure-response relationships for coal mine dust and obstructive lung disease following enactment of the Federal Coal Mine Health and Safety Act of 1969.* Am. J. Ind. Med. 21: 715–734, 1992.

Senate Report Number 95–181, at 21–22, *reprinted* in 1977 United States Code Congressional and Administrative News. 3421–22, 1977.

Silverman, L., C.E. Billings, and M.W. First. Particle Size Analysis in Industrial Hygiene. Academic Press, NY., 1971.

Snipes, M.B. *Current information on lung overload in nonrodent mammals: contrast with rats.* Inhal. Toxicol. 8 (suppl.): 91–109, 1996.

Soutar, C.A., and J.F. Hurley. *Relationship between dust exposure and lung function in miners and ex-miners.* Brit. J. Ind. Med. 43: 307–320, 1986.

Soutar, C.A., B.G. Miller, N. Gregg, A.D. Jones, R.T. Cullen, and R.E. Bolton. *Assessment of human risks from exposure to low toxicity occupational dusts.* Ann. Occup. Hyg. 41 (2): 123–133, 1997.

Starzynski, Z., K. Marek, A. Kujawska and W. Szymczak. *Mortality among different occupational groups of workers with pneumoconiosis: results from a register-based cohort study.* Amer. J. Ind. Med. 30: 718–725, 1996.

Tomb, T.F. Memorandum of August 31, 1981, from Thomas F. Tomb, Chief, Dust Division, Pittsburgh Health Technology Center, MSHA, to William Sutherland, Chief, Division of Health, Coal Mine Safety and Health, MSHA, Subject: *Evaluation of Criterion Used to Select Respirable Coal Mine Dust Samples for Examination for Oversize Particles.*

Tomb, T.F. Memorandum of February 16, 1996, from Thomas F. Tomb, Chief, Dust Division, Pittsburgh Safety and Health Technology Center, MSHA, to Ronald J. Schell, Chief, Division of Health, Coal Mine Safety and Health, MSHA, Subject: *Investigation to Determine the Precision of MSHA's Automatic Weighing System for Weighing Respirable Coal Mine Dust Samples.*

Tomb, T.F., H.N. Treaftis, R.L. Mundell, and P.S. Parobeck. *Comparison of Respirable Dust Concentrations Measured With MRE and Modified Personal Gravimetric Sampling Equipment.* BuMines RI 7772, 1973.

Tomb, T.F. Memorandum of September 1, 1994, from Thomas F. Tomb, Chief, Dust Division, Pittsburgh Safety and Health Technology Center, MSHA, to Ronald J. Schell, Chief, Division of Health, Coal Mine Safety and Health, MSHA, Subject: *Determination of the Precision of Setting the Rotameter Ball to a Calibration Mark on Personal Respirable Dust Sampling Pumps.*

Treaftis, H.N. and T.F. Tomb. *Effect of Orientation on Cyclone Penetration Characteristics.* Am. Ind. Hyg. Assoc. J., 35(10): 598–602, 1974.

Treaftis, H.N., T.F. Tomb, and H.F. Carden. *Effect of altitude on personal respirable dust sampler calibration.* Am. Ind. Hyg. Assoc. J., 37(3): 133–138, 1976.

United Steelworkers of America v. *Marshall,* 647 F.22d 1189, 1265 (D.C. Cir. 1981).

U.S. Bureau of the Census, *Current Population Reports,* Table 18. Resident Population, by Race, 1980 to 1996, and Projections, 1997 to 2050, P25–1095 and P25–1130; and Population Paper Listing PPL–57, March 1997.

U.S. Bureau of the Census, *Current Population Reports,* Table 119. Expectation of Life and Expected Deaths, by Race, and Age: 1994, March 1997.

U.S. EPA, Guidelines and methodology used in the preparation of health effects assessment chapters of the consent decree water criteria documents. **Federal Register** 45(231): 79347–79357, 1980.

Wagner, G.R. Letter of May 28, 1997, from Gregory R. Wagner, M.D., Acting Associate Director for Mining, National Institute for Occupational Safety and Health, to Ronald J. Schell, Chief, Division of Health, Coal Mine Safety and Health, MSHA.

Wagner, G.R. Letter of October 13, 1995, from Gregory R. Wagner, M.D., National Institute for Occupational Safety and Health, to Ronald J. Schell, Chief, Division of Health, Coal Mine Safety and Health, Mine Safety and Health Administration.

Wang, X., E. Yano, K. Nonaka, M. Wang, and Z. Wang. *Respiratory impairments due to dust exposure: a comparative study among workers exposed to silica, asbestos, and coalmine dust.* Amer. J. Ind. Med. 31: 495–502, 1997.

Webster, J.B., C.W. Chiaretta, and J. Behling. *Dust Control in High Productivity Mines.* SME Annual Meeting, Preprint, Society for Mining, Metallurgy, and Exploration, Inc (SME), Littleton, CO, 90–82, 1990.

Weiss, S.T. M.R. Segal, D. Sparrow, and C. Wager. *Relation of* FEV_1 and peripheral blood leukocyte count to total mortality. *The normative aging study.* Am. J. Epidemiol. 142(5): 493–498, 1995.

West, J.B. Respiratory Physiology—The Essentials. Williams and Wilkins Publishers, Baltimore, MD, 1990.

West, J.B. Pulmonary Pathophysiology—The Essentials. Williams and Wilkins Publishers, Baltimore, MD, 1992.

Witschi, H. *Lung overload: a challenge for toxicology.* J. Aerosol Med. 3: S189–S196, 1990.

Yi, Q. and Z. Zhang. *The survival analyses of 2738 patients with simple pneumoconiosis* Occup. Environ. Med. 53: 129–135, 1996.

XVI. Regulatory Text

List of Subjects in 30 CFR Part 72

Coal, Health standards, Mine safety and health, Underground mines, Miscellaneous.

Dated: May 31, 2000.

Alexis M. Herman,

Secretary, Department of Labor.

Dated: May 31, 2000.

Donna E. Shalala,

Secretary, Department of Health and Human Services.

Accordingly, it is proposed by the Department of Labor, Mine Safety and Health Administration, to amend chapter I of title 30 of the Code of Federal Regulations as follows:

PART 72—[AMENDED]

1. The authority citation for part 72 continues to read as follows:

Authority: 30 U.S.C. 811, 813(h), 957, 961.

2. Section 72. 500 is added to subpart E of part 72 to read as follows:

§ 72.500 Single, full-shift measurement of respirable coal mine dust.

The Secretary may use a single, full-shift measurement of respirable coal mine dust to determine average concentration on a shift if that measurement accurately represents atmospheric conditions to which a miner is exposed during such shift.

[FR Doc. 00–14075 Filed 7–6–00; 8:45 am]

BILLING CODE 4510–43–P

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 hearings.

SUMMARY: MSHA is proposing to revoke existing operator respirable dust sampling procedures under parts 70 and 90, and to implement new regulations that would require each underground coal mine operator to have a verified mine ventilation plan. Under this proposal, MSHA would verify the effectiveness of the mine ventilation plan for each mechanized mining unit (MMU) in controlling respirable dust under typical mining conditions. MSHA would collect full-shift respirable dust samples, called ''verification 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 2.0 mg/m^3 and 100 μg/m^3, respectively. The adequacy of these parameters would be demonstrated on shifts during which the amount of the 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.

The proposal would require mine operators to: First, set and maintain the dust control parameters during MSHA verification sampling at levels specified in the plan; second, maintain and make available to MSHA records of the amount of material produced by each mechanized mining unit during each production shift; and third, additional information in mine ventilation plans. For longwall mine operations, MSHA is also proposing to permit the use of either approved powered, air-purifying respirators (PAPRs) or verifiable administrative controls as a supplemental means of compliance if MSHA has determined that further reduction in respirable dust levels cannot be achieved using all feasible engineering or environmental controls appropriate for the operational conditions involved. In addition, through this rule, MSHA would conduct all compliance and abatement sampling under existing parts 70 and 90.

DATES: Comments on the proposed rule should be submitted on or before August 7, 2000.

We are also announcing that we will hold public hearings on the proposed rule within 30 to 45 days of the publication of this rule. The hearing dates, times and specific locations will be announced by a separate document in the **Federal Register**. The rulemaking record will remain open 7 days after the last public hearing.

ADDRESSES: You may use mail, facsimile (fax), or electronic mail to send your comments to MSHA. Clearly identify comments as such and send them—(1) By mail to: Carol J. Jones, Director, Office of Standards, Regulations, and Variances, MSHA, 4015 Wilson Boulevard, Room 631, Arlington, VA 22203;

(2) By fax to: MSHA, Office of Standards, Regulations, and Variances, 703–235–5551; or

(3) By electronic mail to: comments@msha.gov. Written comments on the information collection requirements may be submitted directly to the Office of Information and Regulatory Affairs, OMB, New Executive Office Building, 725 17th Street, NW, Washington, DC 20503, Attn: Desk Officer for MSHA; and to Carol J. Jones, Director, Office of Standards, Regulations, and Variances, MSHA 4015 Wilson Boulevard, Room 631, Arlington, VA 22203; by facsimile to MSHA, at 703–235–5551; or by electronic mail to comments@msha.gov.

The hearings will be held in the following locations: Prestonsburg, Kentucky, (Jenny Wiley State Resort Park); Morgantown, West Virginia; and Salt Lake City, Utah. The hearing dates, times and specific locations will be announced by a separate document in the **Federal Register**.

FOR FURTHER INFORMATION CONTACT: Carol J. Jones, Director, Office of Standards, Regulations, and Variances, MSHA; 703–235–1910.

SUPPLEMENTARY INFORMATION:

I. Table of Contents

The preamble discusses: revocation of existing operator respirable dust sampling requirements, revised procedures for adjusting the respirable dust standard when quartz is present, the proposed rule, engineering controls for respirable coal mine dust, dust control parameters, supplemental controls, health effects of exposure to respirable coal mine dust, degree and significance of the reduction in the number of shifts during which there are overexposures, an analysis of the technological and economical feasibility of this proposed rule, and regulatory impact and flexibility analyses.

The preamble discussion follows this outline:

II. Background

Maintaining a work environment free of excessive levels of respirable coal mine dust and quartz dust (respirable dust) is essential for long-term health protection. Through the joint promulgation of the single, full-shift sample and plan verification proposals, miners would be further protected from the debilitating effects of occupational

respiratory disease by limiting their exposures to respirable coal mine dust to no more than the applicable standard on each shift.[1]

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 current MSHA regulations, when coal mine dust contains more than five percent quartz, the respirable coal mine dust standard is further reduced, by means of a formula. Although MSHA does not currently 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 quartz concentrations to 100 $\mu g/m^3$.

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 work environment where miners work or travel through the application of feasible environmental or engineering control measures. Engineering or environmental control of respirable dust in the mine environment is the ultimate dust-control technique and the principal method for protecting miners' health. These include all methods that control respirable dust levels 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. For full compliance, mine operators must develop, implement, and maintain effective engineering or environmental control measures, and evaluate them at regular intervals to assure that they function as intended. These control measures or ''dust control parameters,'' are specified in the dust control portion of the operator's mine ventilation plan currently required 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 is 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. Section 70.2 defines an MMU to mean ''a unit of mining equipment including hand loading equipment used for the production of material.'' The plans provide a description of specific engineering control measures in use. The plans also contain 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. By monitoring the parameters, one can be assured that respirable dust levels are being adequately controlled without needing to rely on repeated dust sample analyses.

Implementing dust control parameters, which 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 currently used in underground coal mines, adhering to effective ventilation plans is the only practical means of reasonably assuring, 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. Based on the recommendations of the MSHA 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 important for an effective respirable dust control strategy.

Recent advances in technology may 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). Section 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 for real-time data on the performance, the condition of key dust control parameters, and for immediate modification of controls, 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 inspector sampling results, the average dust concentration in the environment of a continuous miner operator (occupation code—036) has been reduced by 86 percent over the past 30 years, from 7.7 mg/m^3 to approximately 1.1 mg/m^3. This accounts for the significant decline in the percentage of operator continuous miner designated occupation (DO) samples exceeding 2.0 mg/m^3, from 49 percent (over 32,000 samples/shifts) in 1971, to 10 percent (over 2,500 samples/shifts) in 1999. Analysis of all valid operator DO samples indicates that in 1971, the 2.0 mg/m^3-dust standard was exceeded on 53,463 (44 percent) of the 122,404 shifts sampled, compared to 3,002 (10 percent) of the 28,727 shifts sampled in 1999 (MSHA, DO Samples by Calendar Year, 1999). 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).

Certain aspects of the current respirable dust program limit MSHA's ability to assure the adequacy of the dust control parameters under typical mining conditions according to two expert panels which reviewed the federal program designed to prevent pneumoconiosis among coal miners. Both the *Coal Mine Respirable Dust Task Group,* an interagency task group

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

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,* established in 1995 by the Secretary of Labor, considered all aspects of the respirable coal mine dust control program and made recommendations for improvement.

A. Coal Mine Respirable Dust Task Group

In response to concerns about the Federal coal mine dust program (MSHA, 1992), MSHA's *Coal Mine Respirable Dust Task Group* (the 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. Among other recommendations, the Task Group recommended that MSHA require mine ventilation plans to be effective under typical mining conditions.

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 inspectors 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 quantity 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 volume quantities, air velocities, water spray pressures, etc., specified in the plan are considered to be a minimum 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 inspectors 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.

The Task Group determined that the use of minimum production levels for evaluating the effectiveness of dust control parameters can result in marginal or inadequate plans. A more detailed discussion of the impact of production on the quality of dust control parameters specified in mine ventilation plans is provided later in this document (in sections III.C.1. and IV.B.). 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 a ''normal production shifts'' for sampling purposes.

A follow-up survey conducted by MSHA in 1994 found that 43 percent or 539 of the 1,245 producing MMUs, worked at least a 9-hour shift. The Task Group also 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 recommendations of Advisory Committee on the Elimination of Pneumoconiosis Among Coal Mine Workers, which was convened in 1995.

B. 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* (the Advisory Committee). The 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 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 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 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 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 proposal:

1. MSHA should take full responsibility for all compliance sampling at a level which assures representative samples of respirable dust exposures under usual conditions of work without adversely impacting the remainder of the Agency's resources and responsibilities.

2. MSHA should, in consultation with the operator, perform scheduled independent dust monitoring to verify the operator's plan.

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

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

5. MSHA should require that the results and monitoring of dust control parameters and production be recorded in order to correlate dust control parameters with dust measurements.

This proposal 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 Advisory Committee in the current respirable coal mine dust program. The proposal would revoke 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 the applicable standard on each shift. These ventilation plans would be verified by MSHA using single, full-shift respirable dust samples. The plans' effectiveness would be monitored on a regular basis by the use of inspector single, full-shift samples. The proposed rule regarding the use of single, full-shift measurements of respirable coal mine dust to determine average concentration is also published in today's **Federal Register**.

MSHA recognizes that the Secretary of Labor's Advisory Committee on the Elimination of Pneumoconiosis Among Coal Workers made several recommendations that also impact on surface coal mine workers. These surface coal mine issues will be addressed by the agency in a separate rulemaking which is currently underway. The scope of that rulemaking will include many of the issues that are addressed in this underground rule including requirements for duct control plans, verification of dust control plans prior to approval, on shift examination of dust control measures, and the elimination of operator sampling for compliance purposes.

III. General Discussion

This section describes the current respirable coal mine dust program and the role of mine ventilation plans in safeguarding the health of miners. Specifically, this section details:

(1) The reasoning behind MSHA's decision to revoke the operator dust sampling programs under 30 CFR parts 70 and 90 and to take full responsibility for all compliance sampling;

(2) The proposed procedures for arriving at an average quartz percentage that is used to establish an applicable dust standard under §§ 70.101 and 90.101;

(3) The existing means for evaluating the effectiveness of dust control parameters stipulated in mine ventilation plans;

(4) The plan approval process;

(5) Methods of assuring compliance with plan requirements; and

(6) MSHA's efforts to monitor plan effectiveness on a regular basis.

There is also a detailed discussion of the hierarchy of dust controls and the continued need for mine ventilation plans to specify dust control parameters in order to preserve the primacy of engineering controls. Finally, as a possible alternative to plan verification, we have included a discussion and a request for comments on the application of personal continuous monitoring technology which is, or may become available, to prevent overexposure on individual shifts.

A. Revocation of the Operator Dust Sampling Program

Under the Federal Coal Mine Health and Safety Act of 1969 (Coal Act) coal mine operators were required to take accurate dust samples at periodic intervals to measure the amount of respirable dust in the mine atmosphere where miners work or travel. The Coal Act also required that citations be issued whenever respirable dust samples collected either by an operator or by federal mine inspectors showed noncompliance with the applicable dust standard. The Coal Act was amended in 1977 (Mine Act), but the respirable dust provisions remained essentially unchanged.

1. Pre-1980 Sampling Program

In 1970, federal regulations were issued that established the first comprehensive coal mine operator dust sampling program. Those regulations required the environment of the occupation on a working section, or MMU, exposed to the highest respirable dust concentration to be sampled—the ''high risk'' occupation concept. All other miners working in the MMU in less risky occupations were assumed to be protected from excessive concentrations of respirable coal mine dust if the high risk occupation was in compliance. Under the program, each operator was required to initially collect and submit ten valid respirable dust samples to determine the average dust concentration (across ten production shifts). If analysis showed the average dust concentration to be within the applicable dust standard, the operator was required to submit only five valid samples a month. If compliance continued to be demonstrated, the operator was required to submit only five valid samples every other month. The initial, monthly, and bimonthly sampling cycles were referred to as the ''original,'' ''standard,'' and ''alternative'' sampling cycles, respectively. When the average dust concentrations exceeded the standard, the operator reverted back to the standard sampling cycle.

Additionally, each working miner was sampled individually every 120 or 180 days, depending on the miner's work assignment, or every 90 days for each miner (now referred to as a part 90 miner) who had a positive chest x-ray for coal workers' pneumoconiosis (CWP) and who elected to exercise the option of transferring to a less dusty area. However, except for the part 90 miner results, these early individual sample results were not used for enforcement, but were forwarded to the National Institute for Occupational Safety and Health (NIOSH) to develop a comprehensive exposure data base for research concerning black lung disease. Each sample was accompanied by a completed mine data card that included, among other things, the occupation and social security number of the sampled miner. This information was also included in the Agency's computer print-out of sampling results that was sent to mine operators.

2. Post-1980 Sampling Program

In 1980, following hearings held throughout the coal fields (in 1977 and 1978), regulations governing operator sampling were substantially revised by reducing the operator sampling burden, to simplify the sampling process, and to enhance the overall quality of the sampling program. The result was to replace the various sampling cycles with a bimonthly sampling cycle and to eliminate the requirement that each working miner be sampled. These are the regulations that currently govern the mine operator dust sampling program. Like the 1970 rules, the current regulations continue to rely on sampling the environment of the DO in the MMU that is exposed to the greatest concentration of respirable coal mine dust, but reduced the number of shifts required to be sampled from ten to five.

Other changes included replacing the requirement that each working miner be sampled individually with the bimonthly collection of one sample from each ''designated area'' (DA) to measure the dust concentrations associated with dust-generating sources in the active workings of the mine, such as along haulage ways, at underground crushers, or at transfer points. These locations are strategically selected so that the environment where miners normally work or travel is monitored for compliance with the applicable dust

standard. The operator's approved ventilation plan identifies the specific locations where DA samples are required to be collected and the dust control measures used at these locations. Another change was to increase the frequency of sampling part 90 miners from every 90 days to one sample every 60 days.

The revised regulations also eliminated the reporting of personal identifiers on the dust data card due to miner concerns that the data may be used by mine operators to characterize the exposure of an individual miner in future black lung claims. It also provided for sampling equipment to be properly maintained and calibrated, and examined during the shift. Additionally, operators' were required to demonstrate a certain level of competence by passing a test administered by MSHA. Since proper use of sampling equipment is essential to the integrity of the sampling process, the certification requirement was intended to provide reasonable assurance that the person conducting sampling was competent to perform the task. After samples have been collected, certified persons are required to properly fill out the dust data card that accompanies each filter cassette. These samples must then be transmitted unaltered to MSHA within 24 hours after the end of each sampling shift, to expedite compliance determinations and minimize periods of miner overexposure.

While not specified in the regulations, operators are permitted by practice to note on the dust data card any reason why they believe the sample(s) transmitted are not valid and should not be used by MSHA to determine compliance. Generally, such samples are voided by MSHA and the operator is required to submit a substitute sample within that bimonthly sampling period.

MSHA may also determine that an operator sample is invalid for many of the same reasons. MSHA may also void operator samples for technical and administrative reasons, such as samples submitted in excess of the number required, or DO samples if they were not taken during a ''normal production shift.'' ''Normal production shift'' is defined in existing §§ 70.2(k)(1), 70.207(a) and (d) as a ''production shift during which the amount of material produced * * * is at least 50 percent of the average production for the last set of five valid samples * * *''

After MSHA has processed the samples, the operator is provided with a report of the sample results, which must be posted on the mine bulletin board for a period of 31 days to provide miners ready access to current information on respirable dust conditions in the mine. Operators are also required to report to MSHA in writing any change in the operating status of the mine, mining unit, or designated area that affects the sampling requirements, within three working days after the change occurs.

An operator who is found to be in violation of the reduced dust standard is issued a citation and must take steps to reduce the dust levels. After corrections have been made, the operator must collect five additional samples within a time period specified by MSHA to demonstrate compliance.

During the development of the 1980 regulations for operator sampling requirements, we received comments that indicated a lack of confidence in our reliance on operator samples for enforcement purposes. In response to these concerns, MSHA published a proposed regulation in 1980 that would have provided miners' representatives the right to observe each phase of the operator dust sampling process with no loss in pay. The proposal intended to promote better cooperation between mine operators and miners in order to improve the effectiveness of the program. In 1985, the Agency decided not to finalize regulations to provide miners' representatives the right to observe operator sampling, stating that compliance with the 1980 revisions to the sampling program had resulted in greater confidence in the overall dust program.

3. Issues Affecting the Credibility of Operator Compliance Sampling

As noted earlier in this proposal, there is general agreement that significant efforts have been made during the past 30 years to reduce dust levels in our Nation's mines. While most mine operators have conscientiously attempted to sample miners' exposure to respirable coal mine dust as required by regulation, because of the actions of some, the operator sampling program continues to be plagued by allegations of fraudulent sampling practices. Despite MSHA's efforts to improve the quality of the operator dust sampling program and to vigorously investigate such allegations and prosecute violators, sampling irregularities continue to be documented involving the physical alteration of the weight of dust collected on the filter, or the collection of samples in low-dust areas of the mine or even outside of the mine.

The Advisory Committee found that during the 10 years prior to the publication of their report, serious questions had been raised regarding the representativeness of respirable dust levels measured by mine operators, the handling of filter cassettes, and the changing of work assignments and/or working conditions during sample collection. The credibility of the operator sampling program was questioned by almost all the representatives of miners who testified before the Advisory Committee. Since 1990, more than 160 mine operators, agents and contractors have pled or been found guilty of submitting fraudulent samples to MSHA. These disclosures correspond with the concerns expressed by critics of the operator sampling program.

Detailed reviews of the respirable dust program by the Task Group and the Advisory Committee identified aspects of the current program that have the potential to negatively affect validity of sampling results which could impact miner health protection and, consequently, its credibility in the minds of the very people the program was designed to protect, the miner. For example, to effectively monitor the mine environment where miners work or travel, it is essential that respirable dust samples are ''representative,'' in that they reflect typical dust conditions to which miners are exposed. The recurrent pattern of disclosures of tampering with the sampling process has highlighted the vulnerability of the current monitoring system to the submission of unrepresentative samples. For example, during the period 1980 to 1990, over 137,000 of the 750,000, or approximately 18 percent of the operator DO samples showed extremely low concentrations (less than or equal to 0.1 mg/m^3), compared to 10 percent for the MSHA samples. Since 1990, 14 percent of the operator DO samples and 3 percent of the MSHA samples were equal to 0.1 mg/m^3.

The fact that sampling is controlled by the mine operator also allows the operator to determine when and under what conditions samples will be collected during all current bimonthly and abatement sampling. This permits the operator to conduct sampling during those periods in the mining cycle when conditions are anticipated to result in lower dust levels in the mine environment. For example, the operator may choose to sample during periods when the volume of air on the MMU is greatest or when ventilation controls are operating at optimum efficiently. Accordingly, these sample results may not be representative of typical exposure levels. Other aspects of the monitoring system that may allow the submission of unrepresentative samples were reported by the Task Group in its report of

findings. Because some operators do not sample every bimonthly period or fail to submit the required number of bimonthly samples, miners may be potentially exposed to excessive levels of respirable dust.

4. Proposed Reforms to the Respirable Dust Monitoring Program

Believing 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, one of the 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. It also recommended that compliance sampling should be carried out at a number and frequency at least at the level required of operators and MSHA.

Accordingly, MSHA is proposing to revoke the operator dust sampling programs under 30 CFR parts 70 and 90 and to take full responsibility for all compliance sampling (i.e., bimonthly 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, as modified herein.

(a) Bimonthly Sampling

MSHA would collect a full-shift sample from the working environment of at least five different occupations, if available, on each producing MMU, instead of sampling only the DO for five consecutive shifts or on shifts worked on five consecutive days as under the current bimonthly sampling program. Proposed revised § 70.2(j) defines full shift, for purposes of bimonthly compliance sampling, as the entire work shift including travel time but excluding any time in excess of 480 minutes. A full-shift sample would also be collected from each DA located inby the section dumping point (*i.e.*, intake air and roof bolter DAs) bimonthly, and from all other DAs once each year. All part 90 miners would be sampled bimonthly as under the current program.

MSHA would issue a citation for noncompliance when a single, full-shift measurement demonstrates, at a high level of confidence, that the applicable dust standard is exceeded. Although MSHA would collect multiple occupational samples from each MMU, we would issue only one citation on a single shift on any one MMU unless more than one dust-generating source was involved.

(b) Abatement Sampling

Under this proposal, MSHA would also assume responsibility for all abatement sampling. As recommended by the Advisory Committee, MSHA would utilize single, full-shift 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 bimonthly sampling, MSHA does not anticipate issuing many citations to MMUs and sectional DAs. However, should an MMU be cited for violation of the applicable dust standard, and a determination be made by the inspector who was onsite that the dust control parameters are no longer adequate for the present operating conditions, MSHA would require the operator to revise the dust control portion of the mine ventilation plan under proposed § 70.219. MSHA would then verify the effectiveness of the revised plan. Citations for violating the applicable dust standard would not be based on verification sampling.

If on the other hand, a determination is made that a change in the plan is not warranted, the operator would take corrective action to prevent miners from being exposed on subsequent shifts. MSHA would then sample the MMU, similarly to bimonthly compliance purposes described previously in paragraph (a) of this section. All five of the occupational samples taken on a single shift would have to be below the applicable standard to demonstrate abatement. If any sample result exceeds the applicable standard, but not at a sufficiently high level of confidence to warrant a citation, then MSHA may sample additional shifts or initiate the plan verification process.

We solicit comments on whether MSHA should require a higher level of confidence that the applicable standards are being complied with before abating a citation for excessive dust. Specifically, should abatement determinations be based on the critical values specified in § 70.209? We also solicit comments on whether abatement sampling should be conducted at or above the Verification Production Level (VPL) as defined in § 70.2(aa). Requiring that abatement be demonstrated under more typical production conditions, as represented by the VPL, would provide assurance that miners will continue to be protected on a majority of the production shifts.

MSHA proposes to conduct abatement sampling involving non-MMU DAs and part 90 miners in the same way as it conducts bimonthly sampling. A violation would be abated if the result of an abatement sample was less than the applicable standard. If sample results exceed the applicable standard but not at a sufficiently high level of confidence to warrant a citation, MSHA may collect additional single, full-shift samples.

As in the case of MMU abatement samples, we solicit comments on whether MSHA should require a higher level of confidence that abatement samples for non-MMU DAs and for part 90 miners demonstrate compliance with the applicable standards before abating a citation for excessive dust. Specifically, should abatement determinations be based on the critical values specified in § 70.209?

(c) Advantages of MSHA Compliance Sampling Over Existing Program

According to section 101(a)(9) of the Mine Act, no health standard promulgated under this title shall reduce the protection afforded miners by an existing mandatory health standard.

For the reasons listed below, MSHA believes that, through the joint promulgation of this proposed rule and the proposed single, full-shift sample rule, miners would be further protected 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, for the first time, have been determined effective under typical mining conditions, will provide reasonable assurance that no miner will be overexposed on individual shifts.
- Implementing single, full-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 MSHA would be sampling fewer shifts, MSHA believes the proposed sampling methodology

would 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 proposed program, MSHA would sample multiple occupations on the same shift. This would provide a more comprehensive assessment of dust conditions to which miners are exposed.
- Since MSHA will be doing all the sampling, we 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 operator dust control program.
- Unlike the current sampling program, which allows operators control over when to sample and under what operating conditions, MSHA's visits 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 sampling, thereby increasing miners' confidence in the dust sampling program.

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

Section 202(b)(2) of the Mine Act and the implementing MSHA regulations require 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 mg/m^3. Under current MSHA regulations in §§ 70.101, and 90.101, the applicable coal mine dust standard is lowered further, by means of a formula (10 divided by the percentage of quartz) prescribed by 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. [2] This is based on the recognition that the toxicity of coal mine dust increases when higher levels of quartz are present. Consequently, as the quartz content of respirable coal mine dust present in the mine atmosphere increases over five percent, the applicable respirable coal mine dust standard is correspondingly lowered. For example, if 10 percent quartz was present, the mine operator would have to continuously maintain respirable dust at or below 1.0 mg/m^3.

The following provides an overview of MSHA's current and proposed revised procedures for arriving at an average quartz percentage that is used to establish an applicable dust standard.

1. Current Procedures

Until 1985, the applicable dust standard was adjusted based on the percentage of quartz determined from a single, full-shift (8 hours or less in duration) respirable dust sample taken by an MSHA inspector. Since MSHA sampled less frequently than we currently do, a reduced standard could remain in place anywhere from 12 to 24 months. During that period the level of quartz could have either increased or decreased significantly. As a result in December 1985, MSHA implemented the procedures in effect. This program, for the first time, enabled mine operators to participate voluntarily in the process of setting reduced dust standards. These procedures are contained in Chapter 1 of MSHA's Coal Mine Health Inspection Procedures Handbook.

The most significant program change involved the use of individual quartz percentages determined from one MSHA and, under certain conditions, up to two coal mine operator full-shift respirable dust samples, referred to as ''optional samples,'' to arrive at an average quartz percentage. It also provides for the automatic reevaluation of work areas and occupations on a reduced dust standard every six months.

Under the existing system, if an MSHA sample contains more than five percent quartz, an operator is afforded the opportunity to submit an optional sample. Provided it has sufficient weight gain (0.45 mg), the quartz content will be averaged with the MSHA sample when sample results do not differ by more than ± 2.0 percent, and the standard set accordingly. If an operator fails to submit an optional sample or it contains insufficient weight for analysis, the standard is adjusted based on the MSHA sample alone. Operators are afforded the ability to submit a second optional sample whenever sample results differ by more than ± 2.0 percent. All three results are then used to compute the average quartz percentage.

Also, in November 1994, MSHA refined its analytical procedure enabling us to analyze inspector low-mass respirable dust samples (0.100 to 0.449 mg) for quartz. Only those samples containing 25 micrograms or more of quartz were used in the standard-setting process. However, this change applied only to filters that were preweighed to 0.001 mg for use by MSHA enforcement personnel. It did not apply to operator-submitted optional samples, which were collected with filters preweighed to 0.01 mg, for which we required a minimum of 0.45 mg of dust to be analyzed for quartz. The ability to accurately analyze samples containing small amounts of dust reinforced MSHA's views about the severity of quartz exposures in some coal mining operations.

A review of MSHA data for FY 1999 shows that of the 778 entities (*i.e.,* MMUs, DAs, designated work positions (DWPs), roof bolters, and part 90 miners) (MSHA, Results of Quartz Sampling Operator Involvement, 1999) placed on an initial reduced standard as a result of an MSHA sample containing more than five percent quartz, 753 (96 percent) of the entities submitted an optional sample. One would expect the level of participation to be high since failure to respond would result in the setting of a lowered dust standard based on the result of the MSHA sample, which first triggered the standard-setting process. Of the 753 entities submitting an optional sample, 231 were afforded the ability to submit a second optional sample (Ibid.). Again, as expected, over 73 percent (170) of those 231 entities submitted a second optional sample, probably because doing so could reduce the quartz average quartz percentage used to establish the applicable dust standard. For comparison, in FY 1992, 93 percent of the operators afforded the opportunity submitted an optional first sample, and 82 percent of the operators given the opportunity submitted a second optional sample.

However, as the following data show, operator participation tended to decline significantly when operators were given the opportunity to submit samples involving established entities on reduced standards. Of the 1122 entities given the option to submit a sample, only 450 or 29 percent responded, compared to 96 percent for entities placed on an initial reduced standard. In 1992, 32 percent of the operators elected to participate.

2. Proposed Revised Procedures

Consistent with MSHA's decision to assume full responsibility for compliance sampling, the Agency is also proposing to rely only on MSHA samples as the basis for setting the applicable dust standard when quartz is present. As discussed below, while the proposed scheme reduces the burden and cost on mine operators to take and

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

submit optional samples, it does not diminish the protections afforded operators under the current program. It continues to consider temporal variability associated with quartz determinations by averaging three MSHA samples collected on different shifts. MSHA recently published a proposed ''Program Policy Letter (PPL) on Samples Used to Determine the Respirable Dust Level When Quartz is Present'' for public comment [64 FR 65671, November 23, 1999] whereby the applicable dust standard would be set based on the results of multiple MSHA samples. It proposes that mine operator samples would no longer be used in combination with MSHA samples to determine the average quartz percentage that is used to set an applicable dust standard. In the proposed rule, MSHA is adopting the sampling approach set out in the PPL. The proposed rule supercedes the proposed PPL, and consequently, the proposed PPL is withdrawn.

We believe that results under the proposed process will be more representative of the quartz level to which miners are exposed. Unlike the current process, which may cause a standard to be set based on the quartz content of a single MSHA sample, three valid MSHA samples would be used to set a reduced standard under the proposed revised procedures [64 FR 65671].[3] Since MSHA is sampling underground mines bimonthly and surface mines semi-annually, we 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 would also begin reporting quartz levels to the nearest tenth of a percent. This is intended to be more protective for the miner than the current truncation of results to a full percentage point.

Under the proposed revised procedures, when an MSHA sample contains more than five percent quartz, we would average the percent of quartz present in three most recent MSHA respirable coal mine dust samples to set the applicable dust standard. If an MMU, DA, DWP, 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 proposed 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 an 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 MMUs, DAs, DWPs, or part 90 miners not on a reduced standard, MSHA would collect and analyze three samples for quartz to determine if a reduced standard was warranted.

Under the proposed procedures, if the newly-established standard is lower than the one in effect, the new standard would 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 dust standard would become effective on the date of the notice.

As published elsewhere in today's **Federal Register**, MSHA is also proposing to take enforcement actions on the basis of inspector single, full-shift, respirable dust measurements. For entities on a reduced standard, MSHA would delay any 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 would be cited for violation of the applicable standard currently in effect. On the other hand, if the quartz content of the sample would cause the dust standard and the corresponding citation threshold value (CTV) to increase so that the single, full-shift measurement would no longer indicate noncompliance, no citation would 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, full-shift measurement of 1.6 mg/m^3 is obtained. Since this measurement exceeds the applicable standard, the operator is in violation of the standard. However, analysis of the DO sample shows that the sample contained 6 percent quartz which, if used, would result in a 1.7-mg/m^3 standard. This indicates that the quartz level in the environment of the DO has changed, suggesting that the current standard may no longer be valid. Therefore, since the original measurement of 1.6 mg/m^3 is less than the 1.7-mg/m^3 standard that should have been in effect on the shift sampled, a citation should 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 may no longer be submitted for determining the applicable standard. It is our belief that the procedures being proposed for setting reduced standards should be more protective for the miners than those in effect. The proposed approach provides for stringent monitoring exposure to quartz which is consistent with Advisory Committee's recommendation that MSHA increase surveillance and reduce exposure to this serious health hazard.

As under the current program, if operating conditions should change following establishment of a lowered dust standard that affect the level of quartz in the working environment, mine operators or miners' representatives will be able to request MSHA to conduct a quartz reevaluation. In the absence of continuous monitoring, mine operators should be cautious in preventing overexposures when abnormal conditions (such as cutting rock to install an overcast or other frequent but short-lived events involving cutting of rock) are encountered between MSHA sampling visits.

3. Validity of Averaging Percentages

The average quartz percentage used to set the applicable dust standard for a particular sampling location or area of a mine is 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 the PPL (op cit.) contended that MSHA's approach of arriving at the average quartz percentage was mathematically incorrect. This commenter recommended that, to more accurately

[3] 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.

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 averaging method does not always result in a larger average quartz percentage value.

TABLE III–1.—FOR TWO SCENARIOS, USING ALTERNATE METHODS, PERCENT OF QUARTZ IN RESPIRABLE DUST

Scenario I			Scenario II		
Dust mass	SiO_2 mass	% SiO_2	Dust mass	SiO_2 mass	% SiO_2
1.7	0.136	8	1.7	0.17	10
1.0	0.04	4	1.0	0.08	8
2.5	0.3	12	2.5	0.15	6
MSHA's Method	Average of % SiO_2 = 8		MSHA's Method	Average of % SiO_2 = 8	
Commenter's Method	Sum (SiO_2 Mass) ÷ Sum (Dust Mass) = 9.2%		Commenter's Method	Sum (SiO_2 Mass) ÷ Sum (Dust Mass) = 7.7%	

These examples show that for situations where MSHA would have determined a quartz percentage of 8 percent, the commenter's method would yield 9 percent in one case and 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 to monitor their function and operation through required on-shift examinations; and
- Evaluate their effectiveness with bimonthly samples in order to provide reasonable assurance that the dust control parameters continue to function as intended.

To control dust in the work environment, existing § 75.370 requires mine operators to develop and submit ventilation plans that are designed to control methane and respirable dust in the mine to MSHA for approval. 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 fully describe all dust controls in use at the mine. If such information is not fully disclosed, it is impossible for MSHA to fully enforce the plan provisions and to determine when the MMU is out of compliance with the ventilation plan.

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 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 inspector sampling or, to a lesser extent and only under certain circumstances, by mine operator bimonthly sampling. Generally, MSHA 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, plans may be implemented which are later determined to be inadequate under typical mining conditions under the existing process.

1. Evaluating and Approving Plan Requirements for Respirable Dust Control

Under the current program, the effectiveness of the plan's dust control parameters is assessed through sampling of the DO and other occupations associated with the MMU. Since there is no requirement for verifying plan effectiveness, we have had to rely on samples that may not be representative of dust concentrations to which miners are exposed.

MSHA sampled annually at each underground mine until recently. The Agency now samples bimonthly in each underground coal mine. This increased sampling effort is part of MSHA's initiative to increase confidence in the federal respirable dust program and to eliminate simple CWP, PMF, and silicosis among coal miners. During sampling inspections, we monitor compliance with the applicable dust standard, measure the concentration of respirable quartz dust; and identify occupations other than the DO that the mine operator should routinely monitor because they are at risk of exposure to excessive concentrations of respirable dust.

Under current inspection procedures, MSHA inspectors sample at least five different occupations, if available, on each MMU on each shift. Samples are normally taken under the mining conditions in effect during sampling. In conjunction with this sampling, the MSHA inspector checks and measures the dust control parameters early in the shift to determine whether the ventilation plan is being followed. The inspector records the findings, and all

the dust controls and work practices in use during sampling on MSHA Form 2000–86 (Revised), *Respirable Dust Sampling and Monitoring Data*. MSHA will issue a citation if the mine operator fails to follow any of the dust control parameters specified in the plan. Normally, the citation requires immediate corrective action to abate the violation. This may involve, for example, unplugging some water sprays or increasing the amount of ventilating air delivered to the MMU. At the conclusion of the sampling shift for an MMU, the inspector determines the total amount of material that was mined (in tons) during the shift.

If the average concentration of the samples taken in one shift is less than, or equal to, the applicable standard, and the actual production is at least 60 percent of the average production over the last 30 production shifts, the MSHA inspector will normally terminate sampling after the first day and will recommend that the plan parameters be approved by the District Manager. This would occur even if the samples were found to contain more than 5 percent of quartz. Such a finding could result in MSHA lowering the dust standard below that in effect at the MMU. Since 1985, MSHA has provided mine operators the opportunity to participate in the process to establish a lower dust standard based on the level of quartz. Mine operators can submit up to two optional samples which are averaged with the MSHA sample to determine the average percentage of quartz which is used to establish a new dust standard for the MMU. MSHA published a proposed Program Policy Letter for comment (64 FR 65671, November 23, 1999) whereby the standard would be determined based solely on the results of multiple MSHA samples. Under that proposal, mine operator samples would no longer be used to calculate a reduced dust standard. Instead, applicable dust standards will be set based solely on the results of MSHA samples.

If the average concentration falls below the standard in effect, but one or more samples exceed it, no decision is made regarding the plan's effectiveness or regarding compliance with the applicable standard. Instead, the inspector must collect additional samples on subsequent production days or shifts to establish that the dust control provisions of the ventilation plan are adequate.

To a lesser extent, if MSHA is unable to schedule a mine visit within the period established by the individual district, the District Manager may rely on the results of operator bimonthly sampling to approve a plan. Generally, this occurs in the case where a plan is upgraded with a change which has been established as effective. MSHA does not routinely approve plans based on operator bimonthly sampling because these samples may be collected during periods when production is not reflective of typical production levels. The current program permits the operator to submit samples which may not be representative of normal dust conditions in the working environment. Under current regulations, operator bimonthly samples will be considered valid, unless voided by MSHA, when the MMU produces at least 50 percent of the average level reported for the last set of five valid bimonthly samples. Since a mine's ''normal production'' level for sampling purposes and the typical production level may diverge greatly over the course of several sampling periods, granting approval under these conditions may not reflect the plan's effectiveness under more typical mining conditions.

2. Compliance with Plan Requirements for Respirable Dust Control

Once MSHA determines that the dust control measures are adequate and approves the mine ventilation plan, the specified dust control parameters are to be employed on a continuous basis to safeguard the health of miners. Since maintaining the approved dust control parameters provides reasonable assurance that respirable dust can be controlled, failure to comply with these requirements would defeat the purpose of the mine ventilation plan and needlessly expose miners to excessive concentrations of respirable dust. Section 75.362 requires mine operators to perform an on-shift examination of the dust control parameters before the MMU begins production in order to assure full compliance. Any deficiencies must be corrected before production begins.

Compliance with approved plan parameters is checked during MSHA's routine sampling inspections: as part of six-month plan reviews, during other non-sampling inspections or investigations, or in conjunction with an ongoing sampling inspection.

3. Monitoring Effectiveness of Plan Requirements for Respirable Dust Control

Because of the dynamic nature of mining, conditions can change significantly in a short period of time. For example, an increase in the concentration of respirable quartz dust will require the applicable standard to be reduced below the level that was effective when the dust control parameters were first evaluated. Such changes can directly impact the effectiveness of the dust-control measures. It is important to regularly monitor the adequacy of the approved dust control requirements to ensure that they remain suitable for the current conditions at the mine and to determine whether the plan should be upgraded. Currently, both MSHA and the mine operator regularly monitor the operator's dust control program. However, for MMUs the mine operator is responsible for making sure that all provisions of the ventilation plan are in effect on every shift.

(a) *Monitoring by Mine Operators*. Since 1980, the current regulations have required mine operators to take five valid samples from the DO in each MMU on a bimonthly basis and submit them to MSHA for processing, to determine compliance with the applicable dust standard. Section 70.207(e) identifies the DO for each method of mining. These are collected either on consecutive normal production shifts, or on production shifts worked on consecutive days, during which the amount of material produced by the MMU is at least 50 percent of the average production reported for the last bimonthly sampling period. These samples must be collected portal-to-portal during the entire shift or for 8 hours, whichever time is less.

Bimonthly samples have provided a periodic evaluation of the quality of the air miners breathe. They also have provided some insight into the effectiveness of the operator's dust control system on the days in which the samples are taken. Mine operators may exceed their minimum plan requirements once they have been approved as effective under current evaluation criteria. Currently, there is no requirement for mine operators to record the dust control measures in use as part of the on-shift examination. Because there is no requirement for such records, MSHA cannot assess the continued adequacy of the approved dust control requirements unless the inspector observes the sampling process.

Although the current operator sampling program may limit the utility of bimonthly samples for plan approval purposes, they allow MSHA to identify approved plans that may no longer be suitable to the conditions at a mine. If multiple individual samples, or their average, exceed the applicable dust standard after the required on-shift examination has been conducted, the approved plan parameters may no longer be effective and may need to be upgraded. If cited, the operator must

take corrective action to lower the concentration of respirable dust to within the permissible concentration as described in current § 70.201(d). The operator must demonstrate, through sampling, that the underlying condition(s) which caused the violation has been corrected. Since MSHA inspectors are not present to observe the action(s) taken by the operator to abate the violation, the ventilation plan is usually not amended to include the changes the operators make to the parameters in order to abate the violation. However, if the operator has a record of noncompliance and MSHA determines that the approved plan parameters may no longer be adequate, MSHA will notify the operator to submit an improved plan. Under current plan approval procedures, if the operator fails to address MSHA's concerns after receiving the second notification, MSHA will move to revoke the operator's mine ventilation plan. If the plan is revoked, the mine must not operate.

As discussed earlier, MSHA is proposing to revoke operators' sampling program in underground mines and assume full responsibility for all compliance sampling.

(b) *Monitoring by MSHA.* One of the objectives of MSHA's dust sampling program is to verify that the controls specified in the approved mine ventilation plan continue to control concentrations of respirable dust under existing mining conditions. As part of this program, the dust control parameters must be checked and measured early in the shift to assure compliance with the approved plan. These checks also verify that the operator is performing the required on-shift examinations. Operators have the opportunity to adjust their dust controls to reflect that which has been approved so the plan can be evaluated. However, most operators choose not to make adjustments for a number of reasons. While inspection procedures require the ventilation plan to include the dust control measures in use during the evaluation, most approved plans do not incorporate all the measures that were actually in place during MSHA sampling. This makes it difficult for MSHA to assess the continued adequacy of the approved dust control parameters. Frequently, decisions must be based only on prior experience or engineering judgment.

When an operator is cited based on MSHA samples, the inspector may require the operator to describe what type of corrective action will be taken. However, if a plan change is required, MSHA must follow similar plan approval procedures. The operator must be notified in writing that the plan is inadequate. In this case, MSHA has sample results and a record of the actual parameters in place which can be used to document the need for a plan change. Most plans which are revised simply incorporate only those dust controls that were in use when MSHA sampled.

MSHA reviews each mine ventilation plan every six months under § 75.370. The review includes: all plan revisions, respirable dust inspection reports, citations for exceeding the applicable dust standard, and comments from representatives of miners. When a deficiency in the respirable dust control portion of the plan is found, the MSHA inspector records comments on MSHA Form 2000–86. MSHA sends these results to the mine operator along with an explanation of whether the operator must make any changes, the reasons for the changes, and the date for submitting a plan revision. MSHA will send a second notification if the operator fails to respond. MSHA may revoke the operator's mine ventilation plan if the operator does not comply.

4. 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's proposal makes a number of changes to the process for evaluating, approving, and monitoring mine ventilation plans, many of which are based on the Advisory Committee's recommendations.

Consistent with the Advisory Committee recommendations, MSHA proposes to add provisions to verify the effectiveness of the ventilation plan in controlling dust, at a production level high enough to demonstrate the plan's effectiveness under typical operating conditions. This would require that MSHA implement procedures for reviewing compliance and production records. It would also require that dust control parameters and production associated with samples on a given shift be recorded in order to demonstrate that parameters specified continue to be effective in controlling dust.

This proposal would require 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 current program, you would have to identify all measures necessary for achieving continuous compliance with the applicable dust standard in the plan.

MSHA proposes to require you 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.

We believe that the 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 would provide assurance that excessive dust concentrations will be avoided, even on shifts with higher-than-average production. This is more protective of miners than the current practice of evaluating plan adequacy based on MSHA inspector samples taken when production can be as low as 60 percent of the average production.

MSHA would require you to maintain records of the amount of material produced by each MMU during each shift. This would enable you 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 higher-than-average production. Although a VPL would be included in the ventilation plan, MSHA would not cite you for producing at levels exceeding the VPL.

Under the proposed plan verification procedures, MSHA will notify you of when we intend to initiate verification sampling. To enable MSHA to evaluate the effectiveness of the plan parameters at or above the VPL, you must make sure that all the dust control parameters specified in your ventilation plan are fully implemented. On the date scheduled for verification sampling, you should arrange to be producing at or above the VPL specified in the plan, using only the dust control parameters and other measures listed in the plan.

Under the proposal, MSHA would perform the sampling necessary to verify your plan. We will collect full-shift samples from the work environment of multiple occupations on each MMU, including the DO. We will collect all samples in accordance with procedures described in Chapter 1 of MSHA's Coal Mine Health Inspection Procedures Handbook (op cit.). In addition, on every shift on which we

collect verification samples, we would measure and record all of the quantitative engineering or environmental parameters. We would also record any other means used to reduce miners' dust exposure on the sampled shift. We will provide you with this information, along with verification sample results, for posting on your mine bulletin board.

In accordance with section 103(f) of the Mine Act, you must provide miners and their representatives the same walkaround rights during plan verification sampling as they are provided during any other physical inspection made pursuant to the provisions of section 103(a) by an authorized representative of MSHA.[4]

Unlike the existing program, the proposal would allow you, for the first time, to use either approved PAPRs or verifiable administrative controls to supplement your engineering or environmental controls for compliance purposes at longwall mining operations. This would be permitted only on an interim basis and only after MSHA determined that you had exhausted all feasible engineering or environmental controls.

Finally, under this proposal, MSHA has established rigorous criteria for determining when to approve a plan. We 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.

D. Hierarchy of Dust Controls

Consistent with the Mine Act, engineering or environmental controls have been the principal method used for preventing or minimizing miners' exposure to these primary and secondary dust sources in the workplace over the past 30 years. Control of dust throughout the work environment gives 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 insure that they are functioning as intended. 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. 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 not only recognized by the Advisory Committee, but also by NIOSH in its criteria document: *Occupational Exposure to Respirable Coal Mine Dust* (NIOSH, 1995), when it 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 is preserved under this proposal. The proposal requires mine operators to utilize all feasible engineering or environmental controls to reduce concentrations of respirable dust to a level at or below the applicable standard.

Administrative controls are another method of avoiding overexposure. Administrative controls refer to work practices that reduce 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 operator, or the occupation designated as 044 by MSHA. This particular form of administrative control is 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 Advisory Committee Report states 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 standard. However, the 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).''

Under the Mine Act and current regulations, mine operators are required to make approved respiratory equipment available to all affected underground miners whenever exposure to concentrations of respirable dust exceeds the applicable dust standard. However, miners are not compelled to use them. While required for interim protection, mine operators cannot use respirators as a substitute for engineering or environmental control measures. Engineering or environmental controls have been found to provide more consistent and reliable protection to all workers. In comparison to respirator programs, the effectiveness of engineering or environmental controls does not rely heavily upon constant supervision or miners' consistent and correct use of the equipment. Furthermore, we can measure dust concentrations to which miners are exposed when engineering or environmental controls are in use. It is more difficult to monitor the effectiveness of a respirator program because the assessment methods are indirect. For these reasons, MSHA's longstanding policy has been that respirators should be used in underground coal mines only as an interim method of protection until feasible engineering or environmental controls are available.

Approved respirators are not acceptable substitutes for feasible engineering or environmental controls.

[4] MSHA believes that under the guidance of the Interpretive Bulletin 43 FR 17546 (April 25, 1978) these 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.

Verification sampling is necessary to obtain information related to approval of the mine's ventilation plan and whether coal mine dust will be adequately controlled to protect miners health. Consequently, miners and their representative would have the right to accompany the inspector with no loss of pay for the time during which the representative exercises this right. However, this right is limited by Section 103(f) to only one such representative of miners.

It is MSHA's position that technology is available to control respirable dust to at or below the applicable standard at MMUs employing continuous and conventional methods of mining. However, MSHA recognizes that, unlike other mining systems, longwall MMUs may have acute dust problems caused by the face-ventilation airstream carrying the shearer-generated face dust over the miners working along the face downwind of the shearer operator (occupation code 044). This makes it more difficult to control the work environment 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 five-fold since 1980, from approximately 890 tons per shift (tps) to more than 4,900 tps in 1998. 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 history 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, most of these particles do not become airborne. Nevertheless, given the amount of dust that is produced per ton of coal mined, a larger quantity of respirable dust would be generated from cutting 8,000 tons of coal than from cutting 4,000 tons. An operator is not required to produce, on a sampled shift, more than 50 percent of the average production reported during the last bimonthly period. Therefore, dust concentrations on sampled shifts may be substantially lower than what is typical and therefore not reflect the dust exposure on that shift.

While significant efforts have been made to implement available control technology, no significant new advancements in longwall control technology have been reported since 1989 (U.S. Bureau of Mines, undated). From 1989 to 1999, the percentage of operators' longwall DO samples exceeding 2.0 mg/m^3 dropped from 34 percent to 20 percent, reflecting the impact of the implementation of those advances in longwall control technology. Although this represents a significant improvement, especially in view of the five-fold increase in average shift production, the 1999 data clearly show 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, such a study has never been undertaken because no industry partner has agreed to participate. Based on our experience, MSHA's position remains that feasible engineering and environmental controls exist for maintaining dust exposures at or below the applicable standard, even at longwall operations. MSHA has concluded that the proposed plan verification process will lead to further improvements in the design and quality of mine ventilation plans. At some high-producing longwall MMUs, however, the engineering or environmental controls available may not succeed in sustaining continuous compliance with the applicable dust standard at certain locations downwind of the longwall operator (occupation code—044).

Mining industry representatives have repeatedly urged MSHA to accept the use of powered, air-purifying respirators (PAPRs) (*e.g.,* Racal® Airstream helmets),[5] as an alternative means of complying with the applicable dust standard when engineering or environmental controls failed or were not feasible. The Airstream helmet originated in the early 1970s at the Safety in Mines Research Establishment in England which developed it primarily for mining use to provide protection for head, eyes, and lungs in a single convenient unit. Because these devices provide a continuous stream of filtered air over the miner's face, it has been suggested that they be viewed as miniature environmental controls, rather than respirators. In September 1997, Energy West Mining Company (Energy West) petitioned the Secretary of Labor to amend the mandatory health standards for underground coal mines at 30 CFR part 70 to allow Airstream helmets or other types of PAPRs to be used as a supplemental means of complying with the applicable dust standard. The petition for rulemaking proposed that the Secretary issue a standard which would supersede the current interim statutory standard, specified in Section 202(h) of the Mine Act. Energy West contended that PAPRs are necessary as a supplemental means of controlling respirable dust because even the most diligent application of feasible engineering/environmental controls could not always prevent overexposure. MSHA has consistently acknowledged that PAPRs can be effective as an interim method of protecting miners when properly selected, used, and maintained. However, MSHA has never considered the Racal® Airstream helmet (or the 3M™ Airstream™ Helmet-Mounted PAPR), or any other respiratory protective device approved and labeled as such by the National Institute for Occupational Safety and Health (NIOSH), to be an engineering, environmental, or administrative control. Hence, it cannot be used as an environmental control to comply with the respirable dust standard.

In order to provide the greatest possible protection for all miners under typical mining conditions, MSHA is proposing to permit, under certain circumstances, the limited use of either approved loose-fitting PAPRs or verifiable administrative controls for compliance purposes. This would provide you with the flexibility to select the most appropriate option for supplementing your engineering or environmental controls. We believe that permitting longwall mine operators to use loose-fitting PAPRs or verifiable administrative controls for compliance purposes will not reduce the level of protection afforded longwall miners by the existing standard.

This aspect of the proposal is limited to longwall mine operations because technology is available to control respirable dust at or below the applicable standard at MMUs employing continuous and conventional methods of mining. Their use at longwall operations would be permitted

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

only after MSHA determines that for a specific MMU, excessive dust concentrations cannot be prevented in the environment of miners required to work downwind of the longwall shearer operator (occupation code—044) by implementing all feasible engineering or environmental controls. We solicit comments concerning the availability of feasible engineering or environmental controls to lower dust levels.

1. Selection of Respirators: Loose-Fitting PAPRs

Loose-fitting PAPRs completely surround the head and cover the face with a full visor or shield. The functional and physical characteristics of loose-fitting PAPRs as described below make them especially well-suited to underground coal mining conditions, and it is for these reasons that MSHA determined that loose-fitting PAPRs are the most suitable type of respirator protection for these conditions.

A loose-fitting PAPR protects the wearer from excessive levels of respirable dust by providing a continuous flow of filtered air and imposing minimal breathing resistance upon the wearer. Loose-fitting PAPRs do not require fit-testing,[6 7] unlike tight-fitting respirators. Furthermore, it is not necessary to be clean shaven for this type of PAPR to be protective.

Loose-fitting PAPRs provide safety advantages over other forms of PAPRs or tight-fitting respirators. In addition to protecting the lungs, the helmet and visor of a PAPR can simultaneously protect the eyes and head from high-velocity nuisance dust, spray, and small pieces of coal from the cutting drums and face and from loose coal falling from the roof. Loose-fitting PAPRs provide easier communication between miners, rather than the muffled communication between workers which is experienced between miners wearing tight-fitting facepieces.

The Racal® Airstream helmet has been in use in underground coal mines since the late 1970s. Over 50 percent of the longwall mines operating have miners who wear Airstream helmets for added protection. This respirator was developed primarily for mining use by the Safety in Mines Research Establishment (SMRE) in England. It combines face, head, and respiratory protection in a single convenient unit. The support hardware which provides the filtered air is packaged in the helmet. Power for the system is provided by a belt-mounted battery. Dusty 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, and exits at the chin. Soft plastic seals join the face-shield visor to the sides of the head and jaw limiting entry of unfiltered mine air (Greenough, 1979). The original Airstream helmet has undergone numerous design improvements since it was first introduced in British coal mines in the mid 1970s. The Airstream helmet is produced by 3M (3M™ Helmet-Mounted Airstream™ series).

2. Protection Factor for Loose-fitting Powered, Air-Purifying Respirators

The type and degree of protection of any respirator depends on the ability of a respirator to prevent hazards from entering the worker's breathing zone. In an underground coal mine, the level of protection afforded by a loose-fitting PAPR to protect a miner depends on the type and condition of the filter material of the air-purifying element, the nature and concentration of the respirable coal mine dust, proper maintenance of the PAPR and battery pack, and especially, how consistently the miner properly wears the PAPR, including having the visor properly lowered. The protection factor, the ratio of the respirable dust concentration outside the respirator to the concentration inside, measure how much protection a respirator might provide to the wearer.

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 loose-fitting, 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 caveat 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 invade the miners' breathing zone through openings along the side and bottom of the visor, even when it is maintained in the full lowered position. The extent to which respirable dust invades a miner's breathing zone, depends, in part, on the MMU's ventilation air velocity and on the miner's work rate and his angle of orientation to the airflow.

Questions have arisen concerning the applicability of NIOSH's APF of 25 for loose-fitting PAPRs to some work environments. It has been contended that NIOSH overestimates the minimum level of protection provided in the workplace even when used within the context of a good respirator program (Myers, *et al.,* 1984). The environmental conditions assumed in NIOSH's estimation of the APF for loose-fitting PAPRs are not consistent with those in underground longwall mining operations. For example, various unique conditions of coal mining (obstructed views and difficulty communicating) may 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. Also, the high velocities of air customarily found on longwall mining faces, 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. 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 protection provided in the workplace. Unlike an APF, an effective protection factor (EPF) reflects the protection provided by a respirator over an actual work shift given specific occupational environmental conditions such as ventilation velocity, when the wearer performs typical work activities and uses the respirator in a typical manner.

Laboratory and in-mine studies (EPF studies) show that mine ventilation air flow or velocity, the primary means

[6 7] Quantitative fit testing and qualitative fit testing are methods used to determine the facepiece seal and fit of a tight-fitting respirator.

longwall operators use to control respirable dust levels, may be the single biggest factor affecting the level of protection provided by the PAPR on a longwall mining face. Cecala, *et al.*, (1981) found protection of loose fitting PAPRs (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 level of protection from a loose-fitting PAPR is also affected by the orientation of the helmet to the airflow. Cecala's wind tunnel tests clearly showed that, at the higher flow 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 loose-fitting, helmeted PAPRs produced an EPF confirming the inverse relationship between wind speed and the level of protection provided by PAPRs shown during wind tunnel testing. Air velocity in underground mines is measured in units of feet per minute (fpm). Under normal face-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 high face-velocity conditions (1,200 fpm), the helmet's dust reduction efficiency decreased significantly, averaging only 49 percent, which is equivalent to an EPF of 2.

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 protection factor of 6.3. This met the target protection factor 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 medium-velocity western longwalls indicated loose-fitting PAPRs had an average dust reduction efficiency of 83.8 percent (Ibid.). Although a different sampling procedure was used, this result is consistent with the average value of 84 percent obtained by Cecala, *et al.,* under normal mine face-velocity conditions. During the test period, the headgate velocity ranged from 345 to 500 fpm, with approximately 88 percent of the recorded velocities falling below 500 fpm. The tailgate velocities ranged from 280 to 550 fpm and only one exceeded 500 fpm. No tests were conducted under high mine face-velocity conditions.

The headgate and tailgate velocities observed by MSHA inspectors at 55 longwall MMUs were reviewed in 1999. The headgate and tailgate 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.

PAPRs have been demonstrated to be effective on longwall MMUs when air velocities do not exceed 500 fpm, but, as described above, there is evidence that their effectiveness is reduced when air velocities are increased. Therefore, given the range of observed longwall face air velocities to which miners are exposed and the proposed requirement that the verified ventilation plan demonstrate that the longwall shearer operator (occupation code—044) be at or below the applicable standard, MSHA is proposing to grant a protection factor of two for loose-fitting PAPRs used under this proposal. Multiplying either the respirable dust standard or the verification limit (whichever is applicable) by the protection factor yields the maximum concentration of respirable dust against which a particular type of respirator can be used. In other words, if MSHA permits a longwall operator to use PAPRs, then the maximum concentration of respirable coal mine dust and quartz dust against which these particular respirators can be used are 4.0 mg/m^3 and 200 $\mu g/m^3$, respectively. A complete respiratory protection program is required to assure that a respirator's protective value is not compromised by improper fitting or usage.

MSHA's determination is based on the best scientific and technical information available as well as sound engineering judgment. However we encourage you to submit comments on the protection factor. We are particularly interested in obtaining more recent data that may be available concerning protection factors as well as the conditions for the use of PAPRs. If you believe MSHA should establish a different protection factor, please submit these data supporting your position.

E. Guidelines for Determining What Is a Feasible Dust Control

The proposal would require a mine operator to implement all feasible engineering or environmental controls that are technologically and economically feasible. 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 *19 00 (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 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 proposed § 70.211 in Section IV of the

proposal, 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 would be made by the Administrator for Coal Mine Safety and Health based on the best available information, experience, and engineering judgment.

F. Application of Continuous Monitoring Technology to Prevent Overexposures on Individual Shifts

Because approved technology that continuously monitors respirable dust and displays dust concentrations in real-time is not available, effective ventilation plans remain the only practical means to provide reasonable assurance, on a continuous basis, that miners are not overexposed on individual shifts. However, MSHA recognizes that person-wearable continuous respirable dust monitors under development may lead to significant improvements in monitoring the work environment in order to improve miner health protection. In an effort to reduce occupational respiratory disease among underground coal miners, MSHA encourages mine operators to adopt new and better dust monitoring technology as part of the approved ventilation plan.

Unlike the current monitoring system, which relies on periodic sampling and requires that corrective action be taken after the necessary delay in obtaining dust level information, continuous monitoring would allow mine operators and miners to be aware of the actual dust conditions at all times, thereby enabling immediate action to avert possible overexposure. The ability to monitor dust exposure continuously during the shift, predict end-of-shift cumulative exposures, and to display the actual end-of-shift exposure would be far more effective in preventing simple CWP and PMF than the current system.

The health benefits of continuous monitoring were clearly recognized by both the Task Group and the Advisory Committee. Both recommended development, field testing, and immediate deployment of such monitors for a variety of purposes. The Task Group concluded that continuous monitoring of the mine environment and dust control parameters offered the best long-term solution for improving the existing federal program designed to prevent simple CWP and PMF among coal miners. Similarly, the Advisory Committee stated in its report 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 availability of this information on a real-time basis would enable mine personnel to focus attention immediately on the need to adjust control parameters to avert possible overexposure. The recent development of continuous dust and continuous dust control parameter monitors, which have both direct reading and data recording/processing capabilities, offers the potential to improve monitoring of the work environment significantly and contribute to the effective control of exposure. (MSHA, 1996).

MSHA has sought a means to measure the concentration of respirable coal mine dust in coal mines on a continuous basis for nearly two decades. Beginning in the 1970's, at the request of MSHA, the former U.S. Bureau of Mines funded several developments of fast-response, direct-readout respirable dust monitors for measuring the concentration of respirable dust.

One type of fast-response respirable dust monitor determined the mass of respirable dust particles collected on a grease-coated disk by the attenuation of beta radiation caused by the dust spot on the impaction disk. The unit was capable of operating for long periods, taking up to 450 1-minute samples, and printing the individual and time-integrated concentrations on a tape.

Other devices have used light-scattering technology to measure and provide an immediate direct readout of dust concentrations. Since light scattering is often dependent on particle characteristics such as size, surface properties, and refractive index, this type of dust monitor does not measure a mass concentration directly and can provide only a relative measurement. However, it can be calibrated in the laboratory to give an approximate mass concentration.

The light-scattering technology was later incorporated in a machine-mounted, continuous respirable dust monitor for use in underground mines. In the early 1980's, however, it was determined that this technology was not effective for monitoring compliance with the applicable dust standard. Nevertheless, instruments which used the light scattering principle were found to be useful tools to locate dust sources and to determine its magnitude. Such instruments continue to be especially useful for evaluating dust-control techniques such as dust collectors and water sprays that can be turned on and off quickly and repeatedly.

The 1992 Task Group report recommended the accelerated development of a fixed-site underground dust monitor, capable of providing continuous information on dust levels and personal sampling devices capable of providing both short-term and full-shift exposure measurements. In response to this recommendation, the former Bureau of Mines, with MSHA's assistance, again evaluated existing technology that could be used in the development of a fixed-site underground mine dust monitor. This was made possible because of advances in sensing and electronic signal processing technology that had occurred since development of the first generation machine-mounted dust monitor in the late 1970's. Eventually a fixed site/machine-mounted continuous respirable dust monitor based on the proprietary mass-measurement technology known as the tapered element oscillating microbalance (TEOM®) was developed and field tested.

The TEOM technique is capable of continuously weighing a filter upon which dust is collected. It provides a real-time record and a permanent record of the total mass collected on the filter. The device can display the time-weighted average (TWA) concentration of respirable coal mine dust (total mass of dust collected divided by the length of time the unit was operated), the instantaneous (real-time) concentration, and the projected full-shift concentration. This would allow a mine operator to adjust control measures or optimize mining procedures to prevent miner overexposure. The full-shift concentration of respirable coal mine dust would be available at the end of the shift. The developer of the fixed-site monitor is also working on a person-wearable, end of shift/continuous respirable dust monitor using the same TEOM technology.

In addition to the TEOM technology, NIOSH is developing another person-wearable device that has the potential for continuously monitoring the mine environment. This device measures the mass of respirable dust indirectly based on the amount of pressure drop detected across the collection filter.

MSHA is seeking ways to encourage voluntary deployment of this technology, once it has been verified as reliable. MSHA has considered allowing mine operators to adopt a continuous personal monitoring strategy as part of the approved ventilation plan, in lieu of plan verification. Under this approach, the operator would have the flexibility of choosing from several technologies available for continuous personal monitoring. If an operator adopts continuous personal monitoring, the following additional information, at a

minimum, would be required for the mine ventilation plan:

1. The specific continuous personal monitoring device the operator intends to use which has been approved by the Secretary;

2. The DO and other occupations or individuals, including part 90 miners, that will be sampled on every production shift and the length of the production shift to be sampled;

3. The procedures for preventing exposure above the applicable dust standard;

4. The manufacturer's calibration and maintenance requirements, and a description of how records of calibration and maintenance will be made available to MSHA, miners and the miner's representatives; and

5. A description of how end-of shift measurements will be recorded, who will certify that such records are accurate and properly taken, how long such records will be maintained, where such records will be made available for inspection by MSHA, miners and the miner's representatives, and how miners will be notified on each production shift of the end-of-shift measurements.

At the present time, we do not believe that technology to enable continuous monitoring of respirable dust has advanced to the point where it could be relied upon as an alternative to plan verification. In the future, when this technology is available, MSHA will consider the implementation of such an alternative to the proposed plan verification program. We request comments on this approach as a possible alternative to plan verification. MSHA is specifically interested in any proposals for the use of continuous personal monitoring, as well as any information which may be available concerning developing technology. Should an operator be interested in implementing a continuous personal monitoring program at a specific mine, MSHA will review the plan and consider development of a pilot program to develop information which may be useful for future rulemaking. MSHA is interested in comments concerning the specific provisions which should be included in the ventilation plan to assure that, if an operator does develop a continuous monitoring program, miners will not be overexposed on any individual shift.

IV. Discussion of Proposed Rule

A. Summary

As recommended by the Advisory Committee in 1996, MSHA is proposing to assume responsibility for all compliance sampling for respirable dust in underground coal mines as required under CFR parts 70 and 90. This proposal includes revocation of bimonthly compliance sampling requirements, abatement sampling requirements, the process for establishing a reduced standard when quartz is present, and operator sampling requirements for miners who have evidence of the development of pneumoconiosis under part 90. In order to provide a greater level of protection than that provided under these sampling requirements, MSHA is proposing to require each underground coal mine operator to have a verified mine ventilation plan. Under this proposal, MSHA would verify the effectiveness of the mine ventilation plan for each mechanized mining unit (MMU) in controlling respirable dust under typical mining conditions.

Mine ventilation plans have long been recognized as a means of addressing mine-specific health and safety issues. Existing § 75.370 requires that each mine operator design a ventilation plan to control methane and respirable dust in the mine. It further requires that the plan be suitable to the conditions and mining system at the mine. However, there is no current provision requiring the effectiveness of mine ventilation plans to be verified under typical mining conditions.

Since 1970, beginning with enforcement of the Federal Coal Mine Health and Safety Act of 1969, the level of respirable dust in underground coal mines has been significantly reduced. Although much progress has been made, MSHA sampling data indicate that some work environments continue to have excessive concentrations of respirable dust. It is MSHA's position that excessive dust levels can be substantially reduced, if not eliminated, by implementing the Advisory Committee's recommendations to enhance plan quality and strengthen the plan approval process. Toward this end, this proposal would revise 30 CFR by revising part 70, subparts A, B, and C amending two existing sections of part 75.

This proposal would require evidence that the mine ventilation plan is effective in controlling respirable dust as required by § 75.370. Within the first 30 days of operating a new MMU, or when required to do so by the District Manager, mine operators would have to specify the operating parameters of an effective plan and then MSHA would verify the plan's effectiveness based on a sufficient number of full-shift samples taken at designated locations.

Under this proposal, we would collect full-shift respirable dust samples, called ''verification 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 2.0 mg/m^3 and 100 $\mu g/m^3$, respectively.

For purposes of plan verification, ''full-shift'' would refer to the entire work shift during which material is produced by an MMU. Currently, many mining operations have work shifts of more than 8 hours. Miners working extended shifts should be protected from the hazards of respirable dust and quartz by the ventilation plan. Accordingly, the proposed verification samples would not be limited to 8 hours or less, as under the current bimonthly operator sampling regulations.

A sample would be valid for verification purposes only if the shift on which it was taken met certain requirements. This is necessary in order to verify that dust controls specified in the plan are sufficient to prevent excessive dust concentrations, even when a higher-than-average amount of material is produced. The proposed operator's requirements for a shift used for verification sampling are:

(1) The dust controls and work practices utilized must be those listed in the mine ventilation plan;

(2) MSHA's measurements of the engineering or environmental control parameters must not exceed 115% of the quantities specified in the plan; and

(3) The amount of material produced must be at least the ''verification production level'' or VPL.

The VPL is defined as the tenth highest production level recorded in the most recent 30 production shifts.

The proposed rule would require mine operators to: (1) Set and maintain the dust control parameters during MSHA verification sampling at levels specified in the plan; (2) maintain and make available to MSHA records of the amount of material produced by each mechanized mining unit during each production shift; and (3) provide additional information in mine ventilation plans.

The number of samples necessary to verify that the dust control parameters proposed for an MMU are effective would depend on the individual sample. Since all such measurements are subject to potential sampling and analytical errors, some of them may fall slightly below the verification limit even when the true concentration of respirable coal mine dust or quartz 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'' established by MSHA provide this margin of error. If the VPL is achieved and dust concentrations are sufficiently low, the District Manager could approve a plan based on as few as one shift of sampling. However, if dust concentration measurements are higher, or if the actual production was less than the VPL MSHA would sample additional shifts.

Consistent with the Mine Act and its implementing regulations, MSHA's longstanding policy has been to preserve the primacy of engineering controls, to the extent that they are technologically and economically feasible. Consequently, MSHA has not accepted the use of approved respiratory protection or administrative controls as a means of achieving compliance with the respirable dust standard. In order to provide all miners with the highest possible level of health protection, as intended by the Mine Act, MSHA is now proposing to permit the use of approved PAPRs or verifiable administrative controls to supplement engineering or environmental controls under certain circumstances for compliance purposes. Their use would be limited to longwall mining operations and permitted only after MSHA has determined, upon request of the operator, that all feasible engineering or environmental controls cannot maintain the mine atmosphere within applicable standards. In such cases, specific requirements governing the use of PAPRs or verifiable administrative controls would be specified in the mine ventilation plan.

Finally, the proposal would require you to maintain, and make available to MSHA inspectors, records of the amount of material produced by each MMU during each production shift over a running six-month period. This, along with routine bimonthly and other sampling data, would enable us to review the suitability of the plan parameters on an ongoing basis.

Although a VPL would be included in the ventilation plan, we would not cite you for producing at levels exceeding the VPL. We would expect production on an MMU to exceed the VPL on about 33 percent of all production shifts. If the District Manager determines that your production exceeds the VPL on more than about 33 percent of the production shifts over a six-month period, then this may trigger the plan verification process using a higher VPL.

These and other provisions of the proposed rule are explained in more detail in the following section-by-section discussion.

B. Section-by-Section Discussion

This section of the preamble explains, section-by-section, the provisions of the proposed rule. The text of the proposed rule is included at the end of the document.

Section 70.2 Definitions-

The existing definitions of certified person, concentration, and designated area (DA) are being modified to more clearly convey the intended meaning under the proposal. These modifications reflect necessary changes as a result of the removal of existing paragraphs and the transfer of other paragraphs, as well as the addition of new references. The proposal also includes definitions of new terms to clarify the mine ventilation plan verification process as it applies to mechanized mining units (MMUs). Some of the definitions are for technical terms developed specifically for this proposal, such as ''verification limit'' and ''verification production level.'' Finally, the definitions of ''certified person,'' ''normal production shift,'' and ''valid respirable dust sample'' would be removed.

We explain these new and revised definitions of terms below. You should also closely examine each proposed section where the term is used to review the context in which it is used.

The following existing definitions are being modified:

Concentration

The existing definition would be modified so that ''concentration'' refers to an 8-hour Mining Research Establishment (MRE) equivalent measure of the amount of sampled material contained per unit volume of air. The proposed revision would include the constant factor of 1.38 which the Secretary currently uses to convert concentration of respirable dust measured with approved sampling devices to an equivalent concentration as measured with an MRE instrument.

MSHA developed the existing coal mine dust standards from 8-hour shift exposure measurements. Therefore, if you take a sample over a period other than eight hours, you must adjust the concentration measurement to be equivalent to an eight-hour exposure. This will protect miners working shifts longer than eight hours, and would be accomplished by multiplying the sampler flow rate by 480 minutes, regardless of the length of time during which the sample was actually collected. (In these examples, to determine equivalent concentrations of respirable coal mine dust: MRE equivalent concentration (mg/m^3)=

$$\left(\frac{\text{accumulated dust (mg)}}{\text{sampling time (min)} * \text{rate of sampling}\left(m^3\right)}\right) * 1.38$$

where: rate of sampling = 0.002 m^3/min).

For example, suppose a DO sample is collected over a 9-hour shift that includes one hour of travel time. Suppose that the amount of dust accumulated during travel is negligible, and the amount of dust accumulated during production is 1.5 mg. If the concentration were not adjusted to an 8-hour equivalent, it would be diluted by the time spent traveling and calculated as 1.92 mg/m^3. Under the proposed definition, the calculated concentration would be 2.16 mg/m^3.

The proposed definition does not change the daily limit on accumulated exposure 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 exposure limit of $8 \times 2.0 =$ 16 mg-hr/m^3. The proposed definition of concentration would maintain this same MRE-equivalent 16 mg-hr/m^3 daily limit, regardless of the length of any shift worked.

To continue the example, the exposure accumulated during a day is the same, whether from 8 hours at an average of 2.16 mg/m^3 or from 9 hours at an average of 1.92 mg/m^3. In either case, the MRE-equivalent exposure accumulated for the day is 17.3 mg-hr/m^3, which exceeds the intended daily limit of 16 mg-hr/m^3. Under the proposed definition, this would be reflected by the fact that the calculated concentration exceeds 2.0 mg/m^3. MSHA solicits comments on this method of adjusting concentrations to an 8-hour equivalent.

Designated Area (DA)

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

Mechanized Mining Unit (MMU)

The existing definition would be modified by removing § 70.207(e) (Bimonthly sampling; mechanized mining units) which will be deleted, and revising § 70.207; and by transferring the requirements for identifying each MMU specified in existing §§ 70.207(f)(1) and (f)(2), to revised § 70.2(o).

Quartz

The existing definition of quartz 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 procedure, thereby enabling other laboratories to reproduce quartz determinations made by MSHA.

The following new definitions are being proposed:

Critical Value

''Critical value'' would mean the maximum acceptable full shift 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 was derived. The specific critical values and their use are detailed in §§ 70.209 and 70.213.

Dust Control Parameters

''Dust control parameters'' would mean the respirable dust control requirements of a mine ventilation plan, including engineering or environmental controls, maintenance procedures, and any other requirements described in a ventilation plan. These requirements are intended for the protection of miners from excessive levels of respirable dust and must be in place on every production shift. To assure compliance with the ventilation plan, you must check the dust control parameters on each MMU before beginning production, as required under § 75.362(a)(2). This term has not been formally defined until now.

Engineering or Environmental Controls

''Engineering or environmental controls'' would mean all methods that control the level of respirable dust in the work environment by either reducing dust generation or by suppressing, diluting, capturing or diverting the dust being generated during the mining process. Throughout the proposal, the terms ''engineering'' and ''environmental'' controls are used interchangeably. The Racal® Airstream helmet (or the 3M™ Airstream™ Helmet-Mounted PAPR), or any other respiratory protective device approved and labeled as such by the National Institute for Occupational Safety and Health (NIOSH), is not defined as an engineering or environmental control.

Full Shift

''Full shift'' is defined differently for purposes of plan verification and abatement sampling, and for bimonthly compliance determinations. For purposes of abatement and plan verification, ''full shift'' would mean an entire work shift, including travel time to and from the MMU. Because of the way MSHA intends to define ''concentration,'' this would be equally protective regardless of the production and travel times. For example, suppose miners at one MMU travel for one hour and mine for eight hours. Miners at another travel for two hours and also mine for eight hours. Suppose, further, that the dust concentration during travel is negligible and that the dust concentrations are identical during production at the two MMUs. Then the amount of dust accumulated on a filter will be the same, say 1.0 mg, in both cases. Applying the proposed definition, the dust concentration calculated for both MMUs would be 1.44 mg/m^3.

For purposes of bimonthly compliance determination, MSHA would continue its current practice of limiting sampling to a 480-minute maximum. MSHA solicits comments on whether ''full shift'' for compliance sampling purposes should be defined in the same way as for abatement and plan verification purposes. MSHA also solicits comments on whether ''full shift'' should be defined, as proposed, in the same way for abatement and plan verification purposes.

Material Produced

''Material produced'' would mean the total amount of coal and/or other substance extracted by an MMU during any production shift. In order to properly assess the effectiveness of the mine 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 MMU each shift under a new paragraph (h) of § 75.370.

MRE

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

Powered Air-Purifying Respirators (PAPRs)

''Powered, air-purifying respirators (PAPR)'' would mean a NIOSH approved loose-fitting respirator that uses a blower to force the ambient air through air-purifying elements to deliver filtered air to the miner's breathing area. Under the proposal, an operator who employs longwall mining has the option of using either powered, air-purifying respirators (PAPRs) or verifiable administrative controls as a supplemental means of control once MSHA has determined that concentrations of respirable dust have been reduced as low as is feasible with engineering and environmental controls. This may include RACAL® Airstream helmets or similar devices that are available now or in the future. The reason for excluding other types of approved respirators is discussed in section II.B.1.

Verifiable Administrative Control

''Verifiable administrative control'' would mean a work practice intended to reduce the miner's full shift exposure to respirable dust hazards by altering the way in which work is performed. Examples include rotation of miners to areas having lower concentrations of respirable dust, rescheduling of tasks, and modifying work activities to reduce exposure. A ''verifiable administrative control'' must be (1) capable of review to confirm proper implementation; (2) clearly understood by miners; and (3) applied consistently over time.

Verification Limits

''Verification limits'' would mean the maximum dust concentration for which the ventilation plan has been verified as effective in maintaining during the full shift. There are two separate verification limits: An MRE-equivalent concentration of 2.0 mg/m^3 for respirable coal mine dust and an MRE-equivalent concentration of 100 μg/m^3 for respirable quartz dust. Both of these

limits apply to dust concentrations measured over a full shift.

MSHA does not enforce a separate standard for quartz dust. It regulates exposures to quartz and coal mine dust by reducing the applicable standard for coal mine dust, by means of a formula, when quartz content of the respirable dust is above 5 percent. This formula (10 divided by the concentration of quartz, expressed as a percentage) establishes an applicable coal mine dust standard that, in effect, limits quartz concentrations in the mine environment to no more than 100 μg/m³. For example, when the quartz content is 5 percent, the applicable standard is 2.0 mg/m³; when the quartz content is 10 percent, the applicable standard is 1.0 mg/m³. Five percent of 2.0 mg/m³ and 10 percent of 1.0 mg/m³ are each 0.100 mg/m³ or 100 μg/m³.

The Advisory Committee recognized that a significant quartz exposure hazard continues to exist in coal mines, especially for operations such as roof bolting. Based on MSHA data, 66 percent of underground coal mines are operating on a reduced dust standard due to the respirable dust in the mine environment containing a high percentage of quartz. MSHA data also indicates that 73 percent of the over 600 roof bolters and over 29 percent of the MMUs sampled bimonthly by mine operators are operating under reduced dust standards. The number of reduced standards in effect indicates that a significant potential health risk due to quartz exposure continues to exist. Under the current program, miners can be exposed to excessive quartz levels while the dust standard-setting process takes place. For example, consider a recent situation where an MSHA dust sample of a roof bolter was 0.9 mg/m³; a level that was in compliance with the applicable standard, 1.3 mg/m³. However, when the sample was analyzed for quartz the results indicated that the actual concentration of quartz dust in the mine environment exceeded 270 μg/m³; or more than two and a half times above the permissible level of 100 μg/m³. The only action that could be taken in this particular situation was to initiate the dust standard-setting process, which, on average, can take at least one month or longer. The existing standard-setting process continues from the time the operator is cited for violating the reduced standard through the time MSHA enforces final corrective action.

Under this proposal, MSHA would require operators to anticipate the potential for quartz exposure and to incorporate controls prior to approval of the mine ventilation plan. In order to verify that the operator has incorporated such controls, 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 percent quartz in the dust during the verification process.

This process would require operators to address both the potential for respirable coal mine dust and quartz dust exposure. As recommended by the Advisory Committee, the proposed plan verification process would establish a monitoring and compliance framework to aid MSHA and the coal mine operator in targeting mining situations where quartz exposure constitutes a significant hazard and enhanced dust control procedures are required.

Verification Production Level (VPL)

The ''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 an MMU. (§ 70.208 explains how to establish the VPL if you do not have records for 30 production shifts.)

We believe that the 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 this VPL would provide assurance that excessive dust concentrations would be avoided on a majority of production shifts. MSHA believes that using this VPL is more protective of miners' health than the current practice of evaluating plan adequacy based on MSHA inspector samples taken when production can be as low as 60 percent of the average production. We note however, that a VPL defined as a higher production percentile than is being proposed would likely assure that miners would be more protected on a majority of production shifts. The Agency welcomes comments on both the use of a VPL and the appropriate production percentile to use to define it.

Since approximately 50 percent of all production shifts are expected to exceed average production, it follows that the vast majority of all production shifts exceed 60 percent of average production. Therefore, by using 60 percent of average production as the lower range of the production criteria for plan evaluation purposes, as required under current inspection procedures, we have no assurance that the plan would be effective under the vast majority of production conditions.

If you do not have records for 30 production shifts, you can use the minimum production actually achieved on a shift used to verify the plan's effectiveness as your VPL.

Verification Sample

''Verification sample'' would mean a sample collected for purposes of plan verification. In order to be valid the sample must be collected on a full shift during which the amount of material produced is at or above the VPL. Only those engineering or environmental controls and other measures listed in the mine ventilation plan may be employed, at levels not exceeding 115% of the quantities specified in the plan during the shift in which the sample is collected. For example, if the plan specifies an air quantity of 4,000 cfm, the quantity measured during verification must not exceed 4,600 cfm (4,000 cfm x 1.15 = 4,600).

Section 70.100 What are the respirable dust standards when quartz is not present?

MSHA is proposing no substantive changes to 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(c). The requirements of revised § 70.2(c) are similar to the previous standard in § 70.206. The proposal retains the respirable dust standard of 2.0 mg/m³ in existing paragraph (a) and the intake air standard for respirable dust of 1.0 mg/m³ in existing paragraph (b).

Section 70.101 What is the 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 respirable dust standard below 2.0 mg/m³ when the quartz content of the respirable dust in the mine atmosphere is above 5 percent. However, the Agency is proposing to change how it arrives at an average quartz percentage that is used to establish an applicable dust standard.

MSHA recently published a proposed ''Program Policy Letter (PPL) on Samples Used to Determine the Respirable Dust Level When Quartz is Present'' for public comment [64 FR 65671, November 23, 1999] whereby the standard would be determined based solely on the results of multiple MSHA samples. Under this proposal, as in the PPL, MSHA would no longer be using a combination of MSHA and mine operator sampling for determining the average quartz percentage, which has been the practice since 1985. Instead, as discussed in section III.B, this proposal

would establish MSHA sampling as the exclusive basis for determining the reduced standard and require three valid MSHA samples to set a reduced standard. Since we are sampling underground mines bimonthly, we will have no difficulty in collecting the required number of samples to arrive at the average quartz percentage. We believe our samples will be more representative of the level of quartz to which miners are exposed than as determined currently. This increased level of sampling should also allay any operator concerns regarding the collection of ''misleadingly high'' samples during atypical periods. We would also begin reporting quartz levels to the nearest tenth of a percent. This is intended to be more protective for the miner than under the current program of truncating results to the nearest full percent. We believe that the method for establishing reduced standards will be more protective for the miners than the current program.

Verification of Ventilation Plan Effectiveness.

Existing § 75.370 requires you to develop an underground coal mine ventilation plan that is designed to control methane and respirable dust in the mine. It further requires that the plan be suitable to the conditions and mining systems at the mine. Proposed §§ 70.201 to 70.211 sets forth the steps that MSHA will follow to demonstrate that your mine ventilation plan required by § 75.370 is effective in controlling respirable dust under typical mining conditions. This demonstration would be required before MSHA approves the mine ventilation plan.

Under §§ 70.201 to 70.211, MSHA would verify the effectiveness, for the control of respirable dust, of all mine ventilation plans submitted to the District Manager for approval under § 75.370. To do this, MSHA would collect full shift samples, called ''verification samples.'' For MSHA to approve the plan, these samples would have to demonstrate that the plan's dust control parameters are effective in maintaining concentrations of respirable coal mine dust and quartz dust in the working environment of MMUs at or below 2.0 mg/m^3 and 100 µg/m^3, respectively, under typical mining conditions.

MSHA has drafted the regulatory text of this proposal in a question and answer format. The remainder of the Section-by-Section discussion also follows this format. As discussed in Chapter IV paragraph A below, we request your comments on this format.

Section 70.201 Who must have a verified ventilation plan?

Section 75.370 requires all underground coal mine operators to submit a mine ventilation plan for approval. The proposed § 70.201 would require the verification of these plans in terms of their effectiveness in controlling dust.

Section 70.202 What is a verified ventilation plan?

A ventilation plan submitted under § 75.370 must be designed to control respirable dust and must be suitable to the conditions and mining systems at the mine. In order for the plan to be verified under this proposal, the plan's dust control parameters must be demonstrated to be effective, at a high level of confidence, in maintaining the concentration of respirable coal mine dust and quartz dust in each MMU at or below 2.0 mg/m^3 and 100 µg/m^3, respectively. This demonstration would be based on MSHA full shift verification samples, which are collected when the amount of material produced is at or above the VPL and only the engineering or environmental controls and other measures included in the ventilation plan are in place, at levels not exceeding 115% of the quantities specified in the plan.

Section 70.203 What will trigger the plan verification process?

There are several ways in which the plan verification process could be initiated. You would trigger the process by submitting a new ventilation plan under § 75.370, or amending a previously approved ventilation plan under § 75.371(f). The verification process could also be triggered if the District Manager requires you to change your plan after determining that your dust control parameters are no longer effective. Finally the verification process could be triggered if you propose revisions to a previously verified ventilation plan and the District Manager determines that the proposed revisions may cause the plan to be inadequate.

Once your ventilation plan has been verified as effective, it should not be necessary to reverify your plan every six months. However, you may be required to change your plan parameters based on (1) results of the MSHA six-month review of the ventilation plan as required by § 75.370(g), (2) excessive dust concentrations measured by MSHA sampling, 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 plan. For example, if you are cited by MSHA for exceeding the applicable dust standard the District Manager may have cause to question the adequacy of the previously-approved plan.

Also, depending on sampling results and production records, if your production exceeds the VPL during MSHA sampling, the District Manager may require you to verify the ventilation plan at the higher production level. For example, suppose your VPL is 10,000 tons and all five MSHA concentration measurements exceed the applicable standard on a shift for which the production is 12,000 tons. Then, if your production records indicate that you have exceeded the VPL on more than 33 percent of all production shifts during the previous six months, MSHA would initiate the verification process.

Section 70.204 When will MSHA conduct verification sampling?

The District Manager will notify you of the schedule for verification sampling after granting provisional approval of your ventilation plan. However, before you receive provisional approval, you may be required to change your plan if the District Manager determines that your dust control parameters are inadequate or unsuitable for the current mining conditions. If provisional approval is not granted, you may not operate the affected MMUs. Since more than 700 existing mine ventilation plans may require verification, MSHA will not be able to verify all plans immediately. Under proposed § 70.204 the District Manager would notify you of the date when MSHA intends to collect verification samples.

Section 70.205 What must I (the operator) do to comply this standard?

When the District Manager notifies you that your mine has been scheduled for verification sampling, you would need to make sure that all the dust control parameters specified in your ventilation plan are fully implemented. Since the objective of plan verification is to determine the effectiveness of the plan's dust control parameters in controlling respirable dust under typical mining conditions, paragraph (a) would require you to utilize only the dust control parameters listed in the ventilation plan that was provisionally approved by the District Manager. On the date scheduled for verification sampling, you should establish production levels at or above the VPL specified in the plan, using only the dust control parameters and other measures listed in the plan.

Recognizing that engineering or environmental controls such as air quantity and velocity 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 levels specified in the plan. If, on the date of verification sampling, a measured quantity exceeds the corresponding quantity specified in the plan by more than 15 percent, you will have the option to either (1) adjust the parameter(s) to what is specified in the plan before verification sampling begins or (2) make no adjustment to the parameter(s) prior to verification sampling. Under the second option, plan approval will be contingent on incorporating into your plan the maximum values of parameters in effect during verification sampling. If verification samples were taken when a parameter measurement exceeded 115 percent of the level specified in the plan, then (assuming none of the verification samples exceeded the critical values) that parameter quantity, as measured, would be incorporated in the plan ultimately approved by the District Manager.

As of the effective date of the final rule, you would be required to begin maintaining records of the amount of material produced by each MMU during each shift. This would enable you to establish the ''verification production level'' (VPL)—the minimum production level at which you must demonstrate the plan's effectiveness.

Before you submit a previously approved ventilation plan to the District Manager for review and approval, proposed paragraph (c) would require you to provide additional information. This additional information is described under § 75.371(f) of this proposal.

To enable us to maximize our inspection resources and to promote an orderly verification process, proposed paragraph (d) would require you to notify the District Manager in a timely manner if you are unable to meet the conditions for verification sampling on the scheduled date. Failure to provide notification may be cause for revocation of the provisional approval of your ventilation plan.

In accordance with section 103(f) of the Mine Act and the recommendations of the Advisory Committee, miners and their representatives would be provided the same walkaround rights during plan verification sampling as they are provided during any other physical inspection made pursuant to the provisions of section 103(a) by an authorized representative of MSHA.

MSHA believes that under the guidance of the Interpretive Bulletin (43 FR 17546, April 25, 1978) these 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.

The process of plan verification sampling is necessary to obtain information related to approval of the mine's ventilation plan and whether coal mine dust will be adequately controlled to protect miners health. Consequently, miners and their representative would have the right to accompany the inspector with no loss of pay for the time during which the representative exercises this right. However, this right is limited by Section 103(f) to only one such representative of miners.

Section 70.206 Who will MSHA sample and where will MSHA place the sampling device(s) when conducting verification sampling?

MSHA will sample specific occupations within an MMU to demonstrate your plan's adequacy. These occupations would be selected because, based on past experience, within an MMU they would likely be exposed to the highest respirable coal mine dust concentration and, therefore, would be at greatest risk of overexposure. Therefore, MSHA would sample the environment of the DO (as under existing § 70.207), the roof bolter operator(s) (occupation codes—012, 014 or 046), the longwall jack setters (occupation code—041), and any other occupation that the District Manager may designate for sampling after reviewing your ventilation plan.

Section 70.207 How many shifts will MSHA sample to verify my ventilation plan?

This proposed section would explain that the number of shifts required to verify your ventilation plan would depend on two factors: first, the actual operating conditions during the shift that is sampled; and, second, the sample results. To qualify as a verification sample, 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 you are able to achieve these operating conditions. We may need to sample several production shifts before the production level on any single shift qualifies for verification purposes. We may verify the plan based on this single shift—but only if all concentration measurements on the sampled shift are at or below the appropriate critical values proposed in § 70.209. This would demonstrate the plan's effectiveness at a high level of confidence. If any of the measurements exceed the appropriate critical value, then we would collect verification samples taken on one to three additional shifts, depending on the concentrations measured on those shifts. Since these additional shifts must also meet the criteria for production, and use only the engineering or environmental controls and other measures specified in the ventilation plan, we may have to sample a total of more than four shifts.

Assuming that you make 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 you made no special production effort, there would be a 13-percent chance we would need to sample more than five shifts and a 1.7-percent chance we would have to sample more than 10 shifts. [8] On the other hand, again assuming no special production effort, there would be a 98-percent chance we would need 10 or fewer shifts and a 70-percent chance that we would need three or fewer shifts. [9] This assumes that the dust concentration measurement for each shift does not exceed the critical value corresponding to the number of shifts sampled. If you make a special effort to achieve high production on the sampled shifts, then fewer shifts would be required.

Section 70.208 What if 30 shifts of production data are not to establish the verification production level (VPL)?

If you are starting a new MMU or mine, you may not have 30 shifts of production data available when you submit a new ventilation plan. In such cases, proposed § 70.208 requires you to establish the VPL as the minimum production level actually achieved on a shift used to verify the plan's effectiveness. For example, assume we initiate verification sampling of your longwall MMU. Based on the dust

[8] Assuming no special production effort, the probability of needing more than n shifts to be sampled before you met 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.

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

concentration measurements obtained on the first shift sampled, your MMU happens to 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. According to the applicable critical values table in § 70.209, we would need to sample at least two more shifts to verify your plan's effectiveness, provided that no sample exceed 1.93 mg/m^3 for respirable coal mine dust or 97 µg/m^3 for quartz dust. Assume that 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 the applicable critical values table in § 70.209, to verify plan effectiveness based on a single shift. In this case, you 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 on a single shift and a determination of the plan's adequacy was based on these three shifts, your VPL would be the minimum production achieved during verification sampling. In any case, the VPL would become part of your ventilation plan.

Section 70.209 When will MSHA approve my ventilation plan?

This is a new section that proposes ''critical values'' that the District Manager would use to determine whether your plan's dust control provisions should be approved. These critical values, which differ according to the number of shifts used for verification, are listed in Table IV–1. When verification sample results do not exceed the appropriate critical value for respirable coal mine dust or quartz dust, we can be confident that the engineering or environmental controls in place during verification sampling successfully prevented excessive dust concentrations at the sampled locations. Therefore, MSHA would approve your plan when the dust control parameters are in place during verification sampling and none of the measurements obtained from your verification samples exceeded the appropriate critical value. Appendix A explains how the critical values were derived.

TABLE IV–1.—CRITICAL VALUES FOR VERIFYING PLAN EFFECTIVENESS. THE RESULT OF EACH VERIFICATION SAMPLE COLLECTED MUST BE LESS THAN OR EQUAL TO THE APPROPRIATE CRITICAL VALUE

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

The proposed approval process would allow the District Manager to base verification sampling on a reasonably small number of shifts, while maintaining a high level of confidence that approved ventilation plans adequately prevent excessive dust concentrations. We would have to sample at least one full shift under the operating conditions specified in the mine ventilation plan before we could make any determination of the plan's adequacy. The plan would be approved if all samples on that shift meet the criteria for a verification sample as defined in § 70.2, and none of the sample results exceed the appropriate critical value for a single shift listed in Table IV–1. However, if any verification sample resulted in a coal mine dust measurement greater than 1.71 mg/m^3 or a quartz dust measurement greater than 87 µg/m^3, samples would be taken on additional shifts.

The following two examples illustrate how we would determine if your plan's dust control provisions should be approved:

Example 1: Suppose samples were taken on two shifts. We would approve the dust control provisions of your plan if all quartz and coal mine dust measurements obtained on the two shifts were less than 1.85 mg/m^3 or 93 µg/m^3, respectively. On the other hand, if one of the roof bolter samples resulted in a quartz concentration measurement of 95 µg/m^3, then we would not approve your plan, based on these two shifts alone. Instead, at least one additional shift would be needed. 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/m^3, and none of the quartz measurements exceeded 97 µg/m^3. (Dust control parameters and production on this additional shift, as well as on the first two shifts, would need to meet the criteria for verification samples in proposed § 70.2 (bb).)

Example 2: Suppose verification samples were taken on four or more shifts. We would approve the dust control provisions as proposed if no measurement exceeded 2.0 mg/m^3 of coal mine dust or 100 µg/m^3 of quartz dust.

Section 70.210 What must I (the operator) do if one or more verification samples exceed either verification limit?

This is a new section that would require you to take certain actions whenever a verification sample results in a measurement exceeding the verification limit for either respirable coal mine dust (2.0 mg/m^3) or quartz dust (100 µg/m^3). You would be required to immediately identify the cause of the high dust concentration and prevent miners from being overexposed on subsequent shifts.

When you receive notice from MSHA that you have exceeded either verification limit, you must immediately take corrective action. You must lower excessive respirable dust concentrations, so that none of your full shift measurements exceed verification limits in any of the identified occupational environments or sampling locations. At the same time, you must make approved respiratory equipment available to affected miners in accordance with § 70.300.

You would also be required to document the corrective actions taken for the District Manager, within five days of MSHA's notification that you have exceeded a verification limit. This documentation must describe all of your corrective actions, including proposed changes in dust control parameters. You would be encouraged to seek technical assistance from the District Manager to help you determine what additional corrective measures would be reasonably likely to reduce excessive dust concentrations.

The District Manager will notify you if your ventilation plan is provisionally approved and when MSHA will again commence verification sampling. The District Manager may require you to make additional changes in your plan parameter(s) based on the results of verification sampling before starting sampling over again. If no changes are required, MSHA will continue

verification sampling from the point at which it stopped.

The District Manager would choose, on a case-by-case basis, between resuming verification sampling or starting plan verification anew. MSHA would not necessarily require a revision of the ventilation plan nor start the ventilation verification process over again because a verification sample exceeded the verification limit by a small amount, such as 0.05 mg/m^3. The decision to continue with your current ventilation plan or start over again with a new ventilation plan, would be based on the information you provide regarding the cause of any excessive dust concentration measurements and the steps you have taken to prevent similar occurrences in the future. For example, suppose dust concentration measurements are excessive due to a deviation in your established operating procedures. It should be possible for you to prevent such occurrences in the future without changing the ventilation plan. If the District Manager finds this to be the case, and accepts your proposed action to prevent similar occurrences, MSHA would resume verification sampling. However, the District Manager may determine that the ventilation plan is not adequate for current operating conditions and require you to change the plan parameters. If so, MSHA would start the verification sampling process over again.

MSHA would not issue citations for exceeding verification limits during the plan verification process. However, MSHA will issue citations under proposed § 70.210(a) for failure to take action required to address the cause of the excessive dust levels once you have been notified by MSHA.

Section 70.211 What if verification samples continue to exceed either verification limit even though I (the operator) believe all feasible engineering and environmental controls are in place?

This proposed section would continue to require you to use all feasible engineering or environmental controls before implementing any supplemental means of control at longwall mining operations. For continuous and conventional mining operations MSHA would suggest additional engineering and environmental controls. Even if these controls do not prevent full shift respirable dust concentrations from exceeding the verification limits, you must continue to use them to reduce respirable dust to the lowest feasible level. Engineering or environmental controls have been the primary form of dust control for the past 30 years. The Advisory Committee recommended that engineering or environmental controls remain the primary means of protecting coal miners. Consistent with the Mine Act and the Advisory Committee's recommendation, under this proposal engineering or environmental controls continue to be recognized the primary means to control exposure to respirable dust.

If you operate an MMU employing either a continuous or conventional mining method, we believe feasible engineering or environmental controls are available to control respirable dust to an acceptable level. Controls include better design of water spray systems for dust suppression and air movement, use of dust collectors, and improved face ventilation systems.

Of approximately 800 continuous miner MMUs operating in over 500 underground mines, over 90 percent employ extended cut techniques and are being operated remotely (Elam, August 1999). As a result, the continuous miner operator, the occupation normally identified as the DO for bimonthly sampling purposes, is no longer required to work close to the face area where material is being extracted.

Roof bolting machines, a major generator of respirable quartz dust on continuous miner MMUs, must be equipped with suitable drill dust controls. Under § 72.630, drill dust must be controlled by permissible dust collectors, by water, water with a wetting agent, by ventilation, or by any other method approved by MSHA.

These and other approaches, as well as results of laboratory and field studies of the effectiveness of various dust controls, can be found in several detailed compilations prepared by the former U.S. Bureau of Mines, whose responsibilities have now been transferred to NIOSH. (U.S. Bureau of Mines various reports, undated). If you exceed either verification limit, the District Manager will suggest that you implement additional controls.

As discussed in section II. B., MSHA recognizes that improvements in control technology have not kept pace with the increase in production technology associated with high-production longwall MMUs. Average longwall shift production reported during bimonthly sampling has increased from 890 tons per shift in 1980, to over 4900 tons per shift in 1999. Given the state of longwall dust control technology, the currently-available engineering or environmental controls may not succeed in sustaining continuous compliance at certain locations downwind of the longwall operator (occupation code—044) at some high-production longwall MMUs under typical mining conditions.

For your longwall operation, if you believe that you have implemented all feasible engineering or environmental controls, you may submit a written request to MSHA's Administrator for Coal Mine Safety and Health in Arlington, Virginia, to request for MSHA to review your longwall mining operation and determine if you have, in fact, implemented all feasible engineering controls.

Upon receipt of such a request, MSHA would solicit guidance from a panel of experts which would be established for making such determinations. 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 your mine, and one other MSHA District. In some cases, we may solicit advice from NIOSH. As part of their deliberations, the expert panel may visit your mine to observe the various controls in operation. Any decisions reached by this panel would be based on the review of available information, their combined experience in dust control, and sound engineering judgement.

If the Administrator determines that you are using all feasible engineering or environmental controls, we would notify you in writing that you have been granted approval to use either PAPRs approved under 42 CFR 84 or verifiable administrative controls as a supplemental means of control to protect miners required to work downwind of the longwall operator. You would also be informed that the location of the DO would be changed from the 060 to the 044 occupation, or other occupation designated by the District Manager depending on how your longwall MMU is ventilated. You must continue to maintain the work environment of the new DO at or below the verification limits using engineering or environmental controls, as demonstrated during plan verification. As discussed earlier, while it may be difficult to make the environment safe for some miners working on the longwall face under certain mining conditions, MSHA believes that an acceptable work environment can be provided for the longwall operator (occupation code—044) and other miners on a continuing basis. You must choose either PAPRs or verifiable administrative controls for your ventilation plan. The notification would grant approval of an interim verification plan allowing the use of PAPRs or administrative controls as a

supplemental means of compliance. You must introduce additional engineering or environmental controls as they become available and feasible. Every six months, as part of our regular review of your mine ventilation plan, we would follow-up on your efforts to comply with this requirement.

Sections 70.212 through 70.215

Use of Approved Powered, Air Purifying Respirators

These sections would establish the requirements for utilizing PAPRs to supplement engineering or environmental controls.

Section 70.212 For my longwall operation, what must I (the operator) do in order to use approved PAPRs to supplement engineering or environmental controls?

This proposed section would require you to submit a revised ventilation plan to MSHA within five days of receipt of MSHA's written approval in accordance with § 70.211 if you choose to use approved PAPRs to supplement engineering or environmental controls. Your revised plan must specify the engineering or environmental controls you believe are capable of maintaining respirable dust concentrations (1) at or below the verification limits in the environment of the new DO (previously occupation 060, and currently occupation 044 or another occupation designated by the District Manager), and (2) at or below two times the verification limits in the environment of any miner working on the longwall face (downwind of the DO) who is required to wear a PAPR.

This is based upon the demonstrated effectiveness of PAPRs on longwall MMUs and the range of longwall air velocities observed by MSHA inspectors discussed earlier in section II.B.2, which led MSHA to reduce the protection factor assigned to loose fitting, helmeted PAPRs from 25 to two. In other words, the maximum full shift, MRE-equivalent concentration of respirable dust allowed in the environment of any miner working on the longwall face (downwind of the DO) who is required to wear a PAPR cannot exceed 4.0 mg/m^3 of respirable coal mine dust and 200 µg/m^3 of respirable quartz dust.

In addition to specifying all feasible engineering or environmental controls to be used, you would be required to include in your plan a written respiratory protection program for PAPRs for all affected miners as described in § 72.710. MSHA's District Manager may require you to modify the respiratory protection program before granting provisional approval of your ventilation plan.

Once MSHA grants provisional approval, we will verify the effectiveness of the revised dust control provisions of the ventilation plan. We will sample the environment of the DO and of those miners that your plan requires to wear approved PAPRs. If effectiveness of the plan is verified, it would become your interim ventilation plan.

In order to continue using PAPRs for compliance purposes, you would be required to maintain the effectiveness of your engineering or environmental controls, as well as the effectiveness of your approved PAPR respiratory protection program. We believe that the effectiveness of a PAPR is dependent upon proper training and continued maintenance. Training and maintenance procedures are part of an effective respiratory protection program. The provision 30 CFR 72.710 requires all respirators used in an underground coal mine to be selected, fitted, used, and maintained in accordance with the provisions of the American National Standards Institutes ''Practices for Respirator Protection ANSI Z88.2–1969.'' These provisions include training miners in the use and maintenance of respirators and the limitations of the specific respirator worn. Necessary maintenance includes examining it 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. Furthermore, all respiratory equipment used in an underground coal mine must be approved by the National Institutes for Occupational Safety and Health (NIOSH) under 42 CFR part 84.

The use of PAPRs is not intended to be permanent. Their use as a supplemental control would be permitted only on an interim basis, until feasible engineering or environmental controls become available. You would have to implement any feasible engineering and environmental controls, as they become available.

Section 70.213 For my longwall operation, when will MSHA approve my interim ventilation plan incorporating a PAPR respiratory protection program?

Approval of your interim mine ventilation plan would depend on the results of verification sampling and the operating conditions in effect for each sample. Paragraph (b) adds additional criteria or ''critical values'' for coal mine dust and quartz dust to those specified in § 70.209. These additional critical values, listed in Table IV–2, would apply to the environments of workers required to wear PAPRs under the plan. The critical values given in § 70.209 would continue to apply to DO samples. However, once an interim ventilation plan is approved, the position of the DO will change. Your plan would be approved if it reflects the dust control parameters in place during verification sampling and none of the verification samples exceed the corresponding critical values. No DO dust sample obtained during the verification process can exceed 2.0 mg/m^3 (respirable coal mine dust) or 100 µg/m^3 (respirable quartz dust). Since we estimate a protection factor of two, no verification sample from the environment where workers are required to wear PAPRs could exceed 4.0 mg/m^3 (coal mine dust) or 200 µg/m^3 (quartz dust).

TABLE IV–2.—CRITICAL VALUES FOR VERIFYING PLAN EFFECTIVENESS IN THE ENVIRONMENT OF WORKERS REQUIRED TO WEAR PAPRS. THE RESULT OF EACH SAMPLE USED TO VERIFY PLAN EFFECTIVENESS FOR SUCH WORK ENVIRONMENTS MUST BE LESS THAN OR EQUAL TO THE APPROPRIATE CRITICAL VALUE

Number of shifts meeting criteria for verification sampling	Critical value for coal mine dust (µg/m^3)	Critical value for quartz dust (µg/m^3)
1	3.54	174
2	3.77	187
3	3.89	194
4 or more	4.0	200

Section 70.214 For my longwall operation, under what circumstances may I (the operator) continue to use PAPRs to supplement engineering or environmental controls?

In order to continue use of PAPRs to supplement your engineering or environmental controls, you must comply at all times with the dust control provisions of your interim mine ventilation plan. This includes: (1) implementing and maintaining all feasible engineering or environmental controls on each shift; and (2) complying with all provisions of your approved PAPR respiratory protection program. In addition, to ensure the continued effectiveness of your approved dust control parameters, no DO sample taken by an MSHA inspector could exceed the applicable dust standard. Furthermore, no MSHA measurement for any miner working downwind of the DO could exceed twice the applicable dust standard.

Finally, you would be required to continue to seek improvements and implement, when they became available, any feasible engineering or environmental controls. MSHA will follow-up on your efforts in this regard as part of its regular six-month review of your mine ventilation plan under § 75.370.

Respirator programs require continuous administrative attention to assure continued effectiveness. MSHA's District Manager would evaluate, at least quarterly, the effectiveness of all installed engineering or environmental controls, the effectiveness of your PAPR respiratory protection program, and your performance in complying with all other plan provisions.

Section 70.215 What if an MSHA DO sample exceeds the applicable dust standard, or an MSHA sample for a miner required to wear a PAPR exceeds twice the applicable dust standard.

This proposed section would require you to review your dust control procedures and promptly take action which would prevent similar occurrences in the future. Also, you must review your approved PAPR respirator program to assure its continued effectiveness. Dust levels in excess of the applicable standard could result from a change in operating conditions, because of an abnormal condition or work practice, or due to production exceeding the VPL. If you determine that you cannot comply with the dust standard, you would need to amend your interim ventilation plan and submit it to the District Manager for review and approval.

If you are cited under § 75.371 for failure to comply with your approved interim plan, the District Manager may conduct an investigation to determine if you are complying with the dust control provisions of your approved interim ventilation plan. If the investigation discloses that you are not following your plan, MSHA may revoke approval of your plan.

Finally, the District Manager may revoke your interim plan and withdraw permission to use PAPRs for compliance purposes if you have a record of noncompliance with your interim ventilation plan, or if MSHA samples indicate that miners are not adequately protected. If this occurs, your revised interim plan must include a VPL at which you can comply with the applicable standard.

Sections 70.216 Through 70.218

Use of Verifiable Administrative Controls

These sections establish requirements for using verifiable administrative controls to supplement engineering or environmental controls.

Section 70.216 For my longwall operation, what must I (the operator) do in order to use verifiable administrative controls to supplement engineering or environmental controls?

''Verifiable administrative controls'' are work practices that reduce miners' daily exposure to respirable dust by altering the way in which work is performed such as rotating miners to areas having lower concentrations of respirable dust. To be considered verifiable administrative controls, it is necessary that the practices: (1) Can be reviewed to confirm proper implementation, (2) are clearly understood by miners, and (3) can be applied consistently over time. If you choose to use verifiable administrative controls for compliance purposes, paragraph (a) requires you to submit a revised ventilation plan to MSHA's District Manager within five days of receiving MSHA's written approval in accordance with § 70.211. This plan must specify: (1) the feasible engineering or environmental controls to be used for reducing respirable dust concentrations to the lowest possible level; (2) the verifiable administrative controls to be implemented on the longwall MMU; and (3) the procedures to be employed for ensuring compliance with the verifiable administrative controls on every shift.

Once MSHA grants provisional approval, we will verify the effectiveness of the revised dust control provisions of the ventilation plan. We will sample *all* miners working on the longwall face, including the DO (occupation code 044 or other occupation designated by the District Manager), to demonstrate effectiveness of the proposed dust control provisions. If effectiveness of the plan is verified, it would become your interim ventilation plan.

The use of verifiable administrative controls is not intended to be permanent. Their use for compliance purposes would be permitted only on an interim basis, until feasible engineering or environmental controls become available. You would have to implement any feasible engineering and environmental controls, as they become available. You must make sure that you continue to comply with your approved administrative controls, and you must maintain the effectiveness of your engineering or environmental controls. Finally, you must implement any feasible engineering or environmental controls methods that become available, and that would prevent full shift dust concentrations from exceeding the applicable dust standard at any location at which miners normally work at the longwall face.

Section 70.217 For my longwall operation, when will MSHA approve my interim ventilation plan incorporating verifiable administrative controls?

Approval of the dust control provisions of your interim ventilation plan depends on the results of your verification samples and on the actual operating conditions under which each sample was taken. None of the samples obtained during the verification process may exceed 2.0 mg/m^3 (coal mine dust) or 100 $\mu g/m^3$ (quartz dust). Under paragraph (b), MSHA's District Manager may approve the dust control provisions of your interim plan if (1) the plan reflects all dust controls, including administrative controls in effect during verification sampling and (2) none of the samples used to verify plan effectiveness exceed the appropriate critical values as specified and explained in § 70.209.

Section 70.218 For my longwall operation with an approved interim ventilation plan, what if an MSHA sample exceeds the applicable dust standard?

Under this section, you must immediately review your dust control procedures, including the effectiveness of your administrative controls, and take action to prevent similar occurrences in the future if any MSHA compliance sample exceeds the applicable dust

standard. Dust levels in excess of the applicable standard could result from a change in operating conditions, because of an abnormal condition or work practice, or due to production levels which exceed the VPL. If changes are made in your interim ventilation plan, you must submit them to the District Manager for review and approval.

If you are cited under § 75.371 for failure to comply with your approved plan, the District Manager may conduct an investigation to determine if you are complying with the dust control provisions of your approved interim ventilation plan. If the investigation discloses that you are not following your plan, approval of your plan may be revoked.

Finally, the District Manager may revoke your interim plan and withdraw permission to use administrative controls for compliance purposes if you have a record of noncompliance with your interim ventilation plan, or if MSHA samples indicate that miners are not adequately protected. If this occurs, your revised interim plan must include a VPL at which you can comply with the applicable standard.

Actions Necessary When You Are in Violation of Respirable Dust Standards

Section 70.219 What must I (the operator) do if I am cited for exceeding the applicable dust standard?

If you are cited for violating § 70.100 or § 70.101, you would be required to promptly review your dust control practices to determine the cause of the excessive dust concentration. You would also be required to take corrective action to prevent miners from being overexposed in the future by lowering the concentration of respirable dust to comply with the applicable dust standard. You would be required to take these actions within the abatement period fixed in a citation.

After reviewing your dust control practices and taking corrective action, you would be required to incorporate changes reflecting these actions into your ventilation plan in accordance with § 75.370(a)(2). If, in your opinion, the corrective actions taken do not warrant a change in your plan's dust control parameters, you would need to explain that in your response to the District Manager. This will enable the District Manager to determine if the ventilation plan should be changed and re-verified.

Based on the dust parameters that were in use for the results of the compliance sample(s) dust concentrations measured by MSHA samples, and the information submitted by the operator regarding the type(s) of corrective action that were taken, MSHA may elect to sample the cited entity to determine the effectiveness of your abatement actions. If these samples indicate compliance with the applicable dust standard, you would be required to incorporate your corrective actions in your mine ventilation plan. At a minimum you would be required to incorporate in your plan the actual parameters that were in effect when MSHA sampled. If the MSHA samples indicate continued noncompliance, then MSHA may revoke approval of your ventilation plan.

Information To Be Posted on the Mine Bulletin Board

Section 70.220 What information must I (the operator) post on the mine bulletin board?

This proposed section would provide ready access to current information relating to the plan verification process and to the respirable dust conditions in the mine. You would be required to post on the mine bulletin board the actual values of specific dust control parameters measured by MSHA on shifts used for plan verification and all sample results. For the same reason, the proposal would require that all written notifications received from the District Manager regarding any aspect of the plan verification process. You could remove the information from the mine bulletin board after the plan is approved by the District Manager.

Also, you would also be required to post the results of MSHA compliance sampling on the bulletin board. These results must be posted for at least 31 days. These posting requirements are intended to promote miner awareness of the conditions under which the mine ventilation plan has been shown to be effective in controlling dust levels in their work environment. The goal is consistent with the statutory intent that miners play a role in preventing unhealthy conditions and practices where they work.

Status Change Reports

Section 70.221 What action must I (the operator) take if the operational status of my mine, MMU, or DA changes?

In order to conduct verification and compliance sampling, it is essential that you provide current information to us concerning the production status of MMUs and DAs within those mines that are in producing status. Therefore, to reduce the chances of visiting a mine whose operating status prevents the MSHA inspector from sampling, you would continue to be required to report the change in operational status of the mine, MMU, or DA to the MSHA District Office or to any other MSHA office designated by the District Manager. You would also be required to report a change in operational status if it would affect the verification sampling requirements under this proposal. Status changes would be reported in writing within three working days after the status change occurred. The reporting of changes in operational status is not a new requirement and is contained in existing § 70.220. MSHA is renumbering existing § 70.220 as § 70.221.

Changes to Part 75

Section 75.370 Mine Ventilation Plan; Submission and Approval

This proposal would amend § 75.370 by adding a new paragraph (h). Paragraph (h) would require that records of the amount of material produced each production shift by each MMU during the previous six-month period be made available for inspection by authorized representatives of the Secretary and the miners' representative.

These records are essential for the plan verification process. The records are needed to establish the verification production level (VPL) required 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 that may affect the plan's adequacy. Finally, because verification of a plan's effectiveness is conditioned on the VPL, these records are necessary to determine if the VPL used in approving a plan continues to reflect typical production levels at the mine.

The production records for each MMU may be maintained in any form utilized by the operator to measure the total amount of material produced, so long as the method is the same as that used to establish the VPL required for plan verification. 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—so long as the same method was consistently used.

Section 75.371 Mine Ventilation Plan; Contents

The proposal would revise paragraphs (f) and (t). Existing paragraph (f) would be revised to require the ventilation plan to include any specific work practices used to minimize the dust

exposure of individual miners, 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, every ventilation plan would be required to include information on the length of each normal production shift and to specify the VPL as defined in § 70.2. Although a VPL would be included in the ventilation plan, MSHA would not cite you for producing at levels exceeding the VPL. We would expect production on an MMU to exceed the VPL on about 33 percent of all production shifts. If the District Manager determines that your production exceeds the VPL on more than 33 percent of the production shifts over a six-month period, then this may trigger the plan verification process using a higher VPL.

For interim plans involving the use of powered, air purifying respirators (PAPRs) or verifiable administrative controls, the plan must also include the information respectively required under § 70.212(b) or § 70.216(a). This additional information is necessary to fully assess the adequacy of mine ventilation plans.

Since MSHA is proposing to revoke existing §§ 70.207 and 70.208 which require sampling by mine operators, existing paragraph (t) would be revised to remove the provision that mine operators identify in the mine ventilation plan the locations where samples for designated areas (DA) will 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 are normally required to 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 proposed § 70.2(e), 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 inspectors as discussed earlier (see Background Section) to determine compliance with the applicable standard and to assess the adequacy of the operator's dust control measures.

Part 90

The proposed rule would revoke all operator sampling requirements associated with coal miners who have evidence of the development of pneumoconiosis under Part 90. MSHA is republishing the entire regulatory text of Part 90 as it would appear under the proposal for ease of review. Aside from a few technical clarifications which are described below, the only change to Part 90 would be to remove all references to operator sampling.

Section 90.1 Scope.

The scope of part 90 would not change under the proposal. However, the phrase ''including respirable dust sampling for Part 90 miners'' would be removed from the end of the sentence which states that ''the rule also sets forth the operator's obligations.''

Section 90.2 Definitions.

All definitions would remain unchanged under the proposal with the exception of those for ''concentration'' and ''mechanized mining unit'' which have been clarified as described below. The definition for ''valid respirable dust sample'' would be removed because mine operators would no longer collect Part 90 samples under the proposal. No discussion has been included below if the definition would not change under the proposal. For ease of reference, subsection references have been added for each definition.

Concentration is a measure of the amount of substance contained per unit volume of air.

The existing definition would be modified so that ''concentration'' refers to an 8-hour Mining Research Establishment (MRE) equivalent measure of the amount of sampled material contained per unit volume of air. The proposed revision would include the constant factor of 1.38 which the Secretary currently uses to convert concentration of respirable dust measured with approved sampling devices to an equivalent concentration as measured with an MRE instrument.

The existing coal mine dust standards were developed from 8-hour shift exposure measurements. Therefore, if a sample is taken over a period other than eight hours, the concentration measurement must be adjusted to be equivalent to an eight-hour exposure. This is necessary in order to provide equal protection to miners working shifts greater than eight hours and would be accomplished by multiplying the sampler flow rate by 480 minutes, regardless of the length of time that the sample was actually collected.

For this example, suppose a DO sample is collected over a 9-hour shift that includes one hour of travel time. Suppose that the amount of dust accumulated during travel is negligible, and the amount accumulated during production is 1.5 mg. If the concentration were not adjusted to an 8-hour equivalent, it would be diluted by the time spent traveling and calculated as 1.92 mg/m^3. Under the proposed definition, the calculated concentration would be 2.16 mg/m^3.

The proposed definition does not change the daily limit on accumulated exposure 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 exposure limit of $8 \times 2.0 = 16$ mg-hr/m^3. The proposed definition of concentration would maintain this same MRE-equivalent 16 mg-hr/m^3 daily limit, regardless of the length of any shift worked.

To continue the example, the exposure accumulated during a day is the same, whether from 8 hours at an average of 2.16 mg/m^3 or from 9 hours at an average of 1.92 mg/m^3. In either case, the MRE-equivalent exposure accumulated for the day is 17.3 mg-hr/m^3, which exceeds the intended daily limit of 16 mg-hr/m^3. Under the proposed definition, this would be reflected by the fact that the calculated concentration exceeds 2.0 mg/m^3. MSHA solicits comments on this method of adjusting concentrations to an 8-hour equivalent.

Mechanized mining unit has been revised to refer to the proposed rule new § 70.205. The definition also clarifies that each MMU is assigned a four digit identification number by MSHA. The MMU retains the identification number 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 to be 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.

Section 90.100 Respirable dust standard.

The Part 90 respirable dust standard would not change. Since MSHA would collect all Part 90 samples under the proposal, the sentence which provides that ''concentrations shall be measured with an approved sampling device and expressed in terms of an equivalent concentration determined in accordance with § 90.206'' would be removed.

Section 90.101 Respirable dust standard when quartz is present.

Because MSHA would collect all Part 90 samples, this section would be

changed by removing the sentence which provides that ''concentrations shall be measured with an approved sampling device and expressed in terms of an equivalent concentration determined in accordance with § 90.206.''

An example has been added to explain how a reduced standard is established when respirable dust associated with a part 90 miner contains quartz in the amount of 20%.

Section 90.102 Transfer; notice.

This section would remain unchanged.

Section 90.103 Compensation.

This section would remain unchanged.

Section 90.104 Waiver of rights; re exercise of option.

This section would remain unchanged.

Section 90.201 MSHA Respirable dust sample reports; Operator status change reporting requirement.

Under the proposal, mine operators would no longer collect respirable dust samples under Subpart C of Part 90. Consequently, all of Subpart C, ''Sampling Procedures,'' including §§ 90.201–209 would be removed. Existing § 90.210 would be renumbered as § 90.201. The requirements of this section would remain unchanged.

Section 90.202 Operator status change reports.

Under the proposal, mine operators would no longer collect respirable dust samples under Subpart C of Part 90. Consequently, all of Subpart C, ''Sampling Procedures,'' including §§ 90.201–209 would be removed. Existing § 90.220 would be renumbered as § 90.202. The requirements of this section would remain unchanged.

Section 90.300 Respirable dust control plan; filing requirements.

There would be no change in the filing requirements for respirable dust control plans under the proposal.

Section 90.301 Respirable dust control plan; approval by District Manager; copy to part 90 miner.

There would be no change in the approval process or notice requirements for respirable dust control plans under the proposal.

V. Health Effects

A. Introduction

Since the 1800s, occupational respiratory disease associated with working in a coal mine has been commonly referred to as ''Black Lung.'' As coal is mined, respirable-sized dust is generated. Depending upon the mine location and its geologic features, silica may also be present in the mine atmosphere. Dust in air that is breathed by miners has the potential to be deposited in their lungs. Some of this dust may be retained. Coal mine dust remaining in the lungs of miners for prolonged periods of time has the potential to result in respiratory diseases, sometimes even after occupational exposure to respirable coal mine dust has stopped. There is a clear and direct relationship between miners' cumulative exposures (*i.e.*, dose multiplied by the time exposed to the coal mine dust) to respirable coal mine dust and the severity of resulting respiratory conditions (as discussed more extensively, later in this section).

Diseases resulting from long-term retention of coal mine dust in the lung include chronic coal workers' pneumoconiosis (simple CWP), progressive massive fibrosis (PMF), silicosis, and chronic obstructive pulmonary disease (COPD) (*e.g.*, asthma, chronic bronchitis, emphysema). Historically, the medical term, ''pneumoconiosis,'' has included simple CWP and PMF and their sub-categories. Chronic, or simple, CWP is partitioned into three levels of severity, proceeding from lowest to highest: category 1, category 2, and category 3. Progressive Massive Fibrosis is similarly divided into three categories of increasing levels of severity: A, B and C.

Miners with simple CWP have a substantially increased risk of developing PMF. In the advanced stages of pneumoconiosis (*i.e.*, PMF), a significant loss of lung function may occur and respiratory symptoms (*e.g.*, breathlessness, wheezing) may persist. Miners are at risk of increased morbidity and premature mortality due to simple CWP, PMF and various other respiratory diseases.

Factors that are important in the development of simple CWP, PMF and COPD include the type of dust (*e.g.*, coal and/or silica), dust concentration (to which the miner was exposed), number of years of exposure, age of the miner (often measured as age at time of medical examination), and rank of the coal (the higher the rank the greater the risk).

In 1998, MSHA estimated that approximately 45,000 miners and 39,000 miners were employed at underground and surface coal mines, respectively (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 among today's coal miners.

Estimates of the prevalence of simple CWP and PMF among the underground coal miners are gathered from the x-ray program, through which operators are required to provide miners the opportunity to be evaluated periodically for the presence of occupational lung disease, mandated pursuant to Section 203(a) of the Mine Act (30 U.S.C. 843(a)). However, miners are not required to participate. From 1970 to 1995, the prevalence of simple CWP and PMF among miners participating in the mandated x-ray program has dropped from 11 percent to 3 percent (MSHA, Internal Chart, 1998).

In accordance with 30 CFR part 50, those cases of occupational illnesses which both surface and underground coal mine operators learn of must be reported to MSHA. Under this requirement, mine operators reported 224 cases of pneumoconiosis (simple CWP and PMF, combined) 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). Since miners participate in both these programs at their own discretion, these data do not include the occupational health experience of all coal miners. The prevalence of occupational lung disease among participating miners may significantly differ from the prevalence among non-participants. Thus, the data from these programs may not be representative of the true magnitude of the prevalence of simple CWP and PMF among today's coal miners.

In the 1990s, MSHA conducted a series of one-time medical surveillance programs, in various regions of the country, to develop a more accurate estimate of the prevalence of simple CWP and PMF. Through these special programs, MSHA tried to minimize obstacles which may prevent some miners from either participating in or reporting to operators the results of respiratory diagnostic procedures. Nine

geographical cohorts of miners, from around the country, were encouraged to participate in an independent x-ray program (MSHA, Internal Chart, 1999). These cohorts included eight active surface coal mining communities in the states of Pennsylvania, Kentucky and West Virginia, as well as the towns of Poteau, Oklahoma and Gillette, Wyoming. A ninth cohort 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 program provided by Section 203(a) of the Mine Act (30 U.S.C. 843(a)). Across the eight surface cohorts surveyed, the prevalence rate of simple CWP and PMF combined, among participants was 4.8%. The prevalence rate among the participating underground Kentucky miners was 9.2%.

Also, as part of its ongoing effort to ''end black lung now and forever,'' beginning in October 1999, MSHA implemented a pilot program to provide miners at both surface and underground mines with confidential health screening. Referred to as the ''Miners' Choice Health Screening,'' the program addresses the key recommendations of the Secretary's Advisory Committee by (1) increasing participation toward the 85-percent level and (2) expanding the scope of the eligibility to include surface coal miners and surface coal mine independent contractors. The pilot program operates separately from the existing Coal Workers' X-ray Surveillance Program administered by NIOSH. Since the Miners' Choice Health Screenings' inception, over 7,000 miners have been screened, with the participation rate in most areas exceeding 50 percent. With half of the x-rays taken during the first six months having been processed by NIOSH, preliminary results indicate a prevalence rate of approximately 2.25 percent.

The National Institute for Occupational Safety and Health (NIOSH) and the Mine Safety and Health Administration (MSHA) are concerned about the prevalence of occupational lung disease among today's miners. Epidemiological studies from the U.S. and abroad have consistently shown that underground and surface coal miners are at risk of developing simple CWP, PMF, silicosis, and chronic obstructive pulmonary disease (NIOSH Criteria Document, 1995).

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, 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 Action: 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 micrometer (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 above 10 μm are largely filtered in the nasal passages, although some of these particles may reach the thoracic (or tracheal-bronchial) region of the lung (*e.g.*, 6% of 20 μm) (American Conference of Governmental Industrial Hygienists, 1999). Thus, there is evidence that ''oversized'' particles (*i.e.*, >10 μm) can move beyond the nose, deeper into the respiratory tract. Particles below 10 μm may 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 whose size is approximately 10 μm or less 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 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 percent quartz. If coal 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 mg/m^3)/(%Quartz)]

The intent of this formula is to maintain miner exposures to quartz below 0.1 mg/m^3 (100 μg/m^3).

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 are identified on chest films and then classified using a scale of 0–3 (*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).

Simple CWP can be associated with a loss of lung function and with premature mortality (Morgan, *et al.*, 1974; Jacobsen, 1976; Cochrane, *et al.*, 1979; Parkes, 1982). MSHA recognizes that simple CWP increases the risk of developing PMF substantially (Cochrane, 1962; Jacobsen, *et al.*, 1971; McLintock, *et al.*, 1971; Balaan, *et al.*, 1993).

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 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 (FEV_1), 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 place them at increased risk of developing COPD. Furthermore, COPD may occur in miners with or without the presence of simple CWP or PMF.

Chronic Obstructive Pulmonary Disease (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. Chronic Obstructive Pulmonary Disease 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-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 job and may diminish his quality of life. 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' 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.

3. Epidemiological Literature

Epidemiology 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–1 lists epidemiology 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–1, 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–1.—RESPIRABLE COAL MINE DUST EPIDEMIOLOGICAL STUDIES, BY REPORTED OUTCOMES FROM 1986 TO PRESENT

Studies	Reported outcomes
Meijers, *et al.,*1997	PMF, CWP, COPD, LLF
Maclaren, *et al.,*1989	PMF, CWP, LLF, RS
Kuempel*, *et al.,*1995	PMF, CWP, COPD
Bourgkard *et al.,*1998	PMF, CWP, LLF
Kuempel*, *et al.,*1997	
Love, *et al.,*1997	
Love, *et al.,*1992	
Attfield and Morring*,1992b	PMF, CWP
Attfield and Seixas*, 1995	
Hodous and Attfield*, 1990	
Hurley and Jacobsen, 1986	
Hurley and Maclaren, 1987	
Hurley, *et al.,* 1987	
Starzynski, *et al.,* 1996	
Yi and Zhang, 1996	
Wang, *et al.,*1997	CWP, LLF
Goodwin and Attfield*, 1998	CWP
Morfeld, *et al.,* 1997	

TABLE V–1.—RESPIRABLE COAL MINE DUST EPIDEMIOLOGICAL STUDIES, BY REPORTED OUTCOMES FROM 1986 TO PRESENT—Continued

Studies	Reported outcomes
Marine, *et al.,*1988	COPD, LLF, RS
Seixas*, *et al.,* 1993	
Soutar and Hurley, 1986	
Carta, *et al.,*1996	LLF, RS
Henneberger and Attfield*, 1997	
Henneberger and Attfield*, 1996	
Seixas*, *et al.,* 1992	
Attfield and Hodous*, 1992	LLF
Lewis, *et al.,* 1996	

COPD: Chronic obstructive pulmonary disease
CWP: 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). They studied a group of approximately 3,200 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 between 1985 and 1988. Chest x-rays were read to determine the number of cases of simple CWP and 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 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 (Kuempel, *et al.* 1997, 1995; Attfield and Seixas, 1995; Goodwin and Attfield, 1998; Attfield and Morring, 1992b). Whenever overexposures (*i.e.*, excursions above the applicable 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); this study population excludes 86 miners for whom there was missing exposure data or unreadable x-rays. 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 quantitative assessment of risk and associated benefits 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. This quantitative assessment follows in Section VI. 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) concluded that there was an 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). Their conclusion, however, was based on pooling of the data (*i.e.*, three combined groups of miners) who had different cumulative exposures (*i.e.*, 20, 66 and 85 mg-yr/m^3).

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 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. 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 per cent 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–1, there were 16 studies in which the loss of lung function (LLF) was examined in coal miners. Six of these studies also included an evaluation of respiratory symptoms (RS) in the miners. There were five 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 analyses 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.

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 other 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 [10] (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

[10] 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).

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

As mentioned previously, in addition to this proposed notice of rulemaking, today's **Federal Register** contains another NPRM, Determination of Concentration of Respirable Coal Mine Dust, RIN 1219–AB18. In combination, these 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 standard on each and every shift. MSHA's improved program to eliminate overexposures on each and every shift includes the simultaneous implementation of an improved tool to identify overexposures (*i.e.,* inspectors use of single, full–shift samples for noncompliance determinations) and this proposed regulation, requiring operators to verify ventilation plans in underground coal mines.

Having reviewed the reported health effects associated with exposure to coal mine dust, we have evaluated the evidence to determine whether the current regulatory strategy can be improved. The criteria for this evaluation is established by the Mine Act under section 101(a)(6)(A) [30 U.S.C. 811(a)(6)(A)] which provides 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 would substantially reduce those risks.

The criteria for evaluating the health effects evidence do not require scientific certainty. The need to evaluate risk does not mean that an agency is placed into a ''mathematical straightjacket.'' *See Industrial Union Department, AFL–CIO* v. *American Petroleum Institute*, 448 U.S. 607, 100 S.Ct 2844 (1980), otherwise known as the ''Benzene'' decision. When regulating on the edge of scientific knowledge, certainty may not be possible and,

> 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 (Id at 656).

The statutory criteria for evaluating the health evidence do not require MSHA and NIOSH to wait for absolute certainty and precision. MSHA and NIOSH are required to use the ''best available evidence'' (section 101(a)(6)(A) of the Mine Act (30 U.S.C. 811(a)(6)(A)).

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 in this notice, is to ensure that no miner is exposed to an excessive concentration (*i.e.*, a concentration in excess of the applicable standard) of respirable dust on any individual shift. Annual inspector samples have demonstrated overexposures on individual shifts in many mines. Data compiled from the far more frequent, bimonthly, operator sampling program show that in many mines, the applicable dust standard is exceeded on a substantial percentage of the production shifts. This pattern has persisted for many years, and, since individual shift excursions above the applicable standard are permitted under the existing program, the same pattern can be expected to continue over the working lifetime of affected miners—unless an effort is made to eliminate excess exposures on individual shifts. In this quantitative risk assessment (QRA), MSHA will demonstrate that reducing coal mine dust concentrations, over a 45-year occupational lifetime, to no more than the applicable standard on just that percentage of shifts showing an excess, thereby lowering the cumulative exposure to respirable coal mine dust than would otherwise occur, would significantly reduce the risk of both simple CWP and PMF among miners. We have estimated the health benefits of the two rules arising from the elimination of overexposures on all shifts at only those MMUs exhibiting a pattern of recurrent overexposures on individual shifts.[11]

Based on 1999 operator data, there were 704 MMUs (out of 1,251 total) at which dust concentrations for the designated occupation (DO) exceeded the applicable standard on at least two of the sampling shifts (MSHA, Datafile:Operator.ZIP).[12, 13] MSHA considers these 704 MMUs, representing more than one-half of all underground coal miners working in production areas, to have exhibited a pattern of recurrent overexposures. Valid operator DO samples were collected on a total of 18,569 shifts at these 704 MMUs, and the applicable standard was exceeded on 3,977 of these shifts, or 21.4 percent. For this 21.4 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 approximately 26 at each of the 704 MMUs). Therefore, assuming representative operating conditions on these shifts, the results can be extrapolated to all production shifts, including those that were not sampled, at these same 704 MMUs. With 99-percent confidence, the overall percentage of production shifts on which the DO sample exceeded the standard was between 20.6 percent and 22.2 percent for 1999. 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 1.12 mg/m^3. If operators tend to reduce production and/or increase dust controls on sampled shifts (as some commenters to the previous single, full-shift sample rulemaking and the Dust Advisory Committee have alleged) then the true values could be

[11] By ''exhibiting a pattern of recurrent overexposures,'' MSHA means that, at a 95-percent confidence level, the applicable standard is exceeded on at least [six] shifts per year. Using a different definition of ''recurrent pattern of overexposures'' in these analyses would change the estimate of the reduction in risk and associated benefits. For example, if the definition were that four or more DO bimonthly exposure measurements exceeded the applicable standard, we could state, with 95% confidence, that the standard was exceeded on at least 20 shifts in a year of 384 shifts. This would reduce the population for whom we are estimating benefits, and decrease the estimated number of prevented cases by 19%.

[12, 13] MSHA estimates an MMU average of 384 production shifts per year. Since mine operators are required to submit five valid designated operator (DO) samples to MSHA every two months, there would typically be 30 valid DO samples—representing 30 of the 384 production shifts—for each MMU that was in operation for the full year. If dust concentrations on two or more of the sampled shifts exceeded the standard, then it follows, at a 95-percent confidence level, that the standard was exceeded on at least [six] shifts over the full year.

higher than the upper endpoints of these 99-percent confidence intervals.

In 1998, MSHA attempted to enforce compliance on individual shifts. Therefore, to compare the 1999 pattern of excess exposures on individual shifts to that of previous years under the current enforcement policy, MSHA examined the regular bimonthly DO sample data submitted to MSHA by mine operators in the eight years from 1990 through 1997. The same three parameters were considered as discussed above for 1997: (1) The percentage of MMUs exhibiting a pattern of recurrent overexposures, as indicated by at least two of the valid measurements above the applicable 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 standard; and (3) for the MMUs identified as exhibiting recurrent overexposures, the mean excess above the applicable standard, as calculated for just those valid measurements that exceeded the applicable 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–1). In 1999, however, there was a significant decrease in the average excess above the applicable 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 inspector 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–1.—1990–1997, DISTRIBUTION OF PARAMETERS OF ANNUAL OVEREXPOSURE TO RESPIRABLE COAL MINE DUST

1990–1997	Parameter #1 (percent)	Parameter #2 (percent)	Parameter #3 (mg/m^3)
Number of Years	8	8	8
Median	52.6	20.5	1.23
Mean (Standard Error)	50.9 (1.62)	20.6 (0.32)	1.25 (0.020)

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 standard among valid DO measurements that exceeded the applicable standard.

MSHA invites public comment on whether these three parameters, based on operators' 1999 samples, under-represent or over-represent the frequency and/or magnitude of excessive dust concentrations on *all* individual shifts—including those that are not sampled. These data suggest that, unless changes are made to enforce the dust standard on every shift, the same average pattern of overexposures observed in 1999 will persist into the future. Therefore, we conclude that without the proposed changes:

- Approximately 56 percent 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 standards on about 21 percent of all production shifts;
- Among those shifts on which DO exposure exceeds the applicable standards, the mean excess for the DO would continue to be *approximately* 1.0 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 the following factors: the average volume of air inhaled on each shift that would otherwise have exceeded the applicable standard, the degree of reduction in respirable dust concentration in the air inhaled on such shifts, and the number of such shifts per working lifetime. If a miner inhales ten cubic meters of air on a shift (U.S. EPA, 1980), reducing the respirable dust concentration in that air by 1.0 mg/m^3 would result in 10 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 mg on 21 percent of the shifts would reduce the total dust inhaled by 504 mg per year, or nearly 22,700 mg over a 45-year working lifetime:

1.0 mg per m^3 of inhaled air
$\times$ 10 m^3 inhaled air per shift
$\times$ 50.4 affected shifts (*i.e.*, 21% of 240) per work year
$\times$ 45 work years per working lifetime
= 22,680 mg less dust inhaled per working lifetime.

The Secretaries invite comments on the health benefits expected from reducing the total coal mine dust inhaled over a working lifetime by this amount.

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 and PMF. Two of the distinguishing qualities of this study are the dose-response relationship over a miners' lifetime and the fact that these data best represent the recent conditions experienced by miners in the U.S. Using this relationship it is possible to evaluate the impact on risk of both simple CWP and PMF expected from bringing dust concentrations down to or below the applicable standard on every shift. This is the only contemporary epidemiological study of CWP and PMF providing such a relationship.

Attfield and Seixas used two or three B readers to identify the profusion of opacities using the ILO classification scheme. 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. The most inclusive category of CWP 1^+ includes simple CWP, categories 1, 2, 3, as well as PMF. 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 of large opacities.

Attfield and Seixas (1995) provided logistic regression models for the prevalence for CWP 1^+, CWP 2^+ and PMF as a function of cumulative dust exposure, expressed as the product of dust concentration measured in the mine atmosphere and duration of exposure at that concentration. These models can be used to estimate the impact on miners' risk of both simple CWP and PMF of reducing lifetime accumulated exposure by eliminating excessive exposures on a given percentage of individual shifts.

At the MMUs being considered (those exhibiting a pattern of recurrent overexposures), bringing dust concentrations down to no more than the applicable 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 21 percent of the shifts, the effect would be to reduce cumulative exposure, for each miner exposed at or above the DO level, by 0.22 mg-yr/m^3 over the course of a working year (*i.e.*, 21 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 10 mg-yr/m^3 (*i.e.*, 45 years times 0.22 mg-yr/m^3 per year). If, as some miners have testified, operator dust samples submitted to MSHA tend to under-represent either the frequency or magnitude (or both) of individual full shift excursions above the applicable standard, then eliminating such excursions would provide a lifetime reduction of even more than 10 mg-yr/m^3 for each exposed miner.

The Attfield and 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 begins work at age 20 and retires at age 65. By the year of retirement, that miner is expected to accumulate nearly 10 mg-yr/m^3 less exposure if individual shift excursions are eliminated. For 65-year-old miners, reducing accumulated dust exposure by a total of 10 mg-yr/m^3 reduces the predicted prevalence of CWP 1^+ by at least 11 per thousand (See Table VI–2).

This 11 per thousand, however, applies only to miners of age 65. The Attfield and 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 from the proposed changes, and partly because the Attfield and 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 extra risk attributable to an extra 10 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 CWP1^+ increases from 12 per thousand at age 65 to 17 per thousand at age 70. Presumably, the increasingly greater predicted reduced risk of disease after age 65 is due to the latent effects of the reduction in earlier exposure.

To project the benefits of the two rules expected from eliminating overexposures on individual shifts, MSHA applied the Attfield and Seixas models to a hypothetical population of miners who, on average, begin working at age 20 and retire at age 65, assuming different lifetimes. The risks for three different ages have been presented to show a range of risk depending on the lifetime: 65, 73, and 80 years. During the 45 ''working years'' between 20 and 65, the lifetime benefit accumulates at a rate of 0.22 mg-yr/m^3 of reduced exposure per year, reaching a maximum of about 10 mg-yr/m^3 at age 65. Between ages 65 and 80, the accumulated reduction in dust exposure remains at an estimated average of 10 mg-yr/m^3, but the benefit in terms of both simple CWP and PMF risk continues to increase, as explained previously.

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, Table 18; U.S. Census March 1997, Table 119).[14] On average, the best estimate of the lifetime benefit to exposed miners is expressed by the reduction in prevalence of disease at age 73. Carrying out the calculation at a 73-year average lifetime, MSHA expects that, at the MMUs under consideration, bringing dust concentrations down to no more than the applicable standard on each shift will:

- Reduce the combined risk of simple CWP and PMF by at least 18 cases per 1000 affected DO miners; [15]
- Reduce the combined risk of simple CWP (category 2 and 3) and PMF by at least 9.8 cases per 1000 affected DO miners;
- Reduce the risk of PMF by at least 5.1 cases per 1000 affected DO miners.

Presented in the first row of Table VI–2 are the average reductions in risk for simple CWP and PMF combined, and PMF alone, over an occupational lifetime, among affected DO miners who live to ages 65, 73, and 80, who have worked at an MMU exhibiting a pattern of recurrent overexposures. Across health outcomes, the benefit due to the predicted reduction in cumulative exposure to respirable coal mine dust, through limiting miners' exposure to no more than the applicable standard on each and every shift, increases with age.

When the dust concentration measured for the DO exceeds the applicable standard, measurements for at least some of the other miners 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, other miners working in the same MMU may be exposed to even higher concentrations than the DO on some shifts. Therefore, in addition to the affected DO miners, there is a population of other affected miners who are also expected to experience a significant reduction in risk as a result of eliminating overexposures on their individual shifts.

To estimate how many miners other than the DO would be substantially affected, MSHA examined the results from all valid dust samples collected by MSHA inspectors in underground MMUs during 1999 (MSHA, Data file: Inspctor.zip). Within each MMU, the inspector typically takes one full-shift sample on the DO and, on the same shift, four or more additional samples representing other occupations. On 896 shifts, at a total of 450 distinct MMUs, the DO measurement exceeded the applicable standard and there were at least four valid measurements for other

[14] Since females have a greater life expantancy than males, expected benefits would increase if the production of female miners were to increase substantially in the future.

[15] ''affected DO miners'' include all miners who work at the 56-percent of MMUs under consideration and who are exposed to dust concentrations similar to the DO over a 45-year working lifetime.

occupations available for comparison. There was an average of 1.2 non-DO measurements in excess of the standard on shifts for which the DO measurement exceeded the standard.[16] For non-DO measurements that exceeded the standard on the same shift as a DO measurement, the mean excess above the standard was approximately 0.8 mg/m^3.[17]

Combining these results with the 21-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 1.2 other miners, in addition to the one classified as DO, is overexposed on at least 21 percent of all production shifts. Over the course of a working year, the reduction in exposure expected for these other miners is 0.17 mg-yr/m^3 (*i.e.*, 21 percent of one year, times 0.8 mg/m^3).

To assess the reduction in risk expected from eliminating all single-shift exposures for faceworkers experiencing lower exposures than the DO, MSHA again applied the Attfield and Seixas models to miners who begin working at age 20, retire at age 65, assuming various lifetimes: 65, 73, and 80 years. This time, however, the resulting decrease in predicted prevalence was multiplied by 1.2/7=0.171, to reflect the fact that the assumed rate of overexposure applies, on average, to about 17 percent of the faceworkers not classified as the DO.[18]

In the second row of Table VI–2, we see that over an occupational lifetime, the beneficial average reduction in risk for simple CWP and PMF combined, and for PMF alone, increases with age. However, the magnitude of the risk reduction is smaller for the affected non-DOs than the affected DOs. This is expected because the estimated probability that a non-DO will be overexposed on a given shift is only 17 percent of the corresponding probability for the DO. Based on this calculation 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 at least: 2.3 fewer cases of PMF or simple CWP per thousand affected miners; 1.3 fewer cases of PMF or simple CWP, categories 2 or 3, per thousand affected miners; and 0.7 fewer cases of PMF per thousand affected miners.

Various data, assumptions and caveats were used to conduct the quantitative risk assessment and benefits analyses. Therefore, we request any information which would enable us to conduct more accurate analyses of the estimated health benefits of the single, full-shift sample rule and plan verification rule, both individually and in combination.

TABLE VI–2.—BY AGE, AVERAGE REDUCTION IN RISK OF OCCUPATIONAL RESPIRATORY DISEASE PER 1,000 AFFECTED UNDERGROUND COAL MINERS EXPECTED TO RESULT FROM IMPLEMENTATION OF SINGLE, FULL-SHIFT SAMPLE AND PLAN VERIFICATION

Type of miner	Reduction in risk of occupational respiratory disease per 1,000 affected miners								
	Simple CWP,[a] (categories 1, 2 or 3) or PMF[b]			Simple CWP (categories 2 or 3) or PMF			PMF		
	Age			Age			Age		
	65	73	80	65	73	80	65	73	80
Affected Designated Occupation Miners[c]	11.0	18.0	25.0	3.7	9.8	21.0	1.8	5.1	12.0
Affected Non-Designated Occupation Miners[d]	1.4	2.3	3.3	0.5	1.3	2.7	0.2	0.7	1.5

[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 56-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.
[d] Affected Non-Designated Occupation (Non-DO) Miners: Includes all underground faceworkers under consideration who are not classified as the DO.

VII. Significance of Risk

The criteria for evaluating the evidence to determine whether these proposed standards improve the regulatory strategy for controlling exposures to respirable coal mine dust are established by the Mine Act pursuant to section 101(a)(6)(A) (30 U.S.C. 811(a)(6)(A))which provides 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 would substantially reduce those risks.

The statutory criteria for evaluating the health evidence do not require MSHA to wait for absolute certainty and precision. MSHA is required to use the ''best available evidence'' (section 101(a)(6)(A) of the Mine Act (30 U.S.C. 811(a)(6)(A)). The need to evaluate risk does not mean that an agency is placed into a ''mathematical straightjacket.'' *See Industrial Union Department, AFL-CIO* v. *American Petroleum Institute,* 448 U.S. 607, 100 S.Ct 2844 (1980), otherwise known as the ''Benzene'' decision. When regulating on the edge of scientific knowledge, certainty may not be possible and,

> 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

[16] 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 1.11.

[17] With 95-percent confidence, the mean excess is at least 0.72 mg/m^3.

[18] There are an estimated 7 non-DO miners for each DO miner, and an average of 1.2 of these 7 miners are overexposed.

side of overprotection rather than underprotection (Id at 656).

We have taken steps in our quantitative risk assessment to conduct a balanced analysis using available data. Some of our assumptions were conservative, others were not.[19]

In identifying the number and percentage of MMUs exhibiting a pattern of recurrent overexposures on individual shifts we chose to include only those MMUs with two or more 1999-operator bimonthly samples in excess of the applicable standard, rather than the population of MMUs with any overexposures.[20] Also, the Quantitative Risk Assessment estimates of reduction in risk are averages across MMUs exhibiting a pattern of recurrent overexposures. For those miners who work at mines exhibiting a pattern of recurrent overexposures which differs from the one applied in the Quantitative Risk Assessment, their reduction in risk would be more than or less than the expected average, depending on whether or not their overexposures are at a higher or lower than average rate and intensity.

Another important decision impacting choice in this risk assessment involves the use of the traditional coal miner work schedule of 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 the parameters of exposure used in our estimates of risk. Even so, to the extent that a proportion of miners may have a more limited work schedule (and occupational exposure), either in number of years, weeks per year, or hours per week, their expected benefit would have to be adjusted downward, all other variables being constant.

Also, because of heavy, physical work, some miners may work at ventilatory rates in excess of the above-cited 10 cubic meters per 8-hour shift; an estimate of this ventilatory rate is 13.5 cubic meters per 8-hour shift (ICRP, 1994). The sub-population of miners with higher breathing rates would inhale more respirable coal mine dust than would otherwise occur given the same environmental exposures, thereby increasing their risks for the development of simple CWP and PMF.

In the QRA, to estimate average reduction in exposure, we chose the best available data sets: 1999 operator bimonthly samples for DOs and NDOs, respectively. Currently, both operator bimonthly and inspector samples[21] may be taken on production shifts that may not reflect typical production levels.[22] Although 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). Some previous commenters and the Dust Advisory Committee have alleged that operators tend to reduce production and/or increase dust controls on sampled shifts. To the extent that our values underestimate the true reduction in respirable coal mine dust exposures, we have underestimated the benefits of these rules.

Based on MSHA's and NIOSH's experience and expertise, and previous comments, we believe the production levels observed on sampling shifts are indeed lower than typical (See discussion in Benefits section). We also believe at some MMUs, more engineering controls at higher levels of efficacy are used during sampling shifts than on the majority of shifts (See discussion in Benefits section). Thus, it is reasonable to conclude that the number of MMUs exhibiting a pattern of recurrent overexposures is greater than the 704 captured in this Quantitative Risk Assessment. Furthermore, the severity and rate of overexposures to respirable coal mine dust among the 704 MMUs exhibiting a pattern of recurrent overexposures are probably also greater than we have estimated. We have derived our best estimate of the reduced risk using the best available data. Yet due to limitations in the data, we believe that we have underestimated the magnitude and frequency of typical respirable coal mine exposures. To the extent that our values underestimate the true reduction in respirable coal mine dust exposures, we have underestimated the benefits of these rules.

Other aspects of our risk assessment methodology reflect more conservative choices including the selection of an occupational lifetime of 45-years. Various factors may affect the consistency of the type and duration of jobs miners hold and hence their associated cumulative exposure levels. For example, some miners who lose their jobs upon mine closure are employed by other mines, sometimes in less-exposed jobs. Some miners may chose to move from job to job over their careers at underground coal mines, sometimes preferring positions away from the mining face. Moreover, if the trend of increasing mechanization continues, there will be fewer miners, and for some of them, their occupational lifetimes will be shorter.

For reasons already explained, we believe these choices are appropriate for this risk assessment. We also recognize that use of the most conservative approach at every step of the risk assessment analysis could produce mathematical risk estimates which, because of the additive effect of multiple conservative assumptions, may overstate the likely risk. We believe this QRA for simple CWP and PMF strikes a reasonable balance based on available data. To the extent that we may have underestimated the magnitude of overexposures which would be prevented, we believe the actual benefits to be greater than we have estimated.

It should be noted that reductions in the prevalence of simple CWP and PMF attributable to eliminating individual shift overexposures are not expected to materialize immediately after the overexposures have been substantially reduced or eliminated. Because these diseases typically arise after many years of cumulative exposure, allowing for a period of latency, the beneficial effects of reducing exposures are expected to become evident only after a sufficient time has passed 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.

VIII. Feasibility Issues

Section 101(a)(6)(A) of the Mine Act (30 U.S.C. 811(a)(6)(A)) requires the Secretary of Labor to 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 such hazards dealt with by

[19] Following terminology used in the Benzene Decision, a ''conservative'' assumption is one that results in more protection for miners than a less conservative assumption. Therefore, estimated benefits are greater under assumptions that are ''conservative'' in this sense.

[20] By ''exhibiting a pattern of recurrent overexposures,'' means that, at a 95-percent confidence level, the applicable standard is exceeded on at least six shifts per year.

[21] Valid MSHA inspector 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 an MMU is at least 56 percent of the average production reported for the last set of five valid samples) (30 CFR 70.101).

[22] Therefore assuming representative operating conditions on these shifts, in our QRA the results were extrapolated to all production shifts, including those that were *not* sampled, at those same 704 MMUs.

such standard over his or her working lifetime. Standards promulgated under this section must be based upon research, demonstrations, experiments, and such other information as may be appropriate. MSHA, in setting health standards, is required to achieve the highest degree of health and safety protection for the miner, and must consider the latest available scientific data in the field, the feasibility of the standards, and experience gained under this and other health and safety laws.

In relation to promulgating health standards, the legislative history of the Mine Act states that:

> * * * This section further provides that ''other considerations'' in the setting of health standards are ''the latest available scientific data in this field, the feasibility of the standards, and experience gained under this and other health and safety laws.'' While feasibility of the standard may be taken into consideration with respect to engineering controls, this factor should have a substantially less significant role. Thus, the Secretary may appropriately consider the state of the engineering art in industry at the time the standard is promulgated.
>
> * * * * *
>
> Similarly, information on the economic impact of a health standard which is provided to the Secretary of Labor at a hearing or during the public comment period, may be given weight by the Secretary. In adopting the language of section 102(a)(5)(A), the Committee wishes to emphasize that it rejects the view that cost benefit ratios alone may be the basis for depriving miners of the health protection which the law was intended to insure.

S. Rep. No. 95–181, at 21–22 (1977), *reprinted* in 1977 U.S.C.C.A.N. 3421–22.

In *American Textile Manufacturers' Institute* v. *Donovan,* 452 U.S. 490, 508–509 (1981), the Supreme Court defined the word ''feasible'' as ''capable of being done, executed, or effected.'' The Court further stated, however, that a standard would not be considered economically feasible if an entire industry's competitive structure were threatened. In promulgating standards, hard and precise predictions from agencies regarding feasibility are not required.

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 those 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.

Based on its vast experience in the sampling of respirable dust levels in the MMU work environment, MSHA believes that technology is currently available to control respirable dust to levels at or below the applicable level at MMUs employing continuous and conventional methods of mining. However, MSHA recognizes that, unlike other mining systems, longwall MMUs may have acute dust problems caused by the face-ventilation airstream carrying the shearer-generated face dust over the miners working downwind along the face. In these high-production longwall MMUs, improvements in dust control technology have not kept pace with increases in production technology. For this reason, the proposed plan verification rule would allow longwall operators who have trouble in meeting MSHA's respirable dust standard and who have exhausted all feasible engineering and environmental controls to use administrative controls or loose-fitting powered air-purifying respirators (PAPRs), until other feasible controls become available.

B. Economic Feasibility

The plan verification rule would clearly be economically feasible for the underground coal mining industry since the underground coal mining industry would derive net compliance cost savings of approximately $2.04 million yearly from the proposed plan verification rule. (Although implementing the plan verification rule would cost about $4.75 million yearly, there would be the following offsetting yearly savings: $2.19 million from reduced mine operator citations based on results from inspector single, full-shift samples and associated abatement sampling, $1.61 million from reduced mine operator citations on results from operators' bi-monthly samples and associated abatement sampling, $2.73 million from the elimination of operator bi-monthly sampling, and $0.27 million from reduced payouts by mine operators for Black Lung cases.) Underground coal mine operators would also obtain a yearly cost savings of approximately $0.42 million in reduced penalty costs associated with the reduction in mine operator citations arising from the proposed plan verification rule. The proposed plan verification rule would therefore provide a total yearly cost savings of about $2.46 million to the underground coal mining industry.

IX. Regulatory Impact Analysis

MSHA's improved program to eliminate overexposures on each and every shift includes (1) the simultaneous implementation of the use of inspector single, full-shift respirable coal mine dust samples to identify overexposures more effectively in both underground and surface coal mines (single, full-shift sample), and (2) in underground coal mines, verified ventilation plans to maintain miners' respirable dust exposure at or below the applicable standard on each and every shift (plan verification). The single, full-shift sample NPRM is published elsewhere in today's **Federal Register**. This part of the preamble reviews several impact analyses which MSHA is required to provide in connection with the proposed plan verification rulemaking. Since single, full-shift sample and plan verification are complementary NPRMs intended to be promulgated at the same time, the detailed presentation of assumptions and estimates for each are available in the same Preliminary Regulatory Economic Analysis (PREA)(MSHA, January 2000).

Assumptions for the requirements of the plan verification rule are based upon information provided by MSHA technical personnel. We encourage the mining community to provide detailed comments in this regard to ensure that plan verification cost assumptions and estimates are as accurate as possible.

A. Costs and Benefits: Executive Order 12866

In accordance with Executive Order 12866, we have prepared a detailed PREA of the estimated costs and benefits associated with the proposed rule for the underground coal mining sector. We have fulfilled this

requirement for the proposed rule and determined that this rulemaking is not a significant regulatory action. The key findings of the PREA are summarized below.

1. Compliance Costs

The proposed plan verification rule would provide yearly *net* compliance cost savings to underground coal mine operators of about $2.04 million. Although implementing the proposed rule would cost about $4.75 million yearly, there would be offsetting yearly savings of: $2.19 million from reduced mine operator citations issued based on MSHA inspectors' single, full-shift sample results and the elimination of associated underground operator abatement sampling; $1.61 million from reduced mine operator citations issued based on bi-monthly sampling results and the elimination of associated underground operator abatement sampling; $2.73 million resulting from underground operators no longer having to perform bi-monthly operator sampling; and $0.27 million from reduced payouts by mine operators for Black Lung cases.

Table IX–1 summarizes the estimated net compliance costs by provision for underground coal mines, for the following three mine size categories: (1) those employing fewer than 20 workers; (2) those employing between 20 and 500 workers; and (3) those employing more than 500 workers.

In addition to these estimated compliance costs, mine operators would derive yearly penalty cost reductions of about $0.4 million (See Table IX–1(a)). Penalty costs conventionally are not considered to be a cost of a rule (and, in fact, are clearly not a compliance cost) but merely a transfer payment from a party violating a rule to the government. Therefore, the penalty costs are not included as part of the compliance costs of the proposed plan verification rule. These penalty costs are relevant, however, in determining the economic feasibility of the proposed plan verification rule.

The derivation of the above cost figures are presented in Chapter IV of the PREA that accompanies this rule.

TABLE IX–1.—PV COST SUMMARY FOR UNDERGROUND COAL MINE OPERATORS*

Detail	<20 Emp.				≥20 Emp. ≤500				>500 Emp.				Total			
	Adj. first year costs	Annualized costs	Annual costs	Yearly costs [a]	Adj. first year costs	Annualized costs	Annual costs	Yearly costs [a]	Adj. first Year costs	Annualized costs	Annual costs	Yearly Costs [a]	Adj. first year costs	Annualized costs	Annual costs	Yearly costs [a]
UNDERGROUND COAL MINES																
PV Rule:																
Compliance Costs	$1,013,905	$70,973	$346,688	$417,661	$7,599,324	$566,960	$3,285,067	$3,852,027	$749,927	$58,653	$420,105	$478,758	$9,363,156	$696,586	$4,051,860	$4,748,446
Reduced Inspector Citations [b]	$234,374	$16,406	−$534,712	−$518,306	$746,981	$52,289	−$1,658,063	−$1,605,774	$33,603	$2,352	−$71,301	−$68,949	$1,014,958	$71,047	−$2,264,076	−$2,193,029
Reduced Operator Citations [c]	$106,512	$7,456	−$247,790	−$240,334	$596,040	$41,723	−$1,334,380	−$1,292,657	$39,325	$2,753	−$76,901	−$74,148	$741,877	$51,932	−$1,659,071	−$1,607,139
Eliminate Bi–Mo.—Sampling	$0	$0	−$556,538	−$556,530	$0	$0	−$2,057,540	−$2,057,540	$0	$0	−$113,712	−$113,712	$0	$0	−$2,727,790	−$2,727,790
Black Lung Savings	$0	$0	−$32,570	−$32,570	$0	$0	−$217,896	−$217,896	$0	$0	−$15,196	−$15,196	$0	$0	−$265,662	−$265,662
Net PV Rule	$1,354,791	$94,835	−$1,024,922	−$930,345	$8,942,345	$660,972	−$1,982,812	−$1,321,840	$822,855	$63,758	$142,995	$206,753	$11,119,991	$819,565	−$2,864,739	−$2,045,174

*Data from Preliminary Regulatory Economic Analysis Table IV–16, Table IV–63, Table IV–81, Table IV–100, Table IV–105, and Table IV–106. Note that these costs do not include penalty costs, which are shown in Table IX–1(a) in this document.

[a] Yearly costs equals annualized costs plus annual costs.

[b] Reduced costs related to: (1) Reduction in citations issued based on MSHA inspector sample results due to better mine ventilation plans arising from PV rule, and (2) reduction in abatement sampling and associated costs due to elimination of bi-monthly operator sampling.

[c] Reduced costs related to: (1) Reduction in citations issued based on operator sample results due to better mine ventilation plans arising from the PV rule, and (2) reduction in abatement sampling and associated costs due to elimination of operator bi-monthly sampling.

TABLE IX–1(A).—PV ANNUAL PENALTY COST SUMMARY*

[Yearly penalties]

Detail	<20 Emp.	≥20 Emp. ≤500	>500 Emp.	Total
Underground Coal Mines				
PV Rule:				
Reduced Inspector Citations	−$28,468	−$202,334	−$5,263	−$236,065
Reduced Operator Citations	−13,309	−160,956	−4,960	−179,225
Total PV Rule Reduction	−41,777	−363,290	−10,223	−415,290

*Data from Preliminary Regulatory Economic Analysis Table IV–16(a), Table IV–82, and Table IV–101.

2. Benefits

Occupational exposure to excessive levels of respirable coal mine dust 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 for details). 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. For example, from 1970 to 1995, the prevalence of simple CWP and PMF among miners, based on the operator sponsored x-ray program, dropped from 11 percent to 3 percent (MSHA, Internal Chart, 1998). Also, later rounds of the National Study for Coal Worker's Pneumoconiosis consistently demonstrated, through prevalence rates in the range of 2.9—3.9 percent, that simple CWP and PMF have not been eliminated.

Through the joint promulgation of single, full-shift sample and plan verification rules, miners would be further protected from the debilitating effects of occupational respiratory disease by limiting their exposures to respirable coal mine dust to no more than the applicable standard on each and every shift.[23] Reducing respirable coal mine dust concentrations over a 45-year occupational lifetime to no more than the applicable standard on just that percentage of shifts showing an excess would lower the cumulative exposure, thereby significantly reducing the risk of both simple CWP and PMF among miners. We have estimated the health benefits of the two rules arising from the elimination of overexposures on all shifts at only those MMUs exhibiting a pattern of recurrent overexposures on individual shifts.

Based on 1999 operator data, there were 704 MMUs (out of 1,251) at which regular (not abatement) designated occupational (DO) samples exceeded the applicable standard on at least two of the sampling shifts reported in 1999 (MSHA, Data file:Operator.ZIP). MSHA considers these 704 MMUs, representing more than one-half of all underground coal miners working in production areas, to have exhibited a pattern of recurrent overexposures. Based on valid DO operator samples were collected on a total of 18,569 shifts at these 704 MMUs; the applicable standard was exceeded on 3,977 of these shifts or 21.4 percent.

At the MMUs being considered (those exhibiting a pattern of recurrent overexposures),[24] bringing dust concentrations down to no more than the applicable 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 21 percent of the shifts, the effect would be to reduce cumulative exposure, for each miner exposed at or above the DO level, by 0.22 mg-yr/m^3 over the course of a working year (i.e., 21 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 DO miner would, on average, amount to a reduction in accumulated exposure of approximately 10 mg-yr/m^3 (i.e., 45 years times 0.22 mg-yr/m^3 per year). If, as some miners have testified, operator dust samples submitted to MSHA tend to under-represent either the frequency or magnitude (or both) of individual full-shift excursions above the applicable standard, then eliminating such excursions would provide a lifetime reduction of even more than 10 mg-yr/m^3 for each exposed miner.

When the dust concentration measured for the DO exceeds the applicable standard, measurements for at least some of the other miners working in the same MMU may also exceed the standard on the same shift, though usually by a smaller amount. Furthermore, although the DO represents the occupation most likely to receive the highest exposure, other miners working in the same MMU may be exposed to even higher concentrations than the DO on some shifts. Therefore, in addition to the affected DO miners, there is a population of other affected miners who are also expected to experience a significant reduction in risk as a result of eliminating overexposures on their individual shifts.

To estimate how many miners other than the DO would be substantially affected, MSHA examined the results from all valid dust samples collected by MSHA inspectors in underground MMUs during 1999 (MSHA, Data file: Inspctor.zip). Within each MMU, the inspector typically takes one full-shift sample on the DO and, on the same shift, four or more additional samples representing other occupations. On 896 shifts, at a total of 450 distinct MMUs, the DO measurement exceeded the applicable standard and there were at least three valid measurements for other occupations available for comparison. There was an average of 1.2 non-DO

[23] For details, see Quantitative Risk Assessment and Significance of Risk sections.

[24] MSHA estimates an MMU average of 384 production shifts per year. Since miner operators are required to submit five valid designated operator (DO samples to MSHA every two months, there would typically be 30 valid DO samples—for each MMU that was in operation for the full year. 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 was exceeded on at least six shifts over the full year.

measurements in excess of the standard on shifts for which the DO measurement exceeded the standard.[25] For non-DO measurements that exceeded the standard on the same shift as a DO measurement, the mean excess above the standard was approximately (0.8 mg/m^3).[26]

Combining these results with the 21-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 1.2 other miners, in addition to the one classified as DO, is overexposed on at least 21 percent of all production shifts. Over the course of a working year, the reduction in exposure expected for these affected non-designated occupational (NDO) miners, is 0.17 mg-yr/m^3 (*i.e.,* 21 percent of one year, times 0.8 mg/m^3).

The expected lifetime for all American males, conditional on their having reached 20 years of age, is 73 years (U.S. Census March 1997, Table 18; U.S. Census March 1997, Table 119).[27] On average, the best estimate of the lifetime benefit to exposed miners is expressed by the reduction in prevalence of disease at age 73. To project the reduction in risk of simple CWP and PMF among affected DOs and NDOs, MSHA applied its best estimate of dose response to a hypothetical cohort of underground coal miners who work on an MMU exhibiting a pattern of recurrent overexposure, and who, on average, begin working at age 20, retire at age 65, and live to age 73.[28] Strengths and weaknesses of various epidemiological studies were presented in the Health Effects section supporting the selection of Attfield and Seixas (1995) as the study that provides the best available estimate of material impairment with respect to simple CWP and PMF. Two of the distinguishing qualities of Attfield and Seixas (1995) are the dose-response relationship over a miner's lifetime and the fact that these data best represent the recent conditions experienced by miners in the U.S. Using this relationship, it is possible to evaluate the impact on risk of both simple CWP and PMF expected from bringing respirable coal mine dust concentrations down to or below the applicable standard on every shift. This is the only contemporary epidemiological study of simple CWP and PMF providing such a relationship.

To estimate the benefits (i.e., number of cases of simple CWP and PMF prevented) of single, full-shift sample and plan verification combined, we applied these estimates of risk reduction to the estimated sub-populations of affected miners. As of February 12, 1999, there were 984 producing MMUs;[29] applying the pattern of recurrent overexposures among MMUs as identified in the Quantitative Risk Assessment, 56 percent, by mine size, we estimate there to be 552 affected MMUs (MSHA Table, November 18, 1999; MSHA Table, February 12, 1999). Based on MSHA's experience, we would expect one DO and seven NDOs for each shift of production at each MMU. Therefore, among underground coal miners working on an MMU, we estimate 12.5% to be designated occupational miners and 87.5% to be non-designated occupational miners.

The benefits that will accrue to coal miners exposed to respirable coal mine dust and to mine operators, and ultimately to society at large, are substantial and take a number of forms. These proposed rules would reduce a significant health risk to underground coal miners, reducing the potential for illnesses and premature death and their attendant costs to miners, their employers, their families, and society.

The joint promulgation of these rules should realize a positive economic impact on the Department of Labor's (DOL's) Black Lung Program and relatedly on mine operators. The Black Lung Program compensates *eligible* miners, and *their* survivors under the Black Lung Benefits Act. This program provides monthly payments and medical benefits (diagnostic and treatment) to miners who are found to be totally disabled by black lung disease, including cases of PMF and simple CWP. In 1986, DOL's Employment Standards Administration reported that 12% of approved cases of Black Lung Program were identified as cases of PMF based on chest radiographs, while sixty-four percent had simple CWP based on chest radiographs. For miners who stopped working in coal mines after 1969 and for whom the 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 benefit payment. If a responsible operator cannot be identified for an eligible miner, benefit payments are made by the Black Lung Disability Trust Fund. To the extent that these rules reduce overexposures to respirable coal mine dust, there should be fewer Black Lung Program cases. Therefore, over time, the associated financial outlay by responsible operators through either insurance premiums or direct payments of Black Lung benefits should be lower than would otherwise occur. The financial impact could be substantial see discussion in Chapter IV, of the PREA. In 1980, the Black Lung Program estimated average lifetime pay-outs for responsible operators for married miners of about $248,700 dollars, assuming a 7 percent annual rate increase (ESA, 1980). In fiscal year 1999, 443 claims for Black Lung Benefits were accepted as new cases; sixty-six percent (293) are the financial responsibility of coal mine operators (Peed, 2000).

Table IX–2 presents the estimated number of cases of simple CWP and PMF that would be prevented among the 56 percent of MMUs exhibiting a pattern of recurrent overexposures. For all categories of simple CWP and PMF combined, we estimate 37 fewer of these cases, among affected miners, than would otherwise occur without the promulgation of single, full-shift sample and plan verification rules. Eleven of these cases would be the most severe form of coal miners pneumoconiosis, PMF, and as such this benefit could be interpreted as prevented premature deaths due to occupational exposure to respirable coal mine dust. Since simple CWP predisposes the development of PMF, it is important that it also be prevented (Balaan, *et al.,* 1993).

As discussed in the Significance of Risk sections, MSHA believes this QRA for simple CWP and PMF strikes a reasonable balance based on available data. Yet, our estimates likely understate the true impact of these rules since our analyses are restricted to a sub-population of affected miners, those working at MMUs exhibiting a pattern of recurrent overexposures, not the broader population of coal miners who will benefit from these rules. Furthermore, to estimate the average

[25] 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 1.11.

[26] With 95-percent confidence, the mean excess is at least 0.72 mg/m^3.

[27] Since females have a greater life expectancy than males, the expected benefits would increase if the proportion of female miners were to increase substantially in the future.

[28] If a different definition of ''exhibiting a recurrent pattern of overexposures'' were used in these analyses, the estimate of the reduction in risk and associated benefits would be different. For example, if the criterion were that four or more DO bimonthly exposure measurements exceeded the applicable standard, we could state, with 95% confidence, that the standard was exceeded on at least 20 shifts in a year of 384 shifts. Using four as the criterion would reduce the population for whom we are estimating benefits, and decrease the estimated number of prevented cases by 19%.

[29] Nine hundred and eighty-four refers to the number of MMUs operating on February 12, 1999. The 1,443 number mentioned previously refers to all MMUs in operation at any time in 1999.

overexposure which would be prevented, MSHA had to use data collected for compliance purposes which may not represent typical environmental conditions.

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;

(2) Current sampling procedures permit sampling measurements to be taken at the mid-range of the distribution of level of production—sampling measurements must be taken on shifts with production at least 60% of the average production during the last 30 days and at least 50% of average production for the last valid set of bimonthly samples for inspector and operator samples, respectively;

(3) Miners have reported and MSHA data have demonstrated lower levels of production on sampling shifts versus non-sampling shifts (MSHA, September 1993);

(4) On some sampling shifts, miners have reported that more engineering controls may be used 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 used on shifts for which the operator does not expect sampling to be conducted given the same production level (Denk, 1993);

(6) Across mine size, designated area samples have been found to be larger 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 (ibid. p 211–212); and

(7) Existing MSHA technical information indicates that some reduction in production levels occurs during some sampling periods on longwalls (Denk, 1990).

Therefore, at a bare minimum, over an occupational lifetime (45-years) for miners who live to age 73 who worked at MMUs exhibiting a pattern of recurrent overexposures, we estimate at least 37 fewer cases of pneumoconiosis (simple coal workers pneumoconiosis (CWP) and progressive massive fibrosis (PMF)) than would otherwise occur without the promulgation of these rules.

Our current quantitative estimate of benefits demonstrates and qualitative discussions punctuate that these rules will have a significant positive impact on the health of our Nation's coal miners when promulgated. Yet, *due to the limitations on these data,* we believe our benefit estimate *may understate* the number of cases of simple CWP and PMF which would be prevented over an occupational lifetime.

MSHA believes that cases of simple CWP and PMF would also be prevented among other types of underground miners, such as roofbolters working in designated areas (DA). Based on MSHA experience it is reasonable to expect roofbolter DA's pattern of overexposures for respirable coal mine dust to be similar to that for miners with the highest exposure on an MMU. If so, we would expect 13 additional cases of simple CWP and PMF to be prevented. Affected DAs include DAs who work at the 56 percent of the MMUs under consideration who are exposed to dust concentrations similar to the DO, over a 45-year occupational lifetime (MSHA Table, November 18, 1999; MSHA Table, February 12, 1999).

Although the effect cannot readily be quantified, to the extent that these rules would also reduce the cumulative exposure to respirable coal mine dust among some miners working in those MMUs not exhibiting overexposures, it is reasonable to expect that we would observe an incremental benefit among that sub-population of coal miners. Moreover, to the extent that the cumulative dust exposure is reduced for miners working in the ''out by'' areas, away from the mining face (i.e., MMU) where coal is extracted from the coal seam, they too may realize occupational health benefits due to the simultaneous promulgation of these proposals. Therefore, our best estimate of 37 prevented cases of simple CWP and PMF, combined, among all affected miners *likely* underestimates the true benefit realized by the coal mining workforce through the reduction of overexposures to no more than the applicable standard on each shift.

Clearly PMF is associated with premature death. Since simple CWP may evolve to PMF, even after occupational exposure has ceased, it has the propensity to become a life threatening illness. By reducing the total number of simple CWP and PMF cases among affected miners from 259 to 222, over 45 years, these standards, at a minimum, are projected to prevent an average of four cases of simple CWP and PMF for each 5-year interval.[30]

For all those reasons previously identified, MSHA believes that its estimate of 37 prevented cases of simple CWP and PMF over a 45 year working life understates the true number of cases of simple CWP and PMF which would be prevented. This belief 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. These claims come from individuals whose exposure for the most part came after the current standard of 2.0 was established in 1972. Thus, we believe the consistent annual approval by the Black Lung Benefits Program, of hundreds of new cases of simple CWP and PMF per year, supports our belief that the true lifetime occupational health benefits of the proposed rules are higher than we have estimated. Even assuming that 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 that future exposures are maintained below the 2.0 exposure limit will reduce the number of new cases of simple CWP and PMF by considerably more than 1 per year.

In addition to the prevention of simple CWP and PMF, each of the 8,640 affected miners at MMUs exhibiting a pattern of recurrent overexposures will realize some health benefit by limiting his or her cumulative exposure to respirable coal mine dust to no more than the applicable standard on each and every shift.

The expected number of prevented cases of simple CWP and PMF would not be realized for some time even after the pattern of overexposures has been minimized or eliminated. This is due, in part, to the latency—that is, the disease does not develop immediately after exposure—of the development of simple CWP and PMF and the pre-existing occupational exposure histories of members of the current coal mining workforce. Our estimated benefit is based on the estimated number of underground coal miners working at the mine face, 17,280. If the size of this workforce significantly changed in the future and the projected pattern of prevented overexposures remained the same, the number of cases of prevented

[30] Applying an estimated prevalence rate of 3.0 percent to the estimated population of affected miners (8,640) results in an estimate of 259 cases of simple CWP and PMF.

simple CWP and PMF would need to be adjusted to account for the change.

Various data, assumptions and caveats were used to conduct the quantitative risk assessment, significance of risk discussion, and benefits analyses. Therefore, we request any information which would enable us to conduct more accurate analyses of the estimated health benefits of the single, full-shift sample rule and plan verification rule, both individually, and in combination.

TABLE IX–2.—OVER A WORKING LIFETIME AMONG AFFECTED MINERS, ESTIMATED NUMBER OF CASES OF CWP [A] AND PMF [B] PREVENTED DUE TO THE IMPLEMENTATION OF SINGLE, FULL-SHIFT 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 [c]	Prevented cases, n=	Reduction in risk [c]	Prevented Cases, n=
Affected Designated Occupational Miners [d]	1,080	18/1000	19.4	9.8/1000	10.6	5.1/1000	5.5
Affected Non-Designated Occupational Miners [e] ..	7,560	2.3/1000	17.4	1.3/1000	9.8	0.7/1000	5.3
Total	8,640	NA	37	NA	20	NA	11

[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.
[d] Affected Designated Occupation (DO) Miners: Includes all miners who work at the 56-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 (Non-DO) Miners: Includes all underground faceworkers under consideration who are not classified as the DO.

B. Regulatory Flexibility Certification and Initial Regulatory Flexibility Analysis

The Regulatory Flexibility Act requires MSHA to conduct an analysis of the effects of the proposed plan verification rule on small entities. That analysis is summarized here; a copy of the full analysis is included in Chapter V of our PREA in support of the proposed single, full-shift sample and plan verification rules. We encourage the mining community to provide comments on this analysis.

The Small Business Administration generally considers a small entity in the mining industry to be one with 500 or fewer workers. MSHA has traditionally defined a small mine to be one with fewer than 20 workers, and has focused special attention on the problems experienced by such mines in implementing safety and health rules. Accordingly, we have separately analyzed the impact of the joint notice proposed rule both on mines with 500 or fewer workers and on those with fewer than 20 workers.

Pursuant to the Regulatory Flexibility Act, MSHA must determine whether the costs of the joint notice proposed rule constitute a ''significant impact on a substantial number of small entities.'' Pursuant to the Regulatory Flexibility Act, if an Agency determines that a proposed rule would not have such an impact, it must publish a ''certification'' to that effect. In such a case, no additional analysis is required (5 U.S.C. § 605). In evaluating whether certification is appropriate, MSHA utilized a ''screening test,'' comparing the costs of the proposed plan verification rule to the revenues of the affected coal sector. If the estimated costs are less than 1 percent of revenues for the affected entities, or they are negative (that is, they provide a cost savings), then the rule is assumed not to have a significant impact on small mine operators.

Table IX–3 compares, for small underground coal mines (using both MSHA's and SBA's definition), MSHA's estimated total annual compliance costs of the proposed plan verification rule to estimated annual revenues.

Table IX–3 shows that under either MSHA's or SBA's definition of a small mine, the proposed plan verification rule would provide a net cost savings to small underground coal mines. As a result, MSHA is certifying that the proposed plan verification rule for underground coal mines would not have a ''significant impact on a substantial number of small entities,'' and has performed no further analyses.

TABLE IX–3.—ESTIMATED YEARLY COSTS OF PROPOSED PLAN VERIFICATION RULE RELATIVE TO YEARLY REVENUES FOR UNDERGROUND COAL MINES

[Dollars in thousands]

Mine size	Proposed rule net costs [a]	Underground coal mine revenues [b]	Costs as percentage of revenues
< 20 employees	($930.1)	$249,418	(0.4%)
< 500 employees [c]	($1,251.9)	$6,883,339	(0.03%)

[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, Office of Standards, Regulations, and Variances, based on 1997 Final MIS data (quarter 1–quarter 4), CM441, cycle 1997/184; and U.S. Department of Energy, Energy Information Administration, Annual Energy Review 1998, DOE/EIA–0384(98), July 1999, p 203.
[c] Includes mines with fewer than 20 employees.

X. Other Statutory Requirements

A. Plain Language

We (MSHA) wrote appropriate portions of this proposed rule in the more personal style advocated by the President's Memorandum on ''plain language.'' ''Plain language'' encourages the use of personal pronouns (we and you); sentences in the active voice; a greater use of headings, lists, and questions, as well as charts, figures, and tables.

In this proposed rule, ''you'' refers to production-operators and independent contractors because they have the primary responsibility for compliance with MSHA regulations. In addition, we recognize and appreciate the value of comments, ideas, and suggestions from labor organizations, industry associations, and other parties who have an interest in health and safety training for miners.

We would appreciate comments and suggestions from all parties on this proposed rule and on our use of ''plain language.'' How could we improve the clarity of this style?

B. 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.

C. 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 rule has first year burden hours (those that occur *only* in the first year) and, annual burden hours which occur in the first year and every year thereafter.

How some types of burden hours and costs were handled requires explanation. In a few cases, the proposed plan verification rule imposes burden hours and costs that would be the same every year, beginning with the first year that the rule takes effect. These are ''annual'' burden hours and costs, as traditionally defined.

In most cases, however, the proposed plan verification rule imposes burden hours and costs which would be the same each year starting with the second year the proposed rule is in effect, but whose first year burden hours and costs would be different. MSHA transformed these first year burden hours and costs and annual burden hours and costs starting in Year 2 into adjusted first year burden hours and costs (first year burden hours and costs minus an amount equal to annual burden hours and costs starting with Year 2 after the rule takes effect) and true annual burden hours and costs starting in Year 1 after the rule takes effect.[31]

[31] A hypothetical example might help to explain this procedure. Suppose that compliance costs are $2,000 the first year and $400 each year thereafter. The adjustment procedure simply splits first year compliance costs into two parts: (1) $400, for the first year of annual costs; and (2) the residual $1,600. Consequently, adjusted first year costs would be $1,600 and annual costs (starting in year 1) would be $400.

First Year Burden Hours

In the first year the plan verification rule is in effect, there would be a total *net* burden hour savings, for underground coal mine operators, of 44,750, which is composed of 7,912 first year burden hours (from Table X–1) and 52,662 annual burden hour savings (from Table X–2). The 44,750 net burden hour savings have associated cost savings of $847,236, which is composed of $360,820 of adjusted first year costs (from Table X–1) and $1,208,056 of annual cost savings (from Table X–2).

Annual Burden Hours in Second Year and Every Year Thereafter

There would be a total *net* annual burden hour savings, for underground coal mine operators, in the second year the proposed plan verification rule is in effect and every year thereafter of 52,662, which has associated cost savings of approximately $1.21 million annually (from Table X–2). These net burden hours and costs include annual burden hour and cost savings due to: reduced mine operator citations based on MSHA inspectors' single, full-shift sample results and the elimination of associated operator abatement sampling; reduced mine operator citations issued based on bi-monthly sampling results and the elimination of associated operator abatement sampling; and savings from operators no longer having to perform bi-monthly operator sampling.

TABLE X–1.—SUMMARY OF PV PROPOSED RULE FIRST YEAR PAPERWORK BURDEN HOURS AND RELATED COSTS THAT OCCUR ONLY IN THE FIRST YEAR*

Detail	<20 emp.			≥20 emp. ≤500			>500 emp.			Total		
	Adjusted first year hours	Adjusted first year costs	Adjusted first year costs annualized	Adjusted first year hours	Adjusted first year costs	Adjusted first year costs annualized	Adusted first year hours	Adjusted first year costs	Adjusted first year costs annualized	Adjusted first year hours	Adjusted first year costs	adjusted first year costs annualized
UNDERGROUND COAL MINES												
PV Rule:												
Increase	1,359	$61,059	$4,274	6,140	$280,581	$20,372	398	$18,425	$1,399	7,897	$360,065	$26,045
Reduced Inspector Citations [a]	3	$151	$11	6	$302	$21	0	$0	$0	9	$453	$32
Reducted Operator citations [b]	3	$151	$11	3	$151	$11	0	$0	0	6	$302	$22
Elimination of Bi-Mo. Sampling	0	$0	$0	0	$0	$0	0	$0	$0	0	$0	$0
Net PV Rule	1,365	$61,361	$4,296	6,149	$281,034	$20,404	398	$18,425	$1,399	7,912	$360,820	$26,099

*Source: Preliminary Regulatory Economic Analysis Tables VII-32, VII-43, and VII-53.
[a] Related to reduced citations issued based on inspector sample results due to better mine ventilation plans arising from the PV rule.
[b] Related to reduced citations issued based on operator sample results due to better mine ventilation plans arising from the PV rule.

TABLE X–2.—SUMMARY OF ANNUAL PAPERWORK BURDEN HOURS AND RELATED COSTS THAT OCCUR IN THE FIRST YEAR AND EVERY YEAR THEREAFTER*

Detail	<20 emp.		≥20 emp. ≤500		>500 emp.		Total	
	Annual hours	Annual costs	Annual hours	Annual costs	Annual hours	Annual costs	Annual hours	Annual costs
UNDERGROUND COAL MINES								
PV Rule:								
Increase	315	$14,126	1,458	$63,236	111	$4,550	1,884	$81,912
Reduced Inspector Citations[a]	−1,012	−$24,678	−2,941	−$71,911	−111	−$2,695	−4,064	−$99,285
Reduced Operator Citations[b]	−474	−$11,606	−2,394	−$58,386	−105	−$2,561	−2,973	−$72,553
Elimination of Bi-Mo. Sampling	−9,084	−$212,901	−35,350	−$830,435	−3,075	−$74,794	−47,509	−$1,118,130
Net PV Rule	−10,255	−$235,059	−39,227	−$897,496	−3,180	−$75,500	−52,662	−$1,208,056

*Source: Preliminary Regulatory Economic Analysis Tables VII–7, VII–33, VII–43, VII–53, and VII–57.

[a] Reduction related to: (1) Reduced citations issued based on inspector sample results due to better mine ventilation plans arising from the PV rule and (2) reduced abatement sampling and associated costs due to the elimination of bi-monthly operator sampling.

[b] Reduction related to: (1) Reduced citations issued based on operator sample results due to better mine ventilation plans arising from the PV rule and (2) reduced abatement sampling and associated costs due to the elimination of bi-monthly operator sampling.

We invite public comments and are particularly interested in comments which:

1. Evaluate whether the proposed collection of information (presented here and in the PREA for the proposed single, full-shift sample and plan verification rules) is necessary for the proper performance of the functions of MSHA, including whether the information will 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, 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. Submit written comments on the information collection not later than September 5, 2000.

Our paperwork submission summarized above is explained in detail in the PREA. The PREA includes the estimated costs and assumptions for each proposed paperwork requirement related to this proposed rule. A copy of the PREA is available from us. 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.

D. National Environmental Protection 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. We have 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, we have preliminarily determined that this proposed standard will have no significant environmental impact.

Commenters are encouraged to submit their comments on this determination.

E. 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.

F. Executive Order 12988 (Civil Justice)

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.

G. 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, we have evaluated the environmental health or safety effects of the proposed rule on children. The Agency has determined that this proposal would not have an adverse impact on children.

H. Executive Order 13084 (Consultation and Coordination With Indian Tribal Governments)

We certify that this proposed rule does not impose substantial direct compliance costs on Indian tribal governments.

I. Executive Order 13132 (Federalism)

We have reviewed this rule in accordance with Executive Order 13132 regarding federalism, and have 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.''

XI. Public Hearings

MSHA plans to hold public hearings on the proposed rule. The hearings will be held in Prestonsburg, Kentucky (Jenny Wiley, State Resort Park); Morgantown, West Virginia; and Salt Lake City, Utah. The hearing dates, times, and specific locations will be announced by a separate document in the **Federal Register**. The hearings will be held under Section 101 of the Federal Mine Safety and Health Act of 1977.

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 crystalline silica 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. When valid measurements do not exceed the appropriate critical values, we can be confident that the verification limits have not been exceeded at the sampled locations.

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 crystalline silica 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 silica 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.[1] 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 Coal Mine Respirable Dust Standard Noncompliance Determinations Notice, (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 silica 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 crystalline silica 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 crystalline silica 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 ventilation plan was 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 $X \le c$, 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 crystalline silica 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 $\le c$, then the 1-tailed 95-percent UCL for μ is $\le$ 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 n^{th} 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 coal mine dust or $X \cdot 1.0302$ for crystalline silica. Consequently, to obtain the critical value, the verification limit is first divided by 1.0336 (coal mine dust) or 1.0302 (crystalline silica 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 crystalline silica 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 $n \ge 4$ is slightly below the verification limit for both types of dust, for simplicity it was set equal to the verification limit as a close approximation.

Appendix B—References

Althouse, R.B., K.M. Bang and R.M. Castellan. ''Tuberculosis comortality with silicosis—United States, 1979–1991.'' Applied Occupational Environmental Hygiene. 10(12):1037–1041, 1995.

American Conference of Governmental Industrial Hygienists (ACGIH). *TLVs® and BEIs®. Threshold Limit Values for Chemical Substances and Physical Agents, Biological Exposure Indices.* Cincinnati, OH, 1999.

American Thoracic Society, 1991.

American Industrial Hygiene Association (AIHA). *The Occupational Environment—Its Evaluation and Control.* Salvatore R. DiNardi, Editor. AIHA Press, Fairfax, VA, 1997.

American Iron and Steel Institute v. *OSHA*, 577 F.2d 825 (3d Cir. 1978).

American Iron and Steel Institute v. *OSHA*, 939 F.2d 975, 980 (D.C. Cir. 1991).

American Textile Manufacturers' Institute v. *Donovan*, 452 U.S. 490, 508–509 (1981).

Armitage, P. *Statistical Methods in Medical Research.* Blackwell Scientific Publications. Oxford, UK. pp. 335–361, 375–384, 1977.

Attfield, M.D. and K. Morring. *The derivation of estimated dust exposures for U.S. coal miners working before 1970.* Am. Ind. Hyg. Assoc. J. 53:248–255, 1992a.

Attfield, M.D. and T.K. Hodous. *Pulmonary function of U.S. coal miners related to dust exposure estimates.* Am. Rev. Resp. Dis. 145:605–609, 1992.

Attfield, M.D. and F.J. Hearl. *Application of data on compliance to epidemiological assessment of exposure-response: the case of data on exposure of United States coal miners.* Occup. Hyg. 3:177–184, 1996.

Attfield, M.D. and N.S. Seixas. *Prevalence of pneumoconiosis and its relationship to dust exposure in a cohort of U.S. bituminous coal miners and ex-miners.* Am. J. Ind. Med. 27: 137–151, 1995.

Attfield, M.D. and G. Wagner. *Respiratory disease in coal miners. In: Rom, W.N. (ed), Environmental and Occupational Medicine.* Second Edition. Boston, MA: Little, Brown, and Company, pp. 325–344, 1992.

Attfield, M.D. and K. Morring. *An investigation into the relationship between coal workers' pneumoconiosis and dust exposure in U.S. coal miners.* Am. Ind. Hyg. Assoc. J. 53: 486–492, 1992b.

[1] 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.

Atuhaire, L.K., M.J. Campbell, A.L. Cochrane, M. Jones, and F. Moore. *Mortality of men in Rhondda Fach 1950–1980.* Brit. J. Ind. Med. 42: 741–745, 1985.

Balaan, M.R., S.L. Weber, and D.E. Banks. *Clinical aspects of coal workers' pneumoconiosis and silicosis.* Occup. Med.: State of the Art Rev. 8: 19–34, 1993.

Bartley, D. Letter of November 10, 1999, from David Bartley, Division of Physical Sciences and Engineering, NIOSH, to Thomas Tomb, Pittsburgh Safety and Health Technology Center, MSHA.

Bhaskar, R., W. Jiang, and L. Xu. *Development of Effective Protection Factors for Racal Airstream Helmets.* Research Report prepared for to Energy West Mining Company, Huntington, Utah, August 16, 1994.

Boden, L.I. and Gold, M. *The accuracy of self-reported regulatory data: the case of coal mine dust.* Am. J. Ind. Med. 6:427–440, 1984.

Bourgkard, E., P. Bernadec, N. Chau, J.P. Bertrand, D. Teculescu, and Q.T. Pham. *Can the evolution to pneumoconiosis be suspected in coal miners?* Am. J. Respir. Crit. Care Med. 158: 504–509, 1998.

Carta, P., G. Aru, M.T. Barbieri, G. Avantaneo, and D. Casula. *Dust exposure, respiratory symptoms, and longitudinal decline of lung function in young coal miners.* Occup. Environ. Med. 53: 312–319, 1996.

Cecala, A.B., J.V. Volkwein, E.D. Thimons, and C.W. Urban. *Protection Factors of the Airstream Helmet.* U.S. Bureau of Mines RI 8591, 1981.

Cochrane, A.L. *The attack rate of progressive massive fibrosis.* Br. J. Ind. Med. 19: 52–64, 1962.

Cochrane, A.L., T.J.L. Haley, F. Moore, and E. Holf. *The mortality of men in the Rhondda Fach, 1950–1970.* Br. J. Ind. Med. 36: 15–22, 1979.

Coggon, D. and A.N. Taylor. *Coal mining and chronic obstructive pulmonary disease: a review of the evidence.* Thorax 53(5): 398–407, 1998.

Cotes, J.E. and Steel, J. *Pneumoconiosis of coalworkers and related occupations.* In: Cotes J.E., Steel J., eds. *Work-related Lung Disorders.* Oxford, England: Blackwell Scientific Publications, 1987.

Denk, J. M. *et al.,* ''Longwall Ventilation and Environmental Dust Control Investigation of the Jim Walter Resources No. 4 Mine.'' MSHA, Investigative Report Nos. P338–V242 and DD–4145, 1990.

Elam, R.A. Letter of April 9, 1999, from Robert A. Elam, Administrator for Coal Mine Safety and Health, MSHA, to Hervey P. Levin, Counsel.

Elam, R.A. Memorandum of August 20, 1999, from Robert A. Elam, Administrator for Coal Mine Safety and Health, MSHA, to District Managers, Subject: *Extended Cut Survey.*

Employment Standards Administration. *Review of Claims Filed Under Black Lung Benefits Amendments of 1981.* Submitted to Congress in 1986.

Employment Standards Administration. Table: Estimated Average of Total Cost of Future Monthly Benefits for Trust Fund and Responsible Operator Claims, p. 9, 1980.

Fiscor, S. *U.S. Longwall Trends—Population Declines Slightly, But Production Continues to Rise.* Coal Age, February 1998.

Freedman, A.P. and S.E. Robinson, *Noninvasive magnetopneumographic studies of lung dust retention and clearance in coal miners.* In: Frantz, R.L. and Ramani R.V., eds. Respirable dust in the mineral industries: health effects, characterization and control. University Park, PA: The Pennsylvania State University, pp. 181–186, 1988.

Garshick, E., M.B. Schenker, and J.A. Dosman. *Occupationally induced airways obstruction.* Med. Clinics N. Amer. 80 (4): 851–879, 1996.

Goodwin, S. and M.D. Attfield. *Temporal trends in coal workers' pneumoconiosis prevalence.* J. Occup. Environ. Med. 40 (12): 1065–1071, 1998.

O'Green, J.E., et al. *An Overview of General Operating Experience as it Relates to Longwall Dust Control.* Paper in the Proceedings of Longwall USA, Pittsburgh, PA, pp. 221–233, 1994.

Greenough, G.K. *Trials of Dust Helmets in Coal Mines.* Mining Engineer, No. 209, pp. 559–565, February 1979.

Haney, R.A., R.S. Ondrey, and K.G. Fields. *Influence of Airflow and Production on Longwall Dust Control.* Paper in the Proceedings of the 6th U.S. Mine Ventilation Symposium, Society of Mining, Metallurgy, and Exploration, Inc. (SME), Littleton, CO, pp. 43–49, 1993.

Hansen, E.F. , K. Phanareth, L.C. Laursen, A. Kok-Jensen, and A. Dirksen. *Reversible and irreversible airflow obstruction as predictor of overall mortality in asthma and chronic obstructive pulmonary disease.* Am. J. Respir. Crit. Care Med. 159:1267–1271, 1999.

Henneberger, P.K. and M.D. Attfield. *Coal mine dust exposure and spirometry in experienced miners.* Am. J. Resp. Crit. Care Med. 153: 1560–1566, 1996.

Henneberger, P.K. and M.D. Attfield. *Respiratory symptoms and spirometry in experienced coal miners: effects of both distant and recent coal mine dust exposures.* Am. J. Ind. Med. 32: 268–274, 1997.

Heyder, J., J. Gebhart, G. Rudolf, C.F. Schiller, and W. Stahlhofen. *Deposition of particles in the human respiratory tract in the size range 0.005–15* μ*m.* J. Aerosol Sci. 17: 811–825, 1986.

Hodous, T.K. and M.D. Attfield. *Progressive massive fibrosis developing on a background of minimal simple coal workers' pneumoconiosis.* In: Proceedings of the VIIth International Pneumoconiosis Conference, August 23–26, 1988, Pittsburgh, PA. Cincinnati, OH: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 90–108, 1990.

Howie, R.M., et al. *Development of a Powered Helmet Respirator Suitable for Use in Coalmines.* Institute of Occupational Medicine, Final Report on Commission of the European Communities Contract 7247/14/041, Report No. TM/87/03, 1987.

Hurley, J.F. and W.M. Maclaren. *Dust-related risks of radiological changes in coal miners over a 40-year working life: report on work commissioned by NIOSH.* Edinburgh, Scotland: Institute of Occupational Medicine, Report No. TM/87/09, 1987.

Hurley, J.F. and W.M. Maclaren. *Factors influencing the occurrence of progressive massive fibrosis (PMF) in miners and ex-miners.* Ann. Occup. Hyg. 32 (Suppl. 1):575–583, 1988.

Hurley, J.F., W.P. Alexander, D.J. Hazledine, M. Jacobsen, and W.M. Maclaren. *Exposure to respirable coalmine dust and incidence of progressive massive fibrosis.* Br. J. Ind. Med. 44:661–672, 1987.

Hurley, J.F., and M. Jacobsen. *Occupational hygiene implications of new results on progressive massive fibrosis in working coalminers.* Ann. Am. Conf. Gov. Ind. Hyg. 14:85–89, 1986.

ICRP. *Human respiratory tract model for radiological protection.* A report of a task group of the International Commission on Radiological Protection. Tarrytown, New York: Elsevier Science, Inc., ICRP Publication No. 66 (Table 6, p. 23), 1994.

Industrial Union Department, AFL-CIO v. *Hodgson,* 499 F.2d 467, 478 (D.C. Cir. 1974).

Industrial Union Department, AFL-CIO v. *American Petroleum Institute et al.,* 448 U.S. 607 (1980).

International Agency for Research on Cancer (IARC) of the World Health Organization. IARC Monographs on the *Evaluation of Carcinogenic Risks to Humans: Silica, Some Silicates, Coal Dust and Para-aramid Fibrils.* Vol. 68. Lyon, France: 1997.

International Labour Office (ILO). *Guidelines for the use of ILO international classification of radiographs of pneumoconiosis.* Rev. ed. Occupational Safety and Health Series No. 22. Geneva, Switzerland, 1980.

Jacobsen, M. *Dust exposure, lung diseases, and coal miners' mortality.* Edinburgh, Scotland: University of Edinburgh, 1976.

Jacobsen, M., S. Rae, W.H. Walton, and J.M. Rogan. *The relation between pneumoconiosis and dust-exposure in British coal mines. In: Walton, W.H. (ed.) Inhaled Particles III. Volume 2.* Surrey, United Kingdom: Unwin Brothers Limited, The Gresham Press, pp. 903–919, 1971.

Jacobsen, M., J. Burns, and M.D. Attfield. *Smoking and coalworkers' simple pneumoconiosis.* Vol. 2. In: Walton W.H., ed. *Inhaled particles IV.* Oxford, England: Pergamon Press, pp. 759–771, 1977.

Kuempel, E.D., L.T. Stayner, M.D. Attfield,and C.R. Buncher. *Exposure-response analysis of mortality among coal miners in the United States.* Am. J. Ind. Med. 28: 167–184, 1995.

Kuempel, E., R.J. Smith, M.D. Attfield, and L. Stayner. *Risks of occupational respiratory disease among U.S. coal miners.* Appl. Occup. Environ. Hyg. 12: 823–831, 1997.

Lewis, T.R., F.H.Y. Green, W.J. Moorman, J.R. Burg, and D.W. Lynch. *A chronic inhalation toxicity study of diesel engine emissions and coal dust, alone and combined.* J. Amer. Coll. Toxicol. 8: 345–375, 1989.

Lewis, S., J. Bennett, and J. Britton. *A cross sectional study of the independent effect of occupation on lung function in British coal miners.* Occup. Environ. Med. 53: 125–128, 1996.

Love, R.G., B.G. Miller, J. Beattie, H.A. Cowie, S. Groat, S. Hagen, P.A. Hutchison, P.P. Johnston, R. Porteous, and C.A. Soutar. *A cross-sectional epidemiological study of the respiratory health and exposure to airborne dust and quartz of current workers in opencast coal mines.* Edinburgh, Scotland: Institute of Occupational Medicine, Report No. TM/92/03, 1992.

Love, R.G., B.G. Miller, S.K. Groat, H.A. Cowie, P.P. Johnston, P.A. Hutchison, and C.R. Soutar. *Respiratory health effects of opencast coalmining: a cross sectional study of current workers.* Occup. Environ. Med. 54: 416–423, 1997.

Maclaren, W.M., J.F. Hurley, H.P.R. Collins, and A.J. Cowie. *Factors associated with the development of progressive massive fibrosis in British coalminers: a case-control study.* Br. J. Ind. Med. 46:597–607, 1989.

Manahan, S. *Environmental Chemistry (Sixth Edition).* Chapter 10, pp. 305–326; Chapter 17, pp. 487–526. Lewis Publishers, Boca Raton, FL, 1994.

Marine, W.M., D. Gurr, and M. Jacobsen. *Clinically important respiratory effects of dust exposure and smoking in British coal miners.* Am. Rev. Resp. Dis. 137: 106–112, 1988.

Mattos, Jay P. Memorandum of July 15, 1999, from Jay Mattos, Chief, Office of Program Policy Evaluation, MSHA to Dr. Michelle Schaper, Toxicologist, MSHA, Subject: Data Request.

Mauderly, J.L. *Usefulness of animal models for predicting human responses to long-term inhalation of particles.* Chest 109 (3): 65S–68S, 1996.

McLintock, J.S., S. Rae, and M. Jacobsen. *The attack rate of progressive massive fibrosis in British coal miners.* In: Walton, W.H. (ed.) *Inhaled Particles III. Vol. II.* Surrey, U.K. Unwin Brothers Limited, The Gresham Press. pp. 933–950, 1971.

Meijers, J.M.M., G.M.H. Swaen, and J.J.M. Slangen. *Mortality of Dutch coal miners in relation to pneumoconiosis, chronic obstructive pulmonary disease, and lung function.* Occup. Environ. Med. 54: 708–713, 1997.

Mercer, T. *Aerosol Technology in Hazard Evaluation.* Introduction, pp. 1–20; Chapter 8, pp. 284–318. Academic Press: New York, 1973.

Miller, B.G., and M. Jacobsen. *Dust exposure, pneumoconiosis, and mortality of coal miners.* Brit. J. Ind. Med. 42: 723–733, 1985.

Mine Safety and Health Administration (MSHA). Internal Chart. *Percentage of Coal Miners X-rayed with Evidence of Black Lung.* 1998.

Mine Safety and Health Administration (MSHA). Data file (Inspctor.ZIP), from Jon Kogut, MSHA, Mathematical Statistician, Contents: Data file containing MSHA inspectors' respirable coal mine dust exposure measurements for underground coal mines calendar year 1999, bimonthly exposure measurements used in Quantitative Risk Assessment to estimate reduction in risk for non-designated occupations, 2000.

Mine Safety and Health Administration (MSHA). Data file (Operator.ZIP), from Jon Kogut, MSHA, Mathematical Statistician, Contents: Data file for underground coal mine operators= calendar years 1990–1999, bimonthly exposure measurements used in Quantitative Risk Assessment to estimate reduction in risk for designated occupations, 2000.

Mine Safety and Health Administration (MSHA). Results of Quartz Sampling Operator Involvement, 1999.

Mine Safety and Health Administration (MSHA). Summary of Valid Designated Occupation Samples by Calendar Year, 1999.

Mine Safety and Health Administration (MSHA). Internal Chart. *Summary of X-Ray Field Screenings.* 1999.

Mine Safety and Health Administration (MSHA). Internal Table. *By Mine Size of Underground Coal Mines, MMUs and Percentages, by Number of Production Shifts.* November 18, 1999.

Mine Safety and Health Administration (MSHA). Internal Table. *Mines and Entity types in Producing Status.* February 12, 1999.

Mine Safety and Health Administration (MSHA). Office of Standards, Regulations, and Variances. *Preliminary Regulatory Economic Analysis (PREA) for the Proposed Rule Concerning Determination of Concentration of Respirable Coal Mine Dust (RIN–1219–AB18) and Proposed Rule for Verification of Dust Control Plans (RIN–1219–AB14), Parts—Amended 70.2, 70.230, 70.231, 70.232, and Amended 75.371 (d),* January 2000.

Mine Safety and Health Administration (MSHA), Coal Division of Health. *Internal Chart: Plan Parameters verses Observed Air on Longwalls.* September 28, 1999.

Mine Safety and Health Administration (MSHA), *Report of the Secretary of Labor's Advisory Committee on the Elimination of Pneumoconiosis Among Coal Mine Workers.* October 1996.

Mine Safety and Health Administration (MSHA). ''Report of the Statistical Task Team of the Coal Mine Respirable Dust Task Group.'' September 1993.

Mine Safety and Health Administration (MSHA), Report of the Coal Mine Respirable Dust Task Group: *Review of the Program to Control Respirable Coal Mine Dust in the United States.* June 1992.

Moorman, W.J., T.R. Lewis, and W.D. Wagner. *Maximum expiratory flow–volume studies on monkeys exposed to bituminous coal dust.* J. Appl. Physiol. 39: 444–448, 1975.

Morfeld, P., H.J. Vautrin, A. Kosters, K. Lampert, and C. Pierkarski. *Components of coal mine dust exposure and the occurrence of prestages of pneumoconiosis.* Appl. Occup. Environ. Hyg. 12: 973–979, 1997.

Morgan, W.K.C., L. Handelsman, J. Kibelstis, N.L. Lapp, and R. Reger. *Ventilatory capacity and lung volumes of U.S. coal miners.* Arch. Environ. Health 28: 182–189, 1974.

Morrow, P.E. *Contemporary issues in toxicology: dust overloading of the lungs and appraisal.* Toxicol. Appl. Pharmacol. 113: 1–12, 1992.

Morrow, P.E. *Possible mechanisms to explain dust overloading of the lungs.* Fundam. Appl. Toxicol. 10: 369–384, 1988.

Myers, W.R., M.J. Peach, III, K.Cutright, and W. Iskander. *Field Test of Powered Air-Purifying Respirators at a Battery Manufacturing Facility.* J. Int. Soc. Respir. Prot., 4(1):62–89, 1986.

Myers, W.R., M.J. Peach III, K. Cutright, and W. Iskander. *Workplace Protection Factor Measurement on Powered Air-Purifying Respirators at a Secondary Lead Smelter: Results and Discussion.* Am. Ind. Hyg. Assoc. J., 45(10):681–688, 1984.

National Research Council. The Report of the Committee on Measurement and Control of Respirable Dust: *Measurement and Control of Respirable Dust in Mines.* National Academy of Sciences, NMAB–363, 1980.

National Institute for Occupational Safety and Health (NIOSH). *Criteria for a Recommended Standard: Occupational Exposure to Respirable Coal Mine Dust.* U.S. Department of Health and Human Services, Public Health Service, Center for Disease Control and Prevention. Publication No. 95–106, Cincinnati, OH, 1995.

National Institute for Occupational Safety and Health. *NIOSH Respirator Decision Logic.* U.S. Department of Health and Human Services, DHHS (NIOSH) Publication No. 87–108.

National Institute for Occupational Safety and Health (NIOSH). *Guide to Industrial Respiratory Protection.* U.S. Department of Health and Human Services, DHHS (NIOSH) Publication No. 87–116.

Nikula, K.J., K.J. Avita, W.C. Griffith, and J.L. Mauderly. *Sites of particle retention and lung tissue responses to chronically inhaled diesel exhaust and coal dust in cynomolgus monkeys.* Environ. Health Perspect. 105 (Suppl. 5): 1231–1234, 1997a.

Nikula, K.J., K.J. Avita, W.C. Griffith, and J.L. Mauderly. *Lung tissue responses and sites of particle retention differ between rats and cynomolgus monkeys exposed chronically to diesel exhaust and coal dust.* Fund. Appl. Toxicol. 37: 37–53, 1997b.

Oberdorster, G. *Lung particle overload: implications for occupational exposures to particles.* Regul. Toxicol. Pharmacol. 21 (1): 123–135, 1995.

Parkes, R.W. *Pneumoconiosis due to coal and carbon.* Second Ed. In: Occupational Lung Disorders, London, England: Butterworths, pp.175–232, 1982.

Peed, Daniel. Memorandum of May 18, 2000, from Dan Peed, Statistician, Employment Standards Administration, DOL, to Rebecca Roper, Senior Scientist, Mine Safety and Health Administration, Subject: *Black Lung Program Statistics.*

Petsonk, E.L., and Attfield, M.D. *Coal Worker's Pneumoconiosis and Other Coal-Related Lung Disease.* In: *Rosenstock, L. and Cullen, M.R. (eds). Textbook of Clinical Occupational and Environmental Medicine.* Philadelphia, PA: W.B. Saunders Company, 1994.

Rasmussen, D.L., W.A. Laquer, P. Futterman, H.D. Warren, and C.W. Nelson. *Pulmonary impairment in Southern West Virginia coal miners.* Am. Rev. Respir. Dis. 98: 658–667, 1968.

Secretary of Labor v. *Callanan Industries, Inc.,* 5 FMSHRC 1900 *(1983), and Secretary of Labor v. A.H. Smith,* 6 FMSHRC 199 (1984).

Seixas, N.S., T.G. Robins, M.D. Attfield, and L.H. Moulton. *Exposure-response relationships for coal mine dust and*

obstructive lung disease following enactment of the Federal Coal Mine Health and Safety Act of 1969. Am. J. Ind. Med. 21: 715–734, 1992.

Seixas, N.S., T.G. Robins, M.D. Attfield, and L.H. Moulton. *Longitudinal and cross sectional analyses of exposure to coal mine dust and pulmonary function in new miners.* Brit. J. Ind. Med. 50: 929–937, 1993.

Seixas, N.S., L.H. Moulton, T.G. Robins, C.H. Rice, M.D. Attfield, and E.T. Zellers. *Estimation of cumulative exposures for the National Study of Coal Workers' Pneumoconiosis.* App. Occup. Environ. Hyg. 6:1032–1041, 1991.

Sherwood, R.J. *Recommendations Concerning the Role of Workplace Testing of Respirators as a Condition of Certification.* Harvard School of Public Health, 1991.

Silverman, L., C.E. Billings, and M.W. First. *Particle Size Analysis in Industrial Hygiene.* Academic Press, N.Y., 1971.

Sipes, M.B. *Current information on lung overload in nonrodent mammals: contrast with rats.* Inhal. Toxicol. 8 (suppl.): 91–109, 1996.

Soutar, C.A., B.G. Miller, N. Gregg, A.D. Jones, R.T. Cullen, and R.E. Bolton. *Assessment of human risks from exposure to low toxicity occupational dusts.* Ann. Occup. Hyg. 41 (2): 123–133, 1997.

Soutar, C.A., and J.F. Hurley. *Relationship between dust exposure and lung function in miners and ex-miners.* Brit. J. Ind. Med. 43: 307–320, 1986.

Spencer, E.R., P.D. Kovscek, and K.G. Fields. *Design and Demonstration of a Continuous Dust Control Parameter Monitoring System.* Department of Energy RI 9623, 1996.

Starzynski, Z., K. Marek, A. Kujawska and W. Szymczak. *Mortality among different occupational groups of workers with pneumoconiosis: results from a register-based cohort study.* Am. J. Ind. Med. 30: 718–725, 1996.

U.S. Bureau of the Census, *Current Population Reports,* Table 18. Resident Population, by Race, 1980 to 1996, and Projections, 1997 to 2050, pp. 25–1095 and pp. 25–1130; and Population Paper Listing PPL–57, March 1997.

U.S. Bureau of the Census, *Current Population Reports,* Table 119. Expectation of Life and Expected Deaths, by Race, and Age: 1994, March 1997.

U.S. Bureau of Mines. *Respirable Coal Dust—Longwall.* Undated.

U.S. Bureau of Mines. *Extended Cut Ventilation.* Undated.

U.S. Bureau of Mines. *Respirable Coal Dust—Continuous Miners.* Undated.

U.S. Bureau of Mines. *Respirable Coal Dust—General.* Undated.

U.S. Bureau of Mines. *Respirable Coal Dust—Scrubbers/Dust Collectors.* Undated.

U.S. Bureau of Mines. *Respirable Coal Dust—Quartz.* Undated.

U.S. Bureau of Mines. *Respirable Coal Dust—Ventilation.* Undated.

U.S. Bureau of Mines. *Respirable Coal Dust Control Technology News.* Undated.

U.S. EPA. Guidelines and methodology used in the preparation of health effects assessment chapters of the consent decree water criteria documents. **Federal Register** 45(231): 49347–49357, 1980.

Wang, X., E. Yano, K. Nonaka, M. Wang, and Z. Wang. *Respiratory impairments due to dust exposure: a comparative study among workers exposed to silica, asbestos, and coalmine dust.* Am. J. Ind. Med. 31: 495–502, 1997.

Webster, J.B., C.W. Chiaretta, and J. Behling. *Dust Control in High Productivity Mines.* SME Annual Meeting, Preprint, Society for Mining, Metallurgy, and Exploration, Inc (SME), Littleton, CO, pp. 90–82, 1990.

Weiss, S.T., M.R. Segal, D. Sparrow, and C. Wager. *Relation of* FEV_1 and peripheral blood leukocyte count to total mortality. The normative aging study. Am. J. Epidemiol. 142(5):493–498, 1995.

West, J.B. *Pulmonary Pathophysiology—The Essentials.* Williams and Wilkins Publishers, Baltimore, MD, 1992.

West, J.B. *Respiratory Physiology—The Essentials.* Williams and Wilkins Publishers, Baltimore, MD, 1990.

Witschi, H. *Lung overload: a challenge for toxicology.* J. Aerosol Med. 3: S189–S196, 1990.

Yi, Q. and Z. Zhang. *The survival analyses of 2738 patients with simple pneumoconiosis.* Occup. Environ. Med. 53: 129–135, 1996.

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: June 20, 2000.

J. Davitt McAteer,

Assistant Secretary for Mine Safety and Health.

Accordingly, it is proposed 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 continues to read as follows:

Authority: 30 U.S.C. 811, 813(h), 957 and 961, unless otherwise noted.

2. Section 70.2 is revised to read as follows:

Subpart A—General

Sec.
70.2 Definitions.

Subpart A—General

§ 70.2 Definitions.

(a) *Act* means 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.*

(b) *Active workings* means any place in a coal mine where miners are normally required to work or travel.

(c) *Concentration* means an 8-hour MRE equivalent measure of the amount of respirable dust per unit volume of air. The concentration of respirable dust is determined in two steps. First, divide the weight of dust in milligrams collected on the filter of an approved sampling device by 480 minutes times the sampler flow rate. Second, multiply that concentration by a constant factor prescribed by the Secretary for the approved sampling device used. The product is the equivalent concentration as measured with an MRE instrument.

(d) *Critical value* means the highest full shift dust concentration measurement that MSHA will accept in approving a mine ventilation plan or interim plan.

(e) *Designated area* (DA) means 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 will be identified by a four-digit identification number assigned by MSHA.

(f) *Designated occupation* (DO) means the occupation or work location on a mechanized mining unit that has been determined by results of respirable dust samples to have the greatest respirable dust concentration.

(g) *District Manager* means the manager of the Coal Mine Safety and Health District in which the mine is located.

(h) *Dust control parameters* means the engineering or environmental controls, maintenance procedures, and any other requirements specified in each ventilation plan that are being used on the mechanized mining unit and throughout the mine to control the level of respirable coal mine dust and respirable quartz dust in the work environment.

(i) *Engineering or environmental controls* means any method to control the level of respirable coal mine dust and quartz dust in the work environment by either reducing dust generation or by suppressing, diluting, capturing or diverting the dust being generated during the mining process. It does not include powered, air-purifying respirators (PAPRs) or any other type of personal protection equipment.

(j) *Full shift* means an entire work shift including travel time but excluding, for purposes of bimonthly sampling only, any time in excess of 480 minutes.

(k) *Interim ventilation plan* means a ventilation plan for a longwall operation under which operators are allowed to use PAPRs or verifiable administrative controls.

(l) *Longwall face* means a working place in a coal mine where coal is extracted from the exposed face or seam using the longwall method of mining.

(m) *Longwall mining section* means the area of the coal mine employing longwall mining, from the loading point of the section up to and including the longwall face. The loading point is also included.

(n) *Material produced* means coal and/or any other substance extracted by a mechanized mining unit during any production shift.

(o) *Mechanized mining unit (MMU)* means a unit of mining equipment including hand loading equipment used for the production of material; or a specialized unit which utilizes mining equipment other than specified in § 70.206 for the production of material. MSHA assigns each MMU a four digit identification number. The MMU retains the identification number 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.

(p) *MRE* means the Mining Research Establishment of the National Coal Board, London, England.

(q) *MRE instrument* means the gravimetric dust sampler with a four channel horizontal elutriator developed by the Mining Research Establishment of the National Coal Board, London, England.

(r) *MSHA* means the Mine Safety and Health Administration of the Department of Labor.

(s) *Powered, air-purifying respirator (PAPR)* means a type of loose-fitting helmet respirator with a visor that uses a blower to force the ambient air through air-purifying elements to deliver filtered air into the miner's breathing area.

(t) *Production shift* means:

(1) With regard to a mechanized mining unit, a shift during which material is produced, or

(2) With regard to a designated area of a mine, a shift during which material is produced and routine day-to-day activities are occurring in the designated area.

(u) *Provisional ventilation plan* means a ventilation plan which has been approved by the District Manager pending verification by MSHA of the effectiveness of the plan's dust control parameters.

(v) *Quartz* means crystalline silicon dioxide (SiO_2) as measured by MSHA's Analytical Method P–7: Infrared Determination of Quartz in Respirable Coal Mine Dust.

(w) *Respirable dust* means dust collected with a sampling device approved by the Secretary and the Secretary of Health and Human Services in accordance with part 74 (Coal Mine Dust Personal Sampler Units) of this title. Sampling device approvals issued by the Secretary of the Interior and Secretary of Health, Education, and Welfare are continued in effect.

(x) *Secretary* means the Secretary of Labor or delegate.

(y) *Verifiable administrative control* means any work practice that can significantly reduce daily exposure to respirable dust hazards by altering the way in which work is performed and which:

(1) Can be reviewed to confirm its proper implementation,

(2) Is clearly understood by miners, and

(3) Can be applied consistently over time.

(z) *Verification limits* means 2.0 mg/m^3 of respirable coal mine dust and 100 μg/m^3 of respirable quartz dust (MRE-equivalent concentrations) measured over a full shift.

(aa) *Verification production level (VPL)* means the tenth highest production level recorded in the most recent thirty production shifts.

(bb) *Verification sample* means a valid sample taken on a full shift during which the amount of material produced is at or above the VPL and using only the engineering or environmental controls and other measures included in the ventilation plan, at levels not exceeding 115% of the quantities specified in the plan.

3. Subpart B is revised to read as follows:

Subpart B—Dust Standards

Subpart B—Dust Standards

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

§ 70.100 What are the respirable dust standards when quartz is not present?

When quartz is not present:

(a) Each operator shall 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 of respirable dust per cubic meter of air as measured with an approved sampling device and in terms of an equivalent concentration determined in accordance with § 70.2(c).

(b) Each operator shall 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 milligrams of respirable dust per cubic meter of air as measured with an approved sampling device and in terms of an equivalent concentration determined in accordance with § 70.2(c).

§ 70.101 What is the respirable dust standard when quartz is present?

When the respirable dust in the mine atmosphere of the active workings contains more than 5 percent quartz as determined by samples taken by the Secretary, the operator shall continuously maintain the average concentration of respirable dust in the mine atmosphere during each shift to which each miner in the active workings is exposed at or below a concentration of respirable dust, expressed in milligrams per cubic meter of air as measured with an approved sampling device and in terms of an equivalent concentration determined in accordance with § 70.2(c), computed by dividing the percent of quartz into the number 10.

Example: The respirable dust associated with a mechanized mining unit or a designated area in a mine contains quartz in the amount of 20%. Therefore, the average concentration of respirable dust in the mine atmosphere associated with that mechanized mining unit or designated area shall be continuously maintained at or below 0.5 milligrams of respirable dust per cubic meter of air (10/20=0.5 mg/m^3).

4. Subpart C is revised to read as follows:

Subpart C—Verification of Underground Coal Mine Ventilation Plan Effectiveness; Use of Approved Powered, Air-Purifying Respirators; Use of Verifiable Administrative Controls; Actions Necessary When in Violation of Respirable Dust Standard; and Status Change Reports

Subpart C—Verification of Underground Coal Mine Ventilation Plan Effectiveness; Use of Approved Powered, Air-Purifying Respirators; Use of Verifiable Administrative Controls; Actions Necessary When in Violation of Respirable Dust Standard; and Status Change Reports

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

Verification of Underground Coal Mine Ventilation Plan Effectiveness

§ 70.201 Who must have a verified ventilation plan?

All underground coal mine operators must have a verified ventilation plan.

§ 70.202 What is a verified ventilation plan?

A verified ventilation plan is a plan that has been demonstrated as effective, at a high level of confidence, in maintaining the concentration of respirable coal mine dust and quartz dust in each MMU at or below 2.0 mg/m^3 and 100 μg/m^3, respectively. This demonstration is based on MSHA verification samples.

§ 70.203 What will trigger the plan verification process?

MSHA will initiate the plan verification process when:

(a) You submit a new ventilation plan under § 75.370 or you amend a previously approved ventilation plan under § 75.371(f); or

(b) The District Manager requires you to change the ventilation plan after determining that your dust control parameters no longer effectively control the concentration of respirable dust in the working environment of an MMU under the current mining conditions; or

(c) You propose revisions to a previously verified ventilation plan and the District Manager determines that the proposed revisions may cause the plan to be inadequate.

§ 70.204 When will MSHA conduct verification sampling?

The District Manager will notify you of the schedule for verification sampling after granting provisional approval of your ventilation plan. Before you receive provisional approval, however, you may be required to change your plan if the District Manager determines that your dust control parameters are inadequate or unsuitable for the current mining conditions.

§ 70.205 What must I (the operator) do to comply with this standard?

To comply with this standard, at the time the District Manager notifies you that MSHA will conduct verification sampling you must:

(a) Set your operating conditions so as to mine at or above the VPL and use only the dust control parameters and other measures listed in your plan on the date scheduled for verification sampling;

(b) For each MMU to be sampled, make available records of the amount of material produced each shift during the previous six-month period as prescribed in § 75.370(h);

(c) Provide the additional information described under § 75.371(f); and

(d) Notify the District Manager if you cannot meet the conditions described in paragraph (a) on the scheduled date.

§ 70.206 Who will MSHA sample and where will MSHA place the sampling device(s) when conducting verification sampling?

(a) MSHA will sample the environment of:

(1) The designated occupation (DO); roofbolter operators; longwall jack setters; and

(2) Any other occupation designated by the District Manager.

(b) Unless otherwise directed by the District Manager, MSHA will take DO samples by placing the sampling device(s) in the following locations:

(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.

§ 70.207 How many shifts will MSHA sample to verify my ventilation plan?

MSHA can approve your ventilation plan based on only one shift of sampling, provided all the samples taken on that shift meet the criteria for a verification sample and none of them exceed the critical values for a single shift specified in §§ 70.209 and 70.213. We will sample additional shifts if one verification sample exceeds the specified critical values, or if any of the samples taken do not meet the criteria for a verification sample.

§ 70.208 What if 30 shifts of production data are not available to establish the verification production level (VPL)?

If you do not have 30 shifts of production data to establish a VPL, the VPL will be the minimum production level attained on a shift that was sampled to verify the plan's effectiveness. This production level must be incorporated into the ventilation plan that is ultimately approved by the District Manager.

§ 70.209 When will MSHA approve my ventilation plan?

MSHA will approve your ventilation plan when:

(a) None of the verification samples exceed the following critical values for respirable coal mine dust and quartz dust:

(1) For respirable coal mine dust, the critical value is:

(i) 1.71 mg/m^3 if samples are collected for only one shift;

(ii) 1.85 mg/m^3 if samples are collected for two shifts;

(iii)1.93 mg/m^3 if samples are collected for three shifts; and

(iv) 2.0 mg/m^3 if samples are collected for four or more shifts.

(2) For respirable quartz dust, the critical value is:

(i) 87 ''$\mu g/m^3$ if samples are collected for only one shift;

(ii) 93 ''$\mu g/m^3$ if samples are collected for two shifts;

(iii) 97 ''$\mu g/m^3$ if samples are collected for three shifts; and

(iv) 100 ''$\mu g/m^3$ if samples are collected for four or more shifts.

(b) You adjust your plan, if necessary, to include all the dust control parameters that were in effect during verification sampling.

§ 70.210 What must I (the operator) do if a verification sample exceeds either verification limit?

If a verification sample exceeds either verification limit, you must:

(a) Immediately take corrective action to lower the concentration of respirable dust in the work environment of the affected occupation or location to a level no greater than the applicable verification limit;

(b) Make approved respiratory equipment available to affected miners following the procedures in § 70.300; and

(c) Within 5 days of receiving results of verification sampling, submit changes in your dust control parameters and any other corrective actions you implemented to the District Manager for review. The District Manager will notify you if your ventilation plan is provisionally approved under § 70.210 (c).

(1) If your ventilation plan is provisionally approved, the District Manager will notify you when MSHA will start verification sampling over again, or continue verification sampling.

(2) If your ventilation plan is not provisionally approved, the District Manager will require you to make additional changes in your plan parameters. Once you have made all required changes to your plan parameters, you will receive provisional approval of your ventilation plan. Then, the District Manager will notify you when MSHA will start verification sampling over again, or continue verification sampling from the point at which it stopped.

§ 70.211 What if verification samples continue to exceed either verification limit even though I (the operator) believe all feasible engineering and environmental controls are in place?

If verification samples continue to exceed the verification limit and you believe all feasible engineering and environmental controls are in place, then:

(a) If the ventilation plan being verified is for an MMU that uses a mining system other than longwall mining, MSHA may suggest additional controls for you to implement.

(b) If the MMU employs a longwall mining system, MSHA may suggest additional controls for you to implement; and, you may request in writing that the Administrator for Coal Mine Safety and Health determine whether or not you are using all feasible engineering or environmental controls to reduce concentrations of respirable dust to as low a level as possible; and

(c) If MSHA determines that you are using all feasible engineering or environmental on your longwall, based on its assessment of the suitability of available control measures to your particular MMU, MSHA will notify you that you may use either powered, air-purifying respirators (PAPRs) approved under 42 CFR 84, or verifiable administrative controls on an interim basis to supplement the engineering or environmental controls you have implemented to achieve compliance, until additional feasible engineering or environmental controls become available. If you use these supplements, the DO would be changed from the 060 to the 044 occupation.

Use of Approved Powered, Air-Purifying Respirators

§ 70.212 For my longwall operation, what must I (the operator) do in order to use approved PAPRs to supplement engineering or environmental controls?

In order to use PAPRs to supplement engineering or environmental controls, you must:

(a) Submit a revised ventilation plan to the District Manager within 5 days of receiving notification allowing you to supplement the engineering or environmental controls on your longwall for compliance purposes. Your plan must include feasible engineering or environmental controls capable of maintaining concentrations of respirable dust in the environment of:

(1) The DO (Occ 044—longwall operator or the occupation selected by the District Manager) at or below the verification limits; and

(2) Any miner working downwind of the DO, who is required to wear a PAPR,

at or below two times the verification limits.

(b) Incorporate in your plan a respiratory protection program for the use of PAPRs following the procedures specified in § 72.710. MSHA's District Manager may require you to make modifications to your respiratory protection program before granting provisional approval;

(c) Obtain provisional approval of your ventilation plan from the District Manager;

(d) Have MSHA verify your plan's effectiveness by sampling the environment of the DO (Occ 044—longwall operator) or other occupation directed by the District Manager and those miners working downwind of the DO who are required to wear approved PAPRs on the longwall face following the verification sampling procedures in §§ 70.205 and 70.206;

(e) Maintain and monitor compliance with the revised ventilation plan; and

(f) Continue to look for improvements that you can make and implement feasible solutions when they become available that would maintain the environment of the miners required to wear PAPRs at or below the verification limits.

§ 70.213 For my longwall operation, when will MSHA approve my interim ventilation plan incorporating a PAPR respiratory protection program?

MSHA will approve your interim ventilation plan when:

(a) None of the verification samples for the DO exceed the critical values for respirable coal mine dust and quartz dust specified in § 70.209;

(b) None of the verification samples for the miners working downwind of the DO, who are required to wear approved PAPRs, exceed the following critical values for respirable coal mine dust and quartz dust:

(1) For respirable coal mine dust, the value is:

(i) 3.54 mg/m^3 if samples are collected for only one shift;

(ii) 3.77 mg/m^3 if samples are collected for two shifts;

(iii)3.89 mg/m^3 if samples are collected for three shifts;

(iv) 4.0 mg/m^3 if samples are collected for four or more shifts.

(2) For respirable quartz dust, the value is:

(i) 174 $\mu g/m^3$ if samples are collected for only one shift;

(ii) 187 $\mu g/m^3$ if samples are collected for two shifts;

(iii) 194 $\mu g/m^3$ if samples are collected for three shifts;

(iv) 200 $\mu g/m^3$ if samples are collected for four or more shifts; and

(c) You adjust your plan, if necessary, to include all the dust control parameters that were in effect during verification sampling.

§ 70.214 For my longwall operation, under what circumstances may I (the operator) continue to use PAPRs to supplement engineering or environmental controls?

You may continue to use approved PAPRs for compliance purposes under the following conditions:

(a) You implement and maintain all feasible engineering or environmental controls on each shift;

(b) You implement and maintain the PAPR respiratory protection program as approved by the District Manager;

(c) No MSHA DO sample exceeds the applicable dust standards, and no MSHA sample for any miner working downwind of the DO and required to wear a PAPR exceeds two times the applicable dust standards; and

(d) You continue to look for improvements that you can make and implement feasible solutions when they become available that would maintain the environment of the miners required to wear PAPRs at or below the verification limits.

§ 70.215 What if an MSHA DO sample exceeds the applicable dust standard, or an MSHA sample for a miner required to wear a PAPR exceeds twice the applicable dust standard?

If an MSHA DO sample exceeds the dust standard you must:

(a) Promptly review your dust control procedures to determine the cause of the high dust concentration levels and take appropriate action to prevent similar occurrences in the future;

(b) Promptly review the continued effectiveness of your approved PAPR respiratory protection program; and

(c) If necessary, make changes to your dust control parameters and submit them to the District Manager for review and approval.

Use of Verifiable Administrative Controls

§ 70.216 For my longwall operation, what must I (the operator) do in order to use verifiable administrative controls to supplement engineering or environmental controls?

In order to use administrative controls for longwall operations you must:

(a) Submit a revised ventilation plan to the District Manager within 5 days of receiving notification allowing you to supplement the engineering or environmental controls on your longwall for compliance purposes. The plan must include the feasible engineering or environmental controls being used to reduce the concentrations of respirable dust on your longwall to as low a level as possible, the verifiable administrative controls to be implemented on the MMU, and a method for ensuring that the administrative controls are complied with at all times;

(b) Obtain provisional approval of your ventilation plan from the District Manager;

(c) Have MSHA verify your plan's effectiveness by sampling all miners working along the longwall face, including the DO (Occ 044—longwall operator) or other occupation designated by the District Manager;

(d) Maintain and monitor compliance with the revised ventilation plan; and

(e) Continue to look for improvements that you can make and implement feasible solutions when they become available that would maintain the environment of the miners required to work downwind of the DO and whose exposure is being controlled by administrative controls at or below the verification limits.

§ 70.217 For my longwall operation, when will MSHA approve my interim ventilation plan incorporating verifiable administrative controls?

MSHA will approve your interim ventilation plan and use of administrative controls on your longwall when:

(a) None of the verification samples exceed the critical values for respirable coal mine dust and quartz dust specified in § 70.209; and

(b) Adjust your plan if necessary, to include all the dust control parameters that were in effect during verification sampling.

§ 70.218 For my longwall operation with an approved interim ventilation plan, what must I (the operator) do if an MSHA sample exceeds the applicable dust standard?

If an MSHA sample exceeds the dust standard you must:

(a) Promptly review your dust control procedures to determine the cause of the excessive dust concentration(s) and take appropriate action to prevent similar occurrences in the future;

(b) Promptly review the continued effectiveness of the administrative controls in use; and

(c) If necessary, make changes to your dust control parameters and submit them to the District Manager for review and approval.

Actions Necessary When in Violation of Respirable Dust Standards

§ 70.219 What must I (the operator) do if I am cited for exceeding the applicable dust standard?

If you are cited for exceeding the dust standard, you must:

(a) Promptly review your dust control procedures to determine the cause of the excessive dust concentration(s); and

(b) Take corrective action to lower the concentration of respirable dust to comply with the applicable standard and notify the District Manager within 24 hours after implementing the corrective action(s). MSHA will then sample to determine the effectiveness of your abatement actions or require reverification of your ventilation plan under proposed § 70.203. If MSHA samples demonstrate:

(1) Compliance—you must incorporate these corrective actions in your mine ventilation plan. MSHA may re-verify your ventilation plan after determining that your dust control parameters originally approved may be ineffective in controlling the concentrations of respirable dust in the working environment of the MMU under the current mining conditions.

(2) Noncompliance—the District Manager may revoke approval of your mine ventilation plan.

Information to Be Posted on the Mine Bulletin Board

§ 70.220 What information must I (the operator) post on the mine bulletin board?

You must post the following information on the mine bulletin board:

(a) All MSHA sample results;

(b) For each MMU, the engineering and environmental controls and other practices in effect on each shift of the verification process, along with the associated values of the dust control parameters measured;

(c) All written notifications from the District Manager regarding any aspect of the plan verification process.

(d) You may remove the posted verification results after the District Manager approves the plan. You must post the results of MSHA respirable dust compliance samples upon receipt for 31 days.

Status Change Reports

§ 70.221 What action must I (the operator) take if the operational status of my mine, MMU, or DA changes?

(a) You must report the change in operational status of the mine, MMU, or DA to the MSHA District Office or to any other MSHA office designated by the District Manager. You must report status changes in writing within 3 working days after the status change has occurred.

(b) Each specific operational status is defined as follows:

(1) Underground mine:

(i) Producing—has at least one mechanized mining unit 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.

(3) Designated Area:

(i) Producing—activity is occurring.

(ii) Nonproducing—activity has ceased.

(iii) Abandoned—the dust generating source has been withdrawn and activity has ceased.

PART 75—[AMENDED]

6. The authority citation for part 75 continues to read as follows:

Authority: 30 U.S.C. 811.

7. Paragraph (h) of § 75.370 of Subpart D is added to read as follows:

§ 75.370 Mine ventilation plan; submission and approval.

* * * * *

(h) The operator must record the amount of material produced 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.

8. 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 § 70.201, the length of each normal production shift, the verification production level (VPL) as defined in § 70.2, and additional provisions for the use of powered, air purifying respirators (PAPRs) or verifiable administrative controls required under § 70.212–215 and § 70.216–218, respectively, must be included for each working section.

* * * * *

(t) The location of each ''designated area,'' and the respirable dust measures used at the dust generating sources for these locations.

PART 90—[Amended]

9. The authority citation for part 90 continues to read as follows:

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

10. Subpart A is revised to read as follows:

Sec.
90.1 Scope.
90.2 Definitions.
90.3 Part 90 option; notice of eligibility; exercise of option.

§ 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 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 rule also sets forth the operator's obligations. This part 90 is promulgated pursuant to section 101 of the Act and supercedes section 203(b) of the Act.

§ 90.2 Definitions.

(a) *Act* means 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*.

(b) *Active workings* means any place in a coal mine where miners are normally required to work or travel.

(c) *Concentration* means an 8-hour MRE equivalent measure of the amount respirable dust per unit volume of air. The concentration of respirable dust is determined in two steps. First, divide the weight of dust in milligrams collected on the filter of an approved sampling device by 480 minutes times the sampler flow rate. Second, multiply that concentration by a constant factor prescribed by the Secretary for the approved sampling device used. The product is the equivalent concentration as measured with an MRE instrument.

(d) *District Manager* means the manager of the Coal Mine Safety and Health District in which the mine is located.

(e) *Mechanized mining unit* (MMU) means:

(1) A unit of mining equipment including hand loading equipment used for the production of material; or

(2) A specialized unit which utilizes mining equipment other than specified in § 70.206(c). MSHA assigns each MMU a four digit identification number. The MMU retains the identification number 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 be 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.

(f) *MRE* means the Mining Research Establishment, of the National Coal Board, London, England.

(g) *MRE instrument* means the gravimetric dust sampler with a four channel horizontal elutriator developed by the Mining Research Establishment of the National Coal Board, London, England.

(h) *MSHA* means the Mine Safety and Health Administration of the Department of Labor.

(i) *Normal work duties* means duties which the part 90 miner performs on a routine day-to-day basis in his or her job classification at a mine.

(j) *Part 90 miner* means 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 (36 FR 20601, October 27, 1971), or under § 90.3 (part 90 option; notice of eligibility; exercise of option) 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, and who has not waived these rights.

(k) *Quartz* means crystalline silicon dioxide (SiO_2) as measured by MSHA's Analytical Method P–7: Infrared Determination of Quartz in Respirable Coal Mine Dust.

(l) *Respirable dust* means dust collected with a sampling device approved by the Secretary and the Secretary of Health and Human Services in accordance with part 74 (Coal Mine Dust Personal Sampler Units) of this title. Sampling device approvals issued by the Secretary of the Interior and Secretary of Health, Education, and Welfare are continued in effect.

(m) *Secretary* means the Secretary of Labor or a designee.

(n) *Secretary of Health and Human Services* means Secretary of Health and Human Services or Secretary of Health, Education, and Welfare.

(o) *Surface work area of an underground coal mine* means 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 coal so extracted, and includes custom coal preparation facilities.

(p) *Transfer* means any change in the work assignment of a part 90 miner by the operator and includes:

(1) Any change in occupation code of a part 90 miner;

(2) Any movement of a part 90 miner to or from a mechanized mining unit; or

(3) Any assignment of a part 90 miner to the same occupation in a different location at a mine.

(q) *Underground coal mine* means 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.

§ 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 shall 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. Each of these miners shall be notified in writing of eligibility to exercise the option.

(b) Any miner who is a section 203(b) miner on January 31, 1981, shall 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 shall 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 (36 FR 20601, October 27, 1971), 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, 4015 Wilson Boulevard, Arlington, Virginia 22203.

(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).

12. Subpart B is revised to read as follows:

Subpart B—Dust Standards, Rights of Part 90 Miners

Subpart B—Dust Standards, Rights of Part 90 Miners

§ 90.100 Respirable dust standard.

After the twentieth calendar day following receipt of notification from MSHA that a part 90 miner is employed at the mine, the operator shall 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 milligrams per cubic meter of air.

§ 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 5 percent quartz, the operator shall 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 a concentration of respirable dust computed by dividing the percent of quartz into the number 10. The application of the formula shall not result in a respirable dust standard in excess of 1.0 milligrams per cubic meter of air.

Example: The respirable dust associated with a part 90 miner contains quartz in the amount of 20%. Therefore, the average concentration of respirable dust in the mine atmosphere associated with that part 90 miner shall be continuously maintained at or below 0.5 milligrams of respirable dust per cubic meter of air (10/20=0.5 mg/m^3).

§ 90.102 Transfer; notice.

(a) Whenever a part 90 miner is transferred in order to meet the respirable dust standard in § 90.100 (Respirable dust standard) or § 90.101 (Respirable dust standard when quartz is present), the operator shall 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.

(b) On or before the twentieth calendar day following receipt of notification from MSHA that a part 90 miner is employed at the mine, the operator shall 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 twenty-first calendar day following receipt of the notification from MSHA.

(c) After the twentieth calendar day following receipt of notification from MSHA that a part 90 miner is employed at the mine, the operator shall give the District Manager written notice before any transfer of a part 90 miner. This notice shall include the scheduled date of the transfer.

§ 90.103 Compensation.

(a) The operator shall 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 (part 90 option; notice of eligibility; exercise of option).

(b) Whenever a part 90 miner is transferred, the operator shall compensate the miner at not less than the regular rate of pay received by that miner immediately before the transfer.

(c) The operator shall 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.

(d) In addition to the compensation required to be paid under paragraphs (a), (b) and (c) of this section, the operator shall pay each part 90 miner the actual wage increases that accrue to the classification to which the miner is assigned.

(e) 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 (part 90 option; notice of eligibility; exercise of option), 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.

(f) 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 shall 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), (c) and (d) 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 Sec. 90.3 (Part 90 option; notice of eligibility; exercise of option) or under the old section 203(b) program (36 FR 20601, October 27, 1971).

(i) When such a position is available, the operator shall 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 shall 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 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 has an average respirable dust concentration exceeding 1.0 milligrams per cubic meter of air or the respirable dust standard established by § 90.101 (Respirable dust standard when quartz is present); 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 MSHA dust sampling shows that the average respirable dust concentration in his or her present position exceeds 1.0 milligrams per cubic meter of air or the respirable dust standard established by § 90.101 (Respirable dust standard when quartz is present).

(b) If rights under part 90 are waived, the miner gives up all rights under part 90 until the miner re-exercises the option in accordance with § 90.3(e) (part 90 option; notice of eligibility; exercise of option).

(c) If rights under part 90 are waived, the miner may re-exercise the option under this part in accordance with § 90.3(e) (part 90 option; notice of eligibility; exercise of option) at any time.

13. Subpart C is revised to read as follows:

§ 90.201 MSHA Respirable dust sample reports; Operator status change reporting requirement.

(a) The Secretary shall provide the operator with a report of the following data on the MSHA respirable dust samples as soon as practicable:

(1) The mine identification number;

(2) The mechanized mining unit, if any, within the mine from which the samples were taken;

(3) The concentration of respirable dust, expressed in milligrams per cubic meter of air, for each valid sample;

(4) The average concentration of respirable dust, expressed in milligrams

per cubic meter of air, for all valid samples;

(5) The occupation code;

(6) The reason for voiding any samples; and,

(7) The Social Security Number of the part 90 miner.

(b) Upon receipt, the operator shall provide a copy of this report to the part 90 miner. The operator shall not post the original or a copy of this report on the mine bulletin board.

§ 90.202 Operator status change reports.

If there is a change in the status of a part 90 miner (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 shall be reported in writing within 3 working days after the status change has occurred.

[FR Doc. 00–16149 Filed 7–6–00; 8:45 am]

BILLING CODE 4510–43–P

DEPARTMENT OF LABOR

Mine Safety and Health Administration

DEPARTMENT OF HEALTH AND HUMAN SERVICES

Centers for Disease Control and Prevention

30 CFR Part 72

RIN 1219–AB18

Determination of Concentration of Respirable Coal Mine Dust

AGENCIES: Mine Safety and Health Administration (MSHA), Labor. National Institute for Occupational Safety and Health (NIOSH), Centers for Disease Control and Prevention, Department of Health and Human Services.

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

SUMMARY: The Mine Safety and Health Administration (MSHA) and the National Institute for Occupational Safety and Health (NIOSH) will hold public hearings to receive comments on the joint notice of proposed rulemaking published in the **Federal Register** on July 7, 2000.

The proposal announced that the Secretary of Labor and the Secretary of Health and Human Services (the Secretaries) would find in accordance with sections 101 and 202(f)(2) (30 U.S.C. §§ 811 and 842(f)(2)) of the Federal Mine Safety and Health Act of 1977 (Mine Act) that the average concentration of respirable dust to which each miner in the active workings of a coal mine is exposed can be accurately measured over a single shift (single, full-shift sampling). The Secretaries are proposing to rescind a previous 1972 finding by the Secretary of the Interior and the Secretary of Health, Education and Welfare, on the accuracy of single-shift sampling.

These hearings will be held pursuant to section 101 of the Mine Act.

Please also see the public hearing notice addressing verification of dust control plans (plan verification) published separately by MSHA in today's **Federal Register**.

DATES: If individuals or organizations wish to make an oral presentation for the record at the hearing, please submit your request at least five days prior to the hearing date. However, you do not have to make a written request to speak. Any unalloted time will be made available to persons making same-day requests.

The public hearings will be held on the following dates and locations:

(1) August 7, 2000 from 8:30 a.m.—5:00 p.m. (Day 1)
August 8, 2000 from 8:30 a.m.—12:00 p.m. (Day 2)(if necessary)
Morgantown, West Virginia

(2) August 10, 2000 from 8:30 a.m.—5:00 p.m. (Day 1)
August 11, 2000 from 8:30 a.m.—12:00 p.m. (Day 2) (if necessary)
Prestonsburg, Kentucky

(3) August 16, 2000 from 8:30 a.m.—5:00 p.m. (Day 1)
August 17, 2000 from 8:30 a.m.—12:00 p.m. (Day 2) (if necessary)
Salt Lake City, Utah

To the extent possible, we would like to hear comments on the notices of proposed rulemaking in sequence. At each hearing site during the first part of Day 1 (until approximately 12:00 p.m.) we would like to hear comments on the single, full-shift sampling proposed rule. The second part of Day 1 we would like to hear comments on the plan verification proposal. If a second day of hearings is necessary at a hearing site, we would devote this time to hear comments on the plan verification proposal.

If necessary, the time can be extended each day to give all interested parties an opportunity to present testimony.

The rulemaking record will close on August 24, 2000.

ADDRESSES: You may use mail, facsimile (fax), or electronic mail to send us your requests to make oral presentations at the public hearings. Clearly identify your requests and send them— (1) By mail to Carol J. Jones, Director, Office of Standards, Regulations, and Variances, MSHA, 4015 Wilson Boulevard, Room 631, Arlington, VA 22203;

(2) By fax to MSHA, Office of Standards, Regulations, and Variances, 703–235–5551; or

(3) By electronic mail to comments@msha.gov.

The hearings will be held on the following dates and the following locations:

1. August 7 and 8,* 2000, Holiday Inn, 1400 Saratoga Avenue, Morgantown, West Virginia 26505, 304–599–1680.
2. August 10 and 11,* 2000, Holiday Inn, 1887 N US 23, Prestonsburg, Kentucky 41653, 606–886–0001.
3. August 16 and 17,* 2000, Hilton Salt Lake City Center, 255 S West Temple, Salt Lake City, Utah 84101, 801–328–2000.

*if necessary

FOR FURTHER INFORMATION CONTACT: Carol J. Jones, Director; Office of Standards, Regulations, and Variances, MSHA, 4015 Wilson Boulevard, Arlington, VA 22203–1984; 703–235–1910.

I. Background

On July 7, 2000, the Secretary of Labor and the Secretary of Health and Human Services (the Secretaries) jointly published a notice of proposed rulemaking finding in accordance with sections 101 (30 U.S.C. 811) and 202(f)(2) (30 U.S.C. 842(f)(2)) of the Federal Mine Safety and Health Act of 1977 (Mine Act) that the average concentration of respirable dust to which each miner in the active workings of a coal mine is exposed can be accurately measured over a single shift. The Secretaries are proposing to rescind a 1972 finding by the Secretary of the Interior and the Secretary of Health, Education, and Welfare, on the accuracy of such single-shift sampling.

II. Conduct of Public Hearings

The hearings will be conducted in an informal manner with a panel of MSHA and NIOSH representatives, chaired by Marvin W. Nichols, Jr. Although formal rules of evidence or cross examination will not apply, the presiding official may exercise discretion to ensure the orderly progress of the hearings and may exclude irrelevant or unduly repetitious material and questions.

Each session will begin with an opening statement from MSHA and NIOSH, followed by an opportunity for members of the public to make oral