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30 CFR Part 75
Sealing of Abandoned Areas; Final Rule

DEPARTMENT OF LABOR

Mine Safety and Health Administration

30 CFR Part 75

RIN 1219–AB52

Sealing of Abandoned Areas

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

ACTION: Final rule.

SUMMARY: This final rule revises MSHA's Emergency Temporary Standard (ETS) and addresses sealing abandoned areas in underground coal mines. The final rule includes requirements for seal strength, design, construction, maintenance and repair of seals and monitoring and control of atmospheres behind seals in order to reduce the risk of seal failure and the risk of explosions in abandoned areas of underground coal mines. It also addresses the level of overpressure for new seals.

EFFECTIVE DATE: This final rule is effective April 18, 2008.

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SUPPLEMENTARY INFORMATION:

The outline of the final rule is as follows:

I. Background

In the Federal Coal Mine Health and Safety Act of 1969 (Coal Act), the predecessor to the existing Mine Act, Congress first recognized that mine operators must isolate abandoned areas of underground coal mines from active workings for the protection of miners' safety:

> In the case of mines opened on or after the operative date of this title, or in the case of areas developed on or after such date in mines opened prior to such date, the mining system shall be designed, in accordance with a plan and revisions thereof approved by the Secretary and adopted by the operator, so that, as each set of cross entries, room entries, or panel entries of the mine are abandoned, they can be isolated from active workings of the mine with explosion-proof bulkheads.

Pub. Law 91–173 (Dec. 1969) Section 303(2)(3).

In the conference report filed in the House, the statement of the managers on the part of the House stated, regarding the requirement that an abandoned area of a mine either be ventilated or sealed, that:

> [t]he determination of which method [(ventilated or sealed)] is appropriate and the safest at any mine is up to the Secretary or [her] inspector to make, after taking into consideration the conditions of the mine, particularly its history of methane and other explosive gases. The objective is that [s]he require the means that will provide the greatest degree of safety in each case. * * * When sealing is required, such sealing shall be made in an approved manner so as to isolate with explosion-proof bulkheads such areas from the active working of the mine.
>
> Under the conference substitute, paragraph (3) of section 303(z) provides that, in the case of mines opened on or after the operative date of this title, or in the case of areas developed on or after such date in mines opened prior to such date, the mining system shall be designed, in accordance with a plan and revisions thereof approved by the Secretary and adopted by the operator, so that, as each set of cross entries, room entries, or panel entries of the mine are abandoned, they can be isolated from active workings of the mine with explosion-proof bulkheads approved by the Secretary or his inspector.
>
> The managers expect the Secretary to take the lead in improving technology in this area of controlling methane accumulations in gob areas and to improve upon this important section 303(z).

Conf. Rep. No. 91–761, 91st Cong. 1st Sess., 82 (Dec. 16, 1969) (statement of the managers on part of the House) (emphasis added).

The Mine Act interim mandatory standards required seals to be ''made in an approved manner so as to isolate with explosion-proof bulkheads such areas from the active workings of the mine.'' 30 U.S.C.863(z)(2).

On May 15, 1992, as part of a comprehensive revision of its standards for ventilation of underground coal mines, MSHA published standards for construction of seals in § 75.335 of the ventilation standards (57 FR 20868). The standard required seals to be constructed of solid concrete blocks at least six inches by eight inches by sixteen inches, but allowed seals to be constructed using alternative methods and materials, provided, among other things, that the seal was capable of withstanding a horizontal static pressure of 20 psi. MSHA based this threshold on a U.S. Bureau of Mines 1971 report entitled ''Explosion—Proof Bulkheads—Present Practices.''

A number of manufacturers developed materials, such as cementitious foams and glass-fiber material, which were tested and subsequently deemed suitable for use in alternative seals and marketed under various trade names. MSHA required the manufacturers to have full-scale seals be subjected to explosion testing at the National Institute for Occupational Safety and Health (NIOSH) Lake Lynn Experimental Mine (Lake Lynn). MSHA then intended for mine operators to construct seals as constructed and tested at Lake Lynn.

On January 2, 2006, an explosion at the Sago Mine in Upshur County, West Virginia caused the death of twelve miners. Later that year, on May 20, 2006, an explosion at the Darby Mine No. 1 in Harlan County, Kentucky, caused the death of five miners. Common to both of these accidents was the failure of the seals in the mine. The failed seals in both mines were constructed with the same approved alternative material for a 20-psi seal. None of the failed seals were constructed in the same manner as they were constructed at Lake Lynn. Therefore, MSHA issued a moratorium on alternative methods and materials for construction of new seals (Program Information Bulletin (PIB) No. P06–11, June 1, 2006, reissued on June 12, 2006 as PIB No. P06–12, reissued on June 21, 2006 as PIB No. PO6–14).

Following these underground coal mine disasters in 2006, Congress passed and the President signed the MINER Act. Section 10 of the MINER Act requires the Secretary of Labor to finalize mandatory health and safety standards relating to the sealing of abandoned areas in underground coal mines, and to increase the 20 psi standard.

MSHA increased the strength of alternative seals to 50 psi and addressed a number of other issues related to the construction and the effectiveness of existing alternative and solid concrete block seals in Program Information Bulletin No. P06–16, ''Use of Alternative Seal Methods and Materials Pursuant to 30 CFR 75.335(a)(2),'' issued on July 19, 2006 (July 2006 PIB).

On February 8, 2007, NIOSH issued a draft report, ''Explosion Pressure Design Criteria for New Seals in U.S. Coal Mines'' (2007 NIOSH Draft Report). The draft report states that ''mine seals and their related systems such as the monitoring, inertization and ventilation systems require the highest level of engineering and quality assurance. Successful implementation of the seal design criteria and recommendations in this report should reduce the risk of seal failure due to explosions in abandoned areas of underground coal mines.'' (2007 NIOSH Draft Report at 40). In the executive summary of the draft report, NIOSH made recommendations for formulating seal design criteria.

On May 22, 2007, MSHA published an Emergency Temporary Standard; notice of public hearings; and notice of close of comment period (72 FR 28796). The comment period, scheduled to close on July 6, 2007, was extended to August 17, 2007 (72 FR 34609) and four public hearings were held. The hearings were held on July 10, 2007, in Morgantown, West Virginia; on July 12, 2007, in Lexington, Kentucky; on July 17, 2007, in Denver, Colorado; and on July 19, 2007, in Birmingham, Alabama.

On August 14, 2007, MSHA extended the comment period to September 17, 2007, (72 FR 45358) to allow commenters additional time to review recently posted documents on MSHA's Web site and a recently published report from NIOSH entitled ''Explosion Pressure Design Criteria for New Seals in U.S. Coal Mines,'' NIOSH Publication No. 2007–144, July 2007, IC–9500 (2007 NIOSH Final Report). With one exception, the final version of this report was little changed from the draft version of this report that was referenced in the ETS. The final report includes a new section 3.3, Homogeneous Methane-Air Mixtures in Sealed-Area Atmospheres. This new section discusses methane layering in sealed areas and asserts that gaseous diffusion will result in a relatively homogeneous mixture within a matter of days after sealing. Other minor changes are related to rounding to metric units (sample pipes should extend 16 feet (5 meters) into the sealed area) and the inclusion of recent NIOSH research on methane flammability that lists the flammability range of methane-air mixtures at sea level as 5.0 percent to 16.0 percent methane.

On December 7, 2007, MSHA posted on the Agency's Web site the U.S. Army Corps of Engineer's Draft Report ''CFD [Computational Fluid Dynamics] Study and Structural Analysis of the Sago Mine Accident'' (USACE's Draft Report). The Agency placed the Report in the rulemaking record for the ETS on Sealing of Abandoned Areas. The Report summarizes the preliminary results of a study performed by the USACE under contract (MSHA NO IA–AR 600012) for MSHA's Technical Support Directorate (Technical Support). The USACE conducted research from August 2006 to April 2007. The USACE provided a draft of the Report of their findings to Technical Support in May of 2007. The Report details the USACE's efforts to mathematically model the methane explosion at the Sago Mine and potentially establish the seal overpressures.

On December 19, 2007, MSHA published a notice (72 FR 71791) to reopen the comment period; announce availability of the USACE's Draft Report; schedule a public hearing; and announce the close of the comment period. A public hearing was held in Arlington, Virginia on January 15, 2008 and the comment period closed on January 18, 2008.

In developing this final rule, MSHA considered the investigation reports of the Sago and Darby mine explosions, implementation and enforcement experience under the ETS, MSHA's in-mine seal evaluations and review of technical literature, the 2007 NIOSH Draft and Final Reports on explosion testing and modeling, the USACE's Draft Report, accident reports, research studies, public comments, hearing transcripts and supporting documentation from all segments of the mining community.

II. Discussion of the Final Rule

This final rule assures that miners can rely on seals to protect them from the hazardous and sometimes explosive environments within sealed areas. This final rule includes requirements for seal strengths; design applications and installation; sampling and monitoring of sealed atmospheres; construction and repair of seals, training for persons conducting sampling and persons constructing or repairing seals, and recordkeeping to protect miners from hazards of sealed areas.

Underground coal mines are dynamic work environments in which the working conditions can change rapidly. Caved, mined-out areas may contain coal dust and accumulated gas which can be ignited by rock falls, lightning, and in some instances, fires started by spontaneous combustion. Seals are used to isolate this environment from the active workings of the mine. Seals are also installed to withstand overpressures resulting from explosions in abandoned areas and to prevent the potentially explosive methane/air mixtures from migrating to the working areas. Overpressure is the pressure above the background atmospheric pressure. For example, air pressure in a car tire is measured with a pressure gauge as 30 psi, which is an overpressure. The absolute pressure of the air inside the tire is 44.7 psi which is 14.7 psi or one atmosphere higher. Explosion pressures are normally expressed as an overpressure beyond standard atmospheric pressure.

A methane/air mixture becomes explosive when 5 percent to 15 percent methane is present with at least a 12 percent oxygen concentration. If an ignition source is available, then an explosion can occur and create overpressures. The homogeneity of the methane/air mixture contributes to the magnitude of the explosion. The homogeneity of the methane/air mixture can vary depending on the elevation and the methane liberation of the sealed area and outside factors such as the temperature and barometric pressure. The speed of an explosion and the physical characteristics of a sealed area can increase the force of the explosion such that detonations and significant pressure piling may be possible.

Pressure piling is the development of pressure in excess of normal atmospheric pressures as a result of the velocity-related compression of the gases in front of the flame. Pressure piling results from the rapid acceleration of the front of the flame. This acceleration process may be increased by cross-sectional restrictions, obstructions and other irregularities in the path of the flame. If the air flow ahead of the front of the flame is sufficiently turbulent, the flame speed may increase and transition from deflagration to detonation. A detonation occurs when the flame of an explosion propagates through the unburned fuel at

a velocity exceeding the speed of sound. A deflagration occurs when the flame of an explosion propagates through unburned fuel at a velocity below the speed of sound.

This final rule addresses seal strength design, construction, maintenance and repair of seals and monitoring and control of atmospheres behind seals in order to reduce the risk of seal failure and the risk of explosions in abandoned areas of underground coal mines. It also addresses the level of overpressure for new seals. This final rule will protect miners from hazards of sealed areas.

III. Section-by-Section Analysis

A. Section 75.335 Seal Strengths, Design Applications, and Installation

The final rule addresses the requirements for seal strengths, design applications, and seal installation.

1. Section 75.335(a) Seal Strengths

Final § 75.335(a) requires that seals constructed in underground coal mines after October 20, 2008 be designed, constructed and maintained in accordance with the provisions of this final rule.

Final § 75.335(a)(1)(i), like the ETS, requires that seals withstand at least 50-psi overpressure when the atmosphere in the sealed area is monitored and maintained inert. Final § 75.335(a)(1)(i) adds new requirements that these seals be designed using a pressure-time curve with an instantaneous overpressure of at least 50 psi, and that the minimum overpressure must be maintained for at least four seconds and then released instantaneously.

Final § 75.335(a)(1)(ii) addresses new requirements that seals constructed to separate the active longwall panel from the longwall panel previously mined be designed using a pressure-time curve with a rate of pressure rise of at least 50 psi in 0.1 second, and that a minimum overpressure of at least 50 psi be maintained.

Final § 75.335(a)(2)(i) revises the ETS and requires that seals withstand overpressures of at least 120 psi if the atmosphere in the sealed area is not monitored, is not maintained inert, and the conditions in final § 75.335(a)(3)(i) through (iii) of this section are not present. Final § 75.335(a)(2)(i) also adds new requirements that these seals be designed using a pressure-time curve with an instantaneous overpressure of at least 120 psi, and that a minimum overpressure of 120 psi be maintained for at least four seconds and then released instantaneously.

Final § 75.335(a)(2)(ii) adds new requirements that seals constructed to separate the active longwall panel from the longwall panel previously mined be designed using a pressure-time curve with a rate of pressure rise of 120 psi in 0.25 second, and that a minimum overpressure of 120 psi be maintained.

Final § 75.335(a)(3) is essentially unchanged from the ETS. It requires seals to withstand overpressures greater than 120 psi if the atmosphere in the sealed area is not monitored and is not maintained inert, and either (i) the atmosphere in the sealed area is likely to contain homogeneous mixtures of methane between 4.5 percent and 17.0 percent and oxygen exceeding 17.0 percent throughout the entire area; or (ii) pressure piling could result in overpressures greater than 120 psi in the area to be sealed; or (iii) other conditions are encountered, such as the likelihood of a detonation in the area to be sealed.

Final § 75.335(a)(3)(iv) retains the ETS requirement that when homogenous explosive atmospheres, pressure piling or the likelihood of a detonation exists, the mine operator must revise the ventilation plan to address the potential hazards. In addition, the operator must conduct an analysis of the mining conditions and revise the plan to include seal strengths sufficient to address these conditions.

MSHA received many comments in response to its request on the appropriateness of the three-tiered approach to seal strength in the ETS. One commenter stated that the strength requirements in the first and second tier are arbitrary. Other commenters objected to the fixed seal strengths and requested that either a case-by-case determination or a risk analysis be made to determine which seal strength is needed. One commenter suggested that a two-tiered approach is adequate and that a third tier is not needed. A commenter stated that the 120-psi value proposed in the ETS is sufficient for design purposes and that the 120-psi load prescribed by the ETS is the highest design criterion for seals among all the coal producing countries. Another commenter stated that an explosion with a force greater than 120 psi could not occur in an underground coal mine. Other commenters, however, stated that greater than 120-psi explosion pressures can occur in sealed areas. Some commenters suggested that a 640-psi seal, as recommended by NIOSH, should be included in the standard. One commenter on the USACE's Draft Report stated that MSHA should consider a provision in the final rule that would assure that seals are explosion-proof.

The Agency believes that a risk based analysis to determine seal strengths on a case-by-case basis rather than the tiered approach is not appropriate for several reasons. In the ETS, the Agency requested comments on alternatives to the seal strength requirements in the ETS, including supporting data, feasibility, and costs. MSHA did not receive any specific information, relative to alternatives requested, that would support a risk-based analysis on a case-by-case basis in this final rule. The rulemaking record contains little information supporting a case for risk analysis or costs and feasibility of such an approach. Commenters did not address how risk analysis on a case-by-case basis would impact the final rule and miner safety. Since the rulemaking record does not support this alternative approach to determine seal strengths, MSHA has not included it in this final rule.

The strength requirements for final § 75.335(a) are based on MSHA's investigation of the explosion at the Sago mine and the 2007 NIOSH Final Report. NIOSH discovered through research testing and modeling that a 50-psi peak overpressure could occur in a limited-volume, unconfined situation. Small, unconfined pockets of gases in an explosive concentration could always exist in a sealed area. If any of these pockets were ignited, a 50-psi pressure pulse could be generated.

In addition, NIOSH stated that a 120-psi peak pressure could occur in a limited, confined-volume situation. According to NIOSH, in such a situation, even if the overall concentration of explosive gases in the gob is well above the explosive concentration, explosive concentrations could be present in some areas. NIOSH further stated that if an explosive mix of methane and oxygen is ignited in this situation, an explosion could generate a peak explosion pressure of 120-psi. Based on the 2007 NIOSH Final Report and the Agency's data and experience, this final rule retains the second tier of the ETS.

Unlike NIOSH's design curves for 50-psi and 120-psi overpressures, NIOSH did not recommend a static approximation to the 640-psi pressure-time curve because ''Additional studies are required * * *.'' (2007 NIOSH Final Report at pg. 61). Although the NIOSH 640-psi pressure-time curve could be used to design seals, in this case a dynamic analysis would have to be conducted by the professional engineer. MSHA considered NIOSH's 640-psi seal design. However, a prescriptive specific dynamic load factor based on the 640-psi design was not determined and

requires further studies as stated in the 2007 NIOSH Final Report. As stated in the ETS, ''Although the recommended maximum seal strength in the 2007 NIOSH Draft Report is 640 psi, MSHA has no empirical or other data at this time, demonstrating that mine conditions exist that will necessitate seals stronger than 120 psi.'' One commenter on the USACE's draft report questioned this statement. MSHA stated in a Memorandum from its Office of Technical Support that ''these comparisons [between the USACE Report and known conditions after the Sago Mine explosion] again brought the practical applicability of results of the study into question.'' The Memorandum further states that: ''Technical Support decided not to publish the study because the critical information necessary to develop an accurate simulation was not available, and therefore, any results could not be relied upon for decision-making. Much of the data provided to the USACE for the three simulations described in the draft report was speculative * * *''

Based on the Agency's available information and data, MSHA could not specifically recommend a 640-psi strength requirement. The final rule retains the third tier of the ETS and requires a seal stronger than 120 psi if certain conditions are encountered. Under the final rule, mine operators must perform a risk analysis and evaluate the atmosphere of the area to be sealed and determine when higher pressure seals should be used and at what strength. The seal design must be approved at the appropriate strength for the specific conditions to be encountered.

Most commenters expressed concern that under the ETS, it is virtually impossible to determine when the conditions requiring a seal greater than 120 psi are present. MSHA has structured the final rule to accommodate pressures greater than 120 psi in recognition of the fact that explosion pressures may exceed this limit under certain conditions. These conditions would be a concern only in sealed areas that are not monitored and not maintained inert. The final rule requires seal strengths greater than 120 psi if seals are constructed around areas that are not monitored and are not inert, and one of the following three conditions occurs: (1) A homogeneous explosive atmosphere exists, (2) pressure piling could result in pressures exceeding 120 psi, or (3) detonation is likely.

MSHA expects that mine operators will sample an appropriate number of locations within the sealed area during the period when seals are reaching their design strength to address whether a homogeneous explosive atmosphere exists. These samples could be taken at various locations, including through seals constructed around the sealed area and possibly through boreholes or shafts within the sealed area. When these seals reach design strength of 120 psi, sampling is no longer required. If the methane concentration stabilizes between 4.5 percent and 17 percent and the oxygen concentration remains above 17 percent in all samples, then the atmosphere is considered homogeneous throughout the sealed area, and seal strengths must be designed to an adequate level above 120 psi, as determined by the professional engineer, which will provide adequate protection for miners underground. MSHA realizes that the seals surrounding the sealed area must be in place prior to sampling.

MSHA expects that mine operators will evaluate the physical characteristics of the underground workings near all seals surrounding the sealed area to address whether pressure piling can occur to a degree that causes explosion overpressures to exceed 120 psi. Overpressures that occurred during the 2006 explosion at the Sago Mine increased in magnitude due to a severe change in the physical characteristics of the underground workings near the seals. The seals at the Sago Mine were constructed to a height of approximately 7 feet. The workings in the sealed area had been previously second mined to a height of nearly 20 feet in some locations near the seals. As the explosion propagated toward the seals, pressure piling occurred and caused excessive pressure at the location of the seals. These factors must be considered by the mine operator to determine if a situation exists that will cause pressure piling, resulting in pressures above 120 psi. If this situation exists, then seal strengths must be designed to an adequate level above 120 psi, as determined by the professional engineer.

MSHA expects that mine operators will fully evaluate potential ignition sources, potential methane concentrations, and potential oxygen concentrations in the sealed areas to determine if detonation could occur. Mine operators should consider whether a high energy ignition source exists in the sealed area, whether extensive volumes of homogeneous mixtures of explosive methane concentrations may exist, and whether sufficient oxygen may be present in the sealed area.

MSHA received several comments on the USACE's Draft Report. The report details the USACE's efforts to mathematically model the methane explosion at the Sago Mine and potentially establish the seal overpressures. The report recommended that additional research was needed to refine the models in order to better predict an explosion pattern.

Commenters stated that computational fluid dynamics modeling could be used effectively to compare the effect of different variables on explosions, but that this type of modeling cannot accurately predict conditions. According to one commenter, their data collection and analysis of an actual gob composition is highly non-homogeneous, and the chance of methane gas detonation in a coal mine is almost zero. Therefore, this commenter stated that the 120-psi criterion in the ETS is adequate.

Final §§ 75.335(a)(1)(i) and (a)(2)(i) include requirements that seal designs must resist explosions of specific duration and intensity. The duration and intensity is characterized in pressure-time curves. A pressure-time curve gives engineers a mechanism to perform a dynamic analysis or to derive a dynamic load factor that they can use in a static analysis of a design. The pressure-time curves in Figures 1 and 2 yield a dynamic load factor (DLF) of 2.0, which is the theoretical maximum (Structures to Resist the Effects of Accidental Explosions, Department of the Army, Report TM 5–1300, November 1990) (1990 Department of the Army Report). Holding the applied pressure for at least four seconds assures that a seal could be loaded elastically at a DLF of 2.0 (1990 Department of the Army Report). The instantaneous release of the overpressure load after at least four seconds gives engineers a criterion to address the rebound effect that would occur in the seal after the explosive force was removed. Under this final rule, a professional engineer could submit, for MSHA approval, a unique design that is able to withstand the prescribed design criteria.

Figures 1 and 2 are the 50-psi and 120-psi pressure-time curves to be used for seal design.

Figure 1. 50-psi pressure-time curve.

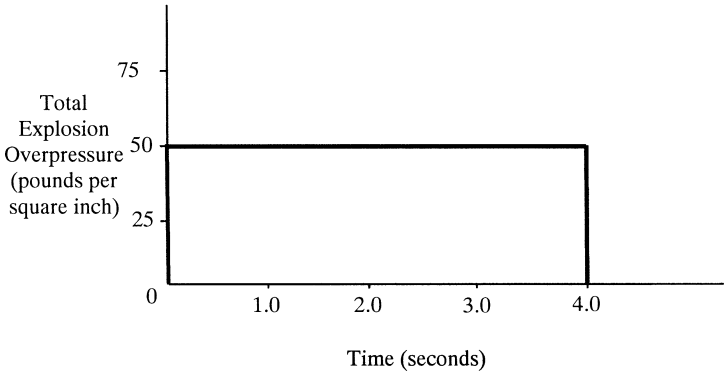
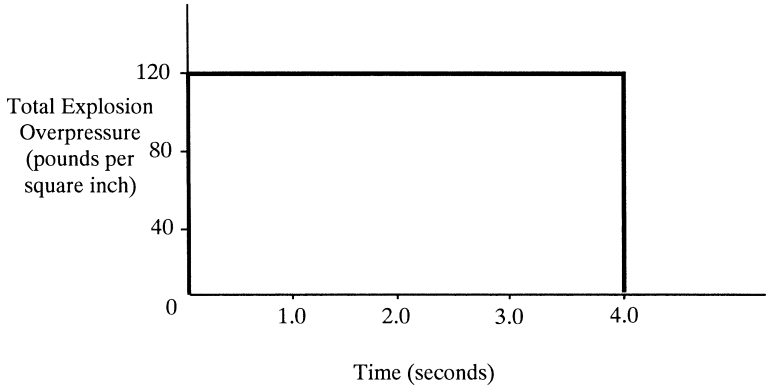


Figure 2. 120-psi pressure-time curve.



Several commenters requested a more prescriptive design standard identifying minimum overpressures. MSHA believes that a more prescriptive standard would eliminate ambiguity and result in greater protection of miners. In response to these comments and for clarity, final §§ 75.335(a)(1)(i) and (a)(2)(i) provide specific pressure-time curves for certain seal designs.

Some commenters requested that they be allowed to use seals constructed to separate the active longwall panel from the longwall panel previously mined. These commenters stated that such seals protect miners from explosions and help control spontaneous combustion, which has historically been a problem in the western U.S. mines. MSHA's enforcement policy under the ETS is consistent with the prescriptive design requirements in final §§ 75.335(a)(1)(ii) and (a)(2)(ii) for these types of seals. These provisions allow seals to be designed using pressure-time curves that characterize an explosion having pressure venting and slower pressure rise times. Such pressure-time curves are published in the 2007 NIOSH Final Report.

Both NIOSH 50-psi and 120-psi pressure-time curves for these seals yield a dynamic load factor of 1.0. The caved roof gob adjacent to seals used to separate the active longwall panel from the longwall panel previously mined minimizes run-up distances, which may otherwise be long enough to generate steeper rise times on either pressure pulse. Thus, both pressure-time curves enable engineers to analyze these seal designs based upon a dynamic analysis or a static, uniform pressure, which is equal to the peak overpressure in the applicable pressure-time curve. Figures 3 and 4 are the 50-psi and 120-psi pressure-time curves that can be used for the design of seals that separate the active longwall panel from the longwall panel previously mined.

Figure 3. Longwall panel 50-psi pressure-time curve.

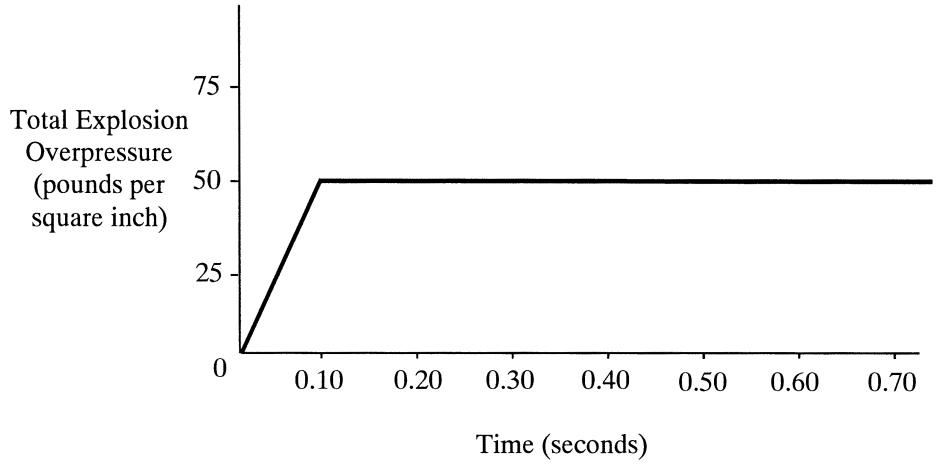
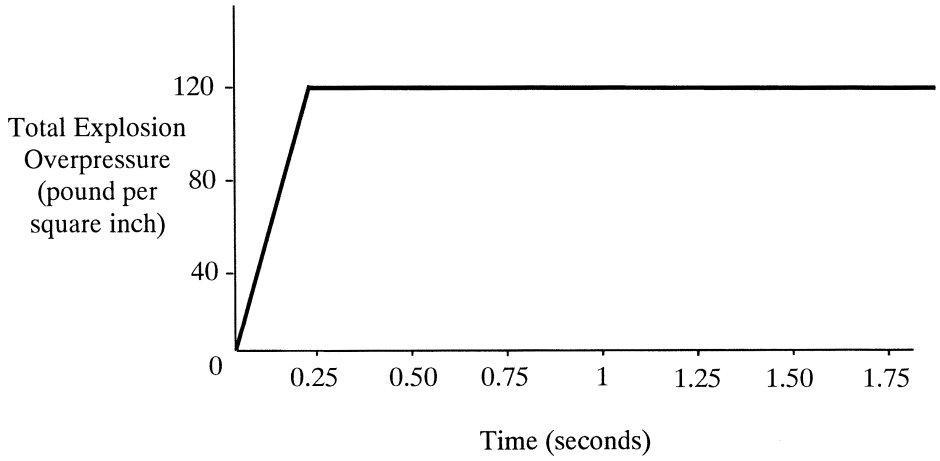


Figure 4. Longwall panel 120-psi pressure-time curve.



Several commenters asked that explosion wave mitigation procedures be allowed in lieu of seal designs to withstand overpressures greater than 120-psi. Based on MSHA's knowledge and experience, if a seal is to withstand overpressures at the design seal strength, then wave mitigation methods may not provide effective protection. Most wave mitigation techniques are designed for a one-time use, after which they do not offer any quantifiable resistance to explosion overpressure. While wave mitigation methods are not discouraged by MSHA, wave mitigation alone cannot be used to meet the requirements of the standard.

Several commenters inquired about a safety factor in the seal designs. Some commenters believed that the seal design requirement in the ETS included a safety factor of two. Like the ETS, this final rule does not require a safety factor in any seal designs. As mentioned above, for static-equivalent seal designs using either of the two prescribed pressure-time curves having an instantaneous rise, a Dynamic Load Factor (DLF) of 2 would be applied to the peak overpressure. The DLF is multiplied by the peak overpressure for a static-equivalent overpressure for which the seal should be designed to resist. For example, a 120-psi seal designed with a static-equivalent procedure would have to withstand a design static overpressure of 240 psi. The two prescribed pressure-time curves that are permitted for use with seals constructed to separate the active longwall panel from the longwall panel previously mined have a DLF of 1. A DLF is not a factor of safety. It is a ratio used to equate a dynamic load with a static load for design purposes. Professional engineers are expected to incorporate load factors in their designs, in addition to the DLF, in accordance with current prudent structural engineering practices.

Many commenters questioned why Mitchell-Barrett seal designs were not permitted under the ETS. Some commenters stated that Mitchell-Barrett seals were tested by NIOSH and that they are capable of holding a static load over 95 psi. This maximum 95 psi overpressure was generated in a small-volume chamber behind the tested seal and was not generated by an explosion pressure wave traveling down a mine opening at the Lake Lynn Experimental Mine, as seals had been tested previously. NIOSH attempted to establish equivalency of a small-volume chamber to the full-scale explosion tests. NIOSH did not establish equivalency between the two types of tests. Also, the pressure-time curve in this final rule for 50-psi seals incorporates a DLF of 2 and results in a static equivalent load of 100 psi. This static equivalent load is greater than the 95 psi static load that NIOSH measured. Mitchell-Barrett seals that were tested

by NIOSH would not be permitted under this final rule for 50-psi seals requiring a DLF of 2.0.

One commenter stated that the ETS would cause existing seals in three mines operated by the mine operator to be replaced with 50-psi rated seals and that replacement of the existing seals would be costly. The final rule does not require replacement of existing seals; rather, for existing seals, it requires operators to monitor methane and oxygen concentration levels and to maintain an inert atmosphere in the sealed area.

Another commenter stated that the turnkey costs for seals used in the company's mines ranged from $12,000 to $25,000 and stated that MSHA had severely understated costs. However, the Agency's cost estimates are weighted averages of the costs for various types of seals. MSHA's estimated turnkey costs range from approximately $7,370 to $25,000 for 50 psi seals and $11,330 to $38,550 for 120 psi seals. The commenter's costs come within the range of seal costs MSHA used to develop its cost estimates.

2. Section 75.335(b) Seal Design Applications

Final § 75.335(b) renumbers and revises ETS § 75.336(a). It requires that seal design applications be based on either engineering design applications or full-scale explosion tests. The final rule permits the applicant to use other equivalent means of physical testing in lieu of full-scale explosion tests. The final rule also requires that seal design applications from seal manufacturers or mine operators be submitted for approval to MSHA's Office of Technical Support, Pittsburgh Safety and Health Technology Center, P.O. Box 18233, Cochrans Mill Road, Pittsburgh, PA 15236.

Final § 75.335(b)(1), like the ETS, sets forth specific requirements for an engineering design application. Under final § 75.335(b)(1)(i), an engineering design application must address the following: Gas sampling pipes, water drainage systems, methods to reduce air leakage, pressure-time curve, fire resistance characteristics, flame spread index, entry size, engineering design and analysis, elasticity of design, material properties, construction specifications, quality control, design references, and other information related to seal construction.

Section 75.335(b)(1)(i) has been revised to include elasticity of design in the engineering design application. MSHA has included this requirement in the final rule for clarity. It is based on the 2007 NIOSH Final Report and on MSHA's experience with seal design approvals under the ETS. NIOSH notes in the 2007 NIOSH Final Report that repeated pressure waves will likely impact the seal structure. Applications for seals designed for overpressures of 120 psi or greater must address elasticity in their design in order to withstand repeated, independent overpressures. This is consistent with current prudent engineering practices and with MSHA's seal approval process under the ETS. Addressing elasticity in seal design does not require a higher seal strength than that under the ETS. The final rule is consistent with MSHA's approved seal designs under the ETS. This final rule retains the other requirements of the ETS.

Final § 75.335(b)(1)(ii), like the ETS, requires that an engineering design application be certified by a professional engineer that the design of the seal is in accordance with current, prudent engineering practices. In addition, it clarifies the ETS requirement and specifies that the professional engineer certify that the seal design is applicable to conditions in an underground coal mine. In the ETS, MSHA discussed the engineering decisions and actions that must be made by and must be the responsibility of the professional engineer. Those included (1) the selection or development of design standards or methods, and materials to be used in seal construction; (2) the development and preparation of the structural analyses and design computations, drawings, and specifications; (3) the selection or development of techniques or methods of testing to be used in evaluating materials used either during seal construction or following completion of seal construction; and (4) the development of construction procedures. This final rule clarifies MSHA's intent that a seal design must reliably function given a set of specific conditions in an underground coal mine, and that a professional engineer must certify that the seal design is applicable to conditions in an underground coal mine.

Several commenters stated that professional engineers who are required to comply with the engineering design application requirements in the ETS could lose complete dominion and control over the design of a seal. A commenter stated that West Virginia state law requires a professional engineer to maintain complete direction and control over all specifications, reports, drawings, plans, design information, and calculations to be certified. Commenters raised an issue concerning a seal designed by MSHA but requiring certification by a professional engineer. Under the ETS, this particular seal approval required a separate review and certification by a professional engineer before it could be used. However, the professional engineer may also use that particular design as basis for a new seal design and submit it to MSHA for approval.

A commenter stated that the design of mine seals for use in West Virginia is engineering work and requires that it be done by a registered West Virginia professional engineer. MSHA accepts the certification of a professional engineer from any state and allows that certification to be used in other states. Each state is responsible for enforcing its rules and regulations.

Another commenter stated that because field conditions change the professional engineer must be allowed to make the necessary field changes to meet those conditions in order to protect the public safety. MSHA acknowledges that some field conditions may change but because of the importance and complexity of the seal designs, the final rule does not permit field changes. Like the ETS, the final rule allows the mine operator to make revisions to the original approved design by submitting those changes that are certified by a professional engineer to MSHA's office of Technical Support for approval.

Final § 75.335(b)(1)(iii) revises ETS § 75.336(a)(1)(iii) and requires that an engineering design application include a summary of the installation procedures related to seal construction. Based on MSHA's field experience under the ETS, the requirement for a summary of installation procedures is more appropriate than that in the ETS for specific information to be included in a Seal Design Table. Under the final rule, the summary should include all of the information necessary to construct a seal including quality control and other necessary information. The application must list provisions that specify quality control procedures for construction and include requirements for material sampling and testing. Material testing should be conducted by a certified laboratory and by qualified personnel. The certification for the laboratory must be from a professional organization such as the International Organization for Standardization (ISO) and the personnel must be able to demonstrate qualifications to ensure proper quality control testing. MSHA's experiences under the ETS reveal that some information included in the seal design application is proprietary. Although this information is required to be submitted to Technical Support for evaluation of

the design, it is not necessary to include it in the ventilation plan for approval by the District Manager. The requirement for the summary information will eliminate the need to disseminate any proprietary information. It will provide the District Manager with information needed to approve the seal design in the ventilation plan.

Final § 75.335(b)(2) requires that seal design applications can be based on full-scale explosion tests or equivalent means of physical testing. During discussions with MSHA on alternatives to full-scale testing, NIOSH indicated that equivalent testing conditions can be represented in suitable hydrostatic test chambers similar to those at the NIOSH Lake Lynn Experimental mine. MSHA believes that an equivalent means of physical testing, that has at least the same level of confidence as full-scale explosion testing, is an acceptable means of compliance and the Agency has included it in the final rule.

Final § 75.335(b)(2)(i), like ETS § 75.336(a)(2)(i), requires certification by a professional engineer that the testing was done in accordance with current, prudent engineering practices for construction in a coal mine. This final rule deletes the requirement in the ETS that the professional engineer be knowledgable in structural engineering. MSHA deleted this requirement because there is no certification available to assure that a professional engineer is knowledgable in structural engineering. MSHA's experience with seal design approvals under the ETS reveals that the Professional Engineers who successfully submit seal designs are knowledgable in structural engineering. MSHA received one comment on this provision which recommended the words ''knowledgable in structural engineering'' be removed.

Final § 75.335(b)(2)(ii), like ETS § 75.336(a)(2)(ii), requires the applicant to provide technical information related to the methods and material used to construct and test the seals. MSHA received no comments on this provision.

Final § 75.335(b)(2)(iii) requires that the application include supporting documentation. This clarifies ETS § 75.336(a)(2)(iii) that required proper documentation. The term ''supporting'' more accurately describes the type of documentation required. This documentation includes: Engineering analyses, construction drawings and specifications, and data that address seal material, fire resistance and flame-spread index. The applicant must establish the materials and material properties required for adequate seal construction. Construction documentation is required to assure that the seals are properly built and reliable to address air leakage, and to verify that the material properties of the seal will meet the specified strength criteria. MSHA received no comments on this provision.

Final § 75.335(b)(2)(iv), like ETS § 75.336(a)(2)(iv), requires the application to include an engineering analysis addressing differences between the seal support during test conditions and the range of test conditions in a coal mine. MSHA received no comments on this provision.

Final § 75.335(b)(2)(v) revises ETS § 75.336(a)(2)(v) and requires that a summary of the installation procedures be included in the application. This requires that applicants submit more appropriate information in the form of a summary of installation procedures rather than specific information included in a Seal Design Table as required by the ETS. This summary should include the installation procedures related to mine specific seal construction. For example, it would include the maximum entry width and height for which the specific design is applicable, the specified strength of the seal material, the thickness of the seal, and the reinforcement and anchorage requirements for the seal. Additional information may be provided at the discretion of the Professional Engineer. MSHA received no comments on this provision.

Final § 75.335(b)(3), like ETS § 75.336(a)(3), provides that MSHA will notify the applicant if additional information or testing is required. It also requires the applicant to provide this information, arrange any additional or repeat tests, and provide prior notification to MSHA of the location, date, and time of such tests. MSHA received no comments on this provision.

Final § 75.335(b)(4), like ETS § 75.336(a)(4), provides that MSHA will notify the applicant, in writing, whether the design is approved or denied. It also provides that if the design is denied, MSHA will specify, in writing, the deficiencies of the application, or necessary revisions. MSHA received no comments on this provision.

Final § 75.335(b)(5), like ETS § 75.336(a)(5), requires that once the seal design is approved, the approval holder must promptly notify MSHA, in writing, of all deficiencies of which they become aware. MSHA received no comments on this provision.

3. Section 75.335(c) Seal installation approval

Final § 75.335(c), like ETS § 75.336(b), requires that the installation of the approved seal design be approved in the ventilation plan.

Final § 75.335(c)(1), like the ETS, requires the mine operator to retain the seal design approval and installation information for as long as the seal is needed to serve the purpose for which it was built. One commenter stated the requirement to retain approval and installation information for an indefinite period places an onerous burden on both the professional engineer and the mine operator, and suggested that the final rule include a definite duration for retaining this information. Based on MSHA's experience under the ETS, the requirement for approval and installation information provides a reliable reference should any problems occur during the service life of the seal. This provides valuable information as to how the seal was constructed and identifies the person responsible for certifying that the provisions in the approved seal design were addressed. In some instances, this information may enable persons to question individuals responsible for designing and constructing the seal to gain an insight as to the circumstances surrounding the construction and identify any problems that may have been encountered during the construction. Accordingly, this provision remains unchanged from the ETS.

Final § 75.335(c)(2), like the ETS, requires that the mine operator designate a professional engineer to conduct or have oversight of seal installation and certify that the provisions in the approved seal design specified in this section have been addressed and are applicable to the conditions in the mine. This final rule also requires that a copy of the certification be submitted to the District Manager with the information provided in final § 75.335(c)(3) and that a copy of the certification be retained for as long as the seal is needed to serve the purpose for which it was built.

One commenter supported this provision and stated that creating accountability in the construction process is a critical component if MSHA is to assure that coal operators take very seriously their obligation to provide a safe workplace with properly designed and constructed seals.

Several commenters opposed this provision. They stated that the requirement to conduct or have oversight of seal installation should be deleted because it would be expensive, difficult because there are many variables in the construction process, and unnecessary because a mine operator must also certify construction. Some commenters stated that a

professional engineer's function is the design of a seal, not oversight of the construction. Several commenters stated that the provision would require a professional engineer to be on site prior to, during, and following construction of every seal to insure that all parameters are met and that would be unnecessary.

Under the final rule, MSHA does not intend that the professional engineer take part in the construction process or be at the seal installation site during the entire construction process. MSHA stated its intent with respect to this requirement at the public hearings. MSHA's existing enforcement policy states that the professional engineer must inspect the set of seals during construction as part of the oversight and certification required by ETS § 75.336(b)(2). To accomplish this oversight, MSHA would expect the professional engineer to: (1) Verify that the seal application is suitable for the specific conditions, (2) confirm that the site preparation is adequate, (3) confirm that the workforce is adequately trained to properly build the seals, (4) verify that the correct materials and procedures are being used to construct the seal, and (5) confirm that adequate quality controls are in place and are being followed. The professional engineer however, does not have to be onsite the entire time that seals are being built.

Based on the Agency's knowledge and experience, MSHA has determined that the oversight by the professional engineer, who would be most familiar with the seal design, will help assure that appropriate seal design implementation and related analyses are performed properly. In addition, it will assure that seals are constructed according to the drawings and specifications of a professional engineer.

Final § 75.335(c)(3), like the ETS, lists specific information that a mine operator must address in the ventilation plan. The information will be used by the District Manager to evaluate a seal installation and determine whether the seal design is appropriate for a particular site.

Final § 75.335(c)(3)(i), like the ETS, requires that mine operators include the MSHA Technical Support Approval Number of the seal design in the ventilation plan. MSHA did not receive any comments on this section. This final rule is unchanged from the ETS.

Final § 75.335(c)(3)(ii) revises ETS § 75.336(b)(3)(iii)(D). It requires a summary of the installation procedures for approval to be included in the ventilation plan. This final rule is derived from the ETS requirement that the mine operator specify construction techniques for each type of seal. It revises the ETS requirement to be consistent with the language in final § 75.335(b)(1)(iii). The information required in this final rule, however, is essentially the same as that required in the ETS. Examples of information required by this provision include: Maximum entry width and height for which the design is applicable; specified strength of the seal; construction steps; and reinforcement and foundation anchorage requirements. In addition, when frame work is used, information should specify frame work size, spacing and materials used, a description of how the frame work is erected, size of other material used, such as concrete block size, wood products used and spacing, and, if needed, an anchorage table for rebar showing lengths, hole size, and other material used with the rebar. If hitching is required, information should specify hitching location, width and depth, calibration of equipment where required, sequence of pouring materials and thickness, sequence and type of roof support used, surface preparation, a description of the material pouring techniques and how cold joints may or may not be permitted, set back distances, a diagram of the water drainage system and air sampling installation, methods for preventing water retention during the curing process, rockdust removal from rib at the seal site, thickness of the seal, and other additional information in the seal design application.

Final § 75.335(c)(3)(iii) revises the ETS. It requires that mine operators provide, in the ventilation plan, a mine map of the area to be sealed and proposed seal locations that include the deepest points of penetration prior to sealing. This final rule revises the ETS by requiring that locations include the deepest points of penetration prior to sealing. This provision will help assure that the area was surveyed, a map of the area to be sealed was completed and the map was submitted by the mine operator. In addition, this final rule requires that the mine map be certified by a professional engineer or a professional land surveyor. It revises the ETS by including a professional land surveyor to certify the mine map to be consistent with existing § 75.1201 which permits a professional land surveyor to certify the mine map.

Final § 75.335(c)(3)(iv), like the ETS, requires that mine operators submit specific mine site information in the ventilation plan. Final § 75.335(c)(3)(iv)(A) requires that the type of seal be included in the ventilation plan. MSHA did not receive any comments on this provision.

Final § 75.335(c)(3)(iv)(B), like the ETS, requires mine operators to include information in the ventilation plan on the safety precautions taken prior to seals achieving design strength. Some commenters stated that this provision should require withdrawal of miners. According to commenters, this would be consistent with NIOSH's recommendation that miners be withdrawn from the affected area until seals reach design strength and the atmosphere in the sealed areas reaches an inert status. Other comments stated that withdrawal is not necessary because the sealed areas contain no likely ignition source, and if an inert atmosphere is present, uncured seals do not present an imminent danger as there is no explosion potential. In addition, some of these commenters stated that withdrawal of miners during seal curing time, which could be up to 28 days, would be too costly.

Based on MSHA's knowledge and experience under the ETS, miners could be exposed to the dangers of an explosion prior to seals achieving their design strength. Accordingly, MSHA believes that safety precautions need to be taken prior to seals achieving design strength. Safety precautions could include withdrawing miners from the entire mine or other area approved by the District Manager. They could also include the use of seals that reach their design strength in considerably less time than 28 days. In addition, the mine operator could inert the atmosphere prior to or during seal installation. If an inert atmosphere is present behind seals that have not reached their design strength, miners would not need to be withdrawn from the affected area. This provision remains unchanged from the ETS.

Final § 75.335(c)(3)(iv)(C) revises the ETS. It requires that the mine operator provide information in the ventilation plan on methods used to address site-specific conditions that may affect the strength and applicability of the seal, including set-back distances. The set-back distance, which is the distance from the corner of a pillar block to a seal, is critical to the long term stability and protection of a seal. Although the ETS did not specifically address set-back distances, many professional engineers included this concept in their design applications.

Based on MSHA's experience under the ETS, professional engineers designing seals have listed a minimum set-back distance of 10 feet when applying for a seal design approval in most instances. MSHA believes,

however, that set-back distances need to be addressed on a mine-by-mine basis. Some coal is softer or harder than others; and the overburden varies, which has an effect on the stability of the coal seam pillar. This means that some coal pillars will remain more or less stable than others over a long period of time. It is also possible to artificially reinforce the stability of less stable coal pillars, for example, by injecting materials into the pillars. Therefore, MSHA is including a requirement that the set-back distance of a seal be addressed in the mine ventilation plan during the seal plan approval process.

Final § 75.335(c)(3)(iv)(D), like the ETS, requires the mine operator to submit information in the ventilation plan on site preparation. MSHA did not receive any comments on this provision.

Final § 75.335(c)(3)(iv)(E), like the ETS, requires the mine operator to include information on the sequence of seal installations in the ventilation plan. MSHA did not receive any comments on this provision.

Final § 75.335(c)(3)(iv)(F), like the ETS, requires that the mine operator provide information in the ventilation plan on the projected date of completion of each set of seals. MSHA did not receive any comments on this provision.

Final § 75.335(c)(3)(iv)(G), like the ETS, requires the mine operator to provide information in the ventilation plan on the supplemental roof support inby and outby each seal. MSHA did not receive any comments on this provision.

Final § 75.335(c)(3)(iv)(H), like the ETS, requires the mine operator to provide information in the ventilation plan on the water flow estimation and dimensions of the water drainage system through the seals. MSHA did not receive any comments on this provision.

Final § 75.335(c)(3)(iv)(I), like the ETS, requires that the mine operator provide information in the ventilation plan on the methods used to ventilate the outby face of seals once completed. MSHA did not receive any comments on this provision.

Final § 75.335(c)(3)(iv)(J), like the ETS, requires the mine operator to provide information in the ventilation plan on the methods and materials used to maintain each type of seal. MSHA did not receive any comments on this provision.

Final § 75.335(c)(3)(iv)(K), like the ETS, requires the mine operator to provide information in the ventilation plan on methods used to address shafts and boreholes in the sealed area. MSHA did not receive any comments on this provision.

Final § 75.335(c)(3)(iv)(L) is derived from ETS § 75.335(a)(3)(iv). This final rule requires the mine operator to provide information in the ventilation plan on an assessment of potential for overpressures greater than 120 psi in the sealed area. ETS § 75.335(a)(3)(iv) required the mine operator to revise the ventilation plan when conditions that would necessitate a seal greater than 120 psi are encountered. This final rule is consistent with the ETS. It includes this provision to assure that the mine operator evaluates the area to be sealed and addresses the need for seals greater than 120 psi.

Final § 75.335(c)(3)(iv)(M) renumbers and clarifies ETS § 75.335(b)(5)(ii). It requires mine operators to provide information in the ventilation plan on additional sampling locations. This final rule is consistent with ETS § 75.335(b)(5)(ii), which required the location of sampling points to be included in the mine operator's action plan. Under this final rule, additional sampling locations could include sampling through boreholes and capped shafts with vent pipes.

Final § 75.335(c)(3)(iv)(N), like the ETS, requires the mine operator to provide, in the ventilation plan, any additional information required by the District Manager. This final rule will help assure that any new developments in technology or any problems related to site-specific conditions in sealing may be addressed by the mine operator through the ventilation plan. MSHA did not receive any comments on this provision.

B. Section 75.336 Sampling and Monitoring Requirements

Final § 75.336, derived from ETS § 75.335(b), revises and renumbers sampling and monitoring requirements for sealed atmospheres. In the final rule, the terms ''sampling'' and ''monitoring'' are used interchangeably. The final rule deletes the requirement in the ETS for mine operators using seals designed to withstand less than 120 psi to develop and follow a protocol to monitor methane and oxygen concentrations in sealed atmospheres. The ETS required that the protocol be approved by the District Manager in the ventilation plan. Requirements to maintain and restore an inert atmosphere in the sealed area are discussed in final § 75.336(b); requirements for sampling pipes are discussed in final § 75.337(g). Requirements for welding, cutting and soldering are discussed in final § 75.337(f); requirements for water drainage systems are discussed in final § 75.337(h); and requirements for training of certified persons conducting sampling are discussed in final § 75.338(a).

Section 75.336(a) of the final rule retains the requirement in ETS § 75.335(b) for a certified person, as defined under existing § 75.100, to monitor sealed atmospheres for methane and oxygen concentrations. Unlike the ETS, the final rule requires sealed atmospheres to be monitored through each sampling pipe and approved sampling location whether seals are ingassing or outgassing. Training requirements for certified persons are addressed in final § 75.338(a) and are unchanged from the ETS.

Final §§ 75.336(a)(1)(i) through (iii) address ETS requirements for sampling frequencies, including initial sampling periods and sampling on a continuing basis. Atmospheres with seals less than 120 psi constructed prior to October 20, 2008, and atmospheres with seals of less than 120 psi constructed after October 20, 2008 must be sampled through each sampling pipe and approved location at least every 24 hours. Under the final rule, the operator may request that the District Manager approve different frequencies and locations in the ventilation plan. Under the final rule, seals of 120 psi or greater must be monitored until they reach their design strength. After they reach their design strength, the final rule does not require the atmosphere in these sealed areas to be monitored and maintained inert.

Final § 75.336(a)(2) is derived from ETS §§ 75.335(b)(1) and (b)(5) and requires the mine operator to evaluate the atmosphere in the sealed area to determine whether sampling through required sampling pipes under final § 75.337(g) provides appropriate sampling locations. The final rule specifies the conditions under which the evaluation must be conducted. When the evaluation results indicate the need for additional sampling locations, the mine operator must establish additional sampling locations and include them in the ventilation plan for approval by the District Manager.

Final § 75.336(a)(3) requires mine operators with an approved ventilation plan addressing spontaneous combustion under existing § 75.334(f) to monitor sealed atmospheres in accordance with the plan.

Final § 75.336(a)(4) is derived from ETS § 75.335(b)(5)(vi) and allows the District Manager to approve the use of a continuous monitoring system in lieu of monitoring provisions in the final rule.

Final § 75.336(b)(1), like ETS § 75.335(b)(3), defines an inert atmosphere as one in which the oxygen concentration is less than 10 percent, or

the methane concentration is less than 3.0 percent or greater than 20.0 percent. Final § 75.336(b)(2) addresses corrective action necessary if the atmosphere is not inert. It requires that when a sealed atmosphere with less than 120-psi seals is not inert, the mine operator must take immediate action to reestablish an inert atmosphere and monitor the sealed atmosphere every 24 hours until it is restored to an inert status.

Final § 75.336(c) revises and clarifies ETS § 75.335(b)(4) and specifies when persons must be withdrawn from the mine due to a hazardous atmosphere in the sealed area.

Final § 75.336(d) clarifies existing MSHA policy that allows the operator to request that the District Manager approve in the ventilation plan a different oxygen concentration if the atmosphere in the sealed area contains carbon dioxide. It also addresses sealed areas where inert gas has been injected, and sampling methods and equipment.

Final §§ 75.336(e)(1) and (e)(2) are the same as ETS §§ 75.335(b)(6) and (b)(7) and include requirements for recording sampling results and any hazardous condition found in accordance with existing § 75.363.

1. Section 75.336(a)

Section 75.336(a) retains the requirement in ETS § 75.335(b) for a certified person, pursuant to § 75.100, to monitor sealed atmospheres. The final rule continues to require the certified person to monitor the sealed area for methane and oxygen concentrations. Under the final rule, unlike the ETS, sealed atmospheres must be monitored whether seals are ingassing or outgassing. Mine operators must also determine the direction of air leakage during monitoring which will indicate whether seals are ingassing or outgassing. Seals outgas when the pressure in the sealed area exceeds the pressure on the outby side of the sealed area. Seals ingas when the pressure outby the sealed area exceeds the pressure in the sealed area.

ETS § 75.335(b)(1) required mine operators to sample sealed atmospheres only when seals were outgassing. MSHA requested comments regarding: its sampling approach; sampling frequency; sampling only when a seal is outgassing; whether a different sampling approach would be more appropriate for the final rule, such as when seals are ingassing; and information and experiences of the mining community concerning sampling sealed areas.

Commenters' views were divided regarding appropriate conditions for monitoring seals, especially on the issue of outgassing and/or ingassing. MSHA received comments in support of the ETS strategy of requiring monitoring when seals were outgassing, while some other comments supported monitoring whether outgassing or ingassing. Several commenters suggested that sampling only during outgassing is inadequate to protect miners, since a greater concern exists when a seal is ingassing and adds oxygen to a fuel-rich environment in the sealed area. One commenter stated that ingassing creates zones of explosive methane-air mixtures and is more dangerous than when the seals are outgassing. A number of other commenters stated that sampling inby an ingassing seal or a seal that is in barometric pressure transition is a recipe for inaccurate sampling, and MSHA should not require sampling during ingassing. Finally, one commenter who supported sampling when seals are outgassing recommended that balance chambers could reduce incidences of barometric pressure changes exceeding the ventilating pressure produced by main mine fans causing seals to ingas. According to this commenter, the sealed atmosphere continues to change at least at the perimeter of the sealed area, and in some parts of the country, this change occurs on a daily or even more frequent basis. This commenter also suggested that MSHA provide incentives for mine operators such as allowing them to use lower-strength seals than required in the ETS. According to the commenter, these incentives should include allowing lower strength seals where balance chambers are used. MSHA acknowledges that a number of sealed atmospheres fluctuate from outgassing to ingassing on a frequent basis. MSHA believes that the sampling strategy under the final rule, based on ingassing or outgassing, would remove the need for balance chambers.

The Agency has reviewed the comments, hearing transcripts, data and other information contained in the rulemaking record regarding sampling and monitoring. MSHA also reviewed the Agency's enforcement history and field experience with implementation under the ETS. The Agency believes that sealed atmospheres should be monitored whether outgassing or ingassing. Since promulgation of the ETS, some operators have experienced significant delays in monitoring sealed areas, especially during the 14-day baseline period and while seals are reaching their design strength. The preamble to the ETS stated:

> If the seal is ingassing during the examination, the certified person must attempt to take a sample during the next weekly examination. After a second attempt is made and the seal is still ingassing, attempts must be made daily until the seal outgases. If repeated sampling indicates that a seal is not likely to outgas, then the mine operator must submit an alternative protocol to the District Manager. (72 FR at 28802)

At the time of promulgation of the ETS, MSHA did not envision that the sampling and monitoring procedure would result in the significant delays that have been experienced in the mining industry. MSHA inspectors also experienced delays in monitoring sealed atmospheres because of having to wait for seals to outgas before a sample could be taken. Also, limiting monitoring to outgassing affected the operators' ability to promptly implement the ETS monitoring requirements for determining whether the sealed atmosphere had reached the explosive range. After a review of the rulemaking record, the Agency does not believe that the record evidence supports limiting monitoring sealed areas to when seals are outgassing. In response to comments and in light of its own experience, the Agency has revised the monitoring requirement in this final rule to require mine operators to monitor sealed atmospheres whether seals are outgassing or ingassing. MSHA expects the final rule provisions to resolve many existing problems with monitoring sealed areas and to enhance safety and health of underground coal miners.

Final §§ 75.336(a)(1) requires monitoring through each sampling pipe and at each approved sampling location. Under § 75.336(a)(1)(i), mine operators must sample atmospheres with seals of 120 psi or greater until the design strength is reached, after which time they may cease sampling. Initial sampling for all newly-constructed seals is necessary to protect miners if an explosive atmosphere forms behind seals before they reach their design strength.

Under § 75.336(a)(1)(ii) of this final rule, like the ETS, the mine operator must monitor for methane and oxygen and maintain an inert atmosphere in the sealed area when using seals less than 120 psi constructed prior to the date of this final rule. Final § 75.336(a)(1)(iii) requires that atmospheres with seals of less than 120 psi constructed after the date of this final rule must be monitored and the atmosphere must be maintained inert.

Final §§ 75.336(a)(1)(ii) and (iii) allow the operator to request that the District Manager approve different sampling locations and frequencies in the ventilation plan provided at least one sample is taken at each set of seals at least every 7 days. Under final

§ 75.335(a)(1)(iii) for less than 120 psi seals constructed after April 18, 2008, the District Manager cannot approve different sampling locations and frequencies in the ventilation plan until after a minimum of 14 days and after seals have reached design strength. MSHA will consider pertinent information supplied by the mine operator, such as the results of the 14-day sampling period and any other previous sampling results, in an operators'' request to change sampling locations and frequencies. The 7-day interval is the same as the ETS monitoring frequency and is consistent with weekly examinations required in existing § 75.364. MSHA believes the sealed atmosphere must be sampled at least every 7 days in the event seal leakage, strata fracturing, roof convergence or another problem has developed and is affecting the sealed atmosphere. Under the final rule, MSHA emphasizes that mine operators must monitor sealed atmospheres at a frequency of every 24 hours unless the District Manager approves a different frequency in the ventilation plan. For newly constructed seals of less than 120 psi, the final rule requires a 14-day sampling period before the District Manager may approve different sampling locations and frequencies. The final rule deletes ETS § 75.335(b)(5)(iii) which required mine operators to specify procedures in the sampling protocol to establish a baseline analysis of oxygen and methane concentrations at each sampling point over a 14-day sampling period to be approved in the ventilation plan. In the final rule, in response to commenters and for clarity, MSHA has included specific parameters for sampling sealed atmospheres. As such, there is no need for a sampling protocol.

Several commenters said that the atmosphere behind all seals should be monitored and maintained inert. One commenter stated that sealed areas cannot be adequately monitored or maintained inert; therefore, all seals must be designed to withstand an explosion. Another commenter stated that monitoring is inadequate to protect miners and that it provides a false sense of security. MSHA believes that monitoring sealed areas informs the mine operator of the presence of potentially hazardous gases in sealed areas. Under the final rule, use of seals designed for less than 120-psi overpressure requires the mine operator to maintain an inert atmosphere in the sealed area since explosions cannot occur within inert atmospheres. MSHA believes that in mines which liberate significant volumes of methane, the atmosphere in sealed areas may become inert naturally. In mines that produce very small volumes of methane, the atmosphere in sealed areas may never become explosive. However, some mines may need to use other means to inert the atmosphere in the sealed area, such as injecting inert gas or pressure balancing of the ventilation system; or injecting material into the strata surrounding the seals to reduce leakage. These methods could inert the atmosphere in the sealed area. Other mines may need to construct new seals that are 120 psi or greater in front of all existing seals. MSHA's existing standards at § 75.334(a)(1) and (a)(2) require that worked-out areas be sealed or ventilated.

Commenters stated that the ETS sampling and monitoring requirements were confusing. A number of commenters criticized the need for District Manager approval of the sampling protocol. Several commenters said that there was no scientific basis for the monitoring, while others said that the final seal regulation should be more prescriptive. Several commenters criticized MSHA's weekly sampling intervals as being too lengthy to protect the miners. One commenter said that their data showed sealed areas never reach equilibrium and that barometric pressure changes continue to affect the sealed atmosphere. Commenters stated that when a sealed area has reached a stable atmospheric composition, weekly sampling is unnecessary.

MSHA continues to believe that weekly samples are necessary to protect miners'' safety and health. Barometric pressure changes, ventilation changes, water accumulations, methane liberation, subsidence, cracked strata near seals, and other changes may render a previously inert atmosphere explosive. Periodic monitoring is necessary to detect these potentially hazardous conditions in the sealed area. The final rule, like the ETS, requires periodic sampling.

Final § 75.336(a)(2) clarifies MSHA's intent under ETS § 75.335(b) for the mine operator to have responsibility for evaluating the atmosphere in the sealed area to determine whether sampling through seal sampling pipes, in accordance with final § 75.337(g), will provide an appropriate sample of the sealed atmosphere. Appropriate sampling must be capable of reliably detecting significant accumulations of explosive methane in the sealed area.

MSHA specifies in the final rule when the mine operator must conduct the evaluation which includes: the planning phase for sealing the area; immediately after the minimum 14-day required sampling; when the mine ventilation system is reconfigured; if changes in the mine occur that could adversely affect the sealed area; or if the District Manager requests an evaluation. When the results of the evaluations indicate the need for additional sampling locations, the mine operator must provide the additional locations and have them approved in the ventilation plan. The District Manager may require additional sampling locations and frequencies in the ventilation plan.

The mine operator shall evaluate the sealed area using the sampling results from the minimum 14-day required sampling and any other relevant information available to confirm that the initial evaluation is valid. A mine ventilation system reconfiguration may affect the direction of air leakage through seals and consequently alter the interpretation of sampling results in order to determine the inert status of the sealed atmosphere. The composition of the sealed atmosphere can be affected by changes in air currents, water accumulations, convergence, cracks in the strata leading to the surface, and the rate and/or location of methane liberation. These changes may affect the distribution of methane and oxygen concentration throughout the sealed area. The District Manager may request an evaluation based on other factors as appropriate.

Many variables affect the atmospheric composition of the sealed area, including size, methane liberation, leakage, ventilation pressures, and barometric changes. Mine operators must analyze each sealed area when determining appropriate sampling locations and frequencies. If the mine operator's analysis indicates that sampling through seal sampling pipes does not render an appropriate evaluation of the sealed atmosphere, the mine operator must establish additional sampling locations and specify them in the ventilation plan for the District Manager's approval.

Under the final rule, the District Manager may require additional sampling locations and sampling frequencies in the mine ventilation plan such as when MSHA sampling results differ from the operator's sampling results, or the District Manager's review of the mine operator's data indicates the atmosphere in the sealed area is not being adequately evaluated. In the ETS, the Agency expressed its intent that under ETS § 75.335(b), mine operators had to evaluate the sealed atmosphere to determine whether additional sampling locations were necessary.

In the ETS, MSHA also emphasized that all seals and the strata around them leak, resulting in an air exchange near the seal during barometric pressure changes. Seals may leak air into a methane-rich sealed atmosphere that can result in explosive methane concentrations. Due to this, MSHA stressed in the ETS the significance of obtaining appropriate samples of atmospheric conditions in the larger portion of the sealed area as opposed to the smaller area immediately inby the seal.

Some commenters objected to the requirement in ETS § 75.335(b) for the mine operators to obtain a representative sample solely through sampling pipes. MSHA acknowledges the limitations of the ETS sampling method for large sealed areas. While sampling a limited number of times or at a reduced frequency may result in an effective evaluation of the sealed area, additional sampling locations can be necessary to determine if a sealed atmosphere is inert. For instance, a sealed atmosphere may have one set of seals ingassing fresh air from the mine while another set of seals is outgassing high concentrations of methane. A transition zone exists where the atmosphere experiences an explosive range of methane between the two sets of seals. Thus, final § 75.336(a)(2) addresses the mine operator's responsibility to include adequate sampling locations and frequencies in the ventilation plan.

Several commenters stated that it is impractical to drill boreholes from the surface due to cost implications, surface topography, or land ownership. Although MSHA recognizes that there may be situations in which it may be impractical to drill boreholes from the surface, the Agency is aware that directional drilling from the surface or from within the mine is commonly practiced in the mining industry and may be used when topographic or land ownership problems are encountered. It is common practice in the mining industry to remove all persons from the affected area when the borehole approaches an unexamined or unventilated area. Other commenters supported a requirement for drilled boreholes to adequately monitor large or unusual sealed areas.

A commenter suggested that it is unreasonable for MSHA to assume that localized samples, regardless of the technique, establish the inert status of the sealed area. MSHA believes that sampling through seals, supplemented with additional sampling locations, where necessary, provides a safe and feasible method of ascertaining atmospheric conditions in the sealed area. Final § 75.336(a)(2) provides that the District Manager can require additional sampling locations, such as boreholes, and frequencies in a mine operator's ventilation plan.

One commenter expressed that it is not a significant hazard when a large sealed area in a mine has explosive mixtures when sampled through pipes, because coalbed methane production wells located above the sealed area produce almost pure methane (greater than the upper explosive limit). MSHA believes that methane extracted from the gob vent borehole primarily comes from the strata above the active coal mine. (Mucho, T.P., W.P. Diamond, F. Garcia, J.D. Byars and S.L. Cario, *Implications of Recent NIOSH Tracer Gas Studies on Bleeder and Gob Gas Ventilation Design,* The Society of Mining Engineers Annual Meeting, 2000). MSHA determined that boreholes used to sample sealed areas must be connected to the open entries within the sealed area. Degasification boreholes typically stop about 30 to 40 feet above the coal seam and do not extend into the sealed area and will not provide an accurate sample of the sealed atmosphere.

Some commenters recommended a risk analysis of sealed areas rather than monitoring. As appropriate, mine operators may include an analysis of the risks in the sealed area in their evaluation of the sealed area for MSHA's consideration. An evaluation under final § 75.336(a)(2) may include size of the sealed area, frequency of sampling, likelihood of spontaneous combustion, depth of the mine, and the patterns of methane liberation. However, the Agency concludes that the rulemaking record does not support a requirement of a risk analysis in lieu of monitoring. Monitoring of the sealed atmosphere in areas where seals less than 120 psi are used, and until the design strength is reached for seals of 120 psi or greater, provides optimum safety for miners because of the unforeseen changes that can occur within the sealed area.

Final § 75.336(a)(3) requires mine operators with an approved ventilation plan addressing spontaneous combustion under existing § 75.334(f) to sample the sealed area as specified in the approved ventilation plan. Section 75.334(f) addresses mines with a demonstrated history of spontaneous combustion and those located in coal seams determined to be susceptible to spontaneous combustion. It requires that the approved mine ventilation plan for these mines specify the measures that will be used to detect methane, carbon monoxide, and oxygen concentrations during and after pillar recovery, and in worked-out areas where no pillars have been recovered; the actions that will be taken to protect miners from the hazards of spontaneous combustion; and the methods that will be used to control spontaneous combustion, accumulations of methane-air mixtures, other gases, dusts, and fumes in the worked-out area. Sampling and maintaining an inert atmosphere are critical in sealed areas in coal mines that are subject to spontaneous combustion of the coal seam due to this inherent ignition source.

Several commenters stated that MSHA should continue to require mine operators to control spontaneous combustion in sealed areas through compliance with § 75.334(f). These commenters stated that the sampling requirements of a spontaneous combustion plan should be more comprehensive than the requirements of § 75.336 to safely manage the combustion potential. MSHA allows the spontaneous combustion monitoring requirements in the approved ventilation plan to be used in lieu of the monitoring requirements of this section which is more protective for miners.

Final § 75.336(a)(4), derived from ETS § 75.335(b)(5)(vi), allows the District Manager to approve the use of a continuous monitoring system in lieu of the monitoring provisions in this section. A continuous monitoring system may include bundles of sampling tubes that sample a frequency of every few hours and monitor at numerous sampling locations in the sealed area. MSHA standards addressing atmospheric monitoring systems are in existing § 75.351 and are applicable to belt air courses, primary escapeways, return air splits, and electrical installations. These standards do not address monitoring in sealed areas. The final rule broadens the scope and applicability of the ETS requirement in that it addresses continuous monitoring systems rather than atmospheric monitoring systems. Since promulgation of the ETS, MSHA does not believe that all of the provisions of § 75.351, atmospheric monitoring systems, are applicable to monitoring sealed atmospheres.

One commenter stated that MSHA did not adequately address continuous gas monitoring systems in the ETS. The final rule allows for use of these monitoring systems. Several commenters expressed that current atmospheric monitoring sensors could not be used in sealed areas due to calibration and maintenance requirements. The final rule deletes

reference to atmospheric monitoring systems.

Mine operators using continuous monitoring systems to monitor sealed atmospheres must submit a revised ventilation plan to the District Manager. The District Manager will review the revised plan to assure that the continuous monitoring system will perform effectively. In making a decision to approve this system, MSHA expects the mine operator to address calibration, recordkeeping, oversight of the continuous monitoring system, maintenance features of the monitoring system and sampling locations.

2. Section 75.336(b)

Final §§ 75.336(b)(1) and 75.336(b)(2) address inert atmospheres in sealed areas. Section 75.336(b)(1), unchanged from ETS § 75.335(b)(3), defines an inert atmosphere as one in which the oxygen concentration is less than 10.0 percent; the methane concentration is less than 3.0 percent; or the methane concentration is greater than 20.0 percent. MSHA has included a margin of safety in the definition of an inert atmosphere so that mine operators can address potential explosion hazards before having to withdraw miners. As the Agency stated in the ETS, the explosive range of methane is 5 to 15 percent when the oxygen level is 12 percent or more (2007 NIOSH Draft Report) which are the traditional values used in the coal mining industry. According to the 2007 NIOSH Draft Report, methane is explosive in air when the concentration ranges from 5 percent to 15 percent by volume. As in the ETS, to allow for the inaccuracy of methane and oxygen detection equipment and potential contamination of samples, oxygen less than 10.0 percent, methane concentration less than 3.0 percent and methane concentration greater than 20.0 percent are used to determine an inert atmosphere.

For atmospheres behind seals with design strengths less than 120-psi, final § 75.336(b)(2) requires the mine operator to take immediate action to restore the sealed atmosphere to an inert condition. Mine operators also must sample sealed atmospheres at least every 24 hours. In addition, MSHA requires withdrawal of miners when methane is between 4.5 and 17 percent and oxygen is 10 percent or greater.

Some commenters stated that until seals ''cure'' all sealed atmospheres must be inert, including seals of 120 psi or greater, or miners must be withdrawn from the mine. A critical time period for seals is immediately after construction prior to seals reaching their design strength. Miners must be protected from the hazard of an explosive atmosphere behind seals prior to seals reaching their design strength. Under the final rule, hazardous conditions are controlled by frequently monitoring and maintaining an inert atmosphere or withdrawing miners from the mine. Under MSHA's final rule, mine operators must monitor and maintain an inert atmosphere behind all newly-constructed seals. After 120-psi seals or greater reach their design strength, they are not required to be monitored under § 75.336. MSHA noted in the ETS that its accident history covering mines in the United States does not include documentation of an explosion in an underground mine that has generated an overpressure greater than 120 psi. One commenter addressing the final draft U.S. Army Corps of Engineers report stated that the chance of having a methane gas detonation in a coal mine is almost zero and further stated that with using actual gob compositions the constant volume explosion loads were found to not exceed 100 psi. Based on the Agency's experience under the ETS and other record evidence, the final rule does not require seals with a design strength of 120 psi or greater to be monitored after they reach their design strength.

Several commenters stated that MSHA's definition of an inert atmosphere in the ETS was overly conservative and recommended the generally accepted definition of a non-explosive atmosphere of oxygen less than 12.0 percent, and methane less than 5.0 percent or greater than 15.0 percent. A commenter suggested an expanded explosion risk buffer zone based on a Queensland, Australia underground coal mining standard. Commenters also stated that MSHA should take a tiered approach to address varying levels of methane and oxygen in the sealed area. Some of these commenters used the term ''explosive buffer zone'' when addressing broader gas concentrations to incorporate a margin of safety into the definition of inert and protocol requirements in ETS §§ 75.335(b)(4) and 75.335(b)(5). The ETS required an action plan for which mine operators were required to address hazards presented and actions to be taken when gas samples indicated that oxygen was 10.0 percent or greater and methane concentrations were 3.0 percent or greater but less than 4.5 percent; 4.5 percent or greater but less than 17.0 percent; and 17.0 percent to 20.0 percent. Several commenters said that no buffer zones are necessary if a gas chromatograph is used to analyze the samples. MSHA believes that chromatographic analyses are more accurate than handheld instruments. MSHA also believes that handheld detectors can be an adequate sampling method to determine the methane and oxygen concentration at a sample location. The definition of an inert atmosphere in the final rule includes a margin of safety to account for sampling less than the entire sealed area and time-related changes in the sealed atmosphere.

A number of commenters said that explosive atmospheres that periodically develop when the barometric pressure is rising or the seals are ingassing are not hazardous. The effects of ingassing depend on several factors including the duration and magnitude of the pressure differential across seals, leakage rates, and the typical methane concentration for the sealed area. Therefore, MSHA believes that hazards may exist when the seals are ingassing and the final rule is structured to address such hazards.

Commenters objected to the ETS requirement for a 14-day baseline sampling period or questioned its benefit. MSHA considered these comments, but the final rule retains a 14-day initial sampling requirement for seals less than 120 psi constructed after April 18, 2008. MSHA believes that monitoring of the sealed area during the initial 14-day period provides optimum safety for miners because of the unforeseen changes that can occur within the sealed area. For newly constructed seals, the final rule is structured so that mine operators can establish the appropriate number of sampling locations. Several commenters expressed concern with the alternative ventilation plan requirements for seals that only ingas or rarely outgas. MSHA has reexamined this issue and believes that monitoring and maintaining an inert atmosphere is protective only when the sealed area is inert at all times. The final rule requires mine operators to establish and maintain an inert atmosphere behind seals less than 120 psi.

Some other commenters stated that all sealed atmospheres must be monitored and maintained inert. Another commenter said monitoring is not the answer and that MSHA must require stronger seals. The final rule is structured so that the mine operator can address unique characteristics of sealed areas through either monitoring and maintaining an inert atmosphere or using seals designed to address the potential overpressures which may develop in the sealed area.

Another commenter stated that MSHA should require gas concentrations in the sealed area to be maintained sufficiently

outside the explosive range to prevent any excursions into the explosive zone during normal changes in barometric pressure. Finally, a commenter suggested that one way to reduce the possibility that a detonation may occur in the sealed area is to keep the methane air behind the seal far from the explosive range so that changes in pressure conditions due to foreseeable events are not possible. This commenter also stated that methane concentration greater than 50 percent could assure that the methane range in the sealed area will not fall within the 5 to 15 percent explosive range. In addition, this commenter stated that the ETS required more frequent monitoring for specified ranges of gases, but the provision does not provide a margin of safety that would prevent swings into the explosive range for foreseeable events such as weather, will not prevent detonations, and sampling, regardless of the technique, will not confirm an inert status of the sealed area.

The Agency's definition of an inert atmosphere incorporates a margin of safety which accounts for sampling less than the entire sealed area and time-related changes in the sealed atmosphere. MSHA believes that the increased sampling frequencies required by the final rule along with the definition of inert and the requirements for withdrawal of miners will provide appropriate and necessary protection of miners.

3. Section 75.336(c)

Final § 75.336(c) revises and clarifies ETS §§ 75.335(b)(4) and (b)(5) and addresses requirements for potentially explosive atmospheres in sealed areas with less than 120-psi seals. Final § 75.336(c) requires that when a sample is taken from the sealed atmosphere with seals of less than 120 psi and the sample indicates that the oxygen concentration is 10 percent or greater and methane is between 4.5 percent and 17 percent, the mine operator must immediately take an additional sample and then immediately notify MSHA. In addition, final § 75.336(c) requires that when the additional sample indicates that the oxygen concentration is 10 percent or greater and methane is between 4.5 percent and 17 percent, persons must be withdrawn from the affected area which is the entire mine or other affected area identified by the operator and approved by the District Manager in the ventilation plan, except those persons referred to in § 104(c) of the Act. Under this final rule, the operator may identify areas in the ventilation plan to be approved by the District Manager where persons may be exempted from withdrawal. The operator's request must address the following factors regarding the location of seals in relation to: (1) Areas where persons work and travel in the mine; (2) escapeways and potential for damage to the escapeways; and (3) ventilation systems and controls in areas where persons work or travel and where ventilation is used for escapeways. The District Manager, in making a determination concerning the area where persons may be exempted from withdrawal, would take these factors into consideration. The operator's request shall also address the gas concentration of other sampling locations in the sealed area and other required information.

Final § 75.336(c) clarifies when miners may reenter the mine and requires the mine operator to have an approved and revised ventilation plan specifying the actions to be taken by the mine operator to protect miners.

MSHA requested comments on the ETS action plan approach to potentially explosive sealed atmospheres and whether that approach provides adequate protection for miners. Several commenters stated that persons should not be withdrawn merely due to explosive samples in the sealed area and that other factors such as the size of the sealed area, roof and weather conditions, or the volume of non-inert atmosphere should be considered. Several commenters wanted MSHA to consider the possibility of defining safety zones around seals. Other commenters said that miners should unconditionally be evacuated from the mine when any sealed atmosphere is in the explosive range. Several commenters questioned whether an action plan could provide protection to miners which would be equivalent to withdrawal. One commenter suggested that rather than withdrawing miners, a ''safety zone,'' or a specific distance, should be established around seals with explosive atmospheres. A commenter stated that keeping miners underground with a sealed atmosphere within the explosive range is an unacceptable risk due to the enormous potential for a catastrophe if a seal fails.

Some action plans approved under the ETS require the withdrawal of miners from the entire mine. MSHA now believes that some large mines with multiple fans, multiple shafts, multiple portals, or multiple escapeways may not require evacuation of the entire mine to protect miners from the hazards presented by an explosion in a sealed area. Accordingly, this final rule allows an operator to identify areas in the ventilation plan to be approved by the District Manager where persons may be exempted from withdrawal. The operator's request must address the factors in this provision of the final rule. For example, in a large mine, the District Manager may approve an area where persons may be exempted from withdrawal if: (1) The area where persons work or travel is remote from the sealed area; (2) the area is on separate air splits that would not be contaminated from the gaseous products of an explosion; and (3) those areas are served by escapeways that would not be impacted by an explosion.

One commenter said that MSHA district offices do not have the resources to properly evaluate proposed action plans required by the ETS and the rule should provide specificity about the actions required to be taken by mine operators. Action plans are not required in the final rule. MSHA has replaced action plans with specific actions to be taken under certain circumstances.

Several commenters said that withdrawal should only be required when oxygen levels in the sealed area exceeded 12 percent because this is the minimum oxygen level that will sustain an explosion at normal atmospheric pressure. Another commenter said that introduction of oxygen caused the formation of an explosive atmosphere. Other commenters said that the explosive gas range is too broad. Another commenter said the Queensland Australia regulation specifies, for continuous monitoring, the maximum oxygen concentration should be 8 percent and the methane concentration should be less than 2.5 percent or greater than 22 percent. Several commenters said that withdrawal should only be required when the atmosphere in sealed area is in the explosive range of methane which they defined as 5 percent to 15 percent.

A commenter recommended using mapping software to generate isopach maps of methane concentration throughout the sealed area in order to determine potentially explosive zones. MSHA does not believe that isopach mapping software, based on arbitrary mathematical interpolations, will accurately represent the complex methane liberation, diffusion and convection processes in the sealed area in combination with leakage through or around seals to predict explosive zones with any degree of reliability.

In the ETS, MSHA referenced the 2007 NIOSH Draft Report which stated that the explosive range is 5 to 15 percent when the oxygen level is 12 percent or more. NIOSH, in its Final Report, stated that methane is explosive in air when the concentration ranges

from 5 percent to 16 percent by volume. The NIOSH Final Report stated: ''A desirable sealed area atmosphere, from a safety perspective is fuel-rich and oxygen-low, which is * * * less than 10% oxygen.'' The final rule continues to account for the inaccuracies of sampling and monitoring equipment, and for potential contamination of the gas sample. The final rule retains the methane range of 4.5 percent to 17.0 percent with oxygen 10 percent or greater for withdrawal of miners as specified in the ETS. This range of methane concentration is slightly broader than the explosive range specified by NIOSH (2007 NIOSH Draft Report and ''Handbook for Methane Control in Mining,'' Information Circular 9486, 2006 (2006 NIOSH IC 9486), and ''Flammability of Methane, Propane, and Hydrogen Gases,'' Cashdollar (2000). The slightly broader range of methane includes a safety measure to help assure the mine operator has time to safely evacuate the mine. MSHA has considered these comments and continues to accept the methane in air mixtures provided by NIOSH as the most appropriate basis for the final rule. The levels in the final rule are the same as those provided in the ETS.

The ETS allowed mine operators to take three samples at one hour intervals before requiring evacuation of the mine. Several commenters objected to this provision. A commenter suggested that three consecutive samples be taken at 24 hour intervals to allow the sealed area to react to changes in the barometer. MSHA believes that it is neither appropriate nor protective of miners' safety to allow them to remain underground two additional hours before a mine operator confirms a hazardous sealed atmosphere. The final rule requires that a second sample be taken immediately and that MSHA be immediately notified regardless of the results of the second sample.

4. Section 75.336(d)

For sealed areas with a demonstrated history of carbon dioxide or where inert gas has been injected, final § 75.336(d) allows the mine operator to use an alternative method to determine if a particular atmosphere is inert as defined in § 75.336(b)(1). This provision also allows the mine operator to use an alternative method to determine when to withdraw miners as provided in § 75.336(c). The mine operator shall address the specific levels of methane, carbon dioxide, nitrogen and oxygen in the ventilation plan; the sampling methods and equipment used; and the methods to evaluate these concentrations underground at the seals.

Some commenters requested MSHA to consider carbon dioxide concentrations when making a determination for inert and explosive atmospheres, because it is slightly more effective at preventing an explosion than nitrogen in normal air. A commenter stated that it is unrealistic to ignore the effects of carbon dioxide on methane explosibility and that MSHA must let mine operators use both the Coward flammability triangle and Zabetakis nose curve to assess whether a sealed atmosphere is explosive. Commenters also requested that MSHA consider excess nitrogen concentrations when determining the sealed atmosphere.

A methane explosion requires the presence of sufficient amounts of methane and oxygen. The presence of carbon dioxide and excess nitrogen affects the concentrations of oxygen and methane needed for an explosion to occur. The two most common gases used for purposes of maintaining a sealed area inert are nitrogen and carbon dioxide. Both gases may be obtained as cryogenic liquids transported to the mine site on tanker trucks. Nitrogen may also be extracted from compressed air using filter technology and carbon dioxide may be produced as the exhaust gas from combustion processes (Tomlinson boiler, diesel engine or jet engine). Both the ETS and final rule implicitly consider nitrogen as an inert gas. Fresh air contains 78% nitrogen and nitrogen is typically the most prevalent gas in sealed atmospheres. If additional nitrogen is injected in a sealed atmosphere, it helps move the gas mixture toward an inert status merely by diluting and rendering harmless the methane and oxygen levels. Carbon dioxide is slightly more effective at producing an inert atmosphere than nitrogen.

This final rule allows mine operators to use carbon dioxide and nitrogen levels to determine how to manage the sealed atmosphere. If the mine operator chooses an alternative method to determine if the sealed atmosphere is inert, the operator must specify the types of instruments that will be used to measure the gas levels and how these more complicated evaluations will be performed at the seal. Because of the critical nature of these measurements and determinations, the use of gas chromatographs and computers located on the surface is not practical except where continuous monitoring systems are used. This surface analytical equipment cannot be used since this final rule requires that a second sample be taken and analyzed immediately after any near explosive gas concentrations are identified.

Although the Zabetakis nose curve or the Coward flammability triangle is designed to show whether a methane mixture is explosive after inert gas is added, the nose curve or flammability triangle is not intended for the purpose of establishing an inert atmosphere under this final rule or the explosibility range contained in the final rule.

The concentration of gases for methane in the nose curve and flammability triangle ranges from approximately 5% to 15%. The nose curve and flammability triangle were not designed to account for the methane ranges specified in the final rule of 4.5% to 17% where a safety factor is used. In addition, the use of the R-Ratio, or ratio of methane to total combustibles, to compensate for the safety factor is not appropriate. The alternative gas concentrations of methane, carbon dioxide, nitrogen and oxygen must be based on sound scientific principles. For example, operators may consider the Bureau of Mines Bulletin 503 (Coward, H.F. and G.W. Jones, ''Limits of Flammability of Gases and Vapors,'' Bulletin 503, U.S. Dept. of the Interior, Bureau of Mines, 1952). The alternative gas concentrations must provide the same levels of protection to the miners as the gas concentrations specified in § 75.336(b) and (c) of this final rule.

MSHA intends that samples of gas concentrations be analyzed promptly. At present, handheld detectors are available to measure carbon dioxide, methane and oxygen. The operator shall address several related issues in the ventilation plan including handheld equipment and methods to take these measurements underground and methods to make the calculations necessary to evaluate the gas concentrations at the seal. The operator should also include methods to ensure the reliability of the sampling equipment, the training of the certified persons who must take these samples and perform these calculations, a system to validate these determinations and the expanded recordkeeping requirements (additional gas concentrations).

5. Section 75.336(e)

Final § 75.336(e), like ETS § 75.335(b)(6) and (b)(7), requires that the mine operator promptly record sampling results and that these records be maintained at the mine for at least one year. MSHA received no comments on this provision.

C. Section 75.337 Construction and repair of seals

Final § 75.337 is derived from the ETS requirements on construction and repair of seals.

1. Section 75.337(a)

Final § 75.337(a) clarifies the ETS and requires mine operators to maintain and repair seals to protect miners from hazards of sealed areas. MSHA is including this provision in this final rule in response to comments concerning seal repairs. This final rule addresses non-structural repairs only. Non-structural repairs are those that are related to general maintenance and include: excessive air leakage through and around seals; repair of minor cracks; spalling of seal coating; water drainage systems; and sampling pipes. One commenter expressed concern that seals may become inaccessible, deteriorate, weaken, and be impossible to repair. This section does not apply to seals that require structural repairs. MSHA will continue to require that seals in need of structural repairs be replaced since they would no longer serve their necessary function. Seals, with the exception of seals used to separate the active longwall panel from the panel previously mined that are inby the longwall face, must be maintained accessible or be replaced.

2. Section 75.337(b)

Final § 75.337(b) renumbers § 75.337(a) of the ETS, and specifies requirements that a mine operator must follow prior to sealing.

Under final § 75.337(b)(1), mine operators must remove insulated cables from the area to be sealed. Final § 75.337(b)(1) clarifies the ETS and requires that mine operators remove batteries and other potential electric ignition sources from the area to be sealed. Because an electric arc can occur if a length of insulated cable were inductively coupled to an electromagnetic pulse such as a lightning strike, this final rule reduces the hazard of an explosion caused by an electric discharge.

Several commenters stated that the removal of insulated cables is unnecessary, infeasible, unrealistic and can be unsafe. One commenter suggested that grounding the ends of a cable may safeguard cables that cannot be removed. Other commenters stated that as mine operators complete mining activities in an area, they recover the more useful cables and may only leave behind damaged or deteriorated cables. Another commenter stated that there can be miles of cables to pumps or electric installations that must continue to run to within days or hours of final sealing, and that it would be impossible to remove these cables prior to sealing. One commenter suggested that cable removal would be unnecessary if seals are constructed to withstand explosive forces. One commenter suggested that the final rule include a provision for removing batteries from the area to be sealed.

To reduce the hazard of an explosion from an electric discharge, and to assure miners' safety, MSHA believes that it is necessary to remove cables, batteries, and other potential ignition sources prior to sealing unless it is not safe to do so. Other potential ignition sources include motors, transformers and electromagnetic devices. Potential electric ignition sources that may expose miners to dangerous conditions, such as those that are buried under a roof fall, would not have to be removed.

Based on MSHA's knowledge and experience, if one end of an insulated cable is grounded and one is not, a potential ignition source remains. Also, a potential ignition source remains even if both ends of a cable are grounded because the condition of the conductors within the cable would not be known. Based on MSHA testing, cable cannot generally be considered safe by grounding either one or both ends.

The final rule includes a clarifying change that if ignition sources cannot be safely removed from the area to be sealed, seals must be constructed to at least 120 psi. NIOSH indicated in their 2007 NIOSH Final Seal Report that a 50 psi peak overpressure could occur in a limited-volume, unconfined situation. Leaving a potential ignition source, such as a cable, in the sealed area could increase the probability that larger pockets of gas, which may be undetected through sampling, could be ignited, resulting in an explosion. An explosion in a larger area could result in overpressures greater than 50 psi. Therefore, the final rule provides appropriate protection for miners if ignition sources cannot be safely removed from the area to be sealed. The installation of at least 120 psi seals would provide protection for miners and prevent the explosion in the sealed area from propagating to the active workings of the mine.

Final § 75.337(b)(2), like the ETS, requires removal of metallic objects that pass through or across seals. Screens, straps, rails, and channels are examples of the types of metallic objects that are required to be removed under this final rule. In addition, this final rule does not include the exception in the ETS for metal sampling pipes, water drainage pipes, and form ties. Removal of metallic objects before seals are built reduces the hazard of methane explosions and improves miner safety.

Several commenters suggested that metal sampling pipes, water drainage pipes, and form ties need not be removed because nonmetallic materials can be used as alternatives. MSHA agrees. Alternative nonmetallic materials exist and can be used for gas sampling pipes, water drainage systems, and form ties. The use of these alternative materials will reduce methane explosion hazards and enhance miner safety.

Several commenters stated that removal of metallic roof support is hazardous. One commenter noted that an accident occurred during removal of wire mesh at a seal location. Based on MSHA's experience, removal of metallic roof support can be accomplished safely so long as appropriate precautions are taken. Under the final rule, the best option would be for an operator to plan the location of the seals and the roof supports, such as cribs and non-metallic mesh, to be used in the area to be sealed.

One commenter requested clarification of the hazards associated with metallic roof mesh or mats that are grounded. Based on MSHA's experience, metallic roof mesh or mats are not always adequately grounded. In addition, metallic roof mesh or mats are potential conductive paths into the sealed area and need to be removed.

One commenter stated that MSHA should not require removal of de-gassing, inerting, or pre-sealing ventilation pipes that may be needed to effectively control the gob atmosphere. Based on MSHA's experience, these metallic objects can provide a conduit for electric current to enter the sealed area and ignite methane/air mixtures. Removal of these objects before seals are built reduces the hazard of methane explosions and improves miner safety. Therefore, in response to its request for comments in the ETS on information concerning the removal of metallic objects, the final rule requires removal of metallic objects through or across seals.

Final § 75.337(b)(3) is new. It requires mine operators to breach or remove all stoppings in the first crosscut inby the seals immediately prior to sealing the area. This procedure is a recognized common practice in the coal mining industry.

One commenter stated that monitoring could easily provide a false sense of security. Another commenter said that sampling behind one seal in a set would not be able to detect a pocket

of explosive gas that may exist. In response to commenters'' concerns, the final rule includes the requirement to remove or breach the stopping in the first connecting crosscuts inby seal locations. Under MSHA's experience, breaching or removing stoppings allows the same atmosphere to exist immediately inby each seal as exists throughout the sealed area. Ventilation stoppings in the first connecting crosscut inby the seal locations are used to maintain ventilation, through the area to be sealed, during seal construction. These stoppings should not be breached or removed until immediately prior to installing the final seal. The timing of the breaching or removing of stoppings is critical and should be addressed in the mine ventilation plan under § 75.335(c)(3)(iv)(N).

3. Section 75.337(c)

Final § 75.337(c), renumbers ETS § 75.337(b), and requires a certified person designated by the mine operator to directly supervise seal construction and repair. Existing § 75.100 defines a certified person as one certified by the Secretary of Labor or the State in which the coal mine is located. Following explosions at the Sago and Darby mines in 2006, MSHA inspected seals in underground coal mines across the country and concluded that some seals were not correctly built. The supervision requirement will help assure that seal construction and repair are performed correctly.

Under final § 75.337(c)(1), the certified person must examine each seal site immediately prior to construction or repair to assure that the site is in accordance with the approved ventilation plan. Under final § 75.337(c)(2), the certified person must examine each seal under construction or repair during each shift to assure that the seal is being constructed or repaired in accordance with the approved ventilation plan. Under final § 75.337(c)(3), the certified person must examine each seal upon completion of construction or repair to assure that construction or repair is in accordance with the approved ventilation plan.

Some commenters objected to these provisions stating that it was unnecessary and burdensome for the certified person to supervise the entire construction process. They stated that trained qualified persons should be permitted to repair or construct seals in accordance with the approved plan and that the certified person can then conduct an examination to assure the plan was followed. Other commenters, however, supported a requirement for a certified person to be on site during each step of seal construction.

MSHA believes that a certified person needs to be in the vicinity of the seal site to address problems and questions during seal construction or repair. Under the final rule, MSHA does not intend that a certified person continuously observe construction or repair of all seals in a set. The certified person should be available at each seal site during the shift to assure proper construction or repair.

Some commenters expressed concern regarding potential conflicts created by requiring that certain tasks be performed, under the ETS, by both professional engineers and certified persons. Based on MSHA's experience under the ETS, the Agency has not encountered any potential conflicts and does not believe any are likely to arise. The role of the professional engineer to have oversight of seal installation is more fully discussed in § 75.335(c).

Final § 75.337(c)(4), like the ETS, requires that the certified person certify by initials, date, and time that the examinations were made. MSHA did not receive any comments on this provision.

Final § 75.337(c)(5), like the ETS, requires that the certified person make a record of the examination at the completion of any shift during which an examination was conducted, and include each deficiency and the corrective action taken. The record must be countersigned by the mine foreman or equivalent mine official by the end of the mine foreman's or equivalent mine official's next regularly scheduled working shift, and the record must be kept at the mine for one year. This recordkeeping requirement allows MSHA and other persons to determine that examinations have been conducted, that results are valid, and that deficiencies in site preparation, construction and repairs were found and corrected. In addition, the record must identify seal completion dates.

One commenter stated that countersigning simply identifies the person to blame in the event of an accident or seal failure. Another commenter stated that countersigning was unnecessary. Historically, the countersigning requirement has been an integral part of MSHA's enforcement of coal mining standards. It is consistent with other recordkeeping requirements in 30 CFR part 75; such as §§ 75.360 (pre-shift examination) and 75.361 (supplemental examination), 75.362 (on-shift examination), 75.363 (hazardous conditions), and 75.364 (weekly examination). The countersignature must be made by the end of the mine foreman's or equivalent mine official's next regularly scheduled working shift. If the mine foreman or equivalent mine official is absent, the person acting in that position would review and countersign the record. Based on MSHA's experience under the ETS, this provision assures that a mine foreman or equivalent mine official is responsible for seal installation.

4. Section 75.337(d)

Final § 75.337(d) renumbers § 75.337(c) of the ETS, and requires that upon completion of construction of each seal, a senior mine management official, such as a mine manager or superintendent, certify that the construction, installation, and materials used were in accordance with the approved mine ventilation plan. It also requires the mine operator to retain the certification for as long as the seal is needed to serve the purpose for which it was built.

Some commenters stated that this certification was unnecessarily duplicative of the certification required by the certified person during construction and repair and the certification required by the professional engineer during the plan approval process. Some commenters stated that the certification requirement by a senior mine official is unreasonable and redundant because the official may not have expertise to make certification; the official may not have knowledge unless present during construction; a professional engineer is required to have ''oversight''; the certified person directly supervises construction and makes a record of the exam; and the mine foreman countersigns the certified person's record. Other commenters suggested modification of the ETS requirement to either allow a senior mine official to rely on reports from the professional engineer and certified person, or to allow a senior mine management official to countersign the official seal record book.

Based on MSHA's experience regarding methane explosions in sealed areas and MSHA's experience regarding the same certification requirements under the ETS, the Agency believes that some amount of redundancy is necessary in the review of these critical seal construction tasks; this provides an added margin of safety for miners. Certifications by certified persons, and senior mine management officials protect miners by helping assure that the seal is correctly designed and constructed.

5. Section 75.337(e)

Final § 75.337(e) renumbers § 75.337(d) of the ETS, and remains essentially unchanged. Final § 75.337(e)(1) requires the mine operator to notify the District Manager between two and fourteen days prior to commencement of seal construction. This final rule revises the ETS requirement to notify the MSHA local field office.

One commenter supported the notification requirement stating that it is necessary so that MSHA can oversee seal construction. This commenter recommended that an MSHA inspector be present at least part of the time during seal construction.

One commenter opposed the notification requirement. This commenter stated that it is inefficient to require contacting MSHA since an MSHA inspector is at the mine over 150 days during the year. In the final rule, MSHA has retained the notification requirement because the Agency believes that it is necessary and it is also responsive to comments.

This requirement gives MSHA the opportunity to observe seal construction and to help assure that the construction, installation and materials were in accordance with the ventilation plan approved by MSHA. The requirement to notify the District Manager establishes consistency with other MSHA notification requirements. Like other notification provisions, the District Manager either contacts the appropriate field office or inspectors from the District Office may make the inspection.

Final § 75.337(e)(2), like the ETS, requires the mine operator to notify the MSHA District Manager, in writing, within five days of completion of each set of seals and provide a copy of the certification required in § 75.337(d) of this section. The purpose of this provision is to give the District Manager notice of completed seal construction. The period immediately following construction of the seal is the time during which seals are achieving full strength and the atmosphere inby the seals may be transitioning into or through a potentially explosive methane/air mixture. During this critical time period, the District Manager may decide to inspect the seals or sample the sealed area.

Final § 75.337(e)(3), like the ETS, requires the mine operator to submit a copy of quality control test results for seal material properties specified in § 75.335 to the District Manager. To clarify the performance required, the final rule includes a requirement that the test results be submitted within 30 days of completion of the tests. The final rule, like the ETS, requires that test results include all tests of seal construction materials. Some commenters expressed concern over a specified time requirement for the submission of quality control tests results because some results are often not available for weeks after the tests are completed. Sampling must be continued on a 24-hour basis for all seals until MSHA receives the test results and determines that they are adequate. Based on MSHA's experience under the ETS, MSHA believes that a 30-day period will provide sufficient time to obtain results and assures that test results are submitted promptly. MSHA has not experienced any problems with this timeframe under the ETS.

6. Section 75.337(f)

Final § 75.337(f) renumbers § 75.335(c) of the ETS, and like the ETS, prohibits welding, cutting, and soldering with an arc or flame within 150 feet of a seal. This final rule revises the ETS by allowing this work within 150 feet of a seal unless it is not safe to do so. The operator may request that the District Manager approve a different location in the ventilation plan. The purpose of this provision is to protect miners from the hazards of open flames near seals. A methane enriched atmosphere can leak through the seal, accumulate out by the seal, and if ignited, the flame can propagate into the sealed area causing an explosion.

The 150-foot limit in the final rule is consistent with an existing MSHA requirement in § 75.1002(a) that non-permissible equipment be excluded within 150 feet of pillar workings or longwall faces. To measure the 150 feet, MSHA recommends that mine operators use the longstanding industry practice of following the shortest distance that air can travel (tight string distance) through crosscuts, entries or other openings (MSHA Program Policy Manual, Volume V, Subpart J (February 2003)).

In response to MSHA's request for comments, some commenters supported and others opposed the provision. Commenters who supported the provision stated that the protection was necessary to prevent another explosion like the one that occurred at the Darby Mine. Commenters who opposed the provision stated that it was too restrictive and unenforceable under current mining conditions. Some of these commenters stated that the provision could significantly interrupt mining operations where the next entry from the seal contains a pre-existing belt, belt-drive, shop area, travelway, or track. In addition, some commenters requested that MSHA consider that some belt drives in underground coal mines have separate splits of large quantities of air, and that compliance flexibility should be included in the final rule to accommodate different mining conditions.

In response to comments and based on MSHA's experience under the ETS, MSHA has revised the ETS. An operator may request that the District Manager approve in the ventilation plan welding, cutting, and soldering with an arc or flame within 150 feet of a seal. The operator's request must address methods the mine operator will use to continuously monitor atmospheric conditions in the sealed area during welding or burning; the airflow conditions in and around the work area; the rock dust and water application methods; the availability of fire extinguishers on hand; the procedures to maintain safe conditions, and other relevant factors. MSHA believes that welding, cutting and soldering with an arc or flame near a sealed area may be allowed depending upon mining conditions at the mine, and that determination should be made by the District Manager on a case-by-case basis.

7. Section 75.337(g)

Final § 75.337(g) renumbers and revises § 75.335(d) of the ETS. Final § 75.337(g)(1) requires one non-metallic sampling pipe in each seal that extends into the center of the first connecting crosscut inby the seal. The final rule requires that if an open crosscut does not exist, the sampling pipe shall extend into the center of the length of the open entry inby the seal. The requirement that only non-metallic materials be used for sampling pipes is consistent with other provisions of this final rule that require the removal of metallic objects through or across seals.

MSHA received many comments regarding the ETS requirements on the locations and number of sampling pipes. Many commenters questioned the requirement of two sampling pipes in each seal. They stated that it is doubtful that two sampling pipes in each seal will provide much additional information and they could result in conflicting and confusing information. In addition, several commenters disagreed with the need for a sampling pipe in each seal. Some commenters questioned whether a representative sample could be obtained by using a sampling pipe through a seal. Several commenters suggested putting a sampling pipe at the high and low points of the seals. One commenter stated that the location and number of

sampling pipes should be based on the mining conditions.

MSHA reviewed sampling data collected under the ETS 14-day baseline requirement and other sampling data, including that associated with the Agency's citations and withdrawal orders. Based on this review, MSHA believes that one sampling pipe provides adequate information and that two sampling pipes in each seal are not necessary and could result in conflicting and confusing information. In addition, the Agency's evaluation of its sampling data from the 15-foot pipe found significant variation of methane concentrations at different seals in the set and between sets of seals for the same sealed area. MSHA attributes this to different ventilation pressures at the various seals and differences in leakage characteristics through the ribs and strata surrounding the seals (cracks, joints, etc), depending on the location of the seals. MSHA believes that sampling points with a longer pipe located within the first connecting crosscut will provide a more representative sample of the sealed area because this atmosphere is less likely to be affected by ingassing. In addition, this sampling location is less susceptible to swings in oxygen levels associated with changes in barometric pressure. Based on comments, data, and Agency experience, MSHA has revised the ETS to remove the requirement that a sampling pipe extend 15 feet into the sealed area.

One commenter stated that gob isolation seals are installed in crosscuts immediately behind the longwall face and, therefore, it would be impossible to meet the requirements to extend one tube into the center of the first connecting crosscut inby the seal as that intersection will no longer exist once the longwall mines pass the crosscut where the seal is to be installed. In addition, this commenter stated that installing sampling pipes near the intersection is not practical as crosscut conditions often quickly deteriorate on the gob side of the seal. Under circumstances where gob isolation seals will have no connecting crosscut inby the seal, or under similar circumstances, the sampling pipe must be extended to the center of the expected open space to obtain a sample that is representative of the gas in the sealed area. In addition, under circumstances where crosscut conditions may deteriorate, sampling pipes should be located so that they are subjected to the least amount of deterioration. Even if some pipes deteriorate, it is unlikely that all pipes will deteriorate at every sampling location. In addition, under this final rule, the District Manager may require additional sampling locations in the ventilation plan under § 75.336.

Final § 75.337(g)(2) retains the ETS requirement that each sampling pipe be equipped with a shut-off valve and appropriate fittings for taking gas samples. MSHA received no comments on this provision.

Final § 75.337(g)(3) is new. It requires the sampling pipes to be labeled to indicate the location of the sampling points when more than one sampling pipe is required under § 75.337(g)(4).

Final § 75.337(g)(4) is derived from and is consistent with existing MSHA enforcement policy under the ETS. If a new seal is constructed to replace or reinforce an existing seal with a sampling pipe, final § 75.337(g)(4) requires the sampling pipe in the existing seal to be extended through the new seal. It also requires that an additional sampling pipe be installed through each new seal to sample the area between seals, as specified in the approved ventilation plan. Final § 75.337(g)(4) is consistent with existing MSHA policy that addresses requirements for placement of the sampling pipe when a new seal is constructed outby an existing seal to replace or reinforce an existing seal.

Final § 75.337(g)(4) was added to clarify requirements gained as a result of MSHA's experience under the ETS concerning construction of new seals immediately outby existing seals that had been either damaged, or had had significant structural defects. In addition, some operators of mines with potentially explosive atmospheres decided to construct new 120-psi seals outby existing seals under the ETS. Under these circumstances, MSHA found that if a new seal is constructed as an extension or reinforcement of an existing seal, there may be no additional sealed area to sample. In addition, most existing seals have only one sampling pipe per set of seals and some sets of seals that predate MSHA's 1992 ventilation standards may have no sampling pipes.

If the new seals are close to the existing seals, an explosion in the area inby the old seals could damage the new seals. By maintaining the area inert between the new seals and the old seals, the possibility of an explosion between the seals effectively is eliminated. MSHA considered requiring the mine operator to drill holes through existing seals to install sampling pipes. MSHA rejected this approach due to the possibility of sparking or frictional ignition associated with drilling.

The final rule requires that sampling pipes in existing seals be extended through the new seals to permit the sampling of the atmosphere inby the existing seals. If there is a space between the new seals and the existing seals, this area will need to be sampled and maintained inert and will require a sample pipe through each new seal. If the space between the seals does not include a connecting crosscut, the new sampling pipe must be extended to the center of the open space.

8. Section 75.337(h)

Final § 75.337(h) renumbers and revises § 75.335(e) of the ETS. It requires that for each set of seals, the seal at the lowest elevation shall have a corrosion resistant, non-metallic water drainage system. In addition, seals must not impound water or slurry, and water or slurry cannot be allowed to accumulate within the sealed area to any depth that can adversely affect a seal.

This final rule revises the ETS requirement by allowing only non-metallic materials to be used for a drainage system. This requirement is consistent with other provisions of this final rule regarding the removal of metallic objects through or across seals. MSHA experience shows that alternatives to metallic materials are readily available for use in drainage systems.

In response to MSHA's request, several commenters stated that the ETS requirement that a seal not impound water is vague, that it is impossible to guarantee that there will be no water at a seal, and that there will always be some minimal amount of standing water in some mines. Seals should not be designed to impound water other than to a minimal depth, such as the height of the water trap. Based on MSHA's experience, drainage systems can be designed to prevent the accumulation and impoundment of mine water inby the seals. The actual size and number of pipes used in a drainage system should be based on the anticipated maximum flow rate at the seal location. In addition to being corrosion resistant and made of non-metallic material, drainage pipes must have strength properties consistent with the design strength of the seal, and the drainage system must have blast resistance equivalent to that of the seal. If the seal design does not allow any impoundment of water, the drainage system design could incorporate a water diversion or pumping system. For example, a low weir or catchment could be constructed across the entry inby the seal to trap sediment and debris that may impede drainage and prevent water from adversely affecting the seal. These provisions addressing water drainage systems and impoundment of water or

slurry accommodate varied mining conditions and assure safe and effective workplaces for miners.

D. Section 75.338 Training

Final § 75.338 addresses training for sampling and seal construction. This final rule consolidates the training requirements of ETS §§ 75.335(b)(2) and 75.337(e) into this new section. The final rule changes the retention period for training certifications from one year to two years from the date of training. This change is made to be consistent with existing MSHA training standards at part 48. It provides that mine operators maintain training records under the final rule for the same period as existing training records. Consistent with the burden cost in MSHA's information collection package for part 48, under OMB Control Number 1219–0009, the Agency determined that increasing the retention period from one year to two would not affect operator costs.

1. Section 75.338(a)

Final § 75.338(a), like the ETS, requires that certified persons conducting sampling be trained in the use of appropriate sampling equipment, procedures, location of sampling points, frequency of sampling, size and condition of the sealed area, and the use of continuous monitoring systems, if applicable, before they conduct sampling, and annually thereafter. The final rule also requires the mine operator to certify the date of training and retain each certification for two years, instead of one year under the ETS. This provision is similar to other certification requirements in 30 CFR part 75.

2. Section 75.338(b)

Final § 75.338(b), like the ETS, requires the mine operator to provide training to miners constructing or repairing seals, designated certified persons, and designated senior mine management officials. This training must be conducted prior to constructing or repairing a seal and annually thereafter. The final rule also requires the mine operator to certify the date of training provided each miner, certified person, and senior mine management official, and retain each certification for two years.

One commenter stated that the record showing certification of training for miners doing the construction of seals is required to be kept for only one year. If there is a seal failure outside of that time period, those records are no longer available during the investigation process. The commenter recommended that the certification be kept for as long as the seal is satisfying the purpose for which it was built.

This final rule revises the ETS by requiring operators to retain training certifications for two years from the date of training. This change is consistent with existing § 48.9 (records of training) which requires training certificates be kept at the mine site for two years. Training certifications need not be kept longer than two years because the final rule requires annual training for miners constructing or repairing seals. Annual training assures that miners are capable of repairing seals when necessary and therefore, the training certification would be up-to-date.

Several commenters requested clarification as to whether the training provisions are included in part 48 training. Training required by the final rule should not be included in part 48 training, although the mine operator may choose to conduct the training at the same time. However, even though the ventilation plan review is required as part of the eight-hour annual refresher training, additional time must be allotted since the training is required by this section, not part 48.

The final rule does not require a minimum amount of time for training. MSHA expects mine operators to determine the time necessary for this training based on the complexity of the seal design in the ventilation plan, construction or repair procedures, materials used, and knowledge and skill levels of persons receiving training. In addition, changes in the approved seal design or approved ventilation plan will necessitate that persons be retrained.

E. Section 75.339 Seals records

Final § 75.339, like ETS § 75.338, addresses seals records.

1. Section 75.339(a)

Final § 75.339(a) lists the records a mine operator is required to maintain and the retention time for those records.

2. Section 75.339(b)

Final § 75.339(b), like the ETS, requires that records be retained at a surface location at the mine in a secure book that is not susceptible to alteration. The final rule allows records to be retained electronically in a computer system that is secure and not susceptible to alteration, if the mine operator can immediately access the record from the mine site.

One commenter stated that after seal construction is completed and quality control test results have been provided to MSHA, the operator should be permitted to retain seal construction certification records at a central location. Because electronic storage of records is a practical and reliable method of records storage, the final rule allows records to be stored electronically, provided that the records are secure and not susceptible to alteration.

3. Section 75.339(c)

Final § 75.339(c) of the final rule remains unchanged from the ETS. It requires that, upon request from an authorized representative of the Secretary of Labor or Secretary of Health and Human Services, or from the authorized representative of miners, mine operators must promptly provide access to any record listed in the table in this section.

4. Section 75.339(d)

Final § 75.339(d), like the ETS, requires that whenever an operator ceases to do business, that operator must transfer all records required to be maintained by this part, or a copy thereof, to any successor operator who must maintain them for the required period. In addition, in response to comments, this final rule revises the ETS to require an operator who transfers control of the mine to another entity to transfer all records to that successor entity. Having access to records will allow MSHA and the new mine operator to determine if seals were designed, constructed, and repaired as approved and maintained to assure their reliability.

F. Section 75.371 Conforming Changes to Other Sections of Part 75

Final § 75.371(ff) requires the mine operator to provide in the ventilation plan the information provided in the sampling requirements in § 75.336 and the seal installation requirements in § 75.335. The sampling requirements in ETS § 75.335(b) are revised and moved to final § 75.336. The installation requirements provided by ETS § 75.336(b)(3) are revised and moved to final § 75.335. Therefore, this provision is revised to conform to the new section numbers.

IV. Executive Order 12866

Executive Order (E.O.) 12866, as amended by E.O.13258 (Amending Executive Order 12866 on Regulatory Planning and Review), requires that regulatory agencies assess both the costs and benefits of regulations. To comply with E.O.12866, MSHA has prepared a Regulatory Economic Analysis (REA) for the final rule. The REA contains supporting data and explanation for the summary materials presented in this

preamble, including the covered mining industry, costs and benefits, feasibility, small business impacts, and paperwork. The REA is located on MSHA's Web site at *http://www.msha.gov/REGSINFO.HTM.* A copy of the REA can be obtained from MSHA's Office of Standards, Regulations, and Variances at the address in the **ADDRESSES** section of this preamble.

Executive Order 12866 requires that regulatory agencies assess both the costs and benefits of significant regulatory actions. Under the Executive Order, a ''significant regulatory action'' is one meeting any of a number of specified conditions, including the following: Having an annual effect on the economy of $100 million or more, creating a serious inconsistency or interfering with an action of another, materially altering the budgetary impact of entitlements or the rights of entitlement recipients, or raising novel legal or policy issues. Based on the REA, MSHA has determined that the final rule does not have an annual effect of $100 million or more on the economy. Therefore, it is not an economically ''significant regulatory action'' under section 3(f) of E.O. 12866. MSHA, however, has determined that the final rule is a ''significant action'' under Executive Order 12866 because it raises novel legal or policy issues.

A. Mine Sector Affected

The final rule applies to all underground coal mines in the United States. Based on MSHA data as of February 5, 2008, there were 624 underground coal mines, employing 42,207 miners, operating in the U.S. in 2007. Based on an MSHA survey conducted in November 2006, 372 underground coal mines have seals. In 2007, these mines employed 32,412 miners, of which 28,009 worked underground.

B. Benefits

To provide a quantitative estimate of the benefits of this final rule, MSHA analyzed the explosions in sealed areas that have taken place since 1993 including the two accidents in 2006 where the seals failed and fatalities occurred. At the Sago Mine, 12 miners died, and at the Darby Mine, 5 miners died. If this final rule had been in effect, these lives might not have been lost.

For purposes of estimating benefits for this final rule, MSHA attributes the potential saving of the 5 miners' lives from the Darby Mine accident to this final rule. MSHA also attributes the potential saving of half of the miners' lives from the Sago Mine accident. (MSHA attributes the remaining miners' lives from the Sago Mine accident to MSHA's 2006 emergency mine evacuation rule.) The total potential saving is 11 lives attributed to this final rule.

One commenter stated that under the ETS, MSHA should not have included as a benefit potential lives saved from the Sago and Darby Mine accidents. This commenter stated that the design of the seals used at both the Sago and Darby Mines was not established as the cause of the deaths, that MSHA's accident reports focus on construction deficiencies of seals at both mines, and that the Darby Mine explosion resulted from miners attempting to cut a metal strap on the inby and outby side of a previously constructed seal. Based on MSHA's experience under the ETS, MSHA believes that the lives lost at the Sago and Darby Mine accidents might have been saved had this final rule been in effect. This final rule, like the ETS, addresses the design, construction, and maintenance of seals, and training of persons involved in seal construction and repair. The final rule requires insulated cables be removed from the area to be sealed, unless it is not safe to do so. In addition, this final rule does not permit welding, cutting, and soldering with an arc or flame within 150 feet of a seal unless such work is approved by the District Manager in the ventilation plan.

MSHA has data on explosions that occurred in sealed areas. From 1993 through 2006, there were 13 explosions in sealed areas. Of the 13 explosions, 11 caused seal damage and had the potential to cause fatalities or injuries, and two caused fatalities or injuries. If the explosions followed approximately the same distribution as they did since 1993, MSHA estimates that this final rule would save approximately one life per year.

Based on the Agency's knowledge and experience, MSHA determined that the risk from explosions in sealed areas was increasing from 1993 through 2006 because the number of seals being installed was increasing during that period. After adjusting this estimate to account for the increased risk during the period, this final rule will save approximately 2 lives per year. The estimate that the final rule will save approximately 2 lives per year is based on an increased risk of an explosion during 1993–2006 because the number of seals in mines increased and the number of mines with seals increased. This is MSHA's best estimate of the number of lives saved per year due to the final rule.

MSHA also developed a higher risk estimate based on the distribution of miners at risk and the characteristics of the explosions. If an explosion with the characteristics of the explosions at Sago or Darby Mines were to occur at a large mine, many lives potentially could be lost. Assuming that the risk of fatality from an explosion in a sealed area does not vary with the size of the mine, and that the number of potential fatalities is proportional to the number of miners working underground, MSHA estimates that approximately 6 lives will be saved per year under this final rule.

MSHA also calculated the cumulative risk over a 45-year working life of a miner. If, under MSHA's best estimate, this final rule saves approximately 2 lives per year, the risk of fatality from an explosion in a sealed area is approximately 3 per 1,000 miners over a 45-year working lifetime. If the final rule saves 6 lives per year under MSHA's higher estimate, the reduction in the lifetime risk of a fatality from an explosion in a sealed area is approximately 9 per 1,000 miners over a 45-year working lifetime.

Under this final rule, an explosion is less likely to occur where the atmosphere behind seals is monitored and maintained inert. This final rule also requires stronger seals to better withstand explosions. The stronger seals will reduce miner injuries and fatalities should an explosion occur.

C. Compliance Costs

MSHA estimates that the final rule will result in total yearly costs for underground coal mine operators of approximately $45.4 million. Total first year costs are estimated to be approximately $46.4 million. Disaggregated by mine size for mines that use seals, yearly costs are $2.8 million for the 83 mine operators with fewer than 20 employees; $37.8 million for the 279 mine operators with 20–500 employees; and $4.8 million for the 10 mine operators with more than 500 employees. Most of the compliance costs occur in the mine size category with 20–500 employees because 75 percent of the mines that use seals are in this category.

V. Feasibility

MSHA has concluded that the requirements of the final rule are technologically and economically feasible. For atmospheres behind seals where the atmosphere will not inert naturally, operators may choose any of the following alternatives for inerting the atmosphere: (1) Injecting inert gas; or (2) pressure balance of the ventilation system; or (3) injecting material into the strata surrounding the seals to reduce leakage. Other mines may choose to

construct new seals that are 120 psi or greater in front of all existing seals in the sealed area.

A. Technological Feasibility

MSHA concludes that the final rule is technologically feasible. This conclusion is based on the requirements of the final rule for training, sampling, construction and repair. Compliance with these requirements is technologically feasible because the materials, equipment, and methods for implementing these requirements currently exist. In addition, this feasibility determination is supported by MSHA's approval of several seal designs at overpressures of 50 psi and 120 psi.

B. Economic Feasibility

The yearly compliance cost of the final rule is $45.4 million, which is 0.3 percent of all revenue for all underground coal mines. MSHA concludes that the final rule is economically feasible because the total yearly compliance cost is well below one percent of the estimated annual revenue for all underground coal mines.

VI. Regulatory Flexibility Act and Small Business Regulatory Enforcement Fairness Act

Pursuant to the Regulatory Flexibility Act (RFA) of 1980, as amended by the Small Business Regulatory Enforcement Fairness Act (SBREFA), MSHA analyzed the impact of the final rule on small businesses. Based on that analysis, MSHA notified the Chief Counsel for Advocacy, Small Business Administration, and certified under the Regulatory Flexibility Act at 5 U.S.C. 605(b) that the final rule does not have a significant economic impact on a substantial number of small entities. The factual basis for this certification is in Chapter V of the REA, and is summarized below.

A. Definition of a Small Mine

Under the RFA, in analyzing the impact of the final rule on small entities, MSHA must either use the Small Business Administration (SBA) definition for a small entity or, after consultation with the SBA Office of Advocacy, establish an alternative definition for the mining industry by publishing that definition in the **Federal Register** for notice and comment. MSHA uses the SBA definition. The SBA defines a small entity in the mining industry as an establishment with 500 or fewer employees. MSHA concludes that it can certify that the final rule does not have a significant economic impact on a substantial number of small entities, those mines with 500 or fewer employees.

B. Factual Basis for Certification

MSHA initially evaluates the impacts on ''small entities'' by comparing the estimated compliance cost of a rule for small entities in the sector affected by the rule to the estimated revenue for the affected sector. When the estimated compliance cost is less than one percent of the estimated revenue, the Agency concludes that the rule does not have a significant economic impact on a substantial number of small entities. When the estimated compliance costs exceeds one percent of revenue, MSHA determines whether a further analysis is required.

For underground coal mines, the estimated 2007 production was 277,830,429 tons for mines that had 500 or fewer employees. Using a 2007 price of underground coal of $40.37 per ton and total 2007 underground coal production in tons, underground coal revenue is estimated to be approximately $11.2 billion for mines employing 500 or fewer employees. Thus, the yearly cost of the final rule for mines that have 500 or fewer employees is 0.36 percent of annual revenue. Using SBA's definition of a small mine (one having 500 or fewer employees), the yearly cost for underground coal mines to comply with the final rule is less than 1 percent of estimated annual revenue. Accordingly, MSHA has certified that the final rule does not have a significant impact on a substantial number of small entities.

VII. Paperwork Reduction Act of 1995

A. Summary

The information collection requirements contained in the final rule are listed by the Office of Management and Budget (OMB) under control numbers 1219–0142 and 1219–0088.

The final rule contains information collection requirements that MSHA estimates will result in 33,560 burden hours and approximately $2.36 million related burden costs to mine operators and seal manufacturers. This final rule contains information collection requirements in the following sections: § 75.335 seal requirements, strengths, design applications, and installation; § 75.336 sampling and monitoring requirements; § 75.337 construction and repair of seals; and § 75.338 training.

A detailed explanation of the burden hours and related costs are in the Paperwork Reduction Act section of the Regulatory Economic Analysis (REA) for the final rule. The REA is located on MSHA's Web site at *http://www.msha.gov/REGSINFO.HTM.* A print copy of the REA can be obtained from MSHA's Office of Standards, Regulations, and Variances.

B. Details

The information collection package has been submitted to the Office of Management and Budget (OMB) for review under 44 U.S.C. 3504(h) of the Paperwork Reduction Act of 1995, as amended. A copy of the information collection package can be obtained from the Department of Labor by e-mail request to *king.darrin@dol.gov* or by phone request at (202) 693–4129.

The information collection package for the ETS, which also served as the proposal for this final rule, was approved by OMB under control numbers 1219–0142, for Sealing of Abandoned Areas; and 1219–0088, for Ventilation Plans, Tests, and Examinations in Underground Coal Mines. MSHA estimated that the information collection requirements in the ETS would result in 82,037 annual burden hours and approximately $4.7 million in related annual burden costs. MSHA has reduced these estimates in the final rule to 33,553 annual burden hours and approximately $2.36 million related annual burden costs. MSHA's estimated reduction in burden hours is due to: (1) The removal of approximately 41,600 hours of sampling time that was inadvertently included with recordkeeping time and counted as paperwork; (2) the removal of approximately 900 hours of time to prepare for training that was inadvertently included as paperwork; (3) the removal of approximately 3,000 hours of paperwork associated with the deleted requirement for a sampling protocol and action plan; and (4) approximately 3,000 hours of paperwork due to various other changes in the final rule.

Several commenters raised concerns regarding the ETS requirement that multiple persons must certify that seal construction was done correctly. These comments are addressed in earlier sections of this preamble.

VIII. Other Regulatory Considerations

A. The Unfunded Mandates Reform Act of 1995

MSHA has reviewed the final rule under the Unfunded Mandates Reform Act of 1995 (2 U.S.C. 1501 *et seq*). MSHA has determined that the final rule does not include any federal mandate that may result in increased expenditures by State, local, or tribal governments; nor will it increase private sector expenditures by more than $100

million in any one year or significantly or uniquely affect small governments. Accordingly, the Unfunded Mandates Reform Act of 1995 (2 U.S.C. 1501 *et seq*) requires no further agency action or analysis.

B. The Treasury and General Government Appropriations Act of 1999: Assessment of Federal Regulations and Policies on Families

Section 654 of the Treasury and General Government Appropriations Act of 1999 (5 U.S.C. 601 note) requires agencies to assess the impact of Agency action on family well-being. MSHA has determined that the final rule has no effect on family stability or safety, marital commitment, parental rights and authority, or income or poverty of families and children. Accordingly, MSHA certifies that the final rule does not impact family well-being.

C. Executive Order 12630: Government Actions and Interference With Constitutionally Protected Property Rights

The final rule does not implement a policy with takings implications. Accordingly, under E.O. 12630, no further Agency action or analysis is required.

D. Executive Order 12988: Civil Justice Reform

The final rule was written to provide a clear legal standard for affected conduct and was carefully reviewed to eliminate drafting errors and ambiguities, so as to minimize litigation and undue burden on the Federal court system. Accordingly, the final rule meets the applicable standards provided in section 3 of E.O. 12988, Civil Justice Reform.

E. Executive Order 13045: Protection of Children From Environmental Health Risks and Safety Risks

The final rule has no adverse impact on children. Accordingly, under E.O. 13045, no further Agency action or analysis is required.

F. Executive Order 13132: Federalism

The final rule does not have ''federalism implications'' because it 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.'' Accordingly, under E.O. 13132, no further Agency action or analysis is required.

G. Executive Order 13175: Consultation and Coordination With Indian Tribal Governments

The final rule does not have ''tribal implications'' because it will not ''have substantial direct effects on one or more Indian tribes, on the relationship between the Federal government and Indian tribes, or on the distribution of power and responsibilities between the Federal government and Indian tribes.'' Accordingly, under E.O. 13175, no further Agency action or analysis is required.

H. Executive Order 13211: Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use

Executive Order 13211 requires agencies to publish a statement of energy effects when a rule has a significant energy action that adversely affects energy supply, distribution or use. MSHA has reviewed the final rule for its energy effects because the final rule applies to the underground mining sector. Because this final rule will result in yearly costs of approximately $45.4 million to the underground coal mining industry, relative to annual revenues of $14.1 billion in 2007, MSHA has concluded that it is not a significant energy action because it is not likely to have a significant adverse effect on the supply, distribution, or use of energy. Accordingly, under this analysis, no further Agency action or analysis is required.

I. Executive Order 13272: Proper Consideration of Small Entities in Agency Rulemaking

MSHA has thoroughly reviewed the final rule to assess and take appropriate account of its potential impact on small businesses, small governmental jurisdictions, and small organizations. MSHA has determined and certified that the final rule will not have a significant economic impact on a substantial number of small entities.

IX. References

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MSHA. Program Information Bulletin No. P06–12, ''Reissued Moratorium on Future Use of Alternative Seal Methods and Materials Pursuant to 30 CFR 75.335 and Assessment of Existing Sealed Areas in Underground Bituminous Coal Mines,'' June 12, 2006.

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MSHA. Procedure Instruction Letter No. I06–V–9, ''Procedures for Approval of Alternative Seals,'' August 21, 2006.

MSHA. Program Policy Manual, Volume V—Coal Mines, Release V–33, February 2003.

MSHA, Approval and Certification Center, Application Cancellation Policy, CDS No. APOL1009, Revised February 27, 2004.

Zipf, R. K., Sapko, M. J., Brune, J. F., ''Explosion Pressure Design Criteria for New Seals in U.S. Coal Mines, Draft Report,'' National Institute of Occupational Safety and Health, U.S. Dept. of Health and Human Services, February 8, 2007.

Zipf, R. K., Sapko, M. J., Brune, J. F., Information Circular–9500, ''Explosion Pressure Design Criteria for New Seals in U.S. Coal Mines,'' National Institute of Occupational Safety and Health, U.S. Dept. of Health and Human Services, July 2007.

List of Subjects in 30 CFR Part 75

Mine safety and health, Reporting and recordkeeping requirements, Underground coal mines, Ventilation.

Dated: April 14, 2008.

Richard E. Stickler,

Acting Assistant Secretary for Mine Safety and Health.

■ Chapter I of Title 30, part 75 of the Code of Federal Regulations is amended as follows:

PART 75—MANDATORY SAFETY STANDARDS—UNDERGROUND COAL MINES

■ 1. The authority citation for part 75 continues to read as follows:

Authority: 30 U.S.C. 811.

■ 2. Revise § 75.335 to read as follows:

§ 75.335 Seal strengths, design applications, and installation.

(a) *Seal strengths.* Seals constructed on or after October 20, 2008 shall be designed, constructed, and maintained to withstand—

(1)(i) At least 50-psi overpressure when the atmosphere in the sealed area is monitored and maintained inert and designed using a pressure-time curve with an instantaneous overpressure of at least 50 psi. A minimum overpressure of at least 50 psi shall be maintained for at least four seconds then released instantaneously.

(ii) Seals constructed to separate the active longwall panel from the longwall panel previously mined shall be designed using a pressure-time curve with a rate of pressure rise of at least 50 psi in 0.1 second. A minimum overpressure of at least 50 psi shall be maintained; or

(2)(i) Overpressures of at least 120 psi if the atmosphere in the sealed area is not monitored, is not maintained inert, the conditions in paragraphs (a)(3)(i) through (iii) of this section are not present, and the seal is designed using a pressure-time curve with an instantaneous overpressure of at least 120 psi. A minimum overpressure of 120 psi shall be maintained for at least four seconds then released instantaneously.

(ii) Seals constructed to separate the active longwall panel from the longwall panel previously mined shall be designed using a pressure-time curve with a rate of pressure rise of 120 psi in 0.25 second. A minimum overpressure of 120 psi shall be maintained; or

(3) Overpressures greater than 120 psi if the atmosphere in the sealed area is not monitored and is not maintained inert, and

(i) The atmosphere in the sealed area is likely to contain homogeneous mixtures of methane between 4.5 percent and 17.0 percent and oxygen exceeding 17.0 percent throughout the entire area;

(ii) Pressure piling could result in overpressures greater than 120 psi in the area to be sealed; or

(iii) Other conditions are encountered, such as the likelihood of a detonation in the area to be sealed.

(iv) Where the conditions in paragraphs (a)(3)(i), (ii), or (iii) of this section are encountered, the mine operator shall revise the ventilation plan to address the potential hazards. The plan shall include seal strengths sufficient to address such conditions.

(b) *Seal design applications.* Seal design applications from seal manufacturers or mine operators shall be in accordance with paragraphs (b)(1) or (b)(2) of this section and submitted for approval to MSHA's Office of Technical Support, Pittsburgh Safety and Health Technology Center, P.O. Box 18233, Cochrans Mill Road, Pittsburgh, PA 15236.

(1) An engineering design application shall—

(i) Address gas sampling pipes, water drainage systems, methods to reduce air leakage, pressure-time curve, fire resistance characteristics, flame spread index, entry size, engineering design and analysis, elasticity of design, material properties, construction specifications, quality control, design references, and other information related to seal construction;

(ii) Be certified by a professional engineer that the design of the seal is in accordance with current, prudent engineering practices and is applicable to conditions in an underground coal mine; and

(iii) Include a summary of the installation procedures related to seal construction; or

(2) Each application based on full-scale explosion tests or equivalent means of physical testing shall address the following requirements to ensure that a seal can reliably meet the seal strength requirements:

(i) Certification by a professional engineer that the testing was done in accordance with current, prudent engineering practices for construction in a coal mine;

(ii) Technical information related to the methods and materials;

(iii) Supporting documentation;

(iv) An engineering analysis to address differences between the seal support during test conditions and the range of conditions in a coal mine; and

(v) A summary of the installation procedures related to seal construction.

(3) MSHA will notify the applicant if additional information or testing is required. The applicant shall provide this information, arrange any additional or repeat tests, and provide prior notification to MSHA of the location, date, and time of such test(s).

(4) MSHA will notify the applicant, in writing, whether the design is approved or denied. If the design is denied, MSHA will specify, in writing, the deficiencies of the application, or necessary revisions.

(5) Once the seal design is approved, the approval holder shall promptly notify MSHA, in writing, of all deficiencies of which they become aware.

(c) *Seal installation approval.* The installation of the approved seal design shall be subject to approval in the ventilation plan. The mine operator shall—

(1) Retain the seal design approval and installation information for as long as the seal is needed to serve the purpose for which it was built.

(2) Designate a professional engineer to conduct or have oversight of seal installation and certify that the provisions in the approved seal design specified in this section have been addressed and are applicable to conditions at the mine. A copy of the certification shall be submitted to the District Manager with the information provided in paragraph (c)(3) of this section and a copy of the certification shall be retained for as long as the seal is needed to serve the purpose for which it was built.

(3) Provide the following information for approval in the ventilation plan—

(i) The MSHA Technical Support Approval Number;

(ii) A summary of the installation procedures;

(iii) The mine map of the area to be sealed and proposed seal locations that include the deepest points of penetration prior to sealing. The mine map shall be certified by a professional engineer or a professional land surveyor.

(iv) Specific mine site information, including—

(A) Type of seal;

(B) Safety precautions taken prior to seal achieving design strength;

(C) Methods to address site-specific conditions that may affect the strength and applicability of the seal including set-back distances;

(D) Site preparation;

(E) Sequence of seal installations;

(F) Projected date of completion of each set of seals;

(G) Supplemental roof support inby and outby each seal;

(H) Water flow estimation and dimensions of the water drainage system through the seals;

(I) Methods to ventilate the outby face of seals once completed;

(J) Methods and materials used to maintain each type of seal;

(K) Methods to address shafts and boreholes in the sealed area;

(L) Assessment of potential for overpressures greater than 120 psi in sealed area;

(M) Additional sampling locations; and

(N) Additional information required by the District Manager.

■ 3. Revise § 75.336 to read as follows:

§ 75.336 Sampling and monitoring requirements.

(a) A certified person as defined in § 75.100 shall monitor atmospheres of sealed areas. Sealed areas shall be monitored, whether ingassing or outgassing, for methane and oxygen concentrations and the direction of leakage.

(1) Each sampling pipe and approved sampling location shall be sampled at least every 24 hours.

(i) Atmospheres with seals of 120 psi or greater shall be sampled until the design strength is reached for every seal used to seal the area.

(ii) Atmospheres with seals less than 120 psi constructed before October 20, 2008 shall be monitored for methane and oxygen concentrations and maintained inert. The operator may request that the District Manager approve different sampling locations and frequencies in the ventilation plan, provided at least one sample is taken at each set of seals at least every 7 days.

(iii) Atmospheres with seals less than 120 psi constructed after October 20, 2008 shall be monitored for methane and oxygen concentrations and maintained inert. The operator may request that the District Manager approve different sampling locations and frequencies in the ventilation plan after a minimum of 14 days and after the seal design strength is reached, provided at least one sample is taken at each set of seals at least every 7 days.

(2) The mine operator shall evaluate the atmosphere in the sealed area to determine whether sampling through the sampling pipes in seals and approved locations provides appropriate sampling locations of the sealed area. The mine operator shall make the evaluation immediately after the minimum 14-day required sampling, if the mine ventilation system is reconfigured, if changes occur that adversely affect the sealed area, or if the District Manager requests an evaluation. When the results of the evaluations indicate the need for additional sampling locations, the mine operator shall provide the additional locations and have them approved in the ventilation plan. The District Manager may require additional sampling locations and frequencies in the ventilation plan.

(3) Mine operators with an approved ventilation plan addressing spontaneous combustion pursuant to § 75.334(f) shall sample the sealed atmosphere in accordance with the ventilation plan.

(4) The District Manager may approve in the ventilation plan the use of a continuous monitoring system in lieu of monitoring provisions in this section.

(b)(1) Except as provided in § 75.335(d), the atmosphere in the sealed area is considered inert when the oxygen concentration is less than 10.0 percent or the methane concentration is less than 3.0 percent or greater than 20.0 percent.

(2) Immediate action shall be taken by the mine operator to restore an inert sealed atmosphere behind seals with strengths less than 120 psi. Until the atmosphere in the sealed area is restored to an inert condition, the sealed atmosphere shall be monitored at each sampling pipe and approved location at least once every 24 hours.

(c) Except as provided in § 75.335(d), when a sample is taken from the sealed atmosphere with seals of less than 120 psi and the sample indicates that the oxygen concentration is 10 percent or greater and methane is between 4.5 percent and 17 percent, the mine operator shall immediately take an additional sample and then immediately notify the District Manager. When the additional sample indicates that the oxygen concentration is 10 percent or greater and methane is between 4.5 percent and 17 percent, persons shall be withdrawn from the affected area which is the entire mine or other affected area identified by the operator and approved by the District Manager in the ventilation plan, except those persons referred to in § 104(c) of the Act. The operator may identify areas in the ventilation plan to be approved by the District Manager where persons may be exempted from withdrawal. The operator's request shall address the location of seals in relation to: Areas where persons work and travel in the mine; escapeways and potential for damage to the escapeways; and ventilation systems and controls in areas where persons work or travel and where ventilation is used for escapeways. The operator's request shall also address the gas concentration of other sampling locations in the sealed area and other required information. Before miners reenter the mine, the mine operator shall have a ventilation plan revision approved by the District Manager specifying the actions to be taken.

(d) In sealed areas with a demonstrated history of carbon dioxide or sealed areas where inert gases have been injected, the operator may request that the District Manager approve in the ventilation plan an alternative method to determine if the sealed atmosphere is inert and when miners have to be withdrawn. The mine operator shall address in the ventilation plan the specific levels of methane, carbon dioxide, nitrogen and oxygen; the sampling methods and equipment used; and the methods to evaluate these concentrations underground at the seal.

(e) *Recordkeeping.* (1) The certified person shall promptly record each sampling result including the location of the sampling points, whether ingassing or outgassing, and oxygen and methane concentrations. The results of oxygen and methane samples shall be recorded as the percentage of oxygen and methane measured by the certified person and any hazardous condition found in accordance with § 75.363.

(2) The mine operator shall retain sampling records at the mine for at least one year from the date of the sampling.

■ 4. Revise § 75.337 to read as follows:

§ 75.337 Construction and repair of seals.

(a) The mine operator shall maintain and repair seals to protect miners from hazards of sealed areas.

(b) Prior to sealing, the mine operator shall—

(1) Remove insulated cables, batteries, and other potential electric ignition sources from the area to be sealed when constructing seals, unless it is not safe to do so. If ignition sources cannot safely be removed, seals must be constructed to at least 120 psi;

(2) Remove metallic objects through or across seals; and

(3) Breach or remove all stoppings in the first crosscut inby the seals immediately prior to sealing the area.

(c) A certified person designated by the mine operator shall directly supervise seal construction and repair and—

(1) Examine each seal site immediately prior to construction or repair to ensure that the site is in accordance with the approved ventilation plan;

(2) Examine each seal under construction or repair during each shift to ensure that the seal is being

constructed or repaired in accordance with the approved ventilation plan;

(3) Examine each seal upon completion of construction or repair to ensure that construction or repair is in accordance with the approved ventilation plan;

(4) Certify by initials, date, and time that the examinations were made; and

(5) Make a record of the examination at the completion of any shift during which an examination was conducted. The record shall include each deficiency and the corrective action taken. The record shall be countersigned by the mine foreman or equivalent mine official by the end of the mine foreman's or equivalent mine official's next regularly scheduled working shift. The record shall be kept at the mine for one year.

(d) Upon completion of construction of each seal a senior mine management official, such as a mine manager or superintendent, shall certify that the construction, installation, and materials used were in accordance with the approved ventilation plan. The mine operator shall retain the certification for as long as the seal is needed to serve the purpose for which it was built.

(e) The mine operator shall—

(1) Notify the District Manager between two and fourteen days prior to commencement of seal construction;

(2) Notify the District Manager, in writing, within five days of completion of a set of seals and provide a copy of the certification required in paragraph (d) of this section; and

(3) Submit a copy of quality control results to the District Manager for seal material properties specified by § 75.335 within 30 days of completion of quality control tests.

(f) *Welding, cutting, and soldering.* Welding, cutting, and soldering with an arc or flame are prohibited within 150 feet of a seal. An operator may request a different location in the ventilation plan to be approved by the District Manager. The operator's request must address methods the mine operator will use to continuously monitor atmospheric conditions in the sealed area during welding or burning; the airflow conditions in and around the work area; the rock dust and water application methods; the availability of fire extinguishers on hand; the procedures to maintain safe conditions, and other relevant factors.

(g) *Sampling pipes.* (1) For seals constructed after April 18, 2008, one non-metallic sampling pipe shall be installed in each seal that shall extend into the center of the first connecting crosscut inby the seal. If an open crosscut does not exist, the sampling pipe shall extend one-half of the distance of the open entry inby the seal.

(2) Each sampling pipe shall be equipped with a shut-off valve and appropriate fittings for taking gas samples.

(3) The sampling pipes shall be labeled to indicate the location of the sampling point when more than one sampling pipe is installed through a seal.

(4) If a new seal is constructed to replace or reinforce an existing seal with a sampling pipe, the sampling pipe in the existing seal shall extend through the new seal. An additional sampling pipe shall be installed through each new seal to sample the area between seals, as specified in the approved ventilation plan.

(h) *Water drainage system.* For each set of seals constructed after April 18, 2008, the seal at the lowest elevation shall have a corrosion-resistant, non-metallic water drainage system. Seals shall not impound water or slurry. Water or slurry shall not accumulate within the sealed area to any depth that can adversely affect a seal.

■ 5. Revise § 75.338 to read as follows:

§ 75.338 Training.

(a) Certified persons conducting sampling shall be trained in the use of appropriate sampling equipment, procedures, location of sampling points, frequency of sampling, size and condition of the sealed area, and the use of continuous monitoring systems if applicable before they conduct sampling, and annually thereafter. The mine operator shall certify the date of training provided to certified persons and retain each certification for two years.

(b) Miners constructing or repairing seals, designated certified persons, and senior mine management officials shall be trained prior to constructing or repairing a seal and annually thereafter. The training shall address materials and procedures in the approved seal design and ventilation plan. The mine operator shall certify the date of training provided each miner, certified person, and senior mine management official and retain each certification for two years.

■ 6. Add § 75.339 to read as follows:

§ 75.339 Seals records.

(a) The table entitled ''Seal Recordkeeping Requirements'' lists records the operator shall maintain and the retention period for each record.

TABLE—§ 75.339(a) SEAL RECORDKEEPING REQUIREMENTS

Record	Section reference	Retention time
(1) Approved seal design	75.335(c)(1)	As long as the seal is needed to serve the purpose for which it is built.
(2) Certification of Provisions of Approved Seal Design is Addressed.	75.335(c)(2)	As long as the seal is needed to serve the purpose for which it is built.
(3) Gas sampling records	75.336(e)(2)	1 year.
(4) Record of examinations	75.337(c)(5)	1 year.
(5) Certification of seal construction, installation, and materials.	75.337(d)	As long as the seal is needed to serve the purpose for which it is built.
(6) Certification of Training for Persons that Sample	75.338(a)	2 years.
(7) Certification of Training for Persons that Perform Seal Construction and Repair.	75.338(b)	2 years.

(b) Records required by §§ 75.335, 75.336, 75.337 and 75.338 shall be retained at a surface location at the mine in a secure book that is not susceptible to alteration. The records may be retained electronically in a computer system that is secure and not susceptible to alteration, if the mine operator can immediately access the record from the mine site.

(c) Upon request from an authorized representative of the Secretary of Labor, the Secretary of Health and Human Services, or from the authorized representative of miners, mine operators shall promptly provide access to any record listed in the table in this section.

(d) Whenever an operator ceases to do business or transfers control of the mine to another entity, that operator shall transfer all records required to be maintained by this part, or a copy thereof, to any successor operator who shall maintain them for the required period.

■ 7. Amend § 75.371 by revising paragraph (ff) to read as follows:

§ 75.371 Mine ventilation plan; contents.

* * * * *

(ff) Seal installation requirements provided by § 75.335 and the sampling provisions provided by § 75.336.

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