PRELIMINARY REGULATORY ECONOMIC ANALYSIS

FOR

REFUGE ALTERNATIVES
FOR UNDERGROUND COAL MINES
PROPOSED RULE

RIN: 1219-AB58

U.S. Department of Labor
Mine Safety and Health Administration
Office of Standards, Regulations, and Variances

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I. EXECUTIVE SUMMARY

INTRODUCTION

In accordance with section 13 of the Mine Improvement and New Emergency Response (MINER) Act of 2006, MSHA is issuing a proposed rule that would require refuge alternatives in underground coal mines. The proposed rule is consistent with, and responsive to, the report issued by the National Institute for Occupational Safety and Health (NIOSH) on refuge alternatives.

This Preliminary Regulatory Economic Analysis (PREA) examines the costs and benefits of MSHA's proposed rule on refuge alternatives. The proposed rule would include requirements for approval of refuge alternatives and components and for purchase, installation, and maintenance and repair of refuge alternatives and components. The proposed rule would include requirements for location of refuge alternatives to assure that they are readily accessible to all persons underground when an emergency occurs, and provisions for installing necessary roof and rib supports in areas where refuge alternatives are placed. In addition, the proposed rule would require that the location of refuge alternatives are noted on underground mine maps. The proposed rule would provide for inspections of refuge alternatives before each shift to assure that they function correctly when they are used, and for miners to be trained in their proper use and care.

MINE SECTOR AFFECTED

The proposed rule would apply to all underground coal mines in the United States. Based on the most recent MSHA data, there were 624 underground coal mines employing approximately 42,200 miners in the United States in 2007, of which 613 mines employ miners working underground. These 613 mines employ approximately 37,800 miners and 5,100 contractors working underground, for a total of approximately 42,900 workers underground.

BENEFITS

In accordance with Executive Order (E.O.) 12866, MSHA has evaluated the potential benefits of the proposed rule. MSHA has evaluated its accident and injury data from 1900 through 2006. For this proposed rule, MSHA estimates that 221 lives could have been saved over the 107 year period. If refuge alternatives had been available, MSHA estimates that the range of lives saved would be between a low of 25 percent and a high of 75 percent . Using these estimates, the proposal would result in approximately one-half life saved per year under the lower estimate or one and one-half lives saved per year under the higher estimate.

The proposed rule would improve mine operators' preparedness for mine emergencies and would require that refuge alternatives provide a life-sustaining environment to facilitate escape or sustain miners trapped underground when escape is impossible.

COMPLIANCE COSTS

MSHA estimates that the proposed rule would result in a total yearly cost of $2.1 million for manufacturers of refuge alternatives. In addition, the proposed rule would result in a total yearly cost of approximately $41.2 million for underground coal mine operators. The total yearly cost of the proposed rule includes the amortized value of first-year costs of approximately

$102.6 million. Disaggregated by mine size, the estimated yearly cost would be $3.1 million for operators with 1-19 employees, $33.1 million for operators with 20-500 employees, and $5.0 million for operators with 500+ employees.

REGULATORY FLEXIBILITY CERTIFICATION AND ANALYSIS

In accordance with § 605 of the Regulatory Flexibility Act, MSHA certifies that the proposed rule would not have a significant economic impact on a substantial number of small entities. Under the Small Business Regulatory Enforcement Fairness Act (SBREFA) amendments to the Regulatory Flexibility Act, MSHA must include in the proposed rule a factual basis for this certification. The Agency must also publish the regulatory flexibility certification statement in the Federal Register, along with the factual basis. The analysis that provides the factual basis for this certification is discussed in Regulatory Flexibility Certification chapter of this document and in the preamble to the proposed rule. MSHA has consulted with the Small Business Administration's (SBA's) Office of Advocacy and believes that the analysis provides a reasonable basis for this certification.

II. INDUSTRY PROFILE

INTRODUCTION

This chapter provides information concerning the structure and economic characteristics of the underground coal mining industry, including the number of mines and employees by type and size of mine. These data are from the U.S. Department of Labor, Mine Safety and Health Administration, Office of Program Evaluation and Information Resources (PEIR), 2007 data as of February 5, 2008. The value of the coal output of the U.S. underground coal mining sector was estimated to be $14.1 billion in 2007.

STRUCTURE OF THE MINING INDUSTRY

MSHA divides the mining industry into two major sectors based on commodity: (1) coal mines and (2) metal and nonmetal mines. Each sector is further divided by type of operation (i.e., underground mines and surface mines). The Agency collects data on the number of mines and on mining employment by mine type and size. MSHA also collects data on the number of independent contractor firms and their employees. Each independent contractor is issued one MSHA contractor identification number but may work at any mine.

STRUCTURE OF THE COAL MINING INDUSTRY

Table II-1 presents data on underground coal mines, by employment size, excluding contractors. Agency data in Table II-1 indicate that there were 624 underground coal mines that reported employment during some portion of calendar year 2007. Underground coal mine employment in 2007 was approximately 43,500, of which 42,200 were miners and 1,300 were office employees. Of the 624 mines, 613 mines have miners working underground. There are approximately 37,800 miners that work underground.

Table II-1: Underground Coal Mines (Excluding Contractors), by Employment Size, 2007

Size of Mine	No. of Mines	No. of Miners	Office Employment	No. of Mines with Miners Underground	No. of Miners Working Underground
1-19 Employees	223	2,300	100	212	1,900
20-500 Employees	391	33,500	1,000	391	30,300
501+ Employees	10	6,400	200	10	5,600
All Underground Coal Mines	624	42,200	1,300	613	37,800

Table II-2 presents data on independent contractors that worked in underground coal mines in 2007. There are approximately 5,100 contractors that work in underground coal mines.

Table II-2: Underground Coal Contractors, 2007

All Underground Coal Contractors			
No. of Firms	Non-Office Employment	Office Employment	Non-Office Employment Working Underground
307	9,200	250	5,100

ECONOMIC CHARACTERISTICS OF THE COAL MINING INDUSTRY

MSHA classifies the U.S. coal mining sector into three major commodity groups: bituminous, lignite, and anthracite. Bituminous operations represent approximately 91 percent of coal mining operations, employ 94 percent of all coal miners, and account for 93 percent of total coal production. Lignite operations represent approximately 1 percent of coal mining operations, employ 5 percent of all coal miners, and account for 7 percent of total coal production. Anthracite operations represent approximately 8 percent of coal mining operations, employ 1 percent of all coal miners, and account for 0.1 percent of total coal production.

The underground coal sector produced an estimated 349 million tons. The average price of coal in underground mines in 2007 was $40.37 per ton. The value of coal produced by the underground sector was approximately $14.1 billion.

III. BENEFITS

INTRODUCTION

On June 15, 2006, the President signed the MINER Act to improve the safety of mines and mining. One of the goals of the MINER Act was to improve emergency response capability in underground coal mines. Toward that end, MSHA has published a number of standards in the last several years and has reiterated in them that, in the event of a mine emergency in an underground coal mine, the miner should be trained to evacuate the mine. Over the years, MSHA has promulgated a number of rules that address the safety of miners in the event of explosions, fires, or inundations in underground coal mines. These rules have included provisions that address escape from a mine, such as: the availability of two separate and distinct escapeways for each working section; maps in an underground mine that delineate escape routes out of the mine; miner participation in practice drills to escape the mine in an emergency situation; and life-saving devices such as lifelines and self-contained self-rescue (SCSR) devices to facilitate escape.

MSHA considers refuge alternatives as a last resort to protect persons who are unable to escape from an underground coal mine in the event of an emergency. This proposed rule would require the availability of refuge alternatives in the event that escape is delayed or not possible. This proposal would improve mine operators' preparedness for mine emergencies and increase miners' safety by requiring refuge alternatives underground to protect and sustain miners trapped when a life-threatening event occurs that prevents escape. The refuge alternatives proposed in the rule may also assist miners in escaping from the mine.

EVALUATION OF ACCIDENT AND INJURY DATA

MSHA has evaluated its accident and injury data from 1900 through 2006. During that period, 264 miners who were alive after a mine accident died later during rescue or escape. Because forty-three lives have previously been attributed to other recent MSHA regulatory actions, a total of 221 lives could have been saved over the 107 year period for purposes of estimating benefits for this proposal. If refuge alternatives had been available, MSHA estimates that the range of lives saved would be between a low of 25 percent and a high of 75 percent. MSHA estimates that 55 lives could have been saved under the lower estimate, and that 166 lives could have been saved under the higher estimate. Using these estimates, the proposal would result in approximately one-half life saved per year under the lower estimate or one and one-half lives saved per year under the higher estimate.

CONCLUSION

The proposed rule would implement the MINER Act. It would require that mine operators install refuge alternatives would include requirements for the use, transport, maintenance, and inspection of refuge alternatives. The proposed rule would also include requirements for training of miners on how to use refuge alternatives during an emergency. To facilitate mine emergency preparedness, refuge alternative training would be integrated into existing escapeway drill training – quarterly mine evacuation training and annual expectations training.

In addition, the proposed rule would include requirements for installing necessary roof and rib support in areas where refuge alternatives are placed. It would also require that the

locations of refuge alternatives be noted on the mine maps so that miners can easily locate the refuge alternatives in an emergency. The proposal would also require that miners be trained to maintain and repair refuge alternatives. In addition, the proposal would require that refuge alternatives (and their components) be inspected before each shift to assure that they are always functioning properly and will be effective in the event of any emergency. The proposal would also include requirements for the location of refuge alternatives to assure that they are readily accessible to all miners underground when an emergency occurs.

IV. COMPLIANCE COSTS

INTRODUCTION

In this chapter, MSHA estimates the total yearly cost of the refuge alternatives proposed rule. Due to rounding, totals presented in this analysis may deviate from the sum of components.

Table IV-1 summarizes the estimated yearly costs of the proposed rule, which includes annualized first-year and intermittent costs and annual costs. MSHA estimates that the proposed rule would result in a total yearly cost of $43.2 million, of which $2.1 million would be incurred by manufacturers of refuge alternatives and $41.2 million would be incurred by underground coal mine operators.

Table IV-1: Summary of Yearly Costs of Proposed Rule

Proposed Requirement				**Yearly Cost**
Cost to Manufacturers				
Application and Approval				$2.1 million
Cost to Mine Operators				
	Mine Size			
	1-19 employees	20-500 employees	501+ employees	Total
Purchase, Installation, Transportation, and Repair of Refuge Alternatives	$2.4 million	$17.5 million	$1.9 million	$21.8 million
Pre-Shift Exams and Revisions to Plans and Maps	$300,000	$5.2 million	$1.2 million	$6.6 million
Training	$520,000	$10.4 million	$1.9 million	$12.8 million
Subtotal of Operators' Yearly Costs	$3.1 million	$33.1 million	$5.0 million	$41.2 million
Cost to Manufacturers and Mine Operators				
Total Yearly Costs				$43.3 million

Table IV-2 shows the estimated average yearly cost of the proposed rule per underground coal mine, by mine size. By mine size, the estimated yearly cost would be: $3.1 million for operators with 1-19 employees; $33.1 million for operators with 20-500 employees; and $5.0 million for operators with 501+ employees

Table IV-2: Average Yearly Cost* per Mine, by Mine Size

Mine Size	Yearly Cost of Proposed Rule	No. of Underground Mines with Refuge Alternatives	Yearly Cost per Mine
1-19 employees **	$3.1 million	106	$30,000
20-500 employees	$33.1 million	391	$85,000
501+ employees	$5.0 million	10	$500,000
All Mines	$41.2 million	507	$81,000

* Excludes refuge alternative and component approval costs.
** An additional 117 mines with 1-19 employees would not require a refuge alternative under the proposed rule.

Table IV-3 summarizes the estimated costs in the first year that the proposed rule would be in effect. Total estimated costs in the first year would be $102.6 million, of which $2.1 million would be incurred by manufacturers and $100.5 million would be incurred by mine operators. The distribution of the $100.5 million cost by mine size is approximately: $8.8 million for operators with 1-19 employees; $80.9 million for operators with 20-500 employees; and $10.9 million for operators with 501+ employees.

Table IV-3: Summary of First-Year Costs of Proposed Rule

Proposed Requirement				**First-Year Cost**
Cost to Manufacturers				
Application and Approval				$2.1 million
Cost to Mine Operators				
	Mine Size			
	1-19 employees	20-500 employees	501+ employees	Total
Purchase, Installation, Transporting, and Repair of Refuge Alternatives	$7.8 million	$64.6 million	$7.8 million	$80.3 million
Pre-Shift Exams and Revisions to Plans and Maps	$360,000	$5.9 million	$1.2 million	$7.4 million
Training	$530,000	$10.4 million	$1.9 million	$12.8 million
Subtotal of Operators' First-Year Costs	$8.8 million	$80.9 million	$10.9 million	$100.5 million
Cost to Manufacturers and Mine Operators				
Total First-Year Costs				$102.6 million

METHODOLOGY

For the proposed rule, MSHA estimates the following costs: (1) one-time or intermittent costs; (2) annual costs; and (3) annualized costs. One-time costs are those that are incurred only once, usually in the first year of compliance. Intermittent costs are those costs that may recur from time to time, but not annually. Capital expenditures, such as equipment costs, are an example of one-time or intermittent costs. Annual costs are costs that normally occur every year. Two examples of annual costs are maintenance costs and recordkeeping costs. Annualized costs are one-time or intermittent costs that are amortized over the economic life of the investment using a specified interest (or discount) rate to produce an equivalent constant stream of costs. For this PREA, the Agency used a (real) discount rate of 7 percent, as recommended by the Office of Management and Budget (OMB), using the annualization formula:

$$a = (i * (1 + i)^n) /((1 + i)^n - 1),$$

where "a" is the annualization factor, "i" is the annual discount rate, and "n" is the economic life of the non-annual recurring investment (in years).

MSHA estimates that the average life of a mine and the average service life of a pre-fabricated self-contained unit is 10 years. MSHA estimates that all the components for all the refuge alternatives have a 5-year service life, except for adjustable wood pieces, block and mortar, and mandoors, which have a 10-year service life. Other cost items including transportation skids, installation of refuge alternatives, installation of supplemental roof and rib supports, and installation of signs, are annualized over a 10-year period. MSHA annualized the first year costs using an annualization factor of 0.244 to reflect a 5-year service life and a 7 percent discount rate, and an annualization factor of 0.142 to reflect a 10-year service life and a 7 percent discount rate. Yearly costs are the sum of annual costs and annualized costs.

In addition, MSHA discounted costs incurred in later years using a 7 percent discount rate to reflect the fact that money can be invested until the cost is incurred and that the real cost would not change over time.

MSHA used hourly wage rates of $33.70 for an underground coal miner, $85.14 for an underground coal mine supervisor or a certified person, $26.37 for an underground coal clerical employee, and $74.32 for an underground coal mining engineer.[1] MSHA assumes that contractors receive the same wage as underground coal miners. The wage rates include benefits such as social security, unemployment insurance, and workers' compensation, but they do not reflect shift differentials or overtime pay. MSHA refers to miner "compensation" in this PREA as "wages," where that term is understood to include benefits.

SCOPE

The proposed rule would apply to underground coal mines. Table IV-4 presents the total number of underground coal miners and contractors, by mine size. The totals include only miners and contractors working underground. The contractors have been apportioned into mine size categories in proportion to the number of miners working underground in each mine size category.

[1] Hourly wage rates are derived from InfoMine USA, Inc., *U.S. Coal Mine Salaries, Wages, & Benefits: 2007 Survey Results*.

Table IV-4: Number of Miners and Contractors Working Underground in 2007 [a]

Mine Size	1-19 Employees	20-500 Employees	501+ Employees	All Underground Miners
Miners	1,900	30,300	5,600	37,800
Contractors	300	4,100	800	5,100
Miners & Contractors	2,200	34,400	6,400	42,900

[a] Source: MSHA Teradata run, February 5, 2008.

DERIVATION OF PROPOSED RULE COMPLIANCE COSTS

The following sections in the chapter address the costs of the proposed rule. Section IV-A presents cost estimates for manufacturers to obtain MSHA approval of a refuge alternative or component. Section IV-B presents cost estimates for mine operators to purchase, install, transport, and maintain and repair refuge alternatives. Section IV-C presents cost estimates for mine operators to examine refuge alternatives during pre-shift examinations, and to revise emergency response plans and maps. Section IV-D presents cost estimates for mine operators to train miners in locating and using refuge alternatives; and to train persons who examine, maintain, repair, and transport refuge alternatives.

MSHA solicits comments on all its cost estimates and on the data and assumptions MSHA used. In your response, please be specific as to suggested alternatives to MSHA's data and assumptions. Where possible, please include specific support for your comments.

Section IV-A: Approval Costs - Part 7

Application Preparation

Proposed § 7.501 would describe the purpose and scope of the approval regulations and proposed § 7.502 would define terms used in the requirements for approval. MSHA estimates no costs for these provisions.

Proposed § 7.503 would require that an application for approval of a pre-fabricated self-contained refuge alternative or component include information to assure that the refuge alternative meets the requirements of the proposed rule. Proposed § 7.504 would include general requirements for pre-fabricated self-contained refuge alternatives and components, including design and safety requirements. Proposed § 7.505 would include requirements for structural components of refuge alternatives, including requirements related to the space and volume, airlock, and resistance to overpressure, flash fires, and other damage. Proposed § 7.506 would include requirements related to breathable air components in the refuge alternative, and proposed § 7.507 would include requirements related to air monitoring components in the refuge alternative and airlock. Proposed § 7.508 would include requirements for harmful gas removal components in the refuge alternative. MSHA estimates costs for these provisions below.

Proposed § 7.509 would require approval markings on the refuge alternative and on components that are approved separately, and proposed § 7.510 would allow for MSHA approval of new technology that the provisions of the proposed rule would not address. MSHA estimates no costs or negligible costs for these provisions.

MSHA estimates that, on average, manufacturers would file 3 applications annually for a pre-fabricated self-contained refuge alternative, and 10 applications annually for a component of a refuge alternative. MSHA expects that there may be more applications in the first few years after the rule takes effect, but that in subsequent years the number of applications would decline.

The proposal would require that the application for a pre-fabricated self-contained refuge alternative include information and drawings sufficient to satisfy the design and technical requirements for the structural, breathable air, air-monitoring, and harmful gas removal provisions in the proposed rule. The application for a component of a refuge alternative would include applicable information required for the components in a pre-fabricated self-contained unit. In addition, an application for a refuge alternative or component would have to include information on the refuge alternative's or component's parts; each component's or part's in-mine shelf life and recommended replacement schedule; materials used in each component or part with their MSHA approval number or a statement that the materials are non-combustible; the capacity and duration of the refuge alternative or component on a per-person per-day basis; the length, width, and height of the space required for storage of each component; and a training manual that contains sufficient detail for each refuge alternative or component addressing the transportation, operation, and maintenance of the unit. More detailed technical information would be needed for a breathable air component, air-monitoring component, or harmful gas removal component.

The application would also have to include the results of testing that demonstrate the ability of the refuge alternative or component to perform as required. Under Part 7, testing could be done by the applicant or a third party. For each test required to be performed on the product, detailed information would have to be supplied with the application. This information would need to include an explanation of the set-up and tear-down procedures related to the test, the instruments used and their analytical accuracy, materials used in the test, the step-by-step procedures for performing each test, and the test conclusions. For a pre-fabricated self-contained refuge alternative, at least six different tests would need to be conducted to verify the proposed 96-hour breathable air performance requirement and at least nine other tests would be needed to verify that the refuge alternative satisfies the other proposed requirements. Some variation of these tests would be required for an application for a refuge alternative component.

In general, MSHA assumes that, upon request from the Agency for additional information, each applicant would have to make changes to the overall application. Based on MSHA experience, MSHA estimates that an applicant would take an average of 400 hours to prepare an application for a pre-fabricated self-contained refuge alternative (300 hours for the original application and 100 hours to make changes). MSHA estimates that an applicant would take an average of 150 hours to prepare an application for a component (100 hours for the original application and 50 hours to make changes). Of the total time to prepare the application and to make changes, MSHA assumes that: 50 percent would be spent by a supervisor; 40 percent would be spent by a chief engineer; and 10 percent would be spent by a clerical employee. MSHA estimated a weighted average hourly wage rate of $74.94 to calculate the cost of preparing and submitting the application (50% x $85.14 + 40% x $74.32 + 10% x $26.37 = $74.94).

To estimate submittal costs, MSHA assumes that an application for a pre-fabricated self-contained refuge alternative, including any changes, would be 300 pages and that an application for a component, including any changes, would be 150 pages. MSHA assumes copy costs of $0.15 per page and approximately 30 minutes (0.5 hours) of clerical time at $26.37 per

hour. In addition, MSHA estimates that total postage costs would be $8 for a pre-fabricated self-contained refuge alternative application and $4.50 for a component application. MSHA estimates that submittal costs would be $66 for an application for a pre-fabricated self-contained refuge alternative [(300 pages x $0.15) + $8 + (0.5 hr. x $26.37)] and $40 for an application for a refuge alternative component [(150 pages x $0.15) + $4.50 + (0.5 hr. x $26.37)].

Multiplying 400 hours by the composite wage rate of $74.94 and then adding the $66 for submittal costs would give an estimated cost of $30,000 to prepare and submit an application for a pre-fabricated self-contained refuge alternative. The annual cost for 3 applicants to prepare and submit an application for approval of a pre-fabricated self-contained refuge alternative is estimated to be $90,000.

Similarly, multiplying 150 hours by the composite wage rate of $74.94 and then adding the $40 for submittal costs would give an estimated cost of $11,300 to prepare and submit an application for a refuge alternative component. The annual cost for 10 applicants to prepare and submit an application for approval of a component of a refuge alternative is estimated to be $113,000.

The total estimated annual cost to prepare and submit applications for refuge alternatives and components would be $203,000.

Costs for Testing by Applicant or Third Party

The proposal would require that tests be conducted by the applicant or a third party and the results provided in the application for MSHA approval of a refuge alternative or component. The proposal would require the following tests to verify the breathable air performance of the refuge alternative for 96 consecutive hours: apparent temperature, carbon dioxide scrubbing, oxygen delivery, positive pressure, and atmospheric monitoring. In addition, the proposal would include the following adequacy tests: tests related to airlock purging, NFPA 2112 flash fire, flame resistance, explosion-proof enclosures, battery, gas analytical accuracy (both preconditioning and long term stability), pounds per square inch (psi) overpressure, carbon monoxide scrubbing, noise and light measurement, and tear resistance.

MSHA's Technical Support staff provided information for the tests. Based on this information, MSHA estimates that the total cost (including setup and tear-down costs) of tests for a pre-fabricated self-contained refuge alternative application is $255,800. The estimated cost of tests for 3 Due to rounding, totals presented in this analysis may deviate from the sum of components.

Pre-fabricated self-contained refuge alternative applications per year is $767,400. Tests for a component application could involve any one or a combination of the tests for the pre-fabricated self-contained refuge alternative. MSHA averaged the costs of tests for a pre-fabricated self-contained refuge alternative to derive an estimate of $21,300 for the testing cost of a component application. The estimated annual cost of tests for 10 component applications per year is $213,000.

The total estimated annual cost of testing to support 3 pre-fabricated self-contained refuge alternative applications and 10 component applications a year is $980,000.

MSHA Approval Services

MSHA charges applicants a fee that covers direct and indirect costs for evaluation and approval services performed by the Agency. As of January 1, 2008, the MSHA fee is $84 per

hour for services rendered.[2] Based on MSHA experience, MSHA estimates that the average time necessary for the Agency to evaluate an application and any changes would total 3,000 hours for a pre-fabricated self-contained refuge alternative and 150 hours for a component.

MSHA's charge for evaluating a pre-fabricated self-contained refuge alternative application is equal to the $84 hourly fee multiplied by 3,000 hours, or $252,000. The estimated annual cost for MSHA to evaluate 3 pre-fabricated self-contained refuge alternative applications a year is $756,000. Similarly, MSHA's charge for evaluating a component application is equal to the $84 hourly fee multiplied by 150 hours, or $12,600. The estimated annual cost for MSHA to evaluate 10 component applications a year would be $126,000.

The total estimated annual cost for MSHA evaluation of 3 pre-fabricated self-contained refuge alternative applications and 10 component applications a year is $880,000.

Summary of Annual Cost for Proposed Part 7 Requirements

Table IV-A shows an estimated annual cost of $2.1 million for manufacturers of refuge alternatives and manufacturers of refuge alternative components to comply with the proposed Part 7 approval requirements.

Table IV-A: Summary of Yearly Costs for Proposed Part 7 Requirements

Proposed Requirement	Total Yearly Cost
Prepare Applications for Approval	$203,000
Testing	$980,000
MSHA Approval Services	$880,000
Total	$2.1 million

Section IV-B: Sections 75.1506 and 75.1507: Requirements for Refuge Alternatives; Purchase, Installation, Transportation, and Maintenance and Repair of Refuge Alternatives

In this section, MSHA estimates the costs of compliance with the requirements in proposed §§ 75.1506 and 75.1507 related to the number and types of refuge alternatives, purchasing and installing of refuge alternatives, transport of refuge alternatives as mining operations move within the mine, and maintenance and repair of refuge alternatives.

Proposed § 75.1506 would require that refuge alternatives be provided, and would include requirements for use and maintenance and repair of refuge alternatives. Proposed § 75.1506(a) would require that the number of refuge alternatives in the mine be sufficient to accommodate all persons expected to be in the mine at one time and would specify the minimum required space per person (60 cubic feet of volume and 15 square feet of floor space). Proposed § 75.1506(b) would specify the locations for refuge alternatives. Proposed § 75.1506(c) would require mine operators to provide adequate roof and rib support for the locations for refuge alternatives and to include the roof and rib support in the roof control plan. Proposed

[2] "Fee Adjustments for Testing, Evaluation, and Approval of Mining Products," Federal Register, December 27, 2007, vol. 72, no. 247, pp. 73380-81.

§ 75.1506(d) would require operators to protect refuge alternatives from damage during transportation, installation, and storage, and proposed § 75.1506(e) would include requirements for removal of refuge alternatives or components from service and for repair in the event of damage. Proposed § 75.1506(f) would require that refuge alternatives be located in areas clear of machinery and obstructions, and § 75.1506(g) would require that refuge alternatives be conspicuously marked.

Proposed §75.1507(a) would require that the types of refuge alternatives be included in the mine's Emergency Response Plan (ERP). Proposed § 75.1507(a) would provide a performance-based approach and allow mine operators to determine the most appropriate refuge alternatives for their mines. Under proposed § 75.1507(a), the mine's ERP must specify the type of refuge alternative used in the mine, which could be: a pre-fabricated self-contained unit; materials pre-positioned for miners to use to construct a secure space with an isolated atmosphere; or a secure space, constructed in-place, with an isolated atmosphere. Each type of refuge alternative would be required to include the following requirements: communications, first aid supplies, sanitation, and lighting (proposed § 7.504). Refuge alternatives would also have to include the following components: structural (proposed § 7.505); breathable air (proposed § 7.506); air monitoring (proposed § 7.507); and harmful gas removal (proposed § 7.508). Proposed § 75.1507 would address requirements for food and water.

In order to estimate the cost of purchasing, installing, transporting, and repairing refuge alternatives, MSHA estimated the total number of each type of refuge alternative that mine operators would likely use to meet the proposed rule, as well as a unit cost for each type. MSHA estimated quantities and unit costs for the following types of refuge alternatives:

- Pre-fabricated self-contained unit for 10 persons, placed near working sections (inby areas).
- Materials pre-positioned on skids near working sections (inby areas) in kits consisting of either brattice curtains and interlocking wood pieces or an inflatable barrier, to be constructed when needed to accommodate 10 or 20 persons.
- Constructed-in-place with concrete stoppings placed away from working sections (in outby areas) for 20 persons.

Number of Refuge Alternatives Needed

MSHA estimates the number of refuge alternatives that would be required under the proposed rule based on the capacity requirements in proposed § 75.1506(a) and the location requirements in proposed § 75.1506(b). Under proposed § 75.1506(a), each operator would have to provide refuge alternatives with sufficient capacity to accommodate every person working underground at any one time. Proposed § 75.1506(b)(1) would require that refuge alternatives be provided between 1,000 feet and 2,000 feet from the working face and from locations where mechanized mining equipment is being installed or removed; and proposed § 75.1506(b)(2) would address refuge alternatives in outby areas and is discussed in more detail below.

To estimate the maximum number of persons working underground at one time, MSHA added 3 percent to the average number of persons on a shift to account for seasonal variation and added 15 percent to account for shift variation for those mines with more than one production shift a day. MSHA also took into account the fact that some mines conduct "hot-seat" practices.

Hot-seat practices occur when the replacement crew enters the mine while the previous crew is still working. When the replacement crew arrives at the working section, this crew switches with the previous crew, which then exits the mine. A mine that engages in this practice has two crews in the mine at the same time.

MSHA estimates that the maximum number of persons working underground at any time in all underground coal mines would be 22,000 persons. Of these, MSHA estimates that 13,700 would work inby or near working sections (1,400 at mines with 1-19 employees; 11,000 at mines with 20-500 employees; and 1,300 at mines with 501+ employees) and 8,000 would work in outby areas (200 at mines with 1-19 employees; 6,900 at mines with 20-500 employees; and 1,100 at mines with 501+ employees). MSHA uses these estimates to derive the number of refuge alternatives, by type, that would be required under the proposal. MSHA's estimate of the number of refuge alternatives near working sections (inby) is based on the number of persons working underground near working sections for mines with 20-500 employees and for mines with 501+ employees. MSHA's estimate of the number of refuge alternatives near working sections (inby) for mines with 1-19 employees is also based on the proximity of underground persons to a portal. MSHA's estimate of the number of refuge alternatives for outby areas for all mine sizes is based on each operator's assessment of the risk to persons in outby areas.

MSHA requests comments on its estimate of the number of refuge alternatives, by type, that would be needed under the proposal. Please be specific in your comment, including alternatives, rationale, safety benefits to miners, technological and economic feasibility, and data to support your comment.

Refuge Alternatives near Working Sections (Inby)

Because the States of West Virginia and Illinois have laws requiring the use of pre-fabricated self-contained units for production crews, MSHA estimates that 60 percent of refuge alternatives near working sections (inby) would be pre-fabricated self-contained units. MSHA estimates that the remaining 40 percent would be materials pre-positioned on transportation skids; half of those would be brattice and wood kits, and half would be inflatable barrier kits. MSHA estimates that refuge alternatives near working sections (inby) would be distributed by mine size as follows:

- Of the 212 mines with 1-19 employees, MSHA estimates that half (106 mines) would be located so close to the portal that they would not need any refuge alternatives. The remaining half (106 mines) would need one refuge alternative in each mine near working sections. Of these 106 refuge alternatives, 64 would be pre-fabricated self-contained units, 21would be 10-person brattice and wood materials pre-positioned on skids, and 21 would be 10-person inflatable barrier materials pre-positioned on skids.
- Of the 391 mines with 20-500 employees, MSHA estimates that there would be a total of 785 refuge alternatives near working sections. Of these 785 refuge alternatives, 471 would be pre-fabricated self-contained units, 157 would be 20-person brattice and wood materials pre-positioned on skids, and 157 would be 20-person inflatable barrier materials pre-positioned on skids. For these 391 mines, there would be refuge alternatives near working sections for all 11,000 persons working underground near working sections: [(471 pre-fabricated self-contained units x 10 persons per unit) + (2 x 157 materials pre-positioned on skids x 20 persons per kit) = 4,710 + 6,280 = 11,000)].

- Of the 10 mines with 501+ employees, MSHA estimates that there would be a total of 95 refuge alternatives near working sections. Of the 95 refuge alternatives, 57 would be pre-fabricated self-contained units, 19 would be 20-person brattice and wood materials pre-positioned on skids, and 19 would be 20-person inflatable barrier materials pre-positioned on skids. For these 10 mines, there would be refuge alternatives near working sections for all 1,300 persons working underground near working sections: [(57 pre-fabricated self-contained units x 10 persons per unit) + (2 x 19 materials pre-positioned on skids x 20 persons per kit) = 570 + 760 = 1,300].

Based on these assumptions, MSHA estimates that, for all mines, a total of 986 refuge alternatives would be needed near working sections (inby areas). Table IV-B1 shows the estimated number of refuge alternatives for inby areas by type and mine size.

Refuge Alternatives for Outby Areas

Under proposed § 75.1506(b)(2), refuge alternatives must be spaced within 1-hour travel distances so that persons in outby areas are never more than a 30-minute travel distance from a refuge alternative or safe exit. This proposed provision provides that an operator may request, and a District Manager may approve, a different location for a refuge alternative based on an assessment of the risk to persons in outby areas. The proposal includes the factors an operator must consider in making an assessment of risks to persons in outby areas. MSHA estimates that:

- Of the 106 mines with 1-19 employees, none would need refuge alternatives in outby areas because persons working in outby areas would never be more than a 30-minute travel distance from the refuge alternative near the inby area or a safe exit.
- Of the 391 mines with 20-500 employees, 101 would not need refuge alternatives because persons working in outby areas would never be more than a 30-minute travel distance from a refuge alternative near the inby area or a safe exit. MSHA estimates that operators of the remaining 290 mines would request approval of a different location for refuge alternatives based on an assessment of risk to persons in the outby area. MSHA estimates that, based on this assessment of risk, 127 mines would need a total of 154 refuge alternatives in outby areas. MSHA estimates that the remaining 163 mines would not need a refuge alternative in outby areas based on an assessment of risk to persons in outby areas.
- All 10 mines with 500+ employees would request approval of a different location for refuge alternatives based on an assessment of risk to persons in outby areas and would need a total of 28 refuge alternatives, based on this assessment.

MSHA assumes that all of the estimated 182 refuge alternatives in outby areas would be constructed-in-place units with concrete stoppings and a 20-person capacity. The Agency is aware that there are other applications for refuge alternatives in outby areas, but believes that such alternatives would be more expensive than a constructed-in-place unit with concrete stoppings. MSHA has estimated costs under the assumption that all refuge alternatives in outby areas would be the least costly option available. Table IV-B1 shows the estimated number of refuge alternatives for outby areas, by mine size.

Table IV-B1: Number of Refuge Alternatives by Type and Mine Size.

Type of Refuge Alternative	Mine Size			All Underground Coal Mines
	1-19 Employees	20-500 Employees	501+ Employees	
Refuge Alternatives for Inby Areas				
Pre-fabricated Self-contained Unit Inby (10-person)	64	471	57	592
Materials Pre-positioned on Skid – Brattice & Wood Kit – Inby (10-person)	21	0	0	21
Materials Pre-positioned on Skid – Brattice & Wood Kit – Inby (20-person)	0	157	19	176
Materials Pre-positioned on Skid – Inflatable Barrier Kit – Inby (10-person)	21	0	0	21
Materials Pre-positioned on Skid – Inflatable Barrier Kit – Inby (20-person)	0	157	19	176
Subtotal for Inby Refuge Alternatives	106	785	95	986
Refuge Alternatives for Outby Areas				
Constructed-in-place Outby – Concrete Stoppings Unit (20-person)	0	154	28	182
Total Refuge Alternatives Inby and Outby	106	939	123	1168

First-Year Unit Costs of Refuge Alternatives, by Type

MSHA has estimated unit and components costs for each type of refuge alternative, and that information is summarized in Table IV-B2. Details of the estimated costs by type of refuge alternative are discussed below.

Many components and requirements are similar or identical for all refuge alternatives. MSHA assumes that the cost of the air monitoring component (multi-gas detector), communications, compressed air regulators, oxygen regulators, first aid supplies, hoses and wrenches, sanitation, and lighting method will be the same for all types of refuge alternatives. MSHA assumes that these costs would be included in the purchase price of pre-fabricated self-contained refuge alternatives.

In addition, MSHA estimates that high-capacity (HC) 4,500-psi cylinders of compressed air would be used in all refuge alternatives, at a cost of $405 each. The Agency estimates that one K-sized 2,200-psi cylinder of oxygen, costing $330, would be needed in all refuge alternatives for every two persons. MSHA assumes that these costs also would be included in the purchase price of pre-fabricated self-contained refuge alternatives.

Similarly, all refuge alternatives will include a harmful gas removal component. MSHA estimates a cost of $830 per person for a harmful gas removal component under the assumption that one half of the harmful gas removal components would use lithium hydroxide curtains and one half would use soda lime pellets. A 96 hour supply for one person is estimated to cost $960 for lithium hydroxide or $700 for the soda lime. MSHA averaged these two costs to yield the average cost of $830 per person for harmful gas removal. MSHA estimates that food and water would cost $10 per person per 24-hour period, or $40 per person for 96 hours as required under

proposed § 75.1507(e)(1). MSHA assumes that these costs would be included in the purchase price of pre-fabricated self-contained refuge alternatives.

Table IV-B2: Unit and Component Costs, by Type of Refuge Alternative

COST ITEM	TYPE OF REFUGE ALTERNATIVE					
	Pre-fabricated Self-contained Unit (10-Person)	Constructed-in-place Unit (20-Person)	Materials Pre-positioned To Construct a Secure Space			
			Brattice & Wood		Inflatable Barrier	
			10-Person	20-Person	10-Person	20-Person
Installation	$404	$472	$202	$202	$202	$202
Roof & rib support materials & installation	$108	$108	$108	$108	$108	$108
Signs materials & installation (5)	$50	$50	$50	$50	$50	$50
Unit price paid to manufacturer	$88,000					
Concrete blocks & mortar		$1,000				
Mandoors (2)		$300				
Air-monitoring (multi-gas detector)	($3,000)*	$3,000	$3,000	$3,000	$3,000	$3,000
Communications	($1,000)*	$1,000	$1,000	$1,000	$1,000	$1,000
Compressed air regulators (2)	($580)*	$580	$580	$580	$580	$580
Oxygen regulators (2)	($574)*	$574	$574	$574	$574	$574
First-aid supply	($200)*	$200	$200	$200	$200	$200
Hoses & wrenches	($200)*	$200	$200	$200	$200	$200
Sanitation (chemical toilet)	($100)*	$100	$100	$100	$100	$100
Chemical light sticks (8)	($16)*	$16	$16	$16	$16	$16
Compressed air cylinders at $405 each	($4,050)*	$2,430	$4,050	$5,670	$4,050	$5,670
Oxygen cylinders at $330 each (per 2 persons)	($1,650)*	$3,300	$1,650	$3,300	$1,650	$3,300
Harmful gas removal at $830 per person	($8,300)*	$16,600	$8,300	$16,600	$8,300	$16,600
Food & water at $10 per person per day	($400)*	$800	$400	$800	$400	$800
Transportation skid			$2,000	$2,000	$2,000	$2,000
Brattice curtain at $100 each			$200	$200	$100	$100
Interlocking wood pieces			$600	$600		
Inflatable barrier					$8,000	$8,000
Total	$88,562	$30,730	$23,230	$35,200	$30,530	$42,500

* Note: Estimated price paid to manufacturer includes this cost.

Pre-fabricated Self-contained Unit: 10-Person Unit for Working Section Areas (Inby)

A pre-fabricated self-contained refuge alternative would be one type of refuge alternative appropriate for locations near working sections (inby areas). Based on manufacturers' descriptions of these units, MSHA estimated that a pre-fabricated self-contained unit designed to support 20 persons would cost $100,000. This price would include the cost of the components and equipment and materials in the self-contained unit. However, a unit of that size, as presently constructed, would not meet the volume and space requirements in the proposed rule; MSHA estimated that a unit of that size could accommodate only 10 persons. Accordingly, the Agency reduced the cost of a pre-fabricated self-contained unit from $100,000 to $88,000, to reflect the reduced costs for oxygen, compressed air, harmful gas removal, and food and water for 10 persons rather than 20 persons.

The estimate would include the following costs:

- $5,670 for components and equipment and materials, identical for all refuge alternatives:
  - $3,000 for air monitoring (multi-gas detector);
  - $1,000 for communications;
  - $580 for 2 compressed air regulators at $290 each;
  - $574 for 2 oxygen regulators at $287 each;
  - $200 for first aid supplies;
  - $200 for a set of hoses and wrenches;
  - $100 for a sanitation method (chemical toilet); and
  - $16 for lighting (8 chemical sticks at $2 each);
- $14,400 for components and materials, similar for all refuge alternatives but which vary by quantities required:
  - $4,050 for 10 cylinders of compressed air at $405 each;
  - $1,650 for 5 cylinders of oxygen at $330 per two persons;
  - $8,300 for harmful gas removal at $830 per person for 10 persons; and
  - $400 for food and water for 96 hours at $40 per person for 10 persons.

Additional costs for a pre-fabricated self-contained unit, not included in the purchase price, would total $562 and would consist of:

- $404 to install the unit (4 miners x 7 hr x $33.70/hr);
- $158 for costs identical for all refuge alternatives:
  - $108 to install supplemental roof and rib support [($200 for materials such as roof bolts, mesh, and straps + 2 miners x $33.70/hr x 0.25 hr for labor) x 50%, the proportion of units expected to be located in areas needing supplementary roof and rib support]; and
  - $50 to install 5 signs identifying and directing persons to the unit ($10 for labor and materials to install each sign).

As shown in Table IV-B2, the estimated purchase cost for a pre-fabricated self-contained unit to accommodate 10-persons is $88,562.

Materials Pre-Positioned Near Working Sections (Inby) to be Constructed when Needed

Materials pre-positioned near working sections (inby areas), to construct a secure space with an isolated atmosphere (refuge alternative) when needed, would consist of kits mounted on material transportation skids. One type of kit would contain a pair of brattice curtains and a set of adjustable, interlocking wood pieces. The other type of kit would contain an inflatable barrier with a special airlock sock, with one brattice curtain to support it. Both of these kits can be equipped to accommodate either 10 or 20 persons.

MSHA estimates that common costs for all pre-positioned materials kits that do not depend on whether a brattice and wood kit or an inflatable barrier kit is used, nor whether the kits are 10-person or 20-person kits, total $8,030 and consist of:

- $202 to install the kit (2 miners x 3 hr x $33.70/hr).
- $158 for costs identical for all refuge alternatives—
  - $108 to install supplemental roof and rib support; and
  - $50 to install 5 signs identifying and directing persons to the kit.
- $5,670 for components and equipment and materials, identical for all refuge alternatives.
- $2,000 for a transportation skid.
- Components and materials similar for all refuge alternatives but which vary by quantities required—
  - 10 or 14 cylinders of compressed air at $405 each;
  - 5 or 10 cylinders of oxygen at $330 each;
  - $830 per person for harmful gas removal; and
  - $40 per person for food and water for 96 hours.

MSHA estimates that, in addition to the 6 high-capacity (HC) 4,500-psi cylinders of compressed air used for airlock purges and to maintain air pressure in the (assembled) unit, a 10-person materials kit would need 4 additional cylinders of compressed air to provide three air purges when the unit is assembled, for a total cost of $4,050 for 10 cylinders. Likewise, a 20-person materials kit would need 8 additional cylinders of compressed air to provide three air purges when the unit is assembled, for a total cost of $5,670 for 14 cylinders.

The Agency estimates that one K-sized 2,200-psi cylinder of oxygen, costing $330, would be needed for every two persons, for a total of $1,650 for a 10-person materials kit and $3,300 for a 20-person materials kit. MSHA estimates a cost of $830 per person for harmful gas removal, for a total cost of $8,300 for a 10-person materials kit and $16,600 for a 20-person materials kit. MSHA estimates a cost of $40 per person for food and water for 96 hours, for a total cost of $400 for a 10-person materials kit and $800 for a 20-person materials kit.

Some costs for pre-positioned materials kits vary by the type of materials included in the kit. MSHA estimates that materials kits with brattice cloth and wood would include two brattice curtains at a

cost of $100 each, for a total cost of $200 for both the 10-person and 20-person kits. Both the 10-person and 20-person brattice and wood materials kits would also include a set of adjustable, interlocking wood pieces at a total cost of $600. MSHA estimates the both the 10-person and 20-person inflatable barrier materials kits would include one brattice curtain at a cost of $100 and an inflatable barrier at a cost of $8,000.

As shown in Table IV-B2, MSHA estimates unit costs of $23,230 for a 10-person pre-positioned materials kit of brattice and wood; $35,200 for a 20-person pre-positioned materials kit of brattice and wood; $30,530 for a 10-person inflatable barrier materials kit; and $42,500 for a 20-person inflatable barrier materials kit.

Constructed-in-Place Unit with Concrete Stoppings: 20-Person Unit for Outby Areas

MSHA estimates that operators would choose a refuge alternative permanently constructed-in-place with concrete stoppings for outby areas. MSHA estimates that such constructed-in-place units would be built to accommodate 20 persons, with the following costs:

- $472 to construct and install the unit (2 miners x $33.70/hr. x 7 hr).
- $158 for costs identical for all refuge alternatives—
  - $108 to install supplemental roof and rib support; and
  - $50 to install 5 signs identifying and directing persons to the kit.
- $1,000 for block and mortar.
- $300 for 2 mandoors at $150 each.
- $5,670 for components and equipment and materials, identical for all refuge alternatives.
- $23,130 for components and materials, similar for all refuge alternatives but which vary by quantities required—
  - $2,430 for 6 cylinders of compressed air at $405 each;
  - $3,300 for 10 cylinders of oxygen at $330 each;
  - $16,600 for harmful gas removal at $830 per person for 20 persons; and
  - $800 for food and water ($40 per person for 20 persons for food and water).

MSHA estimates that, for a 20-person constructed-in-place unit, six high-capacity (HC) 4,500-psi cylinders of compressed air would be needed for airlock purges and to maintain air pressure in the unit and ten K-sized 2,200-psi cylinders of oxygen, costing $330 each, would be needed. MSHA estimates a cost of $16,600 for a harmful gas removal component and $800 for food and water for 20 persons for 96 hours.

As shown in Table IV-B2, MSHA estimates a cost of $30,730 for a 20-person refuge alternative constructed-in-place with concrete stoppings.

Total First-Year Costs for Refuge Alternatives

MSHA combines the unit cost for the various types and sizes of refuge alternatives with the estimated number of each type of refuge alternatives to derive an estimated first-year cost of $72.8

million for refuge alternatives ($67.2 million for refuge alternatives near working sections (inby) and $5.6 million for refuge alternative in outby areas).

The $67.2 million for refuge alternatives near working sections (inby) consists of:

- $52.4 million for 592 pre-fabricated self-contained 10-person capacity units: $5.7 million for mines with 1-19 employees ($88,562 x 64); $41.7 million for mines with 20-500 employees ($88,562 x 471) and $5.0 million for mines with 501+ employees ($88,562 x 57).
- $0.5 million for 21 brattice and wood 10-person capacity kits at $23,230 each for mines with 1-19 employees.
- $0.6 million for 21 inflatable barrier 10-person capacity kits at $30,530 each for mines with 1-19 employees.
- $6.2 million for 176 brattice and wood 20-person capacity kits: $5.5 million for mines with 20-500 employees ($35,200 x 157) and $0.7 million for mines with 501+ employees ($35,200 x19).
- $7.5 million for 176 inflatable barrier 20-person capacity kits: $6.7 million for mines with 20-500 employees ($42,500 x157) and $0.8 million for mines with 501+ employees ($42,500 x 19).

The estimated first-year costs for refuge alternatives in outby areas total $5.6 million for 182 concrete stoppings units (20-person capacity): $4.7 million for mines with 20-500 employees ($30,730 x 154) and $0.9 million for mines with 501+ employees ($30,730 x 28).

Annualized Costs of Refuge Alternatives, by Type

Annualized costs are one-time or intermittent costs that are amortized over the life of the investment to produce an equivalent annual cost. To calculate annualized costs for refuge alternatives, MSHA estimates that some cost items shown in Table IV-B2 have a 5-year service life, while others have a 10-year service life. MSHA multiplies the cost of each item with a 5-year service life by a factor of 0.244 and multiplies the cost of each item with a 10-year service life by a factor of 0.142. Both annualization factors use a 7 percent discount rate. The annualized cost of each type of refuge alternative is the sum of the annualized cost of each component or cost item. Table IV-B3 shows the estimated service life of each cost item and summarizes the annualized costs of each type of refuge alternative. Details of the annualized costs are discussed below.

Table IV-B3: Annualized Costs, by Type of Refuge Alternative

COST ITEM	Service Life (Years)	TYPE OF REFUGE ALTERNATIVE					
		Pre-fabricated Self-contained Unit (10-Person)	Constructed-in-place Unit (20-Person)	Materials Pre-positioned To Construct a Secure Space			
				Brattice & Wood		Inflatable Barrier	
				10-Person	20-Person	10-Person	20-Person
Installation	10	$57	$67	$29	$29	$29	$29
Roof & rib support materials & installation	10	$15	$15	$15	$15	$15	$15
Signs materials & installation (5)	10	$7	$7	$7	$7	$7	$7
Unit price paid to manufacturer	10	$12,496					
Concrete blocks & mortar	10		$142				
Mandoors (2)	10		$43				
Air-monitoring (multi-gas detector)	5	$522 *	$732	$732	$732	$732	$732
Communications	5	$174 *	$244	$244	$244	$244	$244
Compressed air regulators (2)	5	$101 *	$142	$142	$142	$142	$142
Oxygen regulators (2)	5	$100 *	$140	$140	$140	$140	$140
First-aid supply	5	$35 *	$49	$49	$49	$49	$49
Hoses & wrenches	5	$35 *	$49	$49	$49	$49	$49
Sanitation (chemical toilet)	5	$17 *	$24	$24	$24	$24	$24
Chemical light sticks (8)	5	$3 *	$4	$4	$4	$4	$4
Compressed air cylinders at $405 each	5	$705 *	$593	$988	$1,383	$988	$1,383
Oxygen cylinders at $330 each	5	$287 *	$805	$403	$805	$403	$805
Harmful gas removal at $830 per person	5	$1,444 *	$4,050	$2,025	$4,050	$2,025	$4,050
Food & water at $10 per person per day	5	$70 *	$195	$98	$195	$98	$195
Transportation skid	10			$284	$284	$284	$284
Brattice curtain at $100 each	5			$49	$49	$24	$24
Interlocking wood pieces	10			$85	$85		
Inflatable barrier	5					$1,952	$1,952
Total		$16,068	$7,301	$5,366	$8,287	$7,209	$10,129

* These components, materials, or equipment for a pre-fabricated self-contained unit would be replaced after 5 years, so the annualized costs are discounted by 5 years.

Pre-fabricated Self-contained Unit: 10-Person Unit for Inby Areas

MSHA estimates that a pre-fabricated self-contained unit that would accommodate 10 persons would cost $88,000 and have a 10-year service life. The Agency also annualizes over a 10-year period the estimated $562 cost for installation of the unit, installation of supplemental roof and rib supports, and installation of signs. These estimated annualized costs total $12,576 ($88,562 x 0.142)

After the first 5 years, the following components, equipment, or materials in the pre-fabricated self-contained unit would need to be replaced, at an estimated total cost of $20,070: cylinders of compressed air and of oxygen, regulators for the cylinders, hoses and wrenches, air monitoring component, harmful gas removal component, sanitation, lighting, communications, food and water, and first aid supplies. The $20,070 cost for these items is annualized over a 5-year period using a factor of 0.244 and is multiplied by a discount factor of 0.713 to reflect the fact that these costs would not be incurred until the 6th year after the rule takes effect. Thus, estimated annualized cost for the above replacement items is $3,492 ($20,070 x 0.244 x 0.713).

Total estimated annualized cost per pre-fabricated self-contained unit would be $16,068 ($12,576 + $3,492). The total estimated annualized cost for 592 pre-fabricated self-contained units (10-person capacity) is $9.5 million: $1.0 million for mines with 1-19 employees ($16,068 x 64); $7.6 million for mines with 20-500 employees ($16,068 x 471) and $0.9 million for mines with 501+ employees ($16,068 x 57).

Materials Pre-Positioned Near Working Sections to be Constructed when Needed

The estimated annualized cost for a 10-person capacity brattice and wood pre-positioned materials kit is $5,366. The total estimated annualized cost for 21 brattice and wood kits (10-person capacity) is $113,000 at mines with 1-19 employees ($5,366 x 21).

The estimated annualized cost for a 10-person capacity inflatable barrier pre-positioned materials kit is $7,209. The total estimated annualized cost for 21 inflatable barrier kits (10-person capacity) is $151,000 at mines with 1-19 employees ($7,209 x 21).

The estimated annualized cost for a 20-person capacity brattice and wood pre-positioned materials kit is $8,287. The total estimated annualized cost for 176 brattice and wood kits (20-person capacity) is $1.5 million: $1.3 million at mines with 20-500 employees ($8,287 x 157) and $160,000 at mines with 501+ employees ($8,287 x 19).

The estimated annualized cost for a 20-person capacity inflatable barrier pre-positioned materials kit is $10,129. The total estimated annualized cost for 176 inflatable barrier kits (20-person capacity) is $1.8 million: $1.6 million at mines with 20-500 employees ($10,129 x 157) and $190,000 at mines with 501+ employees ($10,129 x 19).

Constructed-in-Place Unit with Concrete Stoppings: 20-Person Unit for Outby Areas

The estimated annualized cost for a constructed-in-place unit is $7,301. The total estimated annualized cost for 182 concrete stoppings units is $1.3 million: $1.1 million for mines with 20-500 employees ($7,301 x 154) and $0.2 million for mines with 501+ employees ($7,301 x 28).

Total Annualized Costs for Refuge Alternatives

Including annualized replacement costs, MSHA estimates that annualized cost for the purchase and installation of all refuge alternatives would be $14.4 million.

Annual Costs for Refuge Alternatives

Cost of Refuge Alternatives for New Mines

Each year, new underground coal mines open, and these mines would incur costs for refuge alternatives that are not included in the $72.8 million estimated first-year cost. Based on an analysis of 2003-2007 MSHA data as of April 4, 2008, the Agency estimates that, each year, 18 percent of mines with 1-19 employees and 8 percent of mines with 20-500 employees would be new underground coal mines. MSHA estimates that there would be no new underground coal mines with 500+ employees. MSHA assumes that the number of refuge alternatives per new mine would be the same as for existing mines of the same size.

MSHA estimates that the annual number of refuge alternatives near working sections (inby) in new mines would be 82, consisting of 19 in mines with 1-19 employees (106 x 0.18) and 63 in mines with 20-500 employees (785 x 0.08). MSHA assumes that 50 percent of these 82 refuge alternatives (41) would be refuge alternatives removed from mines that had reached the end of their working life; the remaining 41 refuge alternatives would be new.

The Agency estimates that the cost per used refuge alternative would be $1,806. This cost consists of $324 [(60% x 2 miners x 6 hr x $33.70) + (40% x 2 miners x 3 hr x $33.70)] to remove the unit from the old mine, $1,000 (flat rate estimate) to transport the unit from the old mine to the new mine, $50 for new signs, $108 for supplemental roof and rib support, and $324 [(60% x 2 miners x 6 hr x $33.70) + (40% x 2 miners x 3 hr x $33.70)] to set up the unit in the new mine. The average estimated cost for a new refuge alternative is $67,600, a weighted average based on the estimated numbers of refuge alternatives in new mines by mine size [(19/82 x 60% x $88,562) + (19/82 x 20% x $23,230) + (19/82 x 20% x $30,540) + (63/82 x 60% x $88,562) + (63/82 x 20% x $35,200) + (63/82 x 20% x $42,500)]. MSHA estimates that the cost per year for all 82 refuge alternatives near working sections (inby) would be $2.8 million [(41 units x $1,806) + (41 units x $67,600)].

MSHA estimates that the annual number of refuge alternatives in outby areas of new underground coal mines would be 12 (154 units x 0.08), all of which would be new refuge alternatives in mines with 20-500 employees. As described earlier, the Agency estimates that the average cost to purchase and install a 20-person constructed-in-place refuge alternative with concrete stoppings is $30,730 per unit. Thus, the estimated cost per year for 12 units in outby areas would be $370,000 (12 x $30,730).

The total estimated cost per year for refuge alternatives in new underground coal mines would be $3.2 million ($2.8 million + $0.4 million). However, these costs would not begin until the second year after the rule would take effect. Therefore, MSHA applied a 7 percent discount factor to these costs. The Agency estimates that the total annual cost of refuge alternatives for new mines would be $3.0 million ($3.2 million/1.07): $0.6 million for mines with 1-19 employees and $2.4 million for mines with 20-500 employees.

Cost to Transport Refuge Alternatives and Install Supplemental Roof and Rib Supports

Proposed § 75.1506(b)(1) would require that refuge alternatives be located between 1,000 and 2,000 feet from the working face and from locations where mechanized mining equipment is being installed or removed. Therefore, the refuge alternatives would have to be transported as the working face advances. MSHA estimates that each refuge alternative near working sections (inby) would be transported an average of 25 times a year. MSHA estimates that it would take two miners 1 hour to transport a refuge alternative. The estimated annual cost to transport one refuge alternative is $1,700 (2 miners x $33.70/hr x 1 hr x 25 relocations/yr).

As previously explained, MSHA estimates that the average cost to install supplemental roof and rib support in the locations where there is a refuge alternative is $108. The estimated average annual cost to install supplemental roof and rib supports for a refuge alternative is $2,700 ($108 x 25 relocations per year). Thus, the average annual cost to transport a refuge alternative and install supplemental roof and rib supports is $4,400 ($1,700 + $2,700). The total annual cost to transport refuge alternatives and install supplemental roof and rib supports is estimated to be $4.4 million: $470,000 for mines with 1-19 employees ($4,400 x 106); $3.5 million for mines with 20-500 employees ($4,400 x 785); and $420,000 for mines with 501+ employees ($4,400 x 95).

Cost to Maintain and Repair Refuge Alternatives

Proposed § 75.1507(a)(2) requires that the emergency response plan include procedures or methods for maintaining approved refuge alternatives and components. MSHA has included the cost for maintaining refuge alternatives in the annualization factors applied to refuge alternative components. These annualization factors reflect the scheduled replacement of the components in refuge alternatives. MSHA assumes that any other maintenance costs would be negligible.

Proposed § 75.1506(e) would require mine operators to remove damaged refuge alternatives from service and to repair or replace them. While a refuge alternative is not in service, all persons except those doing the repairs would have to be withdrawn from the area. MSHA assumes that 10 percent of refuge alternatives near working sections (inby) and 5 percent of refuge alternatives in outby areas (which are less likely to be damaged since they are not transported after installation) would need to be repaired sometime during their 10-year service life. Based on these assumptions, MSHA estimates that each year there would be 13 repairs of refuge alternatives, consisting of: 2 repairs in mines with 1-19 employees; 9 repairs in mines with 20-500 employees; and 2 repairs in mines with 501+ employees.

MSHA estimates that the cost to repair a refuge alternative includes the cost of replacement parts (assumed to be 10 percent of the unit's purchase price) and 2 hours of labor for each repair. The estimated annual cost to make 13 repairs to refuge alternatives would be $74,000, which consists of:

- $11,700 in mines with 1-19 employees [2 repairs x (10% x $57,700 average price of units in inby areas) + (2 hr x $33.70/hr)];
- $52,600 in mines with 20-500 employees [(8 repairs x 10% x $61,200 average price of units in inby areas) + (1 repair x 10% x $31,000 average price of units in outby areas) + (2 hr x $33.70/hr)];
- $9,200 in mines with 501+ employees [(1 repair x 10% x $61,200 average price of units in inby areas) + (1 repair x 10% x $30,000 average price of units in outby areas) + (2 hrs. x $33.70/hr)].

In some cases, mines are large enough so that miners could be shifted to another working area while repairs are being made to the refuge alternative. MSHA assumes that a work crew consists of nine miners and one supervisor. In other cases, where miners cannot be shifted to another area to work, they would have to be withdrawn from the mine until the refuge alternative is repaired, with the exception of those persons doing the repairs.

Of the 13 annual repairs, MSHA assumes that 7 repairs would require miners to shift to another work area for 1 hour of time at an estimated cost of $388 [(9 miners x $33.70/hr) + (1 supervisor x $85.14/hr)]. Thus, the total cost related to these 7 repairs for a work crew to shift to another work area, would be approximately $2,700, which consists of:

- $1,900 ($388 x 5 repairs in mines with 20-500 employees) and;
- $800 ($388 x 2 repairs in mines with 501+ employees).

MSHA assumes that the remaining 6 repairs would require withdrawing miners from the mine until the refuge alternative is repaired. MSHA estimates that this situation would occur 2 times per year in mines with 1-19 employees and 4 times per year in mines with 20-500 employees for 8 hours each time. MSHA assumes that withdrawing miners would not occur in mines with 501+ employees.

The withdrawal of a work crew of nine miners and one supervisor would result in costs associated with delay in production and additional labor costs required for that delayed production. Based on Agency data on tons produced per miner-hour and the price per ton of coal, MSHA estimates that if miners had not been withdrawn, a work crew in mines with 1-19 employees would produce $7,550 worth of coal in 8 hours, and a work crew in mines with 20-500 employees would produce $11,291 worth of coal in 8 hours. MSHA assumes that the coal not produced during the withdrawal of the miners would instead be extracted 5 years later. MSHA calculates the cost of the delay as the value of the coal if produced currently in 8 hours, less the present value of the coal produced in 5 years.

MSHA uses a discount rate of 7 percent and standard discounting formula over 5 years $(1/1.07)^5$ to calculate the present value of the delayed coal production. The present value of $1.00 worth of production in 5 years is $0.713. ($1.00 discounted by 7 percent per year over 5 years = $(1/1.07)^5$ = $ 0.713), so that the cost of delaying $1.00 worth of production by 5 years is $0.287 ($1.00 - $0.713). Similarly, the cost of the delayed production is equal to 0.287 (1 – 0.713) multiplied by the value of 8 hours of current production, for a cost of $2,167 [(0.287 x $7,500] for mines with 1-19 employees and $3,241 [0.287 x $11,291] for mines with 20-500 employees.

A second cost for the period when miners are withdrawn is the cost of the labor needed for the delayed 8 hours of coal production (delayed by 5 years). Based upon Agency data on wage rates, MSHA estimates the cost is equal to the labor cost for a shift multiplied by 0.713, or an estimated $2,215 (8 hrs. x $388 x 0.713).

Based upon Agency data on tons produced per miner-hour, the price per ton of coal, and wage rates, MSHA estimates that the cost of 8 hours of delayed production for a crew of ten persons would be: $4,382 for mines with 1-19 employees ($2,167 + $2,215) and $5,456 for mines with 20-500 employees ($3,241 + $2,215). Thus, the Agency estimates that cost related to withdrawing miners from the mine due to repairs to refuge alternatives would be $30,600, consisting of:

- $8,800 ($4,382 x 2 withdrawals in mines with 1-19 employees) and;
- $21,800 ($5,456 x 4 withdrawals in mines with 20-500 employees)].

The Agency estimates that total annual cost related to repairs to refuge alternatives would be $107,000 ($74,000 for replacement parts and repair time + $2,700 for situations when miners would have to be shifted to another area to work + $30,600 for situations when miners would have to be withdrawn from the mine).

Summary of Yearly Costs to Purchase, Install, Transport, and Maintain and Repair Refuge Alternatives

Combining the annualized cost for existing mines to purchase and install refuge alternatives, the annual cost for new mines to purchase and install refuge alternatives, and the annual costs to transport refuge alternatives (including to preparing roof and ribs), and the annual cost to maintain and repair refuge alternatives, MSHA estimates a total yearly cost of $21.8 million. Table IV-B4 shows the distribution of these costs by type of cost and by mine size.

Table IV-B4: Summary of Yearly Cost to Purchase, Install, Transport (Including Prepare Roof and Ribs), and Maintain and Repair Refuge Alternatives

Type of Refuge Alternative Cost	Mine Size			All Underground Coal Mines
	1-19 Employees	20-500 Employees	501+ Employees	
Purchase and installation for existing mines	$1.3 million	$11.6 million	$1.5 million	$14.4 million
Purchase and installation for new mines	$600,000	$2.4 million	n.a.	$3.0 million
Relocations (including roof and rib preparation)	$470,000	$3.5 million	$420,000	$4.4 million
Maintenance and Repairs	$20,000	$80,000	$10,000	$110,000
Total Yearly Cost	$2.4 million	$17.5 million	$1.9 million	$21.8 million

Section IV-C: Roof Control Plans, Pre-Shift Examinations, Map Revisions, and Emergency Response Plans

Roof Control Plan

Proposed § 75.221 would require the roof control plan to include a description of the roof and rib support necessary for the location of the refuge alternative. MSHA estimates that the revision of the roof control plan would be a one-page addendum that would be filed with MSHA once with no additional revisions needed. MSHA assumes that the roof control plan would be revised by a supervisor, at an hourly wage rate of $85.14, and that the revision would take 30 minutes (0.5 hours), on average, for all mines. In addition, MSHA estimates that a clerical employee would take a total of 3 minutes (0.05 hours), at an hourly wage of $26.37, to copy and submit the one-page addendum to MSHA, plus approximately $1.00 for copies and postage.

Based on the previous assumptions, the estimated cost for a mine to revise the roof control plan is approximately $45 ($85.14 x 0.5 hr + $26.37 x 0.05 hr + $1.00). The estimated first-year cost is $4,800 for 106 mines with 1-19 employees, $17,600 for 391 mines with 20-500 employees, and $450 for 10 mines with 501+ employees, for a total of $23,000.

MSHA estimates that the addendum for roof and rib support for refuge alternative locations would be used for 10 years. Using an annualization factor of 0.142, the estimated annualized cost is $700 for 106 mines with 1-19 employees; $2,500 for 391 mines with 20-500 employees; and $100 for 10 mines with 501+ employees; for a total of $3,300.

Pre-Shift Examination of Refuge Alternatives

Proposed § 75.360 (d) would require that persons conducting the pre-shift examination check the refuge alternative for damage, the integrity of the tamper-evident seal and the mechanisms required to activate the refuge alternative, and the ready availability of compressed oxygen and air. The pre-shift examination takes place before each shift.

MSHA calculates the total annual cost by mine size category by multiplying the value of the additional time it would take a supervisor to examine a refuge alternative during a pre-shift examination by the number of shifts per day, by the number of work days per year, and by the number of refuge alternatives. MSHA estimates that a supervisor would perform the pre-shift examination and would take 6 minutes (0.1 hours) to examine each refuge alternative, at an hourly wage of $85.14. In addition, MSHA estimates the following:

- There would be 106 refuge alternatives in mines with 1-19 employees, 939 refuge alternatives in mines with 20-500 employees, and 123 refuge alternatives in mines with 500+ employees.
- The number of shifts per work day per mine would be one shift for mines with 1-19 employees, two shifts for mines with 20-500 employees, and three shifts for mines with 501+ employees.
- The number of work days per year would be 260 days (5 days per week) for mines with 1-19 employees; 312 days (6 days per week) for mines with 20-500 employees; and 365 days (7 days per week) for mines with 501+ employees.

Based on the previous estimates, the annual cost is approximately $235,000 for mines with 1-19 employees ($85.14/hr. x 0.10 hr. x 1 shift/day x 260 work days x 106 refuge alternatives); $5.0 million for mines with 20-500 employees ($85.14/hr. x 0.10 hr. x 2 shifts/day x 312 work days x 939 refuge alternatives); and $1.1 million for mines with 501+ employees ($85.14/hr. x 0.10 hr. x 3 shifts/day x 365 work days x 123 refuge alternatives). The total annual cost for all mines to examine refuge alternatives during pre-shift examination is approximately $6.4 million.

Mine Ventilation Map, Mine Map, and Escapeway Map

Proposed § 75.372 would require the mine ventilation map to include the location of all refuge alternatives. In addition, proposed § 75.1200 would require the mine map to include the location of all refuge alternatives, and proposed § 75.1505 would require the escapeway map to include the location of all refuge alternatives. MSHA estimates that all maps would need an initial revision plus subsequent revisions each time a refuge alternative is transported to a new location.

MSHA assumes that this requirement would apply to the approximately 507 mines that would install refuge alternatives. For cost estimation purposes, MSHA assumes that all maps at a mine would be revised at the same time. Because mines have to file maps under the existing standard, MSHA includes no filing costs in this estimate. MSHA assumes that the initial revisions to the maps would be performed by a supervisor, at an hourly wage rate of $85.14, and would take, on average, 30 minutes (0.5 hours) for mines with 1-19 employees, 45 minutes (0.75 hours) for mines with 20-500 employees, and one hour for mines with 501+ employees.

Using these assumptions, MSHA calculates the cost for the initial revision of the maps as the value of a supervisor's time to revise the maps multiplied by the number of mines. The first-year cost for all mines with refuge alternatives is estimated to be $4,500 for mines with 1-19 employees ($85.14/hr x 0.5 hr x 106 mines); $25,000 for mines with 20-500 employees ($85.14/hr x 0.75 hrs x 391 mines); and $850 for mines with 501+ employees ($85.14/hr x 1.0 hr x 10 mines), for a total first-year cost of $30,000.

MSHA estimates that the initial revision of the maps is a first-year cost and would be used for the life of the mine (10 years). Using an annualization factor of 0.142, the estimated yearly cost is $640 for 106 mines with 1-19 employees, $3,550 for 391 mines with 20-500 employees, and $120 for 10 mines with 501+ employees, for a total yearly cost of $4,300.

To estimate the costs of revising maps when refuge alternatives are transported, MSHA assumes that a supervisor, at an hourly wage rate of $85.14, would take 90 seconds (0.025 hours) to revise all maps to reflect the new location because such revisions would be computerized and would occur quickly. MSHA assumes that outby refuge alternatives would not be relocated and estimates that each inby refuge alternative would be transported an average of 25 times per year. MSHA calculates the total annual cost of revising the maps when refuge alternatives are relocated as the value of the supervisor's time to make each revision, multiplied by the average number of relocations per refuge alternative each year and by the number of refuge alternatives. The estimated annual cost is $5,600 for mines with 1-19 employees ($85.14/hr x 0.025 hr x 106 inby refuge alternatives x 25 relocations), $41,800 for mines with 20-500 employees ($85.14/hr x 0.025 hr x 785 inby refuge alternatives x 25 relocations), and $5,100 for mines with 501+ employees ($85.14/hr x 0.025 hr x 95 inby refuge alternatives x 25 relocations), for a total of $52,500.

MSHA estimates a total yearly cost of $57,000 ($4,300 for initial revisions + $52,500 relocation revisions) for the requirements in proposed §§ 75.372, 75.1200, and 75.1505 that the mine ventilation map, mine map, and escapeway map, respectively, reflect the locations of refuge alternatives.

Emergency Response Plan

Proposed § 75.1507 would require the mine emergency response plan (ERP) to include information about the refuge alternatives used in the mine, including a description of the types of refuge alternatives, procedures for maintaining them, the rated capacity and expected number of occupants, details about the supply of breathable air, and suitable locations.

MSHA estimates that, for the 507 mines with refuge alternatives, the revision process for the emergency response plan would include an initial revision plus necessary changes, all of which would be submitted to MSHA.

MSHA assumes that the initial and necessary changes would be performed by a supervisor at an hourly wage of $85.14 and on average would take: 12 hours for mines with 1-19 employees; 24 hours for mines with 20-500 employees, and 36 hours for mines with 501+ employees. For cost estimation purposes, MSHA assumes that the information on refuge alternatives would be included in 12 pages of the emergency response plan for mines with 1-19 employees, 24 pages for mines with 20-500 employees, and 36 pages for mines with 501+ employees. In addition, MSHA estimates that a clerical employee would take a total of 6 minutes (0.10 hours) to copy and submit the emergency response plan information for mines with 1-19 employees, 12 minutes (0.20 hours) for mines with 20-500 employees, and 15 minutes (0.25 hours) for mines with 501+ employees. MSHA assumes copy and postage costs of

$3 for mines with 1-19 employees, $6 for mines with 20-500 employees, and $8 for mines with 501+ employees.

Based on the previous assumptions, MSHA calculates a cost per mine of about $1,000 per mine for mines with 1-19 employees ($85.14/hr x 12 hr + $26.37/hr x 0.10 hr + $3 copy and postage cost), $2,000 per mine for mines with 20-500 employees ($85.14/hr x 24 hr + $26.37/hr x 0.20 hrs+ $6 copy and postage cost), and $3,100 per mine for mines with 501+ employees ($85.14/hr x 36 hr + $26.37/hr x 0.25 hr + $8 copy and postage cost).

The total for all mines would be the sum of the cost for each mine size category, or approximately $943,000 ($1000 x 106 mines with 1-19 employees + $2,000 x 391 mines with 20-500 employees + $3,100 x 10 mines with 501+ employees). Using an annualization factor of 0.142, MSHA estimates a total yearly cost of $15,500 for mines with 1-19 employees, $114,000 for mines with 20-500 employees, and $4,300 for mines with 501+ employees, for a total of $134,000 for revising emergency response plans to comply with the requirements in proposed § 75.1507.

Table IV-C shows, by mine size, a summary of the estimated $6.6 million in total yearly costs of complying with the requirements of the proposed rule regarding pre-shift examinations of refuge alternatives and revising the roof control plan, mine ventilation map, mine map, escapeway map, and emergency response plan with the required information on refuge alternatives.

Table IV-C: Summary of Yearly Costs for Pre-Shift Exams and Plan and Map Revisions

Proposed Provisions	Mine Size			Total
	1-19 Employees	20-500 Employees	501+ Employees	
Roof Control Plan	$700	$2,500	$100	$3,000
Pre-Shift Examination	$235,000	$5.0 million	$1.1 million	$6.4 million
Mine Ventilation Map, Mine Map, and Escapeway Map	$6,300	$45,300	$5,200	$57,000
Emergency Response Plan	$15,000	$114,000	$4,000	$134,000
Total	$0.3 million	$5.2 million	$1.2 million	$6.6 million

Section IV-D: Training

The proposed rule would require that the emergency evacuation and firefighting program of instruction include quarterly training and annual expectations training in the activation, use, and maintenance of refuge alternatives. The proposal also would require training for persons who examine refuge alternatives before each shift, as well as training for persons who conduct maintenance and repair of refuge alternatives. This section addresses MSHA's estimates of the costs for training required under the proposed rule.

Mine Emergency Evacuation and Firefighting Program of Instruction

Proposed § 75.1502(c)(3)would require that the mine emergency evacuation and firefighting program of instruction be revised to include instruction for miners in the activation and use of refuge alternatives in an emergency, a summary of procedures for constructing and activating refuge

alternatives, and a summary of procedures for using refuge alternatives. This proposed requirement would apply only to those mines that have refuge alternatives.

MSHA estimates that the revision of this program of instruction would be a two-page addendum that would be submitted to MSHA once, with no additional revisions needed. MSHA assumes that this program of instruction would be revised by a supervisor, at $85.14 per hour, and would take 30 minutes (0.5 hours), on average, for all mines. In addition, MSHA estimates that a clerical employee, at $26.37 per hour, would take a total of 3 minutes (0.05 hours) to copy and submit the two-page addendum. MSHA assumes approximately $1.00 copy and postage costs.

Based on the previous assumptions, MSHA calculates the total cost per mine to revise and submit the program of instruction to be $45 ($85.14/hr x 0.5 hr + $26.37/hr x 0.05 hours + $1.00 copy and postage cost). MSHA calculates the first-year cost as the cost per mine multiplied by the number of mines with refuge alternatives: $4,800 for mines with 1-19 employees, $17,700 for mines with 20-500 employees, and $450 for mines with 501+ employees, for a total of approximately $23,000. Using an annualization factor of 0.142, MSHA estimates a yearly cost of $700 for mines with 1-19 employees, $2,500 for mines with 20-500 employees, and $100 for mines with 501+ employees, for a total of $3,300 to revise the mine emergency evacuation and firefighting program of instruction to comply with the requirements in proposed § 75.1502.

Quarterly Emergency Evacuation Training and Drills

Proposed § 75.1504(b) would require that the quarterly mine emergency evacuation training and drills include physically locating the refuge alternative; locating the refuge alternative while reviewing the mine and escapeway maps, the firefighting plan, and the mine emergency evacuation plan; reviewing the checklist for construction and activation of the refuge alternative and components; and reviewing the procedures for the use of the refuge alternative and components.

MSHA estimates that the proposed requirements for quarterly training on refuge alternatives would be integrated into existing quarterly drills and training. Because quarterly training is required under the existing rule, MSHA estimates no additional cost for quarterly training certification related to refuge alternatives. MSHA assumes that trainers for the quarterly drills and training would be supervisors. Supervisors providing the training would be considered participants in the training for compliance purposes.

MSHA assumes that all coal miners working underground and 20 percent of the contractors working underground in the 507 mines with refuge alternatives would receive quarterly training and annual expectations training on refuge alternatives. Based on these assumptions, MSHA estimates that 38,400 persons would receive this training, distributed by mine size as follows.

- For mines with 1-19 employees: 1,500 miners and 50 contractors, totaling 1,550 persons trained.
- For mines with 20-500 employees: 30,300 miners and 800 contractors, totaling 31,100 persons trained.
- For mines with 501+ employees: 5,600 miners and 150 contractors, totaling 5,800 persons trained.

MSHA assumes that supervisors constitute 15 percent of the 38,400 persons who would receive training. MSHA estimates that the proposed requirements would result in an additional 15 minutes (0.25 hour) per quarterly training at an hourly wage of $33.70 per miner, and $85.14 per supervisor.

Based on these assumptions, MSHA calculates a weighted average annual cost of approximately $41 per person for the additional quarterly training related to refuge alternatives [($33.70/hr x 0.25 hr x 0.85, the proportion of trained persons who are miners + $85.14/hr x 0.25 hr x 0.15, the proportion of trained persons who are supervisors) x 4 times per year]. The total annual cost for quarterly drills and training is calculated as the cost per person of $41 multiplied by the estimated number of persons to be trained. MSHA estimates an annual cost of $64,000 for mines with 1-19 employees ($41/yr x 1,550 persons); $1.3 million for mines with 20-500 employees ($41/yr x 31,100 persons); and $240,000 for mines with 501+ employees ($41/yr x 5,800 persons), for a total annual cost of $1.6 million related to the requirements for quarterly training in proposed § 75.1504. MSHA assumes that new miners would receive quarterly training in the next scheduled quarter.

Annual Expectations Training

Proposed § 75.1504(c)(3) would require that each miner receive annual expectations training in the activation and use of refuge alternatives. This training would include how to construct, where applicable, how to activate, and how to use refuge alternatives similar to those in use at the mine, how to activate and operate the components and equipment, and when to use the refuge alternative during a mine emergency. Under the proposal, expectations training would be required for miners within the first quarter of employment.

MSHA estimates that 38,400 miners working underground would receive regularly scheduled annual expectations training, and that 15 percent of these, or approximately 5,800 persons, would be supervisors. MSHA estimates that this training would be integrated into existing annual expectations training for self-contained self-rescue devices. MSHA estimates that it would take 3 hours to train persons in the use of refuge alternatives and components. Since MSHA assumes that expectations training on refuge alternatives would occur in conjunction with other annual expectations training, MSHA estimates that no additional travel time and associated costs would be incurred. Because annual expectations training is required under the existing standard, MSHA estimates no additional cost for annual expectations training certification related to refuge alternatives.

In addition to the estimated 38,400 miners (including 5,800 supervisors) receiving regularly scheduled annual expectation training, MSHA estimates that additional miners will need to receive expectations training each year due to turnover. MSHA estimates that the annual coal miner turnover rate is 7 percent. MSHA also assumes that, of the newly employed miners, 25 percent would be able to take training in the mine's scheduled annual expectations training and the remaining 75 percent, or about 2,000 miners (38,400 x .07 x.75), would have to receive expectations training from a training contractor in a separate session. MSHA also estimates that supervisors constitute 15 percent of miners, including newly employed miners. Based on these assumptions, MSHA estimates a total of 34,350 miners to be trained (85 percent of 40,400) and 6,100 supervisors to be trained (15 percent of 40,400).

For cost estimation purposes, MSHA assumes that mines would hire a contractor to provide the annual expectations training on the use of refuge alternatives. MSHA estimates that a training contractor would charge $150 per miner for regularly scheduled training, which would cover the cost of the trainer's time, the facility, and the equipment (i.e., a model refuge alternative and components). MSHA estimates that separate training sessions for newly hired miners would involve fewer economies

of scale than regularly scheduled annual expectations training and would therefore be offered at a 33-percent higher cost, approximately $200 per miner.

Based on these assumptions, MSHA estimates the annual cost related to the requirements for annual expectations training as follows:

- Miner wage $33.70 x 3 hours x 34,350 miners to be trained (1,400 in mines with 1-19 employees, 27,800 in mines with 20-500 employees, 5,200 in mines with 501+ employees)
- Supervisor wage $85.14 x 3 hours x 6,100, the estimated number of supervisors to be trained (200 in mines with 1-19 employees, 4,900 in mines with 20-500 employees, 1,000 in mines with 501+ employees)
- $150 scheduled training fee x 38,400, the estimated number of miners and supervisors to receive scheduled training trained (1,500 in mines with 1-19 employees, 31,100 in mines with 20-500 employees, 5,800 in mines with 501+ employees)
- $200 separate training fee x 2,000, the estimated number of miners and supervisors to receive separate training. (100 in mines with 1-19 employees, 1,600 in mines with 20-500 employees, 300 in mines with 501+ employees)

MSHA estimates an annual cost of $450,000 for mines with 1-19 employees; $9.1 million for mines with 20-500 employees; and $1.7 million for mines with 501+ employees, for a total annual cost of $11.2 million related to the requirements for annual expectations training in proposed § 75.1504.

Refuge Alternative Examination, Transportation, Maintenance, and Repair Training

Proposed § 75.1508(a)(1) would require that persons who examine, maintain, repair, and transport refuge alternatives and components be trained in how to perform this work. Under the existing rule, § 75.360(a)(1) requires that a certified person conduct a pre-shift examination, and proposed § 75.360(d) would include refuge alternatives in the pre-shift examination. The person conducting a pre-shift examination of the refuge alternative would check the refuge alternative for damage, the integrity of the tamper-evident seal, mechanisms required to activate the refuge alternative, and the ready availability of compressed oxygen and air. MSHA estimates that training to perform this function would take less than 3 minutes and would be integrated at a negligible cost into the training process for certified persons to perform a pre-shift examination under existing § 75.360(a)(1).

Proposed § 75.1508(a)(1) would also require that persons who are assigned to conduct maintenance and repair on the refuge alternative and to transport the refuge alternative be trained. MSHA estimates that persons assigned to conduct maintenance and repair and to transport the refuge alternative would receive instructions from the manufacturer at the time of purchase as part of the purchase price. MSHA also estimates that two miners per mine would receive this training, each at an hourly wage of $33.70, and that the training would take about 1 hour. MSHA would require a record of the training and estimates that recording by a supervisor would take about 3 minutes (0.05 hours).

Based on these assumptions, MSHA calculates a cost of about $72 per mine for training to maintain, repair, and transport a refuge alternative ($33.70 x 2 miners x 1 hr + $85.14 x 0.05 hr). MSHA estimates a total annual cost of $36,000 for all mines with refuge alternatives: $7,600 for mines with 1-19 employees (106 x $72); $28,200 for mines with 20-500 employees (391 x $72); and $700 for mines with 501+ employees (10 x $72).

Table IV-D shows a summary of the approximately $12.8 million in total yearly training costs under the proposed rule.

Table IV-D: Summary of Total Yearly Training Costs, by Mine Size

Proposed Provisions	Mine Size			Total
	1-19 Employees	20-500 Employees	501+ Employees	
Program of Instruction Revision	$700	$2,500	$100	$3,300
Quarterly Training	$64,000	$1.3 million	$239,000	$1.6 million
Annual Expectations Training	$450,000	$9.1 million	$1.7 million	$11.2 million
Transportation, Examination, and Maintenance and Repair Training	$7,600	$28,000	$1,000	$36,000
Total	$0.5 million	$10.4 million	$1.9 million	$12.8 million

OTHER RELEVANT INFORMATION

The costs estimated in this Preliminary Regulatory Economic Analysis represent what MSHA believes to be the upper bound of the range of estimated compliance costs. MSHA has presented these upper-bound estimates as a conservative approach to estimating compliance costs. These upper-bound estimates are based in part on MSHA's assumption that 60 percent of refuge alternatives required under the proposed rule near working sections (inby) would be pre-fabricated self-contained units and that the remaining 40 percent would be materials pre-positioned on transportation skids (half brattice and wood materials and half inflatable barrier materials).

However, based upon a review of literature and discussions with manufacturers of refuge alternatives, MSHA believes that a more realistic assumption regarding the types of refuge alternatives required under the proposal near working sections (inby) would be 40 percent pre-fabricated self-contained units and 60 percent materials pre-positioned on transportation skids (half brattice and wood materials and half inflatable barrier materials).

MSHA estimates that a pre-fabricated self-contained refuge alternative would cost more than a refuge alternative consisting of materials pre-positioned on a transportation skid. In addition, MSHA estimates that fewer refuge alternatives near working sections (inby) would be needed under the revised assumption because units consisting of materials pre-positioned on skids can accommodate 20 persons whereas pre-fabricated self-contained units can only accommodate 10 persons. As a result, MSHA estimates that costs would be lower under the revised assumption because fewer refuge alternatives near working sections (inby) would be required in total and because a smaller percentage, specifically 40 percent rather than 60 percent, of refuge alternatives near working sections (inby) would be the more costly pre-fabricated self-contained units. MSHA believes that this more realistic assumption provides a lower-bound estimate of costs.

Table IV-E1 shows the estimated number of refuge alternatives, by type of refuge alternative, under the assumption that 40 percent of refuge alternatives near working sections (inby) would be pre-

fabricated self-contained units and the remainder would be materials pre-positioned on transportation skids (half brattice and wood and half inflatable barrier).

Table IV-E1: Number of Refuge Alternatives by Type and Mine Size.

Type of Refuge Alternative	Mine Size			All Underground Coal Mines
	1-19 Employees	20-500 Employees	501+ Employees	
Refuge Alternatives for Inby Areas				
Pre-fabricated Self-contained Unit Inby (10-person)	42	274	33	349
Materials Pre-positioned on Skid – Brattice & Wood Kit – Inby (10-person)	32	0	0	32
Materials Pre-positioned on Skid – Brattice & Wood Kit – Inby (20-person)	0	206	25	231
Materials Pre-positioned on Skid – Inflatable Barrier Kit – Inby (10-person)	32	0	0	32
Materials Pre-positioned on Skid – Inflatable Barrier Kit – Inby (20-person)	0	205	25	230
Subtotal for Inby Refuge Alternatives	106	685	83	874
Refuge Alternatives for Outby Areas				
Constructed-in-place Outby – Concrete Stoppings Unit (20-person)	0	154	28	182
Total Refuge Alternatives Inby and Outby	106	839	111	1,056

The change in the assumption about the number of each type of refuge alternative near working sections (inby) would change the following cost estimates in this PREA:

- The estimated yearly cost for existing mines to purchase and install refuge alternatives would change from $14.4 million (in Table IV-B4) to $11.6 million. The yearly cost would change from: $1.3 million to $1.1 million for mines with 1-19 employees; 11.6 million to $9.3 million for mines with 20-500 employees; and $1.5 million to $1.2 million for mines with 501+ employees.

- The estimated yearly cost for new mines to purchase and install refuge alternatives would change from $3.0 million (in Table IV-B4) to $2.4 million. The yearly cost would change from $600,000 to $470,000 for mines with 1-19 employees and from $2.4 million to $1.9 million for mines with 20-500 employees. (MSHA estimates that there will be no new mines with 501+ employees.)

- The estimated yearly cost for mines to relocate refuge alternatives (including roof and rib preparation) would change from $4.4 million (in Table IV-B4) to $3.9 million. For mines with

1-19 employees, the yearly cost would remain the same at $470,000. The yearly cost would change from $3.5 million to $3.0 million for mines with 20-500 employees and from $420,000 to $370,000 for mines with 501+ employees.

- The estimated yearly cost for mines to repair refuge alternatives would change from $110,000 (in Table IV-B4) to $92,000. The yearly cost would change from: $20,000 to $17,000 for mines with 1-19 employees; $80,000 to $66,000 for mines with 20-500 employees; and $10,000 to $9,000 for mines with 501+ employees.

- The estimated yearly cost for mines to conduct pre-shift examinations of refuge alternatives would change from $6.4 million (in Table IV-C) to $5.7 million. For mines with 1-19 employees, the yearly cost would remain the same at $235,000. The yearly cost would change from $5.0 million to $4.5 million for mines with 20-500 employees and from $1.1 million to $1.0 million for mines with 501+ employees.

- The estimated yearly cost for mines to revise mine maps when refuge alternatives are moved would change from $52,500 to $46,500. (The initial cost of revising maps when refuge alternatives are installed would not change, because the estimated number of mines that would install refuge alternatives, and therefore initially revise their maps, would remain the same.) The total yearly cost to revise mine maps would change from $57,000 (in Table IV-C) to $51,000. For mines with 1-19 employees, the yearly cost would remain the same at $6,300. The yearly cost would change from $45,300 to $40,000 for mines with 20-500 employees and from $5,200 to $4,500 for mines with 501+ employees.

Table IV-E2 summarizes the yearly costs of the proposed rule under MSHA's revised assumption for refuge alternatives near working sections. As a result of the change in assumptions, the estimated yearly cost for mine operators would change from $41.2 million (in Table IV-1) to $36.6 million. By mine size, the estimated yearly cost would be $2.8 million for operators with 1-19 employees, $29.3 million for operators with 20-500 employees, and $4.5 million for operators with 500+ employees.

Table IV-E2: Summary of Yearly Costs of Proposed Rule

Proposed Requirement				**Yearly Cost**
Cost to Manufacturers				
Application and Approval				$2.1 million
Cost to Mine Operators				
	Mine Size			
	1-19 employees	20-500 employees	501+ employees	Total
Purchase, Installation, Transportation, and Repair of Refuge Alternatives	$2.0 million	$14.3 million	$1.6 million	$17.9 million
Pre-Shift Exams and Revisions to Plans and Maps	$260,000	$4.6 million	$1.0 million	$5.9 million
Training	$520,000	$10.4 million	$1.9 million	$12.8 million
Subtotal of Operators' Yearly Costs	$2.8 million	$29.3 million	$4.5 million	$36.6 million
Cost to Manufacturers and Mine Operators				
Total Yearly Costs				$38.7 million

Table IV-E3 summarizes the first-year costs of the proposed rule under the assumption that 40 percent of refuge alternatives near working sections (inby) would be pre-fabricated self-contained units and the remainder would be materials pre-positioned on transportation skids (half brattice and wood and half inflatable barrier). The change in assumptions would reduce the estimated first-year cost from $102.6 million (in Table IV-3) to $84.1 million, of which $2.1 million would be manufacturer costs and $82.1 million would be mine operator costs. The distribution of the $82.1 million cost by mine size would be approximately: $7.3 million for operators with 1-19 employees; $65.7 million for operators with 20-500 employees; and $9.1 million for operators with 501+ employees.

Table IV-E3: Summary of First-Year Costs of Proposed Rule

Proposed Requirement				First-Year Cost
Cost to Manufacturers				
Application and Approval				$2.1 million
Cost to Mine Operators				
	Mine Size			
	1-19 employees	20-500 employees	501+ employees	Total
Purchase, Installation, Transporting, and Repair of Refuge Alternatives	$6.4 million	$50.0 million	$6.1 million	$62.5 million
Pre-Shift Exams and Revisions to Plans and Maps	$360,000	$5.3 million	$1.1 million	$6.8 million
Training	$530,000	$10.4 million	$1.9 million	$12.8 million
Subtotal of Operators' First-Year Costs	$7.3 million	$65.7 million	$9.1 million	$82.1 million
Cost to Manufacturers and Mine Operators				
Total First-Year Costs				$84.1 million

FEASIBILITY

Although MSHA has concluded that the requirements of the proposed rule would be both technologically and economically feasible, MSHA recognizes that all refuge alternative applications may not be appropriate for all mining conditions.

Technological Feasibility

MSHA believes that this proposed rule is feasible because refuge alternatives are currently being manufactured for use in underground coal mines in West Virginia and Illinois. However, MSHA recognizes that it may not be feasible in every case to locate a refuge alternative according to this proposal. In addition, MSHA is aware that using refuge alternatives in low coal mines could be problematic. The Agency further recognizes that certain types of refuge alternatives may not be feasible in low coal mines. MSHA also recognizes that research into some aspects of refuge alternatives is on-going. MSHA will continue to work with NIOSH and the mining community as refuge alternative technology continues to be developed. MSHA solicits comment on the location of refuge alternatives and the use of refuge alternatives in low coal mines. Please be specific in your response, including alternatives, rationale, safety benefits to miners, technological and economic feasibility, and data to support your comment.

Also, all refuge alternative components are currently available. MSHA may approve refuge alternatives or components that incorporate new technology, if the applicant demonstrates that the refuge alternative or components provide no less protection than those meeting the requirements of the proposed rule.

Economic Feasibility

The yearly compliance cost of the proposed rule to underground coal mine operators is $41.2 million, which is approximately 0.3 percent of total annual revenue of $14.1 billion ($41.2 million / $14.1 billion) for all underground coal mines. MSHA concludes that the proposed rule would be economically feasible for these mines because the total yearly compliance cost is below one percent of the estimated annual revenue for all underground coal mines.

REGULATORY ALTERNATIVES CONSIDERED

MSHA also considered certain breathable air options that could be used to meet the requirements of the refuge alternatives proposal: (1) existing boreholes; (2) provisions for 48 hours of breathable air plus borehole pre-arrangements; and (3) compressed air stations. Although mine operators may use these options, MSHA has not included them in the Agency's cost estimates because their costs are more speculative. MSHA has developed a range of costs for these breathable air options.

(1) *Boreholes*: Some mines already have boreholes that were drilled for purposes of exploration, and boreholes may be used for power lines or communications, for pumping water into or out of the mine, and for other purposes. However, the Agency estimates that, for most mines, it would cost between $100,000 and $500,000 to drill new boreholes in order to meet the proposed requirements.

(2) *Provisions for 48 hours plus borehole pre-arrangements*: Proposed § 75.1507(d) would allow the option of sustaining persons for 48 hours, rather than 96, if a mine operator had made arrangements to have a borehole drilled to the refuge alternative within 48 hours of an accident. MSHA has estimated that the difference in cost between 48 hours worth of provisions and 96 hours worth of provisions is $5,000 for 10-person refuge alternatives and $10,000 for 20-person refuge alternatives. In this situation, if boreholes are needed after the 48 hours, MSHA believes that the costs would be similar to those in option 1 above.

(3) *Compressed air stations*: Proposed § 7.506(a) would allow a mine operator to provide breathable air from a compressor station at the surface through a series of pipes, filters, and valves running through the mine to the working sections. Such equipment would save the costs of providing cylinders of compressed air and of oxygen and of harmful gas removal at refuge alternatives. However, only one piped compressed air system has been built and installed, and its estimated cost is in excess of $120,000. MSHA has not included this option in its cost estimates.

MSHA solicits comments on these options for providing breathable air. Please be specific as to their effectiveness and technological and economic feasibility and include supporting data for your rationale.

V. REGULATORY FLEXIBILITY CERTIFICATION

INTRODUCTION

Pursuant to the Regulatory Flexibility Act (RFA) of 1980, as amended by the Small Business Regulatory Enforcement Fairness Act (SBREFA), MSHA has analyzed the impact of the proposed rule on small entities. Based on that analysis, MSHA certifies that the proposed rule would not have a significant economic impact on a substantial number of small entities. The factual basis for this certification is presented below.

DEFINITION OF A SMALL MINE

Under the RFA, in analyzing the impact of a rule on small entities, MSHA must use the Small Business Administration's (SBA's) 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 has not established an alternative definition, and is required to use the SBA's definition. The SBA defines a small entity in the mining industry as an establishment with 500 or fewer employees.

MSHA has also examined the impact of the proposed rule on mines with fewer than 20 employees, which MSHA and the mining community have traditionally referred to as "small mines." These small mines differ from larger mines not only in the number of employees, but also in economies of scale in material produced, in the type and amount of production equipment, and in supply inventory. Therefore, their costs of complying with MSHA's rules and the impact of the agency's rules on them will also tend to be different. This analysis complies with the requirements of the RFA for an analysis of the impact on "small entities" while continuing MSHA's traditional definition of "small mines."

FACTUAL BASIS FOR CERTIFICATION

General Approach

MSHA's analysis of the economic impact on small entities begins with a "screening" analysis. The screening analysis compares the estimated yearly cost of a rule for small entities to their estimated annual revenue. When the estimated cost is less than one percent of the estimated revenue for small entities, MSHA believes it is generally appropriate to conclude that the proposed rule would not have a significant economic impact on a substantial number of small entities. If the estimated cost is equal to or exceeds one percent of revenue, MSHA will investigate whether further analysis is required.

Derivation of Costs and Revenues for Mines

The compliance costs noted in this chapter were previously presented in Chapter IV of this document along with an explanation of how they were derived and the cost impact on mines, by size. Revenue for underground coal mines is derived from data on underground coal prices and tonnage. The 2006 price of underground coal was $38.28 per ton.[3] To estimate the 2007 price, the 2006 price was increased by 5.5 percent to $40.37, using the Bureau of Labor Statistics Producer Price Index for underground bituminous coal.

[3] U.S. DOE, EIA, "Annual Coal Report 2006," Table 28, October 2007.

Total underground coal production in 2007 was approximately 7.7 million tons for mines with 1-19 employees. Multiplying tons by the 2007 price per ton, 2007 underground coal revenue was $310 million for mines with 1-19 employees. Total underground coal production in 2007 was approximately 278 million tons for mines with 1-500 employees. Multiplying tons by the 2007 price per ton, 2007 underground coal revenue was $11.2 billion for mines with 1-500 employees. Total underground coal production in 2007 was approximately 349 million tons. Multiplying tons by the 2007 price per ton, total estimated revenue in 2007 for underground coal production was $14.1 billion.

Results of Screening Analysis

Table V-1 below shows MSHA's upper bound estimate of the cost of the proposed rule compared to mine revenue, by mine size. For underground coal mines, Table V-1 shows that the proposed rule would result in an average yearly cost per mine of approximately $14,000 for mines with 1-19 employees and $59,000 for mines with 1-500 employees. The average yearly cost per mine for all underground coal mines is approximately $66,000.

Table V-1: Cost of Proposed Rule Compared to Mine Revenues, by Mine Size for Underground Coal Mines

Employment size	No. of Mines	Cost of Proposed Rule	Estimated Revenue (in millions)	Cost per Mine	Cost of Rule as Percent of Revenue
1-19	223	$3,147,978	$310	$14,116	1.02%
1-500	614	$36,217,991	$11,217	$58,987	0.32%
All mines	624	$41,202,051	$14,077	$66,029	0.29%

As shown in Table V-1, when applying SBA's definition of a small mine, the estimated the estimated yearly cost of the proposed rule for underground coal mines with 1-500 employees is approximately $36 million, or approximately $59,000 per mine. This is equal to approximately 0.32 percent of annual revenue. Under MSHA's lower-bound estimate, the yearly cost of the proposed rule for mines with 500 or fewer employees is estimated to be approximately $32 million, or approximately $52,000 per mine. This is equal to approximately 0.29 percent of annual revenue. Since, under both the upper- and lower-bound estimates, the yearly cost of the proposed rule is less than one percent of annual revenues for small underground coal mines, as defined by SBA, MSHA has certified that the proposed rule would not have a significant impact on a substantial number of small mining entities, as defined by SBA. The Agency has provided in the analysis included in Chapter IV of this PREA a discussion of the cost impact of the proposed requirements for mines in this category.

As shown in Table V-1, the estimated yearly cost of the proposed rule for underground coal mines with 1-19 employees is approximately $3.1 million, or approximately $14,000 per mine. This is equal to approximately 1.02 percent of annual revenues. Under MSHA's lower-bound estimate, the yearly cost of the proposed rule for mines with 1-19 employees is estimated to be approximately $2.8 million, or approximately $13,000 per mine. This is equal to approximately 0.91 percent of annual revenue. The Agency has provided in the tables in Chapter IV of this PREA the costs of the proposed rule on this category of miners.

MSHA estimates that some mines might experience costs somewhat higher than the average per mine in its size category while others might experience lower costs. Even though the analysis reflects a

range of impacts for different mine sizes, from 0.29 percent to 1.02 percent, the Agency concludes that this is not a significant economic impact on a substantial number of small mines.

VI. OTHER REGULATORY CONSIDERATIONS

THE UNFUNDED MANDATES REFORM ACT OF 1995

MSHA has reviewed the proposed rule under the Unfunded Mandates Reform Act of 1995 (2 U.S.C. 1501 et seq.). MSHA has determined that the proposed rule would not include any Federal mandate that may result in increased expenditures by State, local, or tribal governments or significantly or uniquely affect small governments. MSHA estimates that the proposed rule would increase private sector expenditures by more than $100 million in the first year and has included an analysis of the costs of the requirements of the proposed rule in this PREA.

The costs in this PREA represent what MSHA believes to be the upper bound of the range of estimated compliance costs: $102.6 million first year and $43.3 million yearly. MSHA has presented these upper-bound estimates as a conservative approach to estimating compliance costs. However, based upon a review of literature and discussions with manufacturers of refuge alternatives, MSHA believes that a more realistic assumption of the types of refuge alternatives required under the proposal provides a lower-bound estimate of costs: $84.1 million first year and $38.7 million yearly. MSHA has included these lower-bound estimates of costs. If costs are more in line with the lower-bound estimates, the Congressional Review Act (CRA) would not apply. If costs are more in line with MSHA's upper-bound estimates, then the rule would be classified as a major rule and MSHA would comply with the CRA. Under the CRA, major rules generally cannot take effect until 60 days after the rule is published.

TREASURY AND GENERAL GOVERNMENT APPROPRIATIONS ACT OF 1999: ASSESSMENT OF FEDERAL REGULATIONS AND POLICIES ON FAMILIES

The proposed rule would have no effect on family well-being or stability, marital commitment, parental rights or authority, or income or poverty of families and children. Accordingly, § 654 of the Treasury and General Government Appropriations Act of 1999 (5 U.S.C. § 601 note) requires no further agency action, analysis, or assessment.

EXECUTIVE ORDER 12630: GOVERNMENT ACTIONS AND INTERFERENCE WITH CONSTITUTIONALLY PROTECTED PROPERTY RIGHTS

The proposed rule would not implement a policy with takings implications. Accordingly, Executive Order 12630 requires no further agency action or analysis.

EXECUTIVE ORDER 12988: CIVIL JUSTICE REFORM

The proposed 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 proposed rule meets the applicable standards provided in § 3 of Executive Order 12988.

EXECUTIVE ORDER 13045: PROTECTION OF CHILDREN FROM ENVIRONMENTAL HEALTH RISKS AND SAFETY RISKS

The proposed rule would have no adverse impact on children. Accordingly, Executive Order 13045 requires no further agency action or analysis.

EXECUTIVE ORDER 13132: FEDERALISM

The proposed rule would not have "Federalism implications" because it would 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." MSHA acknowledges that West Virginia and Illinois have laws and/or regulations on refuge alternatives and has drafted the proposed rule to minimize conflict with these laws and regulations.

EXECUTIVE ORDER 13175: CONSULTATION AND COORDINATION WITH INDIAN TRIBAL GOVERNMENTS

The proposed rule would not have "tribal implications" because it would 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, Executive Order 13175 requires no further agency action or analysis.

EXECUTIVE ORDER 13211: ACTIONS CONCERNING REGULATIONS THAT SIGNIFICANTLY AFFECT ENERGY SUPPLY, DISTRIBUTION, OR USE

The proposed rule has been reviewed for its impact on the supply, distribution, and use of energy because it applies to the coal mining industry. The proposed rule would result in yearly costs of approximately $41.2 million to the underground coal mining industry, relative to annual revenues of $14.1 billion in 2007, and 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 * * * (including a shortfall in supply, price increases, and increased use of foreign supplies)." Accordingly, E.O. 13211 requires no further Agency action or analysis.

EXECUTIVE ORDER 13272: PROPER CONSIDERATION OF SMALL ENTITIES IN AGENCY RULEMAKING

MSHA has reviewed the proposed 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 proposed rule would not have a significant economic impact on a substantial number of small entities.

VII. PAPERWORK REDUCTION ACT OF 1995

INTRODUCTION

This section shows the estimated paperwork burden hours and related costs to mine operators and manufacturers under the proposed rule. It provides estimates of the burden hours and related costs in proposed §§ 7.503, 75.221, 75.360, 75.372, 75.1200, 75.1502, 75.1505, 75.1506, 75.1507, and 75.1508.

SUMMARY OF PAPERWORK BURDEN HOURS AND RELATED COSTS

Table VII-1 shows that, in the first year the rule is in effect, mine operators would incur Due to rounding, totals presented in this analysis may deviate from the sum of components.

90,189 burden hours with related costs of approximately $6.8 million. The costs reported in the first year are the annualized first-year costs and annual costs.

Table VII-1: Burden Hours and Costs in the First Year

Detail	Proposed Section	Hours	Costs
Refuge Alternative and Component Application for Approval	§ 7.503	2,700	$202,325
Pre-Shift Examination	§ 75.360(d)	74,819	$6,370,090
Revise Roof Control Plan	§ 75.221(a)(12)	280	$3,168
Initially Revise Mine Map, Ventilation Map, and Escapeway Map	§75.1200(g); §75.372(b)(11); §75.1505(a) & (b)	356	$4,304
Revise Mine Map, Ventilation Map, and Escapeway Map to Reflect Refuge Alternative Relocations	§75.1200(g); §75.372(b)(11); §75.1505(a) & (b)	616	$52,446
Revise and File Emergency Response Plan	§75.1506(b)(2); § 75.1507	11,108	$133,527
Revise and Submit Mine Emergency Evacuation and Firefighting Program of Instruction	§ 75.1502(c)	280	$3,168
Certify Training to Transport, Maintain, and Repair Refuge Alternatives	§ 75.1508(a)(2)	27	$2,299
Record of Repairs of Refuge Alternatives	§ 75.1508(b)	3	$255
Total		90,189	$6,771,582

Table VII-2 shows that, in the second year the rule is in effect, and every year thereafter, mine operators would incur 78,138 burden hours with related costs of approximately $6.6 million. The costs reported for the second year, and every year thereafter, are annual costs.

Table VII-2: Burden Hours and Costs in the Second Year, And Every Year Thereafter

Detail	Proposed Section	Hours	Costs
Refuge Alternative and Component Application for Approval	§ 7.503	2,700	$202,325
Pre-Shift Examination	§ 75.360(d)	74,819	$6,370,090
Revise Mine Map, Ventilation Map, and Escapeway Map to Reflect Refuge Alternative Relocations	§75.1200(g); §75.372(b)(11); §75.1505(a) & (b)	616	$52,446
Record of Repairs of Refuge Alternatives	§ 75.1508(b)	3	$255
Total		78,138	$6,625,116

VIII. REFERENCES

Epperly, H., Gandy, B., & Ingold, D., *Prevent, Escape, Design*, MSHA Technical Support, Approval & Certification Center, Applied Engineering Division, Draft, Undated.

InfoMine USA, Inc., U.S. Coal Mine Salaries, Wages, and Benefits: 2007 Survey Results, 2008.

U.S. Department of Energy, Energy Information Administration, *Annual Coal Report 2006*, October 2007.

U.S. DOL, MSHA , Office of Program Evaluation and Information Resources (PEIR), February 5, 2008 data.