DEPARTMENT OF LABOR

Mine Safety and Health Administration

30 CFR Parts 7 and 75

RIN 1219–AB58

Refuge Alternatives for Underground Coal Mines

AGENCY: Mine Safety and Health Administration, Labor.

ACTION: Final rule.

SUMMARY: The final rule establishes the Mine Safety and Health Administration's (MSHA) requirements for refuge alternatives in underground coal mines and the training of miners in their use. It includes testing and approval requirements. The final rule implements section 13 of the Mine Improvement and New Emergency Response (MINER) Act of 2006. Consistent with the MINER Act, it includes MSHA's response to the National Institute for Occupational Safety and Health (NIOSH) Report on Refuge Alternatives.

DATES: *Effective Date:* The final rule is effective on March 2, 2009.

The incorporation by reference of certain publications listed in the rule is approved by the Director of the Federal Register as of March 2, 2009.

Compliance Dates

1. § 7.503—For any approval consideration by MSHA in the first year, an application for approval of a refuge alternative or component shall be submitted no later than April 30, 2009.

2. § 75.1502(c)(3), (c)(4)(vi), (c)(8), and (c)(10) through (12)—For mines with refuge alternatives in the mine on the effective date of the rule (60 days after date of publication), the operator shall submit a revised program of instruction to the appropriate District Manager for approval by April 30, 2009, and conduct initial mine emergency evacuation training and drills on the refuge alternatives and components, under § 75.1504(b)(3)(ii), (b)(4)(ii), and (b)(6) through (10), within 30 days of program approval. For mines with no refuge alternatives in the mine on the effective date of the rule March 2, 2009, the operator shall submit a revised program of instruction to the appropriate District Manager for approval within 30 days of receipt of the refuge alternatives or components, and conduct initial mine emergency evacuation training and drills on the refuge alternatives and components, under § 75.1504(b)(3)(ii), (b)(4)(ii), and (b)(6) through (9), within 30 days of program approval.

3. § 75.1504(c)(3)—For mines with refuge alternatives in the mine on the effective date of the rule March 2, 2009, the operator shall complete the initial annual expectations training on the refuge alternatives and components no later than December 31, 2009. For mines with no refuge alternatives in the mine on the effective date of the rule March 2, 2009, the operator shall complete the initial annual expectations training on the refuge alternatives and components no later than December 31, 2009, or within 60 days of receipt.

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I. Introduction

This final rule is MSHA's response to the National Institute for Occupational Safety and Health (NIOSH) Report on Refuge Alternatives consistent with section 13 of the Mine Improvement and New Emergency Response (MINER) Act of 2006. The final rule requires that mine operators include refuge alternatives in the Emergency Response Plan (ERP) required by section 2 of the MINER Act. MSHA's objective, consistent with the MINER Act, is to improve the safety of mines and mining. This final rule improves mine operators' preparedness for mine emergencies and requires refuge alternatives underground to protect persons trapped when a life-threatening event occurs that makes escape impossible. Refuge alternatives also can be used to assist trapped miners in escaping from the mine after initial escape becomes impossible.

MSHA developed this final rule based on Agency data and experience, NIOSH recommendations, research on available and developing technology, state regulations, and comments and testimony from the mining community. The final rule includes requirements for—

- Testing and approval of refuge alternatives and components of refuge alternatives;
- Assuring that refuge alternatives are readily available, capable of sustaining trapped miners for 96 hours, and maintained in operating condition; and
- Training miners to locate, deploy and use, maintain, and transport refuge alternatives.

A. Statutory and Rulemaking Background

Section 2 of the MINER Act requires underground coal mine operators to develop and adopt a written Emergency Response Plan (ERP), which must be approved by MSHA. The ERP provides for the evacuation of all individuals endangered by an emergency and the maintenance of individuals trapped underground. All ERPs must provide for emergency supplies of breathable air for individuals trapped underground sufficient to maintain them for a sustained period of time.

MSHA issued Program Policy Letter (PPL) No. P06–V–10 (October 24, 2006) to implement section 2 of the MINER Act. The PPL provides guidance to mine operators for developing ERPs and to MSHA District Managers for approving ERPs. MSHA issued Program Information Bulletin (PIB) No. P07–03 (February 8, 2007) to provide additional guidance to be used in conjunction with the PPL. The PIB includes options for the quantity of breathable air that would be sufficient to maintain persons for a sustained period of time.

Section 13 of the MINER Act provides that NIOSH conduct research on refuge alternatives and submit a report on the results of the research to the Secretary of Labor. NIOSH issued its report in January 2008.

Section 13 of the MINER Act also provides that the Secretary of Labor—

> * * * provide a response to the Committee on Health, Education, Labor, and Pensions of the Senate and the Committee on Education and the Workforce of the House of Representatives containing a description of the actions, if any, that the Secretary intends to take based upon the [NIOSH] report, including proposed regulatory changes and the reasons for such actions.

MSHA reviewed NIOSH's report and determined that refuge alternatives are practical and, when integrated into the mine's comprehensive escape and rescue plans, will increase the chance for survival for persons trapped in underground coal mines.

MSHA published the proposed rule for refuge alternatives on June 16, 2008 (73 FR 34140). MSHA held four public hearings on the proposed rule. The hearings were held on July 29 in Salt Lake City, UT; on July 31 in Charleston, WV; on August 5 in Lexington, KY; and on August 7 in Birmingham, AL. The comment period closed on August 18, 2008.

B. Discussion of the Hazard

In developing the final rule, MSHA reviewed a number of underground coal mine accident reports and 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. MSHA has estimated that recent MSHA standards could have saved the lives of 43 of these miners. Thus, for purposes of estimating benefits, this final rule could potentially have saved the lives of 221 miners over the 107 year period. If refuge alternatives had been available, MSHA estimates that the range of lives saved would have been between a low of 25 percent and a high of 75 percent. Using these estimates, the final rule potentially could save an average of from one to three lives every two years.

The preamble to the proposed rule discussed a number of accidents that reflect typical emergency conditions, hazards, and issues in underground coal mines. The explosions at the Sago Mine on January 2, 2006, and the Darby Mine No. 1 on May 20, 2006, which are especially relevant to this rulemaking, are summarized below.

The explosion at the Sago Mine killed one miner instantly and destroyed seals and filled portions of the mine with toxic levels of carbon monoxide. The remaining 12 miners barricaded themselves on the section when their attempts to evacuate were unsuccessful. The barricade was constructed in an area with high concentrations of carbon monoxide. Eleven miners died before they could be rescued. One miner was rescued, but was severely injured.

The force of the explosion at the Darby Mine No. 1 killed two miners. Four other miners encountered thick smoke and donned their SCSRs while attempting to evacuate. The miners eventually became separated and three died from carbon monoxide poisoning.

C. Timeline for Implementation of the Final Rule

MSHA is providing delayed compliance dates for some sections to give mine operators and applicants the time needed to comply with the stated requirements.

1. By April 30, 2009, an application for approval of a refuge alternative or component must be submitted for first year approval consideration by MSHA in accordance with § 7.503. MSHA expects that first year approvals will be completed by December 31, 2009.

2. By April 30, 2009, mine operators must submit a revised program of instruction to the appropriate District Manager for approval in accordance with § 75.1502. The operator must conduct initial mine emergency evacuation training and drills on refuge alternatives and components, under § 75.1504(b)(3)(ii), (b)(4)(ii), and (b)(6) through (10), within 30 days of program approval.

If the refuge alternatives necessary for the training are not yet available, MSHA will accept, as good faith evidence of compliance with the final rule, a valid, bona fide, written purchase order with a firm delivery date for the refuge alternatives. The mine operator must submit a revised program of instruction to the appropriate District Manager for approval in accordance with § 75.1502 within 30 days of receipt of the refuge alternatives. The operator must conduct initial mine emergency evacuation training and drills on refuge alternatives and components, under § 75.1504(b)(3)(ii), (b)(4)(ii), and (b)(6) through (10), within 30 days of program approval.

3. By December 31, 2009, mine operators must complete the initial annual expectations training on the refuge alternatives and components required by § 75.1504(c). However, if the refuge alternatives or components necessary for the training are not yet available, MSHA will accept, as good faith evidence of compliance with the final rule, a valid, bona fide, written purchase order with a firm delivery date for the refuge alternatives and components. The mine operator must complete the initial annual expectations training on the refuge alternatives and components no later than December 31, 2009 or within 60 days of receipt.

II. Section-by-Section Analysis

In developing this final rule, MSHA relied on the NIOSH report on refuge alternatives; research studies on various refuge alternatives; accident investigation reports, especially those for the 2006 Sago and Darby mine explosions; as well as public comments, hearing transcripts, and supporting documentation from all segments of the mining community, including States that already require refuge alternatives.

A. Part 7 Approvals

The approval requirements for refuge alternatives are set out in 30 CFR Part 7—Testing by Applicant or Third-Party. The final rule provides approval criteria, allows alternatives for satisfying the requirements, and promotes the development of new technology. It provides requirements for a complete self-contained refuge alternative and the following components:

- Structural, which creates an isolated atmosphere and contains the other integrated components.
- Breathable air, which includes the means to supply safe concentrations of oxygen.
- Air-monitoring, which provides occupants of the refuge alternative with devices to measure the concentrations of oxygen, carbon dioxide, carbon monoxide, methane, and other harmful gases, as applicable; and
- Harmful gas removal, which provides for removal of harmful gases from the refuge alternative.

Refuge alternatives also must include provisions for communications, lighting, sanitation, food, water, and first aid. These provisions must be approved in the ERP.

MSHA has a 20-year history of administering the part 7 approval program, which has reduced product testing costs and improved approval efficiency. Under the final rule, new subpart L of part 7 requires that an applicant or a third-party must test the refuge alternative or component according to the final rule. The applicant, usually a manufacturer, provides the required information and test results to MSHA to demonstrate that the refuge alternative or component meets the applicable technical requirements and test criteria. MSHA will issue an approval for a refuge

alternative or one of its components based on the Agency's evaluation of the information and test results submitted with the approval application. The MSHA approval under part 7 assures operators and miners that the refuge alternative can be used safely and effectively in underground coal mines and that the components can be used safely with each other.

The existing general provisions of subpart A of part 7 (§§ 7.1 through 7.10) apply to the testing and approval of refuge alternatives. Existing § 7.3(f) addresses the certification statement and requires that each application for original approval, subsequent approval, or extension of approval of a product shall include a certification by the applicant that the product meets the design portion of the technical requirements, as specified in the appropriate subpart, and that the applicant will perform the quality assurance functions specified in § 7.7. Consistent with the existing requirement, the applicant must provide a certification for refuge alternatives and components.

In addition, existing § 7.8 addresses post-approval product audits and requires that, on request, the approval-holder make a product available to MSHA for audit at no cost to MSHA, but no more than once a year except for cause. Consistent with the existing requirement, the approval-holder must provide a refuge alternative or component to MSHA for audit.

Section 7.501 Purpose and Scope

Final § 7.501, like the proposal, provides that subpart L establishes requirements for MSHA approval of refuge alternatives and components for use in underground coal mines. It states that the purpose of approved refuge alternatives is to provide a life-sustaining environment for persons trapped underground when escape is impossible. Refuge alternatives also can be used to facilitate escape by sustaining trapped miners until they receive communications regarding escape options or until rescuers arrive.

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. NIOSH stated, in its report on refuge alternatives, that—

* * * the potential of refuge alternatives to save lives will only be realized to the extent that mine operators develop comprehensive escape and rescue plans that incorporate refuge alternatives.

Several commenters expressed concern that refuge alternatives have not been proven effective in an actual mine and that human subject testing is necessary for proper functioning and durability of the units. Some commenters requested that MSHA defer promulgating a final rule until human subject testing is completed. Commenters also questioned the use of models and calculations in lieu of human subject testing. However, other commenters stated that human subject testing is not necessary nor is it the best proof of viability. One commenter stated that ''there is enough data available to properly simulate the metabolic heat and breathing of humans without necessarily subjecting humans to the risks of a manned test'' and that ''[t]his is not to say that some manned testing may not be valuable to validate portions [of] the test protocol and for training development.''

The requirements of the final rule are extrapolated from existing Federal and State requirements and from published reports from the U.S. Bureau of Mines and NIOSH. In addition, in developing the final rule, MSHA consulted with experts and other knowledgeable professionals, and evaluated the comments and testimony on the proposal. Based on MSHA's knowledge and experience, the Agency believes that the results of human subject testing, which may be appropriate at some later date, are not necessary for the final rule. Accordingly, the requirements of the final rule are not based on human subject testing.

MSHA continues to work with NIOSH on new technology requirements in the MINER Act. MSHA is aware that NIOSH is developing a protocol and seeking approval for human subject testing. If approved, the results of this human subject testing will not be available prior to the effective date of the final rule. The Agency will consider the results of such testing for future rulemaking, if warranted.

MSHA has analyzed various design specifications of manufactured refuge alternatives and has developed approval requirements that manufacturers must follow. Except as otherwise provided in the rule, mine operators are permitted to use only refuge alternatives and components for which the design specifications have been approved by MSHA. MSHA recognizes that, under the Mine Act, States generally may enact laws or prescribe by regulation additional refuge alternative requirements to the extent they are more stringent than MSHA's standards. Such laws and regulations are limited by principles of conflict preemption to requiring specific refuge alternatives that have been approved by MSHA, and cannot under any circumstances require the use of a refuge alternative that has not been approved. Moreover, it is MSHA's intent that its approval of specifications for a refuge alternative preempts private tort litigation questioning the propriety of those specifications. MSHA weighed various trade-offs in setting requirements for approved refuge alternatives and components, such as those involved in arriving at space and volume requirements and strength requirements. Refuge alternatives and components cannot be altered once approved without seeking potentially time-consuming approval for modifications. Tort suits deeming approved designs insufficient could introduce state-by-state uncertainty to national manufacturers, thereby threatening the steady commercial supply of refuge alternatives and components and potentially leaving miners unprotected.

Section 7.502 Definitions

Final § 7.502, like the proposal, establishes a number of definitions because refuge alternatives represent a relatively new technology for underground coal mines and the terminology may not be widely understood.

One commenter requested that a definition of ''component'' and ''examinable'' be included. MSHA does not believe that the Agency needs to define the term ''component'' because several sections in the final rule identify the four types of components—structural, breathable air, air-monitoring, and harmful gas removal—and their specific requirements. The final rule also clarifies examinations and inspections for structural components.

Apparent Temperature

The final rule clarifies the proposal, and defines apparent temperature as the measure of relative discomfort due to the combined effects of air movement, heat, and humidity on the human body. The final rule clarifies MSHA's intent that the term is used to measure relative discomfort. When no air movement is present, the apparent temperature equals the heat index. As heat and humidity increase, the amount of evaporation of sweat from the body decreases. MSHA received a comment that the Agency should specify the method for determining apparent temperature as part of the definition. The Agency has not specified the method in the definition, which is unchanged; however, the apparent temperature is addressed in the final rule under § 7.504(b).

Breathable Oxygen

The final rule, like the proposal, defines breathable oxygen as oxygen that is at least 99 percent pure with no harmful contaminants. Some commenters suggested that MSHA provide performance-based approval criteria to promote innovative new technology, and that the proposal was unnecessarily restrictive. The final rule, like the proposal, includes necessary parameters for oxygen purity.

One commenter suggested that the final rule include a definition of breathable air. MSHA issued a Program Information Bulletin on Breathable Air (PIB P07–03), which addressed the recommended standards for breathable air as identified by the American National Standards Institute (ANSI)/ Compressed Gas Association (CGA) Commodity Specifications for Grade D Breathable Compressed Air. Accordingly, the final rule does not define breathable air.

Flash Fire

The final rule, like the proposal, defines flash fire as a fire that rapidly spreads through a diffuse fuel, such as airborne coal dust or methane, without producing damaging pressure. MSHA notes that a flash fire may occur in an environment, such as an underground coal mine, where fuel and air become mixed in adequate concentrations to combust. In an underground coal mine, a flash fire can be a rapidly moving flame front from a combustion explosion. In its report, NIOSH recommended that the fire resistance for refuge alternatives be 300 °F for 3 seconds. NIOSH based its recommendation on NFPA 2113–2007, the National Fire Protection Association's ''Standard on Selection, Care, Use, and Maintenance of Flame-Resistant Garments for Protection of Industrial Personnel Against Flash Fire,'' but advised that additional investigation is warranted.

A flash fire is defined by NFPA 2113 as ''a fire that spreads rapidly through a diffuse fuel, such as dust, gas, or vapors of an ignitable liquid, without the production of damaging pressure.'' NFPA 2113 also includes a longer explanation of flash fire in the Annex A.3.3.16. This explanation addresses flame temperatures for diffused fuel flash fires ranging from 1,000° to 1,900 °F. A commenter requested that MSHA clarify the definition of flash fire by adding that a flash fire is not an ongoing fire. MSHA has explained heat transfer and duration and believes the definition given is adequate. The final rule is unchanged.

Noncombustible Material

The final rule, like the proposal, defines noncombustible material as material, such as concrete or steel, that will not ignite, burn, support combustion, or release flammable vapors when subjected to fire or heat. MSHA received one comment requesting modification of the proposed definition to include tent deployment information. MSHA has addressed this comment elsewhere in this preamble under final § 7.505(a)(6) and believes that the proposed definition is adequate. The final rule is unchanged.

Overpressure

The final rule, like the proposal, defines overpressure as the highest pressure over the background atmospheric pressure that could result from an explosion, which includes the impact of the pressure wave on an object. MSHA notes that explosion pressures are normally expressed as an overpressure beyond standard atmospheric pressure. Standard atmospheric pressure is 14.7 pounds per square inch (psi) (one atmosphere) at sea level. For example, air pressure in a car tire is measured with a pressure gauge as 30 psi, which is an overpressure. The absolute pressure of the air inside the tire is 44.7 psi. One commenter supported and no commenters opposed the proposal.

Refuge Alternative

The final rule, like the proposal, defines refuge alternative as a protected, secure space with an isolated atmosphere and integrated components that create a life-sustaining environment for persons trapped in an underground coal mine.

One commenter requested that the proposed definition be modified to emphasize the importance of protecting persons from toxic gases entering the space prior to occupancy and to allow the use of an individual breathable air supply. Under the final rule, refuge alternatives must have an isolated atmosphere and life-sustaining environment. Another commenter requested that the term be defined with more clarity. MSHA believes that the definition as stated provides sufficient detail and concludes that no change to the final rule is necessary.

Section 7.503 Application Requirements

Final § 7.503(a), like the proposal, requires that an application include information to assure that MSHA can determine if a refuge alternative or component meets the technical requirements for approval, functions as intended, and is safe for use in an underground coal mine.

Final paragraph (a)(1), like the proposal, requires that the application contain the refuge alternative's or component's make and model number, if applicable. This provision assists MSHA in identifying specific units or parts from different companies.

One commenter requested that the final rule allow approval of design criteria rather than approval of specific models. MSHA has considered the implications of making this change, such as auditing critical characteristics and integration of components, and determined that no change to the rule is necessary.

Final paragraph (a)(2)(i), like the proposal, requires that the application list the refuge alternative's or component's parts, and include the MSHA approval number for electric-powered equipment. With the approval number, MSHA would be able to verify that electric-powered equipment is either approved as permissible or, with respect to certain equipment such as air-monitoring equipment or gas detectors, is approved as intrinsically safe. MSHA received no comments on this provision.

Final paragraph (a)(2)(ii), like the proposal, requires that the list of a refuge alternative's or component's parts in the application include each component's or part's in-mine shelf life, service life, and recommended replacement schedule. Comments concerning shelf life, service life, and replacement schedule are addressed elsewhere in this preamble under final §§ 7.508(c)(4) and 75.1506(a)(3).

Final paragraph (a)(2)(iii) clarifies the proposal and requires that the application list the refuge alternative's or component's parts that include materials, which have a potential to ignite, used in each component or part with their MSHA approval number. The proposal would have required that the application list the materials used in each component or part with their MSHA approval number or statement that the materials are noncombustible. One commenter stated that not all materials used in refuge alternatives or components can be noncombustible. Another commenter requested clarification of noncombustible materials and MSHA approved electrical components. The final rule clarifies that the MSHA approval number must be included for materials that have a potential to ignite. This provision helps assure that materials are safe for use in an underground coal mine. The hazardous nature of an underground coal mine requires that

sources of ignition be eliminated. The confined space of an underground coal mine necessitates that materials be designed so that they will not contribute to a fire or give off harmful gases when exposed to heat.

Final paragraph (a)(2)(iv) was not in the proposed rule. It requires that the application list the refuge alternative's or component's parts that include a statement that the component or part is compatible with other components; and upon replacement, is equivalent to the original component or part.

Commenters expressed concern regarding the reliability of refuge alternatives that consist of multiple separate components. Some commenters opposed mixing different models of breathable air components because miners might get confused during an emergency and be placed at greater risk.

This new provision is responsive to comments and clarifies MSHA's intent to assure that components or parts that are approved must be interchangeable or must integrate with the other components or parts in the refuge alternative so that the refuge alternative will continue to operate as intended. Under the final rule, if the component or part is a replacement, it must be equivalent to the original component or part. The component or part must be designed for the capacity of the refuge alternative for which it is intended.

Final paragraph (a)(3) is substantively the same as the proposal. It requires that the application specify the capacity and duration (the number of persons it is designed to maintain and for how long) of the refuge alternative or component. For example, the application must include a specific length of time that the refuge alternative or component could support a specified number of persons. This information is necessary so that MSHA can appropriately evaluate the performance of the refuge alternative or component and determine if it meets the requirement that it sustain persons for 96 hours. The final rule includes a non-substantive change. It does not include the ''per-person per-day'' measurement. Comments on capacity and duration and shift changeover are discussed elsewhere in this preamble under final § 75.1506(b)(2).

Final paragraph (a)(4), like the proposal, requires that the application specify the length, width, and height of the space required for storage of each component. The Agency needs this information for components approved separately to assure that the refuge alternative will have enough usable space for occupants when all components are stored. MSHA did not receive comments on this provision.

Final § 7.503(b), like the proposal, requires that the application provide additional specific information. Final paragraph (b)(1) requires that the application specify a description of the breathable air component, including drawings, air-supply sources, piping, regulators, and controls. This information establishes that the component is included and is in its proper location. MSHA received no comments on the proposed requirement.

Final paragraph (b)(2) requires that the application specify the maximum volume of the refuge alternative, excluding the airlock; the dimensions of floor space and volume provided for each person using the refuge alternative; and the floor space and volume of the airlock. This information assures that there is adequate usable space for occupants when all components, parts, equipment, and material are shown in drawings under paragraph (b)(6) in their respective place.

One commenter stated that the phrase in the preamble ''in their respective place'' implied that the rule required defined locations for specific items. The final rule clarifies that the application specify the dimensions of floor space and volume for each person to assure that the space and volume provided for persons is usable and not reserved for storage.

Another commenter questioned why the airlock in a unit is excluded from the space calculations. In response to comments, final §§ 7.505(a)(1) and 75.1506(b)(1) clarify that the airlock may be included in the space and volume of the refuge alternative if waste is disposed outside the unit. Therefore, final § 7.503(b)(2) replaces the term ''interior dimensions'' of the airlock with ''floor space and volume'' of the airlock which must be included in the application.

Final paragraph (b)(3), like the proposal, requires that the application specify the maximum positive pressures in the interior space and airlock and a description of the means used to limit or control the positive pressure. This information allows MSHA to determine whether the atmospheric pressure in the refuge alternative will maintain good air, without being excessive, as persons enter and pass through the airlock. Excessive pressure could create adverse physiological effects on persons. MSHA did not receive comments on this provision. The final rule includes a non-substantive change. MSHA deleted the term ''allowable.''

Final paragraph (b)(4), like the proposal, requires that the application specify the maximum allowable apparent temperature of the interior space and the airlock and the means to control the apparent temperature. MSHA will use this information to evaluate the approval of the refuge alternative. MSHA did not receive comments on this provision. Comments concerning the apparent temperature inside the refuge alternative are discussed elsewhere in this preamble under § 7.504(b)(1).

Paragraph (b)(5) is new and provides further clarification of the Agency's intent with respect to controlling internal apparent temperature. This provision requires that applicants specify in the application the maximum mine air temperature under which the refuge alternative is designed to operate when the unit is fully occupied.

This provision is added in response to commenters' concerns regarding the effect that the mine temperature has on the internal apparent temperature in the refuge alternative. Commenters stated that the temperature outside of the unit must be taken into consideration because of heat transfer. This provision corresponds to the requirement in § 75.1507(a)(12) that the Emergency Response Plan (ERP) include the maximum mine air temperature at each of the locations where refuge alternatives are to be placed.

Final paragraph (b)(6) is redesignated from proposed paragraph (b)(5). Like the proposal, it requires that each application include drawings that show the features of each component and contain sufficient information to document compliance with the technical requirements. MSHA's intent is that the drawings of each component should illustrate the internal configuration of the refuge alternative. Drawings should include the dimensions and layout of the refuge alternative components, controls, and materials necessary for proper operation. This information provides a basis for MSHA approval of the refuge alternative. MSHA did not receive comments on this provision.

Final paragraph (b)(7) is redesignated from proposed paragraph (b)(6) and has been changed from the proposal. It requires that the applicant provide a manual rather than a training manual that contains sufficient detail for each refuge alternative or component addressing in-mine transportation, operation, and maintenance of the unit.

Commenters generally supported the proposal. However, one commenter expressed concern that the manuals not be used as a substitute for miner training because the manufacturer's manual may be too detailed and complicated. Another commenter requested that training materials include

detailed information on turning off devices between readings to conserve battery life and adjusting oxygen flow. Another commenter stated the manual should be written in a manner that includes individual mine specific information such as SCSR caches, communication and tracking, and life lines.

MSHA recognizes that, in general, manufacturers provide information necessary for safe and effective use of their products. Consistent with this general practice, the final rule requires the applicant to provide a manual which contains detailed information on in-mine transportation, operation, and maintenance of the refuge alternative. The manual would be used by MSHA to evaluate and approve the refuge alternative. The final rule clarifies MSHA's intent that the manual be used by operators to develop training material required under § 75.1502(c), concerning mine emergency evacuation program of instruction; § 75.1504(b), concerning quarterly training; § 75.1504(c), concerning annual expectations training; and § 75.1508 concerning training on examinations, maintenance, or repairs.

Final paragraph (b)(8) is redesignated from proposed paragraph (b)(7) and has been changed from the proposal. It clarifies that the applicant must provide a summary of procedures for deploying refuge alternatives. MSHA will use this information to evaluate the approval and the operator may use this information to develop instructions for persons in the deployment of refuge alternatives. This provision changes the proposed requirement that the applicant provide a summary of procedures for ''constructing'' refuge alternatives because prefabricated units do not require construction, and the structural components of units consisting of 15 psi stoppings constructed prior to an event do not require approval under part 7.

Final paragraph (b)(9), redesignated from proposed paragraph (b)(8) and the same as the proposal, requires that the application include a summary of the procedures for using the refuge alternative. This information will be used by MSHA to evaluate the approval and by operators to develop instructions for persons using refuge alternatives. MSHA did not receive comments on this provision.

Final paragraph (b)(10), redesignated from proposed paragraph (b)(9) and the same as the proposal, requires that the application specify the results of inspections, evaluations, calculations, and tests conducted under this subpart. MSHA will use this information to evaluate the effectiveness and compatibility of refuge alternative components. For example, the application must contain the calculation of the rate oxygen is delivered on a per person basis and the results of tests, including calculations, of the carbon dioxide removal (scrubbing) to demonstrate that the refuge alternative will maintain a safe atmosphere for 96 hours. Without having these calculations readily available, the Agency would have difficulty independently verifying that the test results are satisfactory. MSHA did not receive comments on this provision.

Final § 7.503(c), like the proposal, requires that the application for approval of the air-monitoring component provide specific information. This information is necessary for the applicant or third party to make an effective evaluation of the component and to provide a basis for MSHA approval of the air-monitoring component.

Final paragraph (c)(1), like the proposal, requires that the application specify the operating range, type of sensor, gases measured, and any environmental limitations including the cross-sensitivity to other gases, of each detector or device in the air-monitoring component. The Agency believes that this information is essential for MSHA to determine that persons inside the refuge alternative will be aware of the concentrations of carbon dioxide, carbon monoxide, and methane, inside and outside the refuge alternative, including the airlock. In addition, this will assure that oxygen concentrations can be monitored simultaneously. MSHA did not receive comments on this provision.

Final paragraph (c)(2), like the proposal, requires that the application include the procedures for operation of the individual devices so that they function as necessary to test gas concentrations over a 96-hour period. Manufacturers must properly design the system to control gas concentrations inside the refuge alternative. This provision will assist MSHA's evaluation of the air-monitoring component.

One commenter stated that ''few if any monitors exist that will operate for 96 hours continuously.'' The commenter stated that provisions must be made for recharging or changing batteries and that instrument manufacturers should provide ''options for extending the operational life of their devices in a potentially explosive atmosphere.'' In the proposal, MSHA did not state that air monitoring instruments or devices were intended to operate continuously. This issue is discussed elsewhere in this preamble under § 7.507 concerning air monitoring components. The Agency anticipates that refuge alternative manufacturers will work with monitoring instrument manufacturers to satisfy the requirements of this provision. The final rule is the same as the proposal, except for an editorial change for clarity.

Final paragraph (c)(3), like the proposal, requires that the application include procedures for monitoring and maintaining breathable air in the airlock, before and after purging. Monitoring and maintaining breathable air in the airlock is necessary to remove contaminants and minimize contamination inside the refuge alternative as miners pass through the airlock into the interior space. MSHA did not receive comments on this provision.

Final paragraph (c)(4), like the proposal, requires that the application include instructions for determining the quality of the atmosphere in the airlock and refuge alternative interior and a means to maintain breathable air in the airlock. Determining the quality of the air and maintaining breathable air are necessary to sustain trapped miners. MSHA did not receive comments on this provision.

Final § 7.503(d)(1) and (2), like the proposal, require that the application for approval of the harmful gas removal component specify the volume of breathable air available for removing harmful gas both at start-up and while persons enter through the airlock; and the maximum volume of each gas that the component is designed to remove on a per-person per-hour basis. Information on harmful gas removal is essential for MSHA to determine the ability of the refuge alternative to sustain occupants for 96 hours. These final provisions also provide information on the removal of carbon dioxide that is exhaled by the occupants and the removal of other harmful gases.

One commenter stated that this provision is not practical and should be removed. Another commenter recommended that the requirement be performance-based. MSHA does not agree since the Agency needs this information to evaluate the adequacy of the harmful gas removal systems to meet the needs of the occupants for 96 hours. The applicant can calculate the amount of purge air available or scrubbing capability for a range of expected conditions. MSHA expects the application to contain sufficient information to enable the Agency to determine whether the refuge alternative or component meets the technical and performance requirements of this subpart.

Proposed § 7.503(e) is not included in the final rule. It would have required the applicant to certify that each component was constructed of suitable materials, was of good quality workmanship, was based on sound engineering principles, was safe for its intended use, and was designed to be compatible with other components in the refuge alternative, within the limitations specified in the approval.

Several commenters objected to the Agency's use of ''subjective terms.'' One commenter stated that the provision ''leaves itself open to a broad range of interpretations that will result in considerable confusion on the part of applicants and reviewers.'' Commenters stated that the final rule ''must have specific parameters that are measurable and have a clear limit beyond which they fail'' and ''stipulate what these phrases exactly mean'' or remove the provision.

Due to commenters concerns, MSHA evaluated the information, design criteria, and testing results required to be specified in the application for approval. Based on this evaluation, MSHA determined that the content of the application will be sufficient to allow MSHA to evaluate whether the refuge alternative or component meets the requirements for approval. In addition, existing § 7.3(f) requires an applicant's certification that the product meets the requirements specified in the appropriate subpart. Also, to clarify the Agency's intent, and in response to comments, MSHA added a requirement, final § 7.503(a)(2)(iv), that the application provide a statement that the component is compatible with other components. With this change, and with the existing requirements, the Agency determined that it is not necessary to include proposed § 7.503(e) in the final rule.

Section 7.504 Refuge Alternatives and Components; General Requirements

Final § 7.504, like the proposal, addresses safety and health requirements that refuge alternatives and components must meet to gain MSHA approval.

Final § 7.504(a)(1) clarifies the proposal and requires that electrical components that are exposed to the mine atmosphere must be approved as intrinsically safe for use in an underground coal mine. Further, it provides that electrical components located inside the refuge alternative must be either approved as intrinsically safe or approved as permissible.

One commenter supported the proposal stating that refuge alternatives and components should be explosion-proof or intrinsically safe. Another commenter stated that the rule should clarify the use of approved permissible electrical equipment and approved intrinsically safe equipment.

The final rule clarifies MSHA's intent that electrical components of refuge alternatives that are exposed to the mine atmosphere must be approved as intrinsically safe. However, because a non-explosive atmosphere exists inside a refuge alternative, electrical components located inside the unit must be either approved as intrinsically safe or approved as permissible. This provision helps assure that the refuge alternative or component will not contribute to a secondary fire or explosion.

Final paragraph (a)(2), like the proposal, requires that a refuge alternative or component not produce continuous noise levels in excess of 85 dBA in the structure's interior. One commenter stated that noise is not likely to be a problem in a shelter during occupancy and questioned the logic for the proposal. MSHA included this requirement in the final rule because continuous noise above 85 dBA can interfere with communication and could adversely affect hearing, and the Agency is aware that noise controls, such as dampening material, are available to control noise levels.

Final paragraph (a)(3), like the proposal, requires that the refuge alternative or component not liberate harmful or irritating gases or particulates into the structure's interior or airlock. The Agency is aware that some nonmetallic materials off-gas. Vapors, aerosols or particulates should not be released into the refuge alternative. The provision requires that materials used in a refuge alternative or component be tested and evaluated to verify that they do not release harmful or irritating gases. The application would have to include the results of the tests and evaluation. No commenters opposed the proposal.

Final paragraph (a)(4), like the proposal, requires that the refuge alternative or component be designed to be moved safely with the use of appropriate devices, such as tow bars. MSHA recognizes that refuge alternatives could be a hazard to miners during transport. Based on MSHA's experience, the Agency believes that inadequate rigging and towing devices could result in hazards to miners. The refuge alternative should be designed with proper connections and devices to eliminate or reduce hazards that may occur when chains, ropes, or slings are used.

Commenters supported the proposal. One commenter noted that the refuge alternative can be moved safely using a tow bar. The final rule remains unchanged from the proposal.

Final paragraph (a)(5), like the proposal, requires that the refuge alternative and components be designed to withstand forces from collisions of the structure during transport and handling. This provision helps assure that the refuge alternative and components are not damaged during transport and handling.

One commenter suggested that all components be subjected to shock testing. Another commenter noted that many mines have required special attachments or bumpers, and requested that the final rule include these modifications.

Different mining conditions warrant different designs. The final rule is performance-oriented, allowing operators to tailor refuge alternative and component designs to the specific conditions in their mines. Designs can incorporate bumpers, guarding, skids, packing and securing devices, and rigging components. In addition, components should be configured, arranged, and stored to minimize shifting, movement, or damage during handling and routine transport. MSHA has evaluated all comments, and determined that the final rule should be the same as the proposal.

Final paragraph § 7.504(b), like the proposal, requires that the apparent inside temperature be controlled. Body heat and heat generated by chemical reactions (*i.e.*, carbon dioxide scrubbing chemicals) are inherent heat-producing sources within a refuge alternative. Ambient temperature in a refuge alternative also is affected by the mine temperature compounded by high humidity in the sealed environment. High humidity reduces a body's ability to regulate temperature by sweating, which could result in a dangerously elevated internal body temperature. The carbon dioxide absorption process also generates heat and humidity. There is currently no permissible air conditioning equipment that will address heat and humidity in underground coal mines.

Final paragraph (b)(1), like the proposal, requires that when a refuge alternative is fully occupied and used in accordance with the manufacturer's instructions and defined limitations, the apparent temperature in the refuge alternative must not exceed 95° Fahrenheit. MSHA requested comments on the apparent temperature and mitigation of heat stress and heat stroke, and requested that commenters address

the generation of heat and the methods for measuring heat stress on persons occupying the refuge alternative.

Most commenters generally supported the proposal. Some commenters noted that the proposal did not include air-conditioning to address metabolic heat buildup. One commenter stated that the proposal stifles creativity and eliminates innovative new technology, and one commenter suggested using chemical cooling packs or cooling vests to maintain core body temperature at a safe level. MSHA believes that there could be methods, including air conditioning, for controlling temperature that would be acceptable under the final rule. Chemical cooling packs or cooling vests may be used to supplement maintaining core body temperature. However, these devices have not been established as reliable, and therefore, may not be used as a substitute to the requirement for maintaining the apparent temperature inside the refuge alternative.

One commenter suggested that it was not appropriate to require an interior temperature without a corresponding ambient rock temperature. MSHA reviewed NIOSH/Raytheon UTD's Report on Miner Refuge Chamber Thermal Analysis (NIOSH/Raytheon report). The NIOSH/Raytheon report concluded that the rock type has a negligible effect on the conduction of heat away from a refuge alternative in an underground mine. In addition, the NIOSH/Raytheon report stated that the amount of heat conducted through the floor of a refuge alternative is small compared to the amount of heat that is carried away by convection. Accordingly, the final rule does not include a provision for corresponding ambient rock temperature.

One commenter stated that the International Standards Organization (ISO) standard, ISO 7243:1989(E), ''Hot environments—Estimation of the heat stress on working man, based on the WBGT-index (wet bulb globe temperature),'' should be used to evaluate heat stress.

ISO 7243 specifies periods of work and rest based on the air temperature and the level of activity throughout a workday for working in a hot environment daily, with breaks during the day and periods of relief between exposures. The ISO standard does not apply to the conditions addressed by the final rule because persons in a refuge alternative could be exposed for several days without an opportunity to recover.

Apparent temperature is a measure of relative discomfort due to the combined effect of heat and humidity. The concept of apparent temperature was developed by R.G. Steadman (1979) and was based on physiological studies of evaporative skin cooling for various combinations of ambient temperature and humidity. The likelihood of adverse effects from heat may vary with a person's age, health, and body characteristics; however, apparent temperatures greater than 80 °F are generally associated with some discomfort. Core body temperatures in excess of 104 °F are considered life-threatening, with severe heat exhaustion or heat stroke possible after prolonged exposure or significant physical activity. The December 2007 Foster Miller Report[1] concluded that the apparent temperature within a confined space occupied by humans should not exceed 95 °F.

Based on the Agency's review of many standards, studies, and reports, and the comments and testimony, MSHA believes that applying ISO 7243 could result in dangerously high apparent temperatures in the refuge alternative. This is because the limit specified in ISO 7243 is an 8-hour average, not a maximum continuous exposure. Therefore, using the ISO 7243 average as a maximum exposure level would allow as much as 50% higher temperature than even the ISO 7243 standard allows, and for a continuous 96-hour period as opposed to 8 hours. This would be fatal to the occupants. Accordingly, the final rule is the same as proposed.

Final paragraph (b)(2) clarifies the proposal and requires that tests be conducted to determine the maximum apparent temperature in the refuge alternative when used at maximum occupancy and in conjunction with required components. In addition, the final rule requires that an application include these test results including calculations. The final rule clarifies MSHA's intent that tests be conducted and that the test results including calculations be reported on the application. Test results could also include data, records, and other supporting documentation reported on the application. MSHA received no comments on this provision.

Final § 7.504(c), like the proposal, requires that refuge alternatives include additional measures to protect the safety and survival of miners. These requirements include a means for communicating with persons on the surface, lighting, sanitation, first aid, and repairs.

Final paragraph (c)(1), requires a two-way communication facility that is a part of the mine communication system, which can be used from inside the refuge alternative; and accommodations for an additional communication system and other requirements as defined in the communications portion of the operator's approved Emergency Response Plan (ERP). MSHA is aware that these additional systems may not yet be available, but as they are developed, mine operators will be required to include them in their ERPs. The MINER Act requires, by June 15, 2009, that ERPs contain wireless communication systems. MSHA is working with NIOSH on this emerging technology and will provide further guidance to the mining community with respect to the Agency's expectations for ''wireless communication'' systems in ERPs. Manufacturers may need to provide other accommodations for these systems. In the final rule, this provision has been revised to reflect the language in the safety standards for communications facilities in this rulemaking. Comments addressing these communication systems are addressed in that section.

In the preamble to the proposed rule and in the Agency's opening statements at the public hearings, MSHA requested comments on including a requirement that refuge alternatives be designed with a means to signal rescuers on the surface. This was intended to be a means to assure that rescuers on the surface could be contacted if the communications systems become inoperable. This signal would have been similar to what miners had done in the past by hammering on the roof, ribs, or floor to create sounds that can be detected by seismic devices located on the surface.

One commenter stated that the final rule should not require the use of a seismic location device unless MSHA is willing to obtain significant upgrades to its seismic capabilities. However, most commenters did not respond to MSHA's request on this issue.

MSHA also requested comments on whether the final rule should include a requirement that the manufacturer design refuge alternatives with a means to signal underground rescuers with a homing device. Such a requirement would assure that rescuers could detect the trapped miners within the mine.

Some commenters supported adding a provision for a homing device in refuge alternatives. They stated that the signal could help rescuers determine whether anyone was in the refuge alternative. Several opposed such a provision, for example, stating that the homing device was unnecessary because there already is a requirement to identify the locations of the units on the escapeway maps.

The final rule, like the proposal, does not contain a provision addressing

[1] Foster Miller. *Phase II Report*, December 2007.

signaling or homing devices. After reviewing the comments, MSHA agrees with commenters opposing such provisions and has determined that the requirements for a signaling device that would create a seismic sound to be detected by rescuers on the surface should not be included in the final rule. Likewise, the Agency has determined that the requirements for a homing device that would create an electronic signal to be detected by rescuers underground should not be included in the final rule.

Final paragraph (c)(2), like the proposal, requires that refuge alternatives include lighting sufficient for persons to perform tasks. Lighting is essential to allow persons to read instructions, warnings, and gauges; operate gas monitoring detectors; and perform other activities related to the operation of the refuge alternatives.

In the preamble to the proposal, MSHA recommended a minimum of 1 foot candle of lighting be provided per miner per day.[2] The Agency also noted that lighting should not generate significant heat, or require continual manual power for light generation.

Several commenters recommended light sticks and cap lamps. Another commenter stated that MSHA should be flexible with respect to a lighting requirement and that the proposal requires technology that may not be currently available. One commenter stated that MSHA should not require 1 foot-candle per day per miner. Another commenter pointed out that there may be added risks of electrical hazards and requested that, as the provision presents more potential problems than it solves, it be omitted from the final rule.

Although MSHA agrees that light sticks can be used, higher intensity lighting may be required for certain tasks. The final rule includes the same performance-oriented requirement as the proposal. The final rule includes a non-substantive change. It includes the term ''for persons.''

Final paragraph (c)(3), like the proposal, requires that refuge alternatives include a means to contain human waste effectively and minimize objectionable odors. A plastic bag and closed receptacle could be used to contain waste and prevent objectionable odors. The final rule does not require a specific method of waste disposal. The length, width, and height of the container housing the sanitation system, including operating instructions, should be in the refuge alternative's manual. Information regarding sanitation assures that the applicant has included an adequate means for containing waste.

One commenter pointed out a number of options for sanitation and waste disposal that are currently available. Some commenters requested that the final rule require that human waste be disposed of outside the refuge alternative. Under the final rule, waste can be disposed of from the interior of the refuge alternative, as long as the disposal does not compromise the integrity of the refuge alternative or affect its operation. The final rule is the same as proposed.

Final paragraph (c)(4), like the proposal, requires that refuge alternatives include first aid supplies. This requirement assures that first aid supplies are available for treating injured miners.

One commenter requested that the Agency specify the nature and quantity of required supplies. Another commenter stated that first aid kits should contain instructions for treating injuries that could be anticipated in the aftermath of an accident and warned that the inclusion of ''anxiety and or sleep inducing drugs'' could present medical issues.

First aid supplies must be adequate to provide for the number of persons injured in an emergency. In an underground mine emergency, MSHA expects that there will be a proportionally higher number of injuries related to lacerations, burns, and fractures resulting from explosions and fires. The refuge alternative must contain first aid supplies to address these injuries, but the final rule does not specify the content of the first aid kit. The final rule is the same as the proposal and is consistent with the safety standards for ERPs in this final rule.

Final paragraph (c)(5), like the proposal, requires that refuge alternatives be stocked with materials, parts, and tools for repair of components. Manufacturers could provide a repair kit with necessary materials and appropriate tools to perform repairs. Materials and tools should include metal repair materials, fiber material, adhesives, sealants, tapes, and general hardware (*i.e.*, screws, bolts, rivets, wire, zippers and clips). Powered tools must be approved as intrinsically safe and permissible. One commenter supported and no commenters opposed the proposal. The final rule is the same as the proposal.

Final paragraph (c)(6), is redesignated and clarified from proposed § 7.506(i). It requires a fire extinguisher that meets the requirements for portable fire extinguishers used in underground coal mines under part 75; and that is appropriate for fires involving the chemicals used for harmful gas removal; and that uses a low-toxicity extinguishing agent that does not produce a hazardous by-product when activated. One commenter supported and no commenters opposed the proposal. The final rule clarifies MSHA's intent. MSHA's intent is that the fire extinguisher must protect miners from potentially toxic chemicals in the confined atmosphere of a refuge alternative. The final rule requires that a fire extinguisher meet the requirements of MSHA's existing standards for portable fire extinguishers. It changes the proposed requirement limited to carbon dioxide chemicals to chemicals used for harmful gas removal, and non-toxic extinguishing agent to low-toxicity extinguishing agent. The final rule does not include the proposed requirement that the fire extinguisher not produce hazardous by-product when heated.

Final § 7.504(d)(1), (2), and (3) are substantively the same as the proposal, and require that containers used for storage of refuge alternative components or provisions be airtight, waterproof, and rodent-proof; easy to open and close without the use of tools; and conspicuously marked with an expiration date and instructions for use. These requirements assure that the containers' contents will be useable when needed.

One commenter requested clarification of the components that are covered by this provision. Another commenter requested that the final rule only apply to specific items, such as food and water, which are subject to degradation.

The final rule clarifies the proposal by including the term ''or provisions.'' Provisions include items such as supplies, materials, systems, and food and water. Food and water would need to be contained in airtight, waterproof, and rodent-proof containers because these provisions are subject to degradation.

Section 7.505 Structural Components

Final § 7.505, like the proposal, addresses structural component requirements for refuge alternatives.

Final paragraph (a)(1) requires that refuge alternatives provide at least 15 square feet of floor space per person, like the proposal, but includes changes in the required cubic feet of volume per person according to the following chart for mining heights:

[2] MIL–STD–1472F, Lighting for bomb shelters, NOTICE 1, 05 December 2003.

Mining height (inches)	Unrestricted volume (cubic feet) per person *
36 or less	30
>36 – ≤42	37.5
>42 – ≤48	45
>48 – ≤54	52.5
>54	60

* Includes an adjustment of 12 inches for clearances.

In addition, the final rule clarifies that the airlock can be included in the space and volume if waste is disposed outside the refuge alternative.

The volume of the refuge alternative is calculated by assuming two factors: (1) 6 inches is necessary to allow for clearance of the refuge alternative to be moved; and (2) the usable interior height of the refuge alternative is reduced by 6 inches for the roof and floor beams. As an example, a 36-inch mine height is reduced by 6 inches for clearance and 6 inches for inside beams leaving 24 inches or 2 feet. The 24 inches or 2 feet multiplied by 15 square feet of floor space equals 30 cubic feet of volume per person. Under the final rule, MSHA intends for persons to have this space without being affected by other factors such as stored items.

In the preamble to the proposed rule and in the Agency's opening statements at the public hearings, MSHA requested comments on the proposed requirement of at least 15 square feet of floor space and 60 cubic feet of volume per person, particularly in low mining heights. MSHA received comments in support of and opposed to the proposal.

Some commenters supported 15 square feet of floor space per person, but stated that the 60 cubic feet of volume per person was not a sufficient amount of space for each miner and could result in a higher risk of carbon dioxide exposure or excessive heat within the refuge alternative. These commenters urged MSHA to adopt the 85 cubic feet recommendation of NIOSH. In its comment on the proposed rule, NIOSH stated that the NIOSH recommendation of 85 cubic feet was ''based on published research conducted under the old civil defense program [OCDM 1958], and it is difficult to apply those findings directly to mining applications.'' NIOSH further stated that in the absence of NIOSH testing, it supports the interior volume requirement in the proposed rule.

Other commenters stated that both the proposed space and volume requirements were excessive in an emergency because persons could survive with less space. In addition, some stated that larger refuge alternatives were hard to transport, would require more compressed air and oxygen cylinders, or may not be feasible in all seam heights. Others stated that due to the orientation of the occupants, floor space per person is the critical measurement, and not volume. Some commenters stated that less space was needed because most of the time the maximum number of persons to be accommodated would be less than half because overlapping crews, i.e., hot-seating, occurs only during a small part of the work day.

Many commenters suggested space and volume criteria that were less than those in the proposal. In support of their position, some of these commenters relied on the South African standard for spacing while others relied on various engineering studies or manufacturer findings. Commenters suggestions ranged from 6.4 to 10 square feet of floor space and from 30 to 46.5 cubic feet of volume. Other commenters suggested a performance-oriented approach, stating that MSHA should not specify any space and volume requirements.

Finally, some commenters stated that the proposal omitted consideration of seam height. These commenters stated that compliance with the proposal would be difficult in mines with low seam heights.

For mining heights greater than 54 inches, the final rule requires 60 cubic feet of volume. However, in response to commenters' concerns, the final rule includes varying requirements for volume, based on mining heights that are less than or equal to 54 inches. These varying volume requirements accommodate commenters' concerns regarding the ability to maneuver, deploy, or use larger units in mines with low seam heights.

After reviewing the comments, MSHA determined that the proposed 15 square feet of floor space per person is necessary to assure that persons can conduct necessary activities in the refuge alternative. Occupants will need to attend to harmful gas removal; monitor gas levels; attend to basic needs, such as drinking, eating, and using the sanitation facilities; and provide care to injured miners. Adequate space is needed to accommodate larger than average persons. In addition, adequate volume is needed for proper function of passive harmful gas removal systems. It is also important to note that larger volumes are more effective at dissipating heat because of increased surface area, which helps control the apparent temperature in the interior space of the refuge alternative. MSHA recognizes that the lower mining height refuge alternatives may have less volume per person, but must still maintain apparent temperature as required in this final rule.

Some commenters expressed concern regarding the statement in the preamble to the proposal that the space requirements do not include the airlock. They stated that, once everyone was inside, the airlock was usable space and should be included in calculating the space and volume per person. To clarify the Agency's intent with respect to the proposal and in response to comments, under the final rule, the airlock may be included in calculating space and volume provided that waste is disposed of outside the refuge alternative.

Final paragraph (a)(2), like the proposal, requires that refuge alternatives include storage space that secures and protects the components during transportation and that permits ready access to components for maintenance examinations. Paragraph (a)(2) has been clarified to reflect the Agency's intent that this requirement applies to maintenance examinations rather than preshift visual examinations.

MSHA clarified the final rule in response to a comment asking for clarification regarding the type of examinations required under this paragraph. MSHA intends that a refuge alternative must be designed to allow maintenance examinations to be conducted. The components must be secured to prevent shifting during transport or moves. Maintenance examinations assure that the components will be readily available for deployment. Preshift examinations are discussed elsewhere in this preamble under §§ 7.505(d)(1) and 75.360(d).

Final paragraph (a)(3), like the proposal, requires that refuge alternatives include an airlock that creates a barrier and isolates the interior space from the mine atmosphere, except for a refuge alternative capable of maintaining adequate positive pressure. This provision addresses the need to provide breathable air to persons entering the refuge alternative if the mine atmosphere is contaminated. In this case, pressures need to be incrementally higher in the interior space as compared to the airlock and the airlock pressure needs to be higher than the mine atmosphere. Persons will pass through the airlock via airtight doors into the interior space. The exception to the requirement for an airlock recognizes that the positive pressure would prevent outside air from contaminating the refuge alternative; therefore, an airlock would not be necessary.

One commenter stated that both positive pressure inside the shelter and

an airlock must be required for all types of shelters. Another commenter asked that MSHA clarify ''adequate positive pressure'' and the scenario under which this exception will be accepted. In the final rule, the Agency uses the commonly understood definition of ''adequate'' to mean that there would be sufficient positive pressure to allow the refuge alternative to function as it would with an airlock. After considering the comments received, the final rule is the same as the proposal.

Final paragraph (a)(3)(i), like the proposal, requires that the airlock be designed for multiple uses to accommodate the structure's maximum occupancy. This requirement assures access for the maximum number of persons for which the refuge alternative is designed.

One commenter requested clarification of the proposed requirement relating to the number of purges. MSHA has performed limited carbon monoxide purge testing that indicates a 50 percent carbon monoxide concentration reduction with each purge. In PIB P07–03, under Safe Haven Assumptions providing breathable air, MSHA addressed carbon monoxide (CO) purging. Purging ''efficiency'' was estimated to require compressed air cylinders providing at least three times the amount of safe haven volume. Miners are to be inside the volume being purged wearing an SCSR until purging is accomplished. The Agency anticipated using compressed air cylinders as necessary to reduce Safe Haven concentration to less than 25 parts per million (ppm) for safe havens with a captive volume (not using positive pressure forced air from either a compressed air line or borehole from the surface).

Final paragraph (a)(3)(ii), like the proposal, requires that the airlock be configured to accommodate a stretcher without compromising its function. The airlock must be large enough to accommodate a stretcher with an injured miner while the outside door is closed and the inside door is open.

One commenter, who supported the proposal, stated that this proposed requirement was absolutely necessary to accommodate the need to bring injured miners into an airlock. Another commenter noted that a large amount of space would be required to accommodate a stretcher in the airlock. MSHA believes that this final requirement is necessary to accommodate a stretcher in the air lock and to allow transfer of the injured miner on the stretcher into the refuge alternative's interior space. MSHA notes that elsewhere in the final rule, in response to comments, the Agency has clarified its intent with respect to the maximum volume of refuge alternatives and stated that the airlock can be included in calculating space and volume. After a review of all comments, the final rule is the same as the proposal.

Final paragraph (a)(4) makes editorial changes, but is substantively the same as the proposal and requires that refuge alternatives be designed and made to withstand 15 pounds per square inch (psi) overpressure for 0.2 seconds prior to deployment. This requirement assures that the refuge alternative is capable of withstanding an initial explosion and that the components are not damaged and are able to function as intended.

MSHA received comments both in support of and opposed to the proposal. One commenter who supported the proposal stated that ''the 15 psi value for the survivability of the shelter is sufficient as levels higher than that would not likely result in survivors.'' Other commenters who supported the proposal referred to the West Virginia Mine Safety Technology Task Force Report of May 29, 2006, which recommended that refuge alternatives only be designed to survive an initial event.

Commenters who opposed the proposal stated that the proposal was inadequate because explosions can create pressures greater than 20 psi, that refuge alternatives should be capable of withstanding a second explosion, and that inflatable shelters are unsafe because they may not endure a second explosion.

The final rule is consistent with the NIOSH Report, which recommended a 15 psi overpressure for 0.2 seconds. NIOSH test results from the Lake Lynn Laboratory support a 15 psi overpressure and a 0.2 second duration for a typical blast wave propagation in an underground mine. MSHA notes that the Agency has reviewed information from the U.S. Department of Defense weapon designers which use a 13 psi peak overpressure as the 100% lethal threshold.

With respect to secondary explosions, the NIOSH report states that a number of factors make optimal design of refuge chambers difficult. These factors include the complexity of mine explosions and the interaction of the explosion with the physical environment. The Report further states: ''[t]he most likely locations of an initial explosion can be predicted with some certainty,'' and ''[i]f there is an ignition source, there could be subsequent explosions, although the location and strength of these are more difficult to forecast.'' Because of the difficulty in predicting the likelihood and strength of a secondary explosion, the final rule does not include strength requirements with respect to a second explosion. After reviewing all the comments, the final rule is substantively the same as the proposal.

Final paragraph (a)(5) makes an editorial change, but is substantively the same as the proposal, and requires that refuge alternatives be designed and made to withstand exposure to a flash fire of 300 °Fahrenheit for 3 seconds prior to deployment. This requirement assures that the refuge alternative is capable of withstanding a fire and that the components will not be damaged and are able to function as intended.

One commenter agreed with the proposal. The final rule is substantively the same as the proposal.

Final paragraph (a)(6), substantively the same as the proposal, requires that structural components of refuge alternatives be made with materials that do not have a potential to ignite or are MSHA-approved. Materials under this final rule could include, but are not limited to, inflatable shelters and any materials providing a secure space to protect the inside atmosphere from the hazardous outside atmosphere. MSHA notes that materials are generally tested for noncombustibility under American Society for Testing and Materials (ASTM) E136 ''Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 Degrees C'' (2004), although a similar ISO test, ISO 1182:2002 also exists. Tests for flame resistance in existing 30 CFR 7.27 could be used to determine the flame resistance of materials that have the potential to ignite.

One commenter requested that MSHA clarify the extent of materials that must be flame resistant or noncombustible and clarify whether the requirement applies to materials that will be deployed and used only after the event occurs.

This provision applies to any materials used to provide a secure space to protect persons from the hazardous outside atmosphere. This final rule assures that the refuge alternative is capable of withstanding a fire and that the components will not be damaged and are able to function as intended in case of an emergency. Taken together, paragraphs (a)(4), (a)(5), and (a)(6) would assure that the refuge alternative is able to withstand an initial fire and that the structure and internal components and provisions will not be damaged and will function as intended following the emergency. The final rule

remains substantively the same as the proposal.

Final paragraph (a)(7) makes an editorial change, but is substantively the same as the proposal, and requires that refuge alternatives be made from reinforced material that has sufficient durability to withstand routine handling and resist puncture and tearing during deployment and use. Refuge alternatives need to be made from reinforced material to be capable of withstanding the harsh underground mining environment. This especially applies to refuge alternatives with inflatable structures.

One commenter supported and no commenters opposed the proposed requirement. The final rule is substantively the same as the proposal.

Final paragraph (a)(8), makes an editorial change, but is substantively the same as the proposal, and requires that refuge alternatives be guarded or reinforced to prevent damage to the structure that would hinder deployment, entry, or use. This requirement assures that the refuge alternative will be designed to incorporate protective features to protect the integrity of the structure and operation of doors, inflatable extensions of the refuge alternative, and other functions necessary to deploy, enter, or use the refuge alternative.

One commenter supported and no commenters opposed the proposal. The final rule is substantively the same as the proposal.

Final paragraph (a)(9), like the proposal, requires that refuge alternatives permit measurement of outside gas concentrations without exiting the structure or allowing entry of the outside atmosphere. Gas monitoring of the atmosphere outside the refuge alternative is needed when there is a lack of communication with rescuers and persons are considering whether evacuation is a viable option.

Several commenters supported the proposal. One commenter stated that it was absolutely essential to be able to measure outside gas concentrations without exiting the structure or allowing outside air to enter. The final rule is the same as the proposal.

Final paragraph § 7.505(b), like the proposal, requires inspections or tests of the structural components. Final paragraph (b)(1) clarifies the proposal and requires that a test be conducted to demonstrate that trained persons can fully deploy the structure, without the use of tools, within 10 minutes of reaching the refuge alternative. This provision assures that persons can deploy and use the refuge alternative in a short amount of time upon reaching it. In a worst-case scenario, where only one SCSR is available to provide 60 minutes of breathable air, the first 30 minutes could be used to evacuate and, if evacuation is not possible, return to the refuge alternative. If the person returns to the refuge alternative, 10 minutes could be used to establish a secure space between the interior and exterior atmospheres, and 20 minutes could be used to purge the interior space to establish a breathable atmosphere. Under the final rule, testing should be conducted simulating real-life situations and conditions, such as smoke, heat, humidity and darkness while using SCSRs.

Several commenters questioned whether miners could activate the refuge alternative within 10 minutes. MSHA recognizes there may be differences in refuge alternatives necessitating different start-up procedures. Training requirements for persons deploying and using refuge alternatives are addressed in part 75. The Agency has included this training requirement in recognition of the limited time available for persons to establish a secure space between the interior and exterior atmospheres and to purge the refuge alternative to establish a breathable air atmosphere. The final rule clarifies the Agency's intent that a ''test'' be conducted. The final rule is substantively the same as the proposal.

Final paragraph (b)(2) clarifies the proposal and requires that a test be conducted to demonstrate that an overpressure of 15 psi applied to the pre-deployed refuge alternative structure for 0.2 seconds will not allow gases to pass through the structure. The test must verify that the refuge alternative structure is capable of withstanding an initial explosion, and that gases do not pass through the structure following an explosion. The test should demonstrate the integrity of the structure and that doors remain operational.

MSHA did not receive any comments on this proposal. The final rule clarifies that a ''test'' be conducted and makes an editorial change. The final rule is substantively the same as proposed.

Final paragraph (b)(3) clarifies the proposal and requires that a test be conducted to demonstrate that a flash fire of 300 °F for 3 seconds will not allow gases to pass from the outside to the inside of the structure. The test must verify that the refuge alternative structure is capable of withstanding a flash fire, and that gases do not pass through the structure following a flash fire. The test should demonstrate the integrity of the structure and that doors remain operational.

MSHA did not receive any comments on this proposal. The final rule clarifies that a ''test'' be conducted. The final rule is substantively the same as proposed.

Final paragraph (b)(4) clarifies the proposal and requires inspections to determine that overpressure forces of 15 psi applied to the pre-deployed structure for 0.2 seconds do not prevent the stored components from operating. This provision helps assure that stored components are capable of withstanding an initial explosion and will function as intended following an explosion.

One commenter supported and no commenters opposed the proposal. The final rule clarifies that an ''inspection'' be conducted and makes an editorial change. The final rule is substantively the same as proposed.

Final paragraph (b)(5) clarifies the proposal and requires an inspection to determine that a flash fire of 300 °F for 3 seconds does not prevent the stored components from operating. This provision helps assure that stored components are capable of withstanding a flash fire and will function as intended following a flash fire.

One commenter supported and no commenters opposed the proposal. The final rule clarifies that an ''inspection'' be conducted. The final rule is substantively the same as proposed.

Final paragraph (b)(6) clarifies the proposal and requires a test to demonstrate that each structure resists puncture and tearing when tested in accordance with ASTM D2582–07 ''Standard Test Method for Puncture-Propagation Tear Resistance of Plastic Film and Thin Sheeting.'' This standard is copyrighted by ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428–2959. Individual reprints (single or multiple copies) of this standard may be obtained by contacting ASTM at the above address or at 610–832–9585 (phone), 610–832–9555 (fax), or *service@astm.org* (e-mail); or through the ASTM Web site (*http://www.astm.org*). A copy may be inspected at any MSHA Coal Mine Safety and Health district office, or at MSHA's Office of Standards, 1100 Wilson Blvd., Room 2353, Arlington, Virginia, 22209, or at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, call 202–741–6030, or go to: *http://www.archives.gov/federal_register/code_of_federal _regulations/ibr_locations.html.*

This requirement assures that the material used to make the refuge alternative is capable of withstanding the harsh mining environment and

abrasion, tears, and punctures which might result during handling, transportation, and deployment. This especially applies to inflatable-type refuge alternatives and tent refuge alternative structures. These materials must be capable of maintaining a secure space without compromising the interior atmosphere of the refuge alternative.

One commenter supported and no commenters opposed the proposal. The final rule clarifies that a ''test'' be conducted. The final rule is substantively the same as proposed.

Final paragraph (b)(7) clarifies the proposal and requires a test to demonstrate that each reasonably anticipated repair can be completed within 10 minutes of opening the storage space for repair materials and tools. MSHA is concerned that inflatable-type refuge alternative structures have the potential to be ripped, torn, or develop a leak. A leak or tear must be repaired without delay to avoid jeopardizing the safety of persons occupying the refuge alternative. The atmosphere of a refuge alternative must remain isolated at all times. The test would demonstrate that a miner would be able to make a repair such as mending a tear or resealing the fabric within 10 minutes of opening the storage space.

Some commenters questioned whether a person could repair the refuge alternative structure within 10 minutes. A commenter stated that the manufacturer cannot guarantee any particular time frame for repairs, especially during an emergency, and that mandating a time limit is neither practical nor enforceable.

MSHA recognizes there may be differences in refuge alternatives, and, hence, in refuge alternatives' repair procedures. This requirement in included in the final rule in recognition of the limited time available, to repair a structure or to re-establish a secure space between the interior and exterior atmospheres of the refuge alternative to maintain a breathable air atmosphere. Training requirements for miners for refuge alternatives, which are addressed in part 75, must cover repairs. Training will help prepare miners for the possible need to repair a refuge alternative after a protective isolated atmosphere has been established. After considering the comments, the final rule clarifies that a ''test'' be conducted, but the final rule is substantively the same as the proposal.

Final paragraph (b)(8) clarifies the proposal and requires a test to demonstrate that no harmful gases or noticeable odors are released from nonmetallic materials before or after the flash fire test. It also requires a test to identify the gases released and determine their concentrations. This requirement assures that the nonmetallic materials will not emit odors that may sicken persons occupying the refuge alternative. Noticeable odors also might indicate that a material is giving off vapors or gas. Although a noticeable odor may not be objectionable, it could still be harmful. Testing should include instruments used for detecting any released gases. Nonmetallic materials such as paints, plastics, and fiber that are used in the manufacturing of the refuge alternative structure should not release harmful fumes, vapors, or gases.

One commenter stated that, when the refuge alternative is stored, only the externally exposed components need to be tested for toxic gases when exposed to a flash fire test. This commenter suggested that the final rule clarify that requirement only applies to materials potentially exposed to flash fires in the stored configuration.

MSHA expects that a number of different types and combinations of refuge alternatives and components will be used, and that some of these will likely be stored inside the structural components. Testing would address the interior materials and components to assure that they do not release harmful fumes, vapors, or gases under normal conditions. An inspection must be performed to determine that no harmful gases or harsh odors are released from nonmetallic materials after the flash fire test. A properly designed system also would control heat penetration inside the refuge alternative to protect the components and materials in the interior of the refuge alternative.

The Agency agrees with the commenter that the flash fire test would be performed on a stored refuge alternative and its components with the contents of the refuge alternative inside. However, the contents of a refuge alternative should remain inside the refuge alternative when a test is performed.

The final rule clarifies that an ''inspection'' be conducted after the flash fire test. The final rule is substantively the same as the proposal.

Final § 7.505(c) makes an editorial change, but is substantively the same as the proposal, and provides requirements for pressurized air if it is used to deploy the structure or maintain its shape. Final paragraph (c)(1), like the proposal, requires a pressure regulator or other means to prevent over-pressurization of the structure. Over-pressurization of the interior space or airlock space would create a safety hazard. The regulator must be designed to assure that effective relief of overpressure can be accomplished.

Final paragraph (c)(2), like the proposal, requires a means to repair and re-pressurize the structure in case of failure of the structure or loss of air pressure. If the inflatable-type refuge alternative is damaged or leaks, it will need repair and additional compressed air to re-establish the pressure and volume of air that was lost.

One commenter supported and no commenters opposed the proposal. The final rule remains the same as the proposal.

Final § 7.505(d)(1) makes an editorial change, but is substantively the same as the proposal, and requires that the refuge alternative structure provide a means to conduct a preshift examination of the components critical for deployment, without entering the structure. This requirement assures that necessary inspections can be performed to identify problems that may occur in case of an emergency. The gauges and controls for critical components, such as compressed air and oxygen, should be easy to observe to determine the readiness of those components.

Some commenters supported the proposal. Other commenters opposed it, stating that the final rule should require that a preshift examination be conducted inside the refuge alternative to examine critical components.

MSHA does not encourage entering a refuge alternative for pre-shift examinations. The Agency believes that the structure should be designed so that components critical for deployment, such as gauges and controls, can be easily observed externally. After considering the comments, the final rule remains substantively unchanged from the proposal.

Final paragraph (d)(2), like the proposal, requires that the refuge alternative structure provide a means to indicate unauthorized entry or tampering. This requirement assures that a refuge alternative is intact and ready for use, if necessary.

One commenter supported the proposal. Another commenter requested that the proposal be changed to permit operators to enter the refuge to examine the cylinders on a regular basis, and that there should be a requirement for a means to detect tampering with components and materials stored inside the refuge.

As stated in the proposal, tamper-proof seals are necessary and must be provided for visual indication of unauthorized entry into the refuge alternative. This deters tampering with

or pilfering of the contents of the refuge alternative. Refuge alternatives would need to be designed so that if examination or repair requires entry into the refuge alternative, then the seal or other means can be replaced. The final rule remains unchanged from the proposal.

Section 7.506 Breathable Air Components

Requirements in this section assure that there is adequate breathable air inside the refuge alternative because maintaining breathable air inside the refuge alternative is vital to sustain persons trapped underground. The Agency recognizes that different types and combinations of breathable air components from several manufacturers may be used to provide breathable air for refuge alternatives.

Final § 7.506(a), clarifies the proposal and requires that breathable air must be supplied by compressed air cylinders, compressed breathable-oxygen cylinders, or boreholes with fans installed on the surface or compressors installed on the surface. The final rule clarifies MSHA's intent that fans or compressors installed on the surface are to be used with boreholes. In addition, the final rule contains an editorial change, but remains substantively unchanged from the proposal. It requires that only uncontaminated breathable air be supplied to the refuge alternative. These final requirements assure that the breathable air component is reliable and ready to be deployed and used.

One commenter stated that specific approval requirements could stifle innovation and technological advances, and that MSHA should follow a performance-oriented approach and specify only the quantity and quality of air or oxygen entering the shelter. MSHA is promulgating this final rule to implement the MINER Act's goal related to the maintenance of individuals trapped underground in the event that miners are not able to evacuate the mine. To achieve this goal, the Agency's final rule must provide requirements that assure that refuge alternatives will operate effectively. To allow for innovations in technology, the Agency has developed a final rule that is largely performance-oriented. Under the final rule, applicants have a variety of options for developing refuge alternatives that will maintain trapped miners. In addition, final § 7.510 allows MSHA to approve refuge alternatives and components that incorporate new technology if the applicant demonstrates that the refuge alternative or component provides at least the same level of protection as those meeting the requirements of Subpart L—Refuge Alternatives.

One commenter observed that, in at least two mines outside the United States, operators had installed backup systems for providing breathable air. Another commenter also supported backup systems for providing breathable air. While the final rule does not require the use of a secondary, independent breathable air component (a backup system), operators are encouraged to provide backup breathable air systems for use with refuge alternatives.

One commenter suggested that the final rule include an option that would permit mines with existing exhaust ventilation systems to ventilate through boreholes to provide breathable air in the refuge alternative. The final rule does not permit this type of option because it is not reliable. Breathable air systems must be able to operate following an explosion or fire. Main mine fans are sometimes damaged by explosions and may not be operable following an explosion or fire.

Final § 7.506(b) clarifies the proposal and provides requirements that assist MSHA in evaluating the effectiveness, compatibility, and supply of the breathable air component. The final rule, which is substantively the same as the proposal, states that the procedures must be ''included'' rather than ''followed''.

Final paragraph (b)(1) requires that mechanisms be provided and procedures be included so that, within the refuge alternative, the breathable air will sustain each person for 96 hours.

Several commenters requested an explanation with respect to the requirement for providing 96 hours of breathable air, some stating that 48 hours of breathable air would be sufficient. Other commenters supported the 96-hour requirement.

Each mine emergency is a unique event and it is impossible to predict with precision the period of time required to maintain miners prior to rescue. To provide for an added margin of safety, the Agency has determined that it is necessary to require a 96-hour supply of breathable air. The 96-hour supply of breathable air in the final rule will assist the rescue effort by providing necessary time for rescuers to safely reach trapped miners. The depth of the mine, the geology of the overburden, and the terrain above the mine significantly affect rescue activities. Mine rescue protocol requires monitoring of mine atmospheres and assessing the risk prior to mine rescue teams entering the mine and making progressive steps underground toward trapped miners. Successful mine rescue progression often requires repairs to damaged infrastructure, *e.g.*, roof control systems, and ventilation controls. History has shown there can be delays associated with implementing successful mine rescue protocols and procedures that can delay reaching trapped miners.

In MSHA's February 8, 2007, PIB P07–03, the Agency stated that it considered 96 hours of breathable air to be necessary, and concluded that a 96-hour supply was warranted. In arriving at the 96-hour requirement in this final rule, MSHA reviewed recent and historical data on entrapments. While most safety and health professionals and researchers agree that refuge alternatives can sustain trapped persons, there is not general agreement on the amount of time that the refuge alternative should be capable of sustaining miners. After reviewing Agency data and comments, the Agency continues to believe that the 96-hour requirement is necessary and the final rule is the same as proposed.

Final paragraph (b)(2), like the proposal, requires that mechanisms be provided and procedures be included so that, within the refuge alternative, the oxygen concentration is maintained at levels between 18.5 and 23 percent. This requirement is consistent with the NIOSH report.

A commenter stated that the minimum oxygen level in refuge chambers should be 19.5 percent. Existing § 75.321 requires that the air in areas where persons work or travel must contain at least 19.5 percent oxygen. MSHA believes that the recommendation in the NIOSH Report for a minimum of 18.5 percent will be adequate to sustain miners in the isolated atmosphere of the refuge alternative. Like the proposal, the final rule includes a range for oxygen due to the variety of oxygen delivery systems used. Further, MSHA has included the upper limit to lessen the risk of fire or explosion.

MSHA believes that the atmosphere in refuge alternatives would experience levels of 18.5 percent only intermittently and of short duration and expects that the level of 19.5 percent would be available to persons for most of the time. Data show that short-term levels of 18.5 percent are not harmful to the persons who are normally at rest, not working, and are not likely to experience difficulty breathing, conditions that are likely to be present in the refuge alternative. The Foster

Miller Report [3] cites a large body of work, from a number of sources, indicating safe working levels for oxygen below 19.5 percent. Based on its review of comments and data, the Agency has kept the final rule the same as proposed.

Final paragraph (b)(3) clarifies the proposal and requires that mechanisms be provided and procedures be included so that, within the refuge alternative, the average carbon dioxide concentration is 1.0 percent or less, and excursions do not exceed 2.5 percent.

MSHA calculated oxygen consumption rates for persons using a refuge alternative. Because most activity would involve sleeping or resting, and because a small amount of activity would involve taking readings or changing curtains, MSHA estimated activity levels of ⅘ of the time at rest and ⅕ of the time engaged in moderate activity. Oxygen consumption at the assumed breathing rate would be 1.32 cubic feet per hour per person (0.022 cubic feet per minute per person). These oxygen consumption rates were based on the U.S. Bureau of Mines, Foster Miller Report, ''Development of Guidelines for Rescue Chambers,'' Volume I, 1983.

In PIB P07–03, MSHA demonstrated the rate at which a person would experience adverse health effects from carbon dioxide if it were not removed from the environment. MSHA used air supply calculations and activity levels based on information provided in the Foster Miller report. The Agency used a hypothetical sealed space with a volume of 1,800 cubic feet (20 feet long, 18 feet wide and 5 feet high) that contained one person. The initial air quality was assumed to be 19.5 percent oxygen and 0.03 percent carbon dioxide, and the breathing rate (⅘ of the time at rest and ⅕ of the time engaged in moderate activity) for oxygen inhaled is 0.022 cubic feet per minute per person.

For this example, MSHA found that one person could be maintained 49.5 hours in an 1,800 cubic foot enclosed space with an initial air quality of 19.5 percent oxygen and 0.03 percent carbon dioxide. This equates to 1.65 minutes per cubic foot of enclosed space (volume). Using these same parameters, 10 persons could be maintained for 4.95 hours before the carbon dioxide concentration reached the defined unacceptable level of 3 percent based on Peele Mining Engineers' Handbook and MSHA's current Short Term Exposure Limit. Further, under the circumstances, 10 persons would reach 10 percent carbon dioxide and resulting unconsciousness in approximately 16.6 hours.

One commenter stated that the MSHA requirement for carbon dioxide levels was too stringent and cited international standards that were 5 percent. Several commenters discussed the ill effects of high levels of carbon dioxide and supported MSHA's proposal.

The NIOSH report recommends that components operate to maintain carbon dioxide at or below the levels in the final rule (1 percent with excursions not exceeding 2.5 percent) and, based on a review of medical information, research, and accident experience, MSHA is aware of ill effects associated with exposure to concentrations of carbon dioxide greater than the levels in the final rule. MSHA reviewed international standards for safe levels of carbon dioxide and found none to be higher than 1.25 percent for extended periods. The concentrations of carbon dioxide in the enclosed atmosphere of a refuge alternative need to be within established limits to prevent debilitating or even lethal effects. Based on comment, data, and Agency experience, the final rule remains at 1 percent and excursions must not exceed 2.5 percent.

Final § 7.506(c) makes an editorial change, but is substantively the same as the proposal and requires that breathable air supplied by compressed air from cylinders, fans, or compressors provide a minimum flow rate of 12.5 cubic feet per minute (cfm) of breathable air for each person. Compressor air intakes should be installed and maintained to assure that only clean, uncontaminated air enters the compressors. In addition, compressors must have the capacity to deliver the required volume of air at the point of expected usage.

MSHA notes that the use of compressed air cylinders as the sole means of providing breathable air may be impractical and the Agency encourages mine operators to consider other options. As MSHA pointed out in PIB P07–03, when using a borehole to deliver sufficient quantities of breathable air, a fan or equivalent method should be used to force fresh air into the hole with enough positive pressure to overcome total mine pressure.

During the rulemaking process and at each public hearing, MSHA requested comments on the proposed flow rate and asked that commenters be specific including alternatives, rationale, safety benefits to miners, technological and economic feasibility, and supporting data.

Several commenters opposed the proposal. Some of these commenters stated that the minimum flow rate was too high. Other commenters requested clarification that the minimum flow rate only applied when carbon dioxide is not scrubbed. One commenter suggested that the manufacturer determine flow rate based on the refuge alternative design.

The minimum flow rate in this final rule is based on MSHA studies, comparisons with existing OSHA requirements, and engineering handbooks. MSHA has determined that the flow rate of 12.5 cfm is the minimum amount of air needed for respiration and dilution of carbon dioxide and other harmful gases. In addition, the 12.5 cfm flow rate assures positive pressure to prevent contamination from the mine atmosphere. This requirement applies to breathable air systems that do not incorporate carbon dioxide scrubbing components. The Agency's intent is for breathable air supplied by compressed air from cylinders, fans, or compressors to be used from the surface through a borehole or with an in-mine horizontal piping system that is protected from explosions. Based on comment, data, and Agency experience, the final rule remains the same as the proposal.

Final paragraph (c)(1), like the proposal, provides requirements for fans or compressors. In PIB P07–03, MSHA provided a number of recommendations that should be followed when compressors are used to provide breathable air underground. These recommendations would also apply when fans are used for the same purpose. MSHA recommended that compressor air intakes should assure that only clean, uncontaminated air enters the compressors.

Final paragraph (c)(1)(i), like the proposal, requires that fans or compressors be equipped with a carbon monoxide detector located at the surface that automatically provides a visual and audible alarm if carbon monoxide in supplied air exceeds 10 parts per million (ppm). This provision helps assure that harmful levels of carbon monoxide are not transferred into the refuge alternative. This requirement is the same as the carbon monoxide concentration in supplied breathable air from oil-lubricated compressors as established by OSHA in 29 CFR 1910.134(i)(7), which will maintain uniformity in requirements for the use of this specialized equipment. Although the NIOSH recommended value of maximum concentration of carbon

[3] Foster Miller. *Phase II Report,* Chapter 4, Table 2, page 3, December 2007; and U.S. Bureau of Mines. *Development of Guidelines for Rescue Chambers, Volume I,* Table 2, page 20, October 1983.

monoxide is 25 ppm, MSHA believes that, based on the Agency's experience, controlling supplied air delivered to a refuge alternative should contain no more than 10 ppm.

One commenter stated that a carbon monoxide detector should not be required when systems are not equipped with internal combustion engines. One commenter supported the proposed requirement for a carbon monoxide detector located on the surface.

The final rule, like the proposal, requires the use of carbon monoxide detectors when fans and compressors are used on the surface. The Agency recognizes that compressors or fans may operate in the vicinity of other equipment having gas or diesel engines and the carbon monoxide detector safety feature is necessary to assure the persons in the refuge alternative are delivered uncontaminated air.

Final paragraph (c)(1)(ii) merged proposed paragraphs (c)(1)(ii) and (iii) and requires fans or compressors to include in-line air-purifying sorbent beds and filters or other equivalent means to assure the breathing air quality and prevent condensation. Further, it requires maintenance instructions that provide specifications for periodic replacement or refurbishment. Sorbent beds and filters and maintenance instructions help assure that the air quality is maintained and condensation is prevented.

One commenter stated that purifying sorbent beds should not be required when systems are not equipped with internal combustion engines. Regardless of whether internal combustion engines are used, in-line air-purifying sorbent beds and filters or other equivalent means are necessary to assure the breathing air quality and to prevent condensation when fans and compressors are used on the surface.

Final paragraph (c)(1)(iii) is redesignated from proposed paragraph (c)(1)(iv) and clarifies that fans or compressors provide positive pressure and an automatic means to assure that the pressure is relieved at 0.18 psi, or as specified by the manufacturer, above mine atmospheric pressure in the refuge alternative.

Positive pressure in the refuge alternative that exceeds total mine pressure will prevent contamination and allow sufficient quantities of breathable air. An automatic means, such as a relief valve, must be provided to assure that the refuge alternative is not over-pressurized when breathable air is supplied. Excessive pressure creates adverse physiological effects. MSHA requested comments on the proposed setting for pressure relief and whether a higher pressure relief should be required.

Some commenters stated that the proposed relief pressure should be modified, especially with inflatable refuge alternatives. Some commenters noted that most steel-type refuge alternatives have pressure relief set at 0.25 psi.

The Foster Miller report specifies a minimum of 5 inches of water gauge overpressure in the refuge alternative which is equivalent to approximately 0.18 psi. Although most manufactured refuge alternatives presently have pressure relief valves set at 0.25 psi, too much pressure differential makes opening doors difficult for persons entering the refuge alternative. The final rule addresses all types of refuge alternatives and clarifies the required setting for pressure relief. For prefabricated units, the pressure must automatically be relieved at 0.18 psi, or as specified by manufacturer, above mine atmospheric pressure. For refuge alternatives consisting of 15 psi stoppings constructed prior to an event, the pressure must automatically be relieved at 0.18 psi above mine atmospheric pressure.

Final paragraph (c)(1)(iv), redesignated from proposed paragraph (c)(1)(v), requires that fans or compressors include warnings to assure that only uncontaminated breathable air is supplied to the refuge alternative. MSHA expects that the warning could be a highly visible tag or label affixed to the supplied air fans or compressors stating that only uncontaminated breathable air may be supplied to the trapped persons in the refuge alternative. Care should be exercised when using compressors in the vicinity of other equipment having gas or diesel internal combustion engines because these engines emit toxic gases, such as carbon monoxide, sulfur dioxide, and nitrogen oxides, which can contaminate the air being supplied by the compressor. In addition, compressors requiring oil can generate carbon monoxide (CO) which can be supplied inadvertently to miners. Oil-type compressors could be used; however, the air quality should be sampled and controlled using carbon monoxide filtration. Oil-less compressors that do not generate carbon monoxide do not require carbon monoxide filtering.

There were no comments related to the proposal. The final rule is unchanged from the proposal.

Final paragraph (c)(1)(v), redesignated from proposed paragraph (c)(1)(vi), requires that fans or compressors include air lines to supply breathable air to the refuge alternative. Final paragraph (c)(1)(v)(A) requires that air lines be capable of preventing or removing water accumulation. This requirement helps prevent the accumulation of water, which could affect the quantity and quality of breathable air provided underground. MSHA understands that coal mines are not entirely horizontal and may contain dips where water can accumulate in the piping. Moisture-laden air should not be piped into the area where miners are trapped. If moisture is not removed, water could accumulate in the refuge alternative. MSHA anticipates air dryers with drain valves will be used. In addition, air lines or pipes that are pre-installed should be capped to prevent the entry of rain or moisture-laden air. If horizontal air lines or pipes are used, they should be provided with a means to automatically drain any water accumulation.

One commenter requested that the proposal be modified to require the applicant to explain how preventing or removing water accumulation will be accomplished, if necessary, because many mines in the southwest desert do not have significant rainfall or humidity.

Regardless of the location of the mine, all compressed air systems must have moisture removal capabilities because all atmospheric air contains water vapor. During compression, air temperature is increased significantly, which allows the air to retain moisture. After compression, air is typically cooled reducing its ability to retain water vapor. A proportion of this water vapor condenses into liquid water which must be removed, for example, by a drain fitted to the compressor after-cooler. The final rule is the same as the proposal.

Under final paragraph (c)(1)(v)(B), air lines must be designed and protected to prevent damage during normal mining operations, a flash fire of 300° Fahrenheit for 3 seconds, a pressure wave of 15 psi overpressure for 0.2 seconds, and ground failure. This requirement provides protection for air lines that come from boreholes or air lines from the surface that are extended underground to a refuge alternative. Operators could achieve protection required under this final rule by burying pipes by through trenching. Trenching would have to be deep enough to protect the pipes from mine traffic, explosions, ground movement, or equipment damage.

One commenter supported the proposal, but stated that it may sometimes be impossible to protect air lines due to geologic conditions. MSHA recommended trenching and burying air

lines as one method of protecting air lines from damage; however, the final rule is performance-oriented, allowing other methods of protecting air lines to be used. The final rule remains unchanged from the proposal.

Final paragraph (c)(1)(vi), redesignated and the same as proposed paragraph (c)(1)(vii), requires that fans or compressors assure that harmful or explosive gases, water, and other materials cannot enter the breathable air. Harmful gases could contaminate filters or other components or collect in the equipment and affect the quality of the air being supplied to trapped miners.

There were no comments on this proposal and the final rule remains the same as the proposal.

Final paragraph (c)(2) clarifies the proposal and requires that redundant fans or compressors and power sources be provided to permit prompt re-activation of equipment in the event of failure. This requirement assures that breathable air will be maintained in the event of failure of one of the sources of breathable air. The final rule clarifies that redundant fans or compressors and power sources are required rather than a ''redundancy of'' fans or compressors and ''each power source'' in the proposal.

There were no comments to this proposal and the final rule is substantively the same as the proposal.

Final paragraph (d), like the proposal, provides requirements for compressed breathable oxygen. Final paragraph (d)(1) requires that compressed breathable oxygen include instructions for activation and operation. This information will assure that persons activating and operating the cylinders have the proper information to correctly perform the task so as to not imperil the lives of persons within the refuge alternative.

One commenter suggested that the operating instructions cover adjustment of oxygen flow to prevent oxygen toxicity in the refuge alternative.

Under the final rule, instructions should include topics such as adjusting oxygen flow rates and checking for loose connections, sounds of leaking gas, damage to hoses along the length or at the fittings, and broken gauges. These instructions assure that compressed air tanks are secure and pressure regulators are properly set and that wrenches and pliers will be in proper working order. Instructions could be developed from sources such as ASTM Stock No.: MNL 36, ''Safe Use of Oxygen and Oxygen Systems: Guidelines for Oxygen System Design, Materials Selection, Operations, Storage, and Transportation.''

The final rule remains the same as the proposed rule.

Final paragraph (d)(2), like the proposal, requires that compressed, breathable oxygen provide oxygen at a minimum flow rate of 1.32 cubic feet per hour per person.

One commenter supported the proposal, but requested clarification of the activity levels that MSHA relied on to support the proposed minimum flow rate.

MSHA relied on the activity levels stated in PIB P07–03, which contains breathing rates and calculations for persons who need to use a refuge alternative. No commenters opposed the proposal. The final rule remains the same as the proposed rule.

Final paragraph (d)(3), like the proposal, requires that compressed breathable oxygen include a means to readily regulate the pressure and volume of the compressed oxygen. Regulating compressed breathable oxygen is necessary to assure that oxygen levels remain within the recommended values. In addition, all oxygen valves should be opened slowly to prevent the oxygen from heating.

One commenter agreed and no commenters opposed the proposal. The final rule remains the same as the proposed rule.

Final paragraph (d)(4), like the proposal, would require that compressed breathable oxygen include an independent regulator as a backup in case of failure. It is crucial to maintain a continuous supply of breathable air to persons trapped underground.

Some commenters opposed the proposal. These commenters stated that backup regulators are not necessary because these devices have been used for decades with an excellent safety record and minimal failure. Some commenters also stated that the proposal would require additional piping and fittings which would increase the risk of oxygen leaks.

A backup regulator assures that breathable air will be maintained during an emergency. Based on MSHA's review of literature and system analyses, MSHA notes that there is the potential for failure and instances where regulators have failed. Persons who need to use the refuge alternative must be able to rely on oxygen regulators for survival. If a regulator fails during an emergency, it would take too much time and would be too difficult to repair and re-establish breathable air especially if persons inside the unit are injured. In addition, based on MSHA's review of costs, the Agency believes that the cost of a backup regulator is small compared to the cost of an entire unit. Further, the Agency believes that there is no additional risk of an oxygen leak because these regulators are safe to use and must be checked periodically to assure that they will function properly. Accordingly, backup regulators must be provided. The final rule remains the same as the proposed rule.

Final paragraph (d)(5), like the proposal, requires that compressed breathable oxygen be used only with regulators, piping, and other equipment that is certified and maintained to prevent ignition or combustion. A compressed breathable oxygen system should not be used with a previously used compressed air system because a fire or explosion could occur when pure oxygen contacts oil and grease from the previously used compressed air system.

One commenter supported the proposal. One commenter opposed the requirement for certified equipment and materials that are used downstream of the regulator because the equipment and materials carry oxygen that is not under high pressure and, therefore, is not a hazard. Based on MSHA's experience, the Agency believes that there is a risk of fire or explosion for all oxygen supply piping and equipment and, therefore, it is necessary that the equipment and materials be certified. The final rule remains the same as the proposal.

In the final rule, MSHA has moved proposed § 7.506(e) and (f) addressing carbon dioxide removal components' instructions and testing to final § 7.508(a), (b), and (c) addressing harmful gas removal components. This move places all the instructions and testing requirements for harmful gas removal in the same section (discussed later in this preamble).

The final rule does not include proposed § 7.506(g), which addressed the use of respirators as a breathable air component. Proposed paragraph (g)(1) would have required respirators or breathing apparatus to be NIOSH-approved with a means of flow and pressure regulation. Proposed paragraph (g)(2) would have required that respirators or breathing apparatus be equipped with fittings that connect only to a breathable air compressed line. Proposed paragraph (g)(3) would have required that respirators or breathing apparatus allow for communication, and the provision of food and water while preventing the entry of any outside atmosphere. Proposed paragraph (g)(4) would have required that respirators or breathing apparatus be capable of being worn for up to 96 hours.

Several comments opposed the use of respirators, citing uncertainties regarding the wearing of respirators for

prolonged periods. They also questioned how the respirator type system would provide refuge.

After reviewing the comments, MSHA considered possible adverse effects that might be associated with respirator use and determined that this provision should not be included in the final rule. The use of respirators for 96 hours may present medical problems, such as lung damage due to lack of humidity or poisoning due to skin exposure to toxic gases. In addition, the use of masks would require special individual fitting to prevent leakage. Further, injured persons may not physically be able to don the mask. Accordingly, the final rule does not include the use of respirators as a breathable air component.

Final paragraph (e) is redesignated from and clarifies proposed paragraph (h) and requires that an applicant prepare and submit an analysis or study demonstrating that the breathable air component will not cause an ignition. The final rule clarifies MSHA's intent that an analysis or study should evaluate the potential fire and ignition risks of breathable air components, equipment, or materials. Final paragraph (e)(1) requires that the analysis or study specifically address oxygen fire hazards and fire hazards from chemicals used for removal of carbon dioxide. Final paragraph (e)(2) requires that the analysis or study identify the means used to prevent any ignition source. These requirements minimize or prevent the inherent potential fire hazard from oxygen and the fire hazards from chemicals used for removal of carbon dioxide. Applicants should analyze inherent potential fire hazards and include a mitigation plan to minimize or prevent ignition of breathable air component equipment or materials.

One commenter supported the proposal, stating that the analysis should be completed to assure all potential fire and ignition risks are analyzed and addressed by design. Another commenter suggested that there should be a Material Safety Data Sheet (MSDS) on everything within the refuge alternative because MSDSs have all the information requested in a form familiar to users.

Under the final rule, fire and ignition hazards must be analyzed and addressed in the breathable air component design; however, applicants may provide MSDSs for persons using refuge alternatives. While the language has been changed slightly, the final rule requirements are the same as the proposal.

Proposed paragraph (i), concerning fire extinguishers, is moved to final § 7.504(c)(6).

Section 7.507 Air-Monitoring Components

Final § 7.507(a), like the proposal, requires that each refuge alternative have an air-monitoring component that provides persons inside with the ability to determine the concentrations of carbon dioxide, carbon monoxide, oxygen, and methane, inside and outside the structure, including the airlock. The ability to monitor these gases inside the refuge alternative is critical to the survival of persons occupying the refuge alternative. For example, monitoring methane minimizes possible oxygen deficiency or explosion. In addition, the ability to monitor the atmosphere outside the refuge alternative assists persons inside the refuge alternative in making crucial decisions regarding rescue and evacuation.

One commenter stated that the air monitoring component should be portable and permit use inside and outside the refuge alternative. The final rule does not specify that the air monitoring component has to be either portable or fixed nor does it state that only electronic type instruments be used. Any measurements taken outside the refuge alternative should be through ports that prevent contamination of the refuge alternative. Under the final rule, monitoring outside the refuge alternative should be periodic, as needed, and would not need to be continuous. Pumps attached to hoses could be used to safely draw samples from outside the refuge alternative.

One commenter supported the proposal to monitor the outside atmosphere while another commenter opposed the proposal, stating that persons should stay in the refuge alternative until rescued. MSHA believes that the measurement of the outside atmosphere will be important so that refuge alternative occupants will have necessary information to relay to rescuers on the surface and make crucial decisions regarding evacuation. MSHA reiterates the longstanding principle in mine rescue that miners should first attempt to evacuate the mine, and if evacuation is impossible, then retreat to the refuge alternative.

One commenter stated that part 75 did not have a comparable monitoring requirement. This is not correct; the emergency response plan provision in part 75 requires monitoring inside and outside the refuge alternative.

One commenter stated that the airlock monitoring requirement should be eliminated. The Agency believes that the monitoring of all the inside atmosphere, including the airlock, is necessary because persons occupying the refuge alternative will be accessing the airlock. The final rule remains as proposed.

Final § 7.507(b), like the proposal, requires that refuge alternatives designed for use in mines with a history of harmful gases, other than carbon monoxide, carbon dioxide, and methane, be equipped to measure those harmful gas concentrations. Some mines have a history of liberating harmful gases such as hydrogen sulfide, volatile hydrocarbons, or sulfur dioxide. The ability to detect and measure harmful gases is necessary for the safety of the persons using the refuge alternative.

A commenter requested that the final rule specify each gas that would need to be monitored because monitors are gas specific. Under the final rule, the Agency intends that refuge alternatives designed for use in mines with a history of harmful gases, other than those mentioned, must be equipped to measure the gases encountered. Manufacturers will know the conditions in the mines in which their refuge alternatives will be used. The final rule remains as proposed.

Final § 7.507(c), like the proposal, requires that the air-monitoring component be inspected or tested and the test results be included in the application. This requirement assures that the monitors or detectors are suitable for and will perform under mining conditions. Air monitoring component must be approved as intrinsically safe or permissible in accordance with the general requirements for approval of refuge alternative components under § 7.504(a)(1).

MSHA received no comments on the proposal. The final rule is the same as the proposal.

In the final rule, MSHA has included proposed § 7.507(d), addressing air-monitoring component approval numbers in the approval application, in final § 7.503(2)(i), which addresses application requirements.

Final § 7.507(d), redesignated from proposed § 7.507(e), like the proposal, addresses requirements for air-monitoring components. Final paragraph (d)(1) requires that the total measurement error, including the cross-sensitivity to other gases, not exceed ±10 percent of the reading, except as specified in the approval. Gas analyzer specifications under existing part 7, concerning diesel engine approvals under existing § 7.86(b)(9), specify the gas analyzer instrument error, including

cross-sensitivity to other gases, as ±5 percent. The ±10 percent accuracy in this final rule allows for random and systematic errors in measurement. It is important to control the measurement error and cross-sensitivity because of the uncertainty inherent with the instrument and measurement, and the need for reproducibility of the instrument measurements. This final requirement is necessary to assure the readings taken by persons in the refuge alternative verify that the air is breathable and does not have the potential for fires and explosions.

MSHA did not receive comments on this provision. The final rule remains the same as the proposal.

Final paragraph (d)(2), redesignated from paragraph (e)(2), like the proposal, requires that the measurement error limits not be exceeded after start-up, after 8 hours of continuous operation, after 96 hours of storage, and after exposure to atmospheres with a carbon monoxide concentration of 999 ppm (full-scale), a carbon dioxide concentration of 3 percent, and full-scale concentrations of other gases. Full-scale concentrations are those at the upper limit of the air monitoring instrument's capability to measure accurately within the instrument's error factor.

This requirement allows persons using gas monitors or detectors to determine accurate gas concentrations throughout the duration of occupancy in the refuge alternative and at different parameters such as startup, after 8 hours of continuous operation, during storage when continuously exposed to the maximum recommended gas concentrations, and at other concentrations much higher than the recommended maximum values. It takes into account the effects high gas concentration levels may have on these measurements over extended periods of time. For example, MSHA reviewed the ANSI standard for carbon monoxide detection instruments to evaluate the performance testing of instruments at different levels of carbon monoxide, including high levels.

A commenter stated that the proposed concentration of 999 ppm for carbon monoxide was too high and that the wording of the provision was unclear. MSHA reviewed data from previous accidents and found that a carbon monoxide concentration of 999 ppm may exist following an explosion or fire. It is necessary to evaluate the effects of the higher concentrations on the instruments because the higher limits may exist prior to purging the airlock. The carbon monoxide limit for the atmosphere inside the refuge alternative is 25 ppm. After considering the comments, the Agency has determined that the final rule should remain the same as the proposal.

Final paragraph (d)(3), redesignated from proposed paragraph (e)(3), like the proposal, requires that calibration gas values be traceable to the National Institute for Standards and Technology (NIST) ''Standard Reference Materials'' (SRMs). This requirement, which is based on existing § 7.86(b)(16), assures that the air-monitoring equipment is properly calibrated. The NIST SRMs are recognized and accepted industry standards. There were no comments to the proposal. The final rule is the same as the proposal.

Final paragraph (d)(4) merged proposed paragraphs (e)(4) and (e)(5) and requires that the analytical accuracy of the calibration gas and span gas values be within 2.0 percent of NIST gas standards. This requirement is based on existing § 7.86(b)(16) and (17), which also reference analytical accuracy of calibration gases within 2.0 percent of NIST gas standards.

There were no comments on the proposal. The final rule is substantively the same as the proposal.

Final paragraph (d)(5), redesignated from proposed paragraph (e)(6), like the proposal, requires that the detectors must be capable of being kept fully charged and ready for immediate use. This requirement assures that persons using refuge alternatives have detectors that are reliable and ready for use.

One commenter stated that keeping the detector batteries charged requires too much maintenance. The final rule requires that the methods of charging and calibrating be stated in the emergency response plan. It is imperative that the detectors be inspected and ready for immediate use in the event of an emergency that requires using the refuge alternative. After considering the comments, the final rule remains the same as the proposal.

Section 7.508 Harmful Gas Removal Components

Final § 7.508, like the proposal, provides requirements for harmful gas removal. Final paragraph (a)(1) requires that purging or other effective procedures be provided for the airlock to dilute the carbon monoxide concentration to 25 ppm or less and the methane concentration to 1.0 percent or less as persons enter, within 20 minutes of persons deploying the refuge alternative.

Some commenters opposed the 25 ppm carbon monoxide limit and suggested a limit of 50 ppm. One commenter stated that a 50 ppm level will reduce the required time in the airlock and allow persons to enter the refuge main chamber more quickly. This commenter added that further dilution will occur between the airlock and the main chamber of the refuge alternative estimating that the time it takes to reach 50 ppm will be 25 percent shorter than the time it takes to reach 25 ppm.

MSHA understands that the airlock may contain carbon monoxide concentrations as high as 50 ppm when persons are entering the refuge alternative. The carbon monoxide concentration of 50 ppm recommended by some commenters is generally based on an 8-hour exposure per day. However, after all persons have entered the refuge alternative, the interior of the refuge alternative, including the airlock, must be maintained at 25 ppm or less because, under the final rule, the airlock is usable space that persons may occupy. MSHA reviewed other standards pertaining to carbon monoxide exposure, and considered that persons could be entrapped for periods up to 96 hours. For these reasons, the final rule remains at 25 ppm for carbon monoxide, since the Agency believes that the interior space of the refuge alternative must be maintained at this level. This carbon monoxide limit is consistent with the NIOSH report. The methane concentration limit has been changed from the proposal to be consistent with existing standards governing methane limits.

One commenter stated that MSHA should clarify that purge air must be in addition to the 96 hours of breathable air that each person must have. Under the final rule, MSHA intends that the air that is used to purge the airlock must be in addition to the breathable air needed to sustain persons for 96 hours.

One commenter stated that the entire interior, and not just the airlock, should be purged. The final rule, like the proposal, provides that refuge alternatives should be configured to assure that the inside air is isolated from the mine atmosphere, which minimizes the quantity of purge air needed to purge the interior space. An airlock, which provides a transition area between the mine atmosphere and the refuge alternative's interior space, minimizes contamination of the interior space. Therefore, airlocks need to be capable of removing contaminants or configured in a way that assures that contaminated mine atmosphere is prevented from migrating through the airlock into the interior space of the refuge alternative. This requirement assures that contaminated air is forced

out of the refuge alternative. Purge air should be provided from compressed air cylinders.

Another commenter stated that purging the airlock within 20 minutes of persons activating the refuge alternative is an excessive amount of time. Based on MSHA's experience, the Agency believes that 20 minutes to purge the airlock and to establish a breathable air atmosphere is appropriate and necessary.

One commenter requested clarification of the initial concentration of methane so that purge air volumes can be computed. The final rule does not specify an initial concentration of methane, but the Agency expects that the initial test concentration, prior to purging, should be a minimum of 12 percent.

Another commenter stated that MSHA should specify that all flow rates be defined at ''Standard Temperature and Pressure'' (STP) conditions, ''including the assumptions of CO_2 production from humans.'' The Agency contacted an author of the Foster Miller Report and determined that 60 °F was used as the standard temperature and that there is general agreement that 14.7 psi is the standard pressure at 1 atmosphere. Because approved permissible electrical components may be present in the refuge alternative, in the final rule, the proposed 1.5 percent concentration of methane was reduced to 1.0 percent to be consistent with existing § 75.323(b)(1)(i) and (ii).

Final paragraph (a)(2), like the proposal, requires that chemical scrubbing or other effective procedures be provided so that the average carbon dioxide concentration in the occupied structure does not exceed 1.0 percent over the rated duration and excursions do not exceed 2.5 percent. Carbon dioxide is an asphyxiant produced by human respiration. The carbon dioxide concentration limit is consistent with the NIOSH report.

To prevent the accumulation of harmful concentrations of carbon dioxide, scrubbing systems have been developed to chemically absorb the carbon dioxide. Carbon dioxide scrubbing systems may be active or passive. Passive systems rely solely on natural air currents for the air to react with the chemical bed. Passive system chemicals are usually packaged in curtains. These curtains would be suspended in the refuge chamber. Active systems force air through a chemical bed by fans or compressed air, and are generally more efficient than passive systems.

One commenter supported and no commenters opposed the proposal. The final rule is the same as proposed with one editorial change.

Final paragraph (a)(2)(i), redesignated from proposed § 7.506(e)(2), like the proposal, requires that carbon dioxide removal components be used with breathable air cylinders or oxygen cylinders. Carbon dioxide removal components must be compatible with the overall system for providing breathable air. The carbon dioxide removal systems are dependent on the occupancy and volume of the refuge alternative. The breathable air system is also dependent on those same factors.

One commenter supported and no commenters opposed the proposal. The final rule is the same as proposed.

Final paragraph (a)(2)(ii), redesignated from proposed § 7.506(e)(3), like the proposal, requires that carbon dioxide removal components remove carbon dioxide at a rate of 1.08 cubic feet per hour per person. As stated previously, MSHA is assuming that breathing rates for persons who have reached refuge alternatives reflect activity levels of ⅘ at rest and ⅕ moderate activity. Therefore, using the respiratory quotient, which is the ratio of CO_2 expelled to O_2 consumed, the average carbon dioxide generation is 1.08 cubic feet per hour per person. These breathing rates were based on the Foster Miller report.

One commenter supported and no commenters opposed the proposal. The final rule is the same as proposed with one editorial change.

Final paragraph (a)(3), redesignated from proposed § 7.506(e)(1), requires that harmful gas removal components must include instructions for deployment and operation. The final rule clarifies that instructions are required for harmful gas removal components, which include carbon dioxide removal components.

One commenter supported and no commenters opposed the proposal. The final rule is substantively the same as the proposal.

Final paragraph (b), like the proposal, addresses requirements for each chemical used for removal of harmful gas. Final paragraph (b)(1), like the proposal, requires that each chemical for removal of harmful gas be contained such that when stored or used it cannot come in contact with persons and it cannot release airborne particles. This provision is consistent with the NIOSH report which stated that the scrubbing material must not become airborne or otherwise cause respiratory distress or other acute reaction.

Because harmful gas removal chemicals are caustic, each would need to be contained. One way of packaging these chemicals is in curtains or cartridges that are isolated so that contact with or exposure to the chemicals is prevented. For example, commonly used CO_2 removal systems include lithium hydroxide or soda lime curtains or soda lime cartridges. These curtains or cartridges assure that persons do not contact the caustic chemicals, which can cause burns. Chemicals must be activated without compromising the packaging materials and exposing persons to chemical hazards.

MSHA received no comments on this proposal. The final rule includes proposed § 7.506(e)(4), concerning carbon dioxide removal components, and contains editorial changes, but remains substantively the same as the proposal.

Final paragraph (b)(2) requires that each chemical used for removal of harmful gas be provided with all materials; parts, such as hangers, racks, and clips; equipment; and instructions necessary for its deployment and use. Depending on the type of CO_2 removal system, instructions could include deployment and proper handling of materials. These instructions would assure that mine operators have the proper information to correctly perform tasks involving carbon dioxide removal components. This provision clarifies the proposal and will expedite deployment of the scrubbing system to reduce start-up time and make the system easy to use for the occupants. MSHA's intent is that the steps required to deploy the harmful gas removal component should not be difficult and should be designed on a per-person incremental basis to make the system easily understood by occupants.

MSHA received no comments on the proposal. The final rule includes proposed § 7.506(e)(1) and (5) concerning carbon dioxide removal components, but remains substantively the same as the proposal.

Final paragraph (b)(3), like the proposal, requires that each chemical used for removal of harmful gas be stored in an approved container that is conspicuously marked with the manufacturer's instructions for disposal of used chemicals. This requirement assures appropriate containment during shipping and storage. MSHA's intent is that an approved container is one that is accepted under general chemical industry practice and appropriate for pre-deployment transport and storage. Deployment and disposal instructions should be provided to assure persons are not exposed or otherwise injured while handling chemicals.

MSHA received no comments on the proposal. The final rule includes proposed § 7.506(e)(6) concerning carbon dioxide removal components, but remains substantively the same as the proposal.

Final § 7.508(c), like the proposal, provides requirements for testing each harmful gas removal component to determine its ability to remove harmful gases. Final paragraph (c)(1) requires that the component be tested in a refuge alternative structure that is representative of the configuration and maximum volume for which the component is designed. The requirement assures that the test results are representative of actual conditions.

A commenter stated that purging a contaminated space should not be an accepted practice unless the purging process can be proven totally effective at providing a safe, livable atmosphere for all of the occupants in every situation. Under the final rule, test results should confirm that purging or scrubbing is effective in removing harmful gases. If the data are from small-scale tests or prototype testing, interpretations and assumptions should represent full-scale performance.

One commenter supported the proposal. The final rule makes editorial changes, but is substantively the same as proposed.

Final paragraph (c)(1)(i), like the proposal, requires that the test include three sampling points located vertically along the centerlines of the length and width of the structure and equally spaced over the horizontal centerline of the height of the structure. The required sampling points assure an accurate representation of the gas concentration found in the middle of the structure as opposed to the ends, corners, top, sides, or bottom.

MSHA did not receive comments on the proposal; the final rule is the same as the proposal.

Final paragraph (c)(1)(ii), like the proposal, requires that the structure be sealed airtight. This requirement helps prevent contamination which could interfere with the testing. MSHA did not receive comments on the proposal; the final rule is the same as the proposal.

Final paragraph (c)(1)(iii), like the proposal, requires that the operating gas sampling instruments be placed inside the structure and continuously exposed to the test atmosphere. This requirement is necessary to assure that the instruments operate as designed in the actual space and representative atmosphere including higher temperatures and humidity.

A commenter stated that the electronics of some precision carbon dioxide analyzers can be affected by high temperature and humidity and can negatively impact analyzer accuracy. MSHA intends that the tests required by the final rule will verify the accuracy of the instruments in high temperature and high humidity to assure that measurements are accurate.

One commenter recommended that as an alternative, the final rule permit external analyzers and require that these analyzers have a response time of less than 1.5 minutes and that a minimum 99.5% of sampled gases be returned into the refuge alternative. An external analyzer would be inappropriate for tests requiring the monitors to be exposed to the inside atmosphere. However, an external analyzer would be acceptable as a supplemental testing instrument for this test. MSHA would allow for tests of gas monitoring components to be simultaneous with the harmful gas removal tests.

After evaluating the comments, MSHA has determined that the final rule should remain the same as the proposal.

Final paragraph (c)(1)(iv), like the proposal, requires that the sampling instruments simultaneously measure the gas concentrations at the three sampling points. Simultaneous sampling helps determine the interior atmosphere at different locations at a given point in time, eliminates any sampling variability introduced by sequential sampling, and determines if a homogenous atmosphere is maintained throughout the refuge alternative.

MSHA received no comments on the proposed provision; the final rule is the same as the proposal.

Final paragraph (c)(2) is substantively the same as the proposal and requires that when testing the component's ability to remove carbon monoxide, the structure be filled with a test gas of either purified synthetic air or purified nitrogen that contains 400 ppm carbon monoxide, ±5 percent. The final rule includes the ±5 percent to be consistent with final paragraph (c)(2)(i). The 400 ppm testing concentration was selected based on the American Conference of Industrial Hygienists (ACGIH) Short Term Exposure Limit (STEL). The test should determine the performance of the gas purification/decontamination system in achieving gas concentration level reductions for the entire ingress/egress process at maximum occupancy. MSHA received no comments on the proposal.

Final paragraph (c)(2)(i), like the proposal, requires that, after a stable concentration of 400 ppm, ±5 percent, carbon monoxide has been obtained for 5 minutes at all three sampling points, a timer be started and the structure purged or CO otherwise removed. The stabilization of the concentration will assure that gas is distributed throughout the structure and the test is properly performed.

MSHA received no comments on the proposed provision; the final rule is the same as the proposal. Comments related to the ending concentration were addressed earlier in the harmful gas removal section.

Final paragraph (c)(2)(ii), like the proposal, requires that the carbon monoxide concentration readings from each of the three sampling instruments be recorded every 2 minutes. This requirement assures that there are sufficient data points to constitute a valid test. Recording should continue until stabilization is reached at the lowest concentration.

MSHA received no comments on the proposed provision; the final rule is the same as the proposal.

Final paragraph (c)(2)(iii), like the proposal, requires that the time be recorded from the start of harmful gas removal until the readings of the three sampling instruments all indicate a carbon monoxide concentration of 25 ppm or less. This requirement assures that the time to remove carbon monoxide and deploy the refuge alternative is less than the time to deplete the SCSR. All occupants should be able to be located safely inside the refuge alternative prior to depletion of their SCSRs.

Comments related to the 25 ppm concentration were addressed earlier in this section. The final rule makes editorial changes, but is substantively the same as the proposal.

Final § 7.508(c)(3), redesignated from proposed § 7.506(f), requires that the carbon dioxide removal component be tested to demonstrate that it can maintain average carbon dioxide concentration at 1.0 percent or less, with excursions not to exceed 2.5 percent under the following conditions: (i) at 55 °F (±4 °F), 1 atmosphere (±1 percent), and 50 percent (±5 percent) relative humidity; (ii) at 55 °F (±4 °F), 1 atmosphere (±1 percent), and 100 percent (±5 percent) relative humidity; (iii) at 90 °F (±4 °F), 1 atmosphere (±1 percent), and 50 percent (±5 percent) relative humidity; (iv) at 82 °F (±4 °F), 1 atmosphere (±1 percent), and 100 percent (±5 percent) relative humidity. MSHA uses the standard error terminology of ±5 percent, but recognizes that +5 percent does not apply to relative humidity at 100 percent. This requirement is consistent with the NIOSH report.

Some CO_2 scrubbing components may not perform as well as others. The most commonly used CO_2 scrubbing chemicals performed within an acceptable range in underground mines. Testing under final paragraphs (c)(3)(i) through (iv) represents extreme conditions that CO_2 scrubbing components may be exposed to in underground coal mines. The increased temperature and humidity ranges reflect increases in the occupancy of a refuge alternative, although MSHA assumes that some body heat and moisture generation will be dissipated through the refuge alternative into the mine air, roof, ribs, and floor. Testing and evaluation of the CO_2 scrubbing components will enable mine operators to make informed choices in selecting scrubbing components.

One commenter stated that there is difficulty in controlling humidity to these extremely tight tolerances and that there is difficulty in measuring relative humidity to the required level of precision in the proposed rule. The commenter added that very high quality chilled mirror humidity sensors are typically unable to measure 100 percent relative humidity to 5 parts in 1,000. Other comments included questions concerning the temperatures and if they were starting values only, and if the four temperatures were to be maintained throughout the test. Another comment recommended that the requirements specify that the addition of water vapor into the testing chamber be maximized at the metabolic rate being simulated.

The proposed tolerances for humidity were based on an instrument specification and not a measurement specification. However, based on comments, MSHA believes that there could be difficulty in measuring relative humidity to the proposed level of precision. Therefore, MSHA has changed the proposed tolerances for relative humidity to ±5 percent.

Under the final rule, MSHA has not changed the proposed tolerances for temperature. Temperature must be measured inside the refuge alternative, and held constant within the tolerances of ±4 °F. Tests should simulate the occupancy and accurate metabolic rates per number of persons.

Final paragraph (c)(4) is new and requires that testing demonstrate the component's continued ability to remove harmful gases effectively throughout its designated shelf-life, specifically addressing the effects of storage and transportation.

One commenter requested that the harmful gas removal component be subjected to shock testing prior to approval. In response to this comment, MSHA believes that there may be potential chemical degradation associated with time, transport, and environmental conditions. The final rule, however, does not include a specific requirement for shock testing. Instead, it includes a performance-oriented requirement that testing demonstrate the component's continued ability to remove harmful gases effectively throughout its designated shelf-life.

Final paragraph (d), like the proposal, provides that alternate performance tests may be conducted if the tests provide the same level of assurance of the harmful gas removal component's capability as the tests specified in this final rule. If the applicant plans to use alternate tests, they must be specified in the approval application. The applicant must demonstrate that the alternate tests will assure the same degree of protection as that provided in this final rule. There were no comments on the proposal; the final rule is the same as the proposal.

Section 7.509 Approval Markings

Final § 7.509(a), like the proposal, requires that each approved refuge alternative or component be identified by a legible, permanent approval marking that is securely and conspicuously attached to the component or its container. The marking should be placed to avoid damage or removal.

Final § 7.509(b) clarifies the proposal and requires that each approval marking be inscribed with the component's MSHA approval number, and any additional markings required by the approval. The final rule clarifies MSHA's intent that the approval marking be ''inscribed with the component's MSHA approval number'' rather than ''include the refuge alternative's and component's MSHA approval number''. In addition, the final rule does not include the proposed expiration date.

Final paragraphs (a) and (b) assure that only approved materials and components are used in refuge alternatives. MSHA did not receive any comments on the proposal. The final rule makes clarifications, but is substantively the same as the proposal.

Final § 7.509(c), like the proposal, requires that each refuge alternative structure provide a conspicuous means for indicating an out-of-service status, including the reason it is out of service. This requirement will provide information necessary for maintenance and repair.

MSHA did not receive any comments on the proposal. The final rule is the same as the proposal.

Final paragraph § 7.509(d), like the proposal, requires that the airlock be conspicuously marked with the recommended maximum number of persons that can use it at one time. This requirement assures that the airlock will be used as intended to allow safe passage of persons and to prevent any contamination of the interior space atmosphere.

MSHA did not receive any comments on the proposal. The final rule is the same as the proposal.

Section 7.510 New Technology

Final § 7.510, like the proposal, provides that MSHA may approve a refuge alternative or a component that incorporates new knowledge or technology, if the applicant demonstrates that the refuge alternative or component provides no less protection than those meeting the requirements of the final rule. Because some aspects surrounding the use of refuge alternatives involve developing technology, MSHA believes that innovations in technology will continue, resulting in further improvements in miner safety and health. The final rule would permit applicants to incorporate technological improvements so long as they provide equivalent protection to that in the final rule.

MSHA believes that credible scientific research supports the use of refuge alternatives. Refuge alternatives are technologically feasible. They use commercially available technology that can reasonably be integrated into most coal mining operations dependent upon specific physical characteristics of the mine. MSHA recognizes that using refuge alternatives in low coal mines could be problematic. Certain types of refuge alternatives may not be feasible in low coal mines. During the rulemaking process and at each of the public hearings, MSHA specifically solicited comment on the use of refuge alternatives in low coal mines, and asked that commenters be specific including alternatives, rationale, safety benefits to miners, technological and economic feasibility, and supporting data.

One commenter stated that miners at low coal mines deserve the same protection as those working in high seams. Another commenter stated that prefabricated units are available as short as 27 inches for low coal. The NIOSH report stated that ''it may be impractical to implement viable refuge alternatives in the few mines that operate in very

low coal, e.g., less than 36 inches.'' In response to commenters' concerns regarding the ability to maneuver, deploy, or use larger units in mines with low seam heights, the final rule has changed the proposed volume requirements to take mining height into consideration.

MSHA believes that the requirements in the final rule are feasible. Refuge alternatives are currently being manufactured for, and some are currently in place in, underground coal mines. The Agency will continue to work with NIOSH and the mining community as refuge alternative technology continues to evolve and will inform the mining community of any changes in technology. MSHA recognizes that it may not be feasible in every case to install a refuge alternative in accordance with all of the requirements in the final rule. In addition, MSHA recognizes that some aspects of refuge alternatives involve developing technology, for example, wireless communications facilities and means of controlling the temperature inside refuge alternatives.

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 final rule.

B. Part 75 Safety Standards

Section 75.221 Roof Control Plan Information

Final § 75.221(a)(12), like the proposal, requires that the operator describe the roof and rib support necessary for the refuge alternative in the roof control plan. Some commenters supported the proposal. Other commenters stated that the roof support specified in the mine's roof control plan should be sufficient and that additional roof support may not be necessary in all cases.

Roof and rib falls could damage a refuge alternative and compromise its integrity. Humidity, fire, vibration, shock, and thermal effects may require the use of additional roof support for areas housing refuge alternatives. Due to the vital role of refuge alternatives in the event of an emergency, mine operators must plan for their location and assure that they are adequately protected from possible roof and rib falls. MSHA encourages the mine operator to prepare locations for refuge alternatives in advance. If additional roof or rib support is needed to protect these units at the selected locations, the operator must describe it in the mine's roof control plan. MSHA agrees that with proper advance planning, additional roof support may not be necessary in all cases. The final rule requires additional support, if necessary. If the roof support in the operator's existing plan is sufficient to protect the refuge alternative, the operator must so state.

Section 75.313 Main Mine Fan Stoppage With Persons Underground

Final § 75.313(f) clarifies the proposal and requires that any electrical components exposed to the mine atmosphere be approved as intrinsically safe for use during fan stoppages. It also requires that any electrical components located inside the refuge alternative be either approved as intrinsically safe or approved as permissible for use during fan stoppages.

Commenters generally supported the proposal that electric-powered components operated during fan stoppages be intrinsically safe. Some suggested that permissible electrical equipment that is located inside the refuge alternative also be allowed to operate during fan stoppages.

Mine explosions, mine fires, and coal bumps and bounces may compromise the mine ventilation system resulting in a mine fan stoppage. A refuge alternative that is normally located in intake air may be exposed to a potentially explosive mixture of methane in the aftermath of a mine emergency. Similar to existing § 75.313(e), the final rule clarifies MSHA's intent that only approved intrinsically safe electrical components that are exposed to the mine atmosphere are allowed to be operated during fan stoppages. However, electrical components that are located inside the refuge alternative would not be exposed to an explosive mixture of methane. The atmosphere inside the refuge alternative is isolated, secure, and monitored for harmful gases. Therefore, after considering comments, the final rule clarifies MSHA's intent by including a provision that electrical components located inside the refuge alternative be either approved as intrinsically safe or approved as permissible for use during fan stoppages.

Section 75.360 Preshift Examination at Fixed Intervals

Final § 75.360(d) makes an editorial change, but is substantively the same as the proposal. It requires that the person conducting the preshift examination check the refuge alternative for damage, the integrity of the tamper-evident seal and the mechanisms required to deploy the refuge alternative, and the ready availability of compressed oxygen and air.

During the rulemaking process and at all the public hearings, MSHA requested specific comments on the visual damage that would be revealed during the preshift examinations, and asked that commenters be specific including alternatives, rationale, safety benefits to miners, technological and economic feasibility, and supporting data. The Agency was concerned with the feasibility and practicality of visually checking the status of refuge alternatives without having to enter the structure or break the tamper-evident seal.

Commenters supported examinations of refuge alternatives, but offered differing opinions on the extent and frequency of these examinations. Some commenters supported preshift examinations, while others supported weekly examinations, examinations following relocation, or examinations based on the manufacturer's recommendations. In addition, some commenters favored examinations of the exterior and some of the interior components based on the design, while others favored only exterior examinations.

Most commenters agreed with MSHA that refuge alternatives may be damaged by persons, mining equipment, or the mine environment. Damage may also occur when the unit is moved. Damage could consist of sheared bolts or dents which affect the proper functioning of the unit. Also, compressed gas storage systems may leak.

Due to the critical purpose of refuge alternatives, the final rule requires that refuge alternatives be examined as part of the preshift examination. Because preshift examinations occur on a routine basis, they will assure that potentially dangerous conditions are detected and corrected before refuge alternatives are used and that the refuge alternatives are operational when needed.

Some commenters requested clarification of the extent or degree of the examination. Under this final rule, the preshift examination consists of an examination of the complete structure that is made without entering the unit to detect visible damage to the refuge alternative structure and damage to the tamper-evident seal. The examination includes observing the gauges showing the ready availability of compressed oxygen and air. The examination should include observing the battery status and testing the communications system. If the preshift examination reveals that the tamper-evident seal or other evidence indicates unauthorized entry or tampering, further examination of the refuge alternative and components

should be conducted to assure that the unit, components, and provisions are not damaged and that components and provisions are not missing. Following this examination, the seal or other means should be immediately replaced.

Section 75.372 Mine Ventilation Map

Final § 75.372(b)(11), like the proposal, requires that the location of all refuge alternatives be shown on the mine ventilation map. Some commenters supported the proposal. One commenter opposed the proposal stating that the location of each refuge alternative should only be indicated on the escapeway map.

This requirement facilitates an evaluation of the effectiveness of a potential refuge alternative location. The location of the refuge alternative in relationship to potential hazards such as seals and oil and gas wells will be evaluated during the ventilation map review. The mine ventilation map is often used as a reference during mine rescue efforts. Plotting refuge alternatives on the ventilation map and knowing their accurate locations could aid decisions during rescue operations.

Section 75.1200–1 Additional Information on Mine Map

In the final rule, MSHA has added new § 75.1200–1(n) to clarify the proposal that the locations of refuge alternatives are additional information that must be shown on the mine maps required under existing § 75.1200. Commenters generally supported including this information on the mine map. One commenter stated that the mine communication system and its relationship to the location of each refuge alternative should be identified on the official mine map every time that either is relocated. The commenter also stated that the refuge alternative location should be posted on the mine map no later than the end of the shift following relocation. One commenter opposed the proposal stating that the refuge alternatives should only be indicated on the escapeway map.

The existing § 75.1200 mine map forms the basis for decisions made during mine rescue efforts. Plotting refuge alternatives on the mine map allows the mine rescue decision makers to determine where miners may be sheltered after a mine emergency. This information will be critical to mine rescue personnel in locating trapped persons. Because each refuge alternative must have a communication facility that is part of the mine communication system, this final rule does not include a provision requiring the mine communication system to be identified on the mine map relative to the location of each refuge alternative every time that either is relocated. Moreover, existing § 75.1202–1 already requires that the mine map be kept up-to-date by temporary notations. Final § 75.1200–1(n) addressing the location of refuge alternatives on the mine map is added to be consistent with other requirements in part 75.

Section 75.1202–1 Temporary Notations, Revisions, and Supplements

Final § 75.1202–1(b)(4), like the proposal, requires the new location of a refuge alternative to be shown on the mine map with temporary symbols each time it is moved. MSHA received one comment supporting this proposal.

Knowing the locations of refuge alternatives is critical to effective decision-making during rescue operations; refuge alternatives must be kept current on the mine map. The final rule is the same as the proposal.

Section 75.1500 Emergency Shelters

In the final rule, like the proposal, § 75.1500 is removed and reserved. The statutory provisions are being deleted and replaced with specific requirements for refuge alternatives in existing §§ 75.1501, 75.1502, 75.1504, and 75.1505 and new §§ 75.1506, 75.1507, 75.1508, and 75.1600–3. MSHA received one comment supporting the proposal.

Section 75.1501 Emergency Evacuations

Final § 75.1501(a)(1), like the proposal, requires that the responsible person know the locations of refuge alternatives. MSHA received one comment supporting the proposal.

Under the final rule, the designated responsible person must have current knowledge of the locations, types, and capacities of refuge alternatives to make necessary informed mine evacuation decisions in the event of an emergency.

Section 75.1502 Mine Emergency Evacuation and Firefighting Program of Instruction

Final § 75.1502(c)(3), makes an editorial change, but is substantively the same as the proposal, and requires that instruction in the deployment, use, and maintenance of refuge alternatives be added to the mine emergency evacuation program of instruction. This requirement assures that miners are able to effectively deploy and use refuge alternatives in case of an emergency. It also assures that miners are able to maintain the refuge alternative, by repairing or correcting any problems that may develop during storage or use. The final rule is consistent with NIOSH findings that refuge alternatives have the potential for saving lives if they are part of a comprehensive escape and rescue plan and if appropriate training is provided. MSHA received no comments on this proposal.

Final paragraph (c)(4)(vi), like the proposal, requires that the program of instruction include using refuge alternatives. Although MSHA expects that miners would occupy refuge alternatives only if evacuation is not possible, they need to know how to deploy and use the refuge alternative in the event of an emergency. MSHA did not receive comments on this proposal.

Final paragraph (c)(8), like the proposal, requires that the program of instruction include the locations of refuge alternatives. The locations of refuge alternatives may be critical for persons who are involved in mine emergencies. MSHA did not receive comments on this proposal.

Final paragraph (c)(10) is changed from the proposal and requires a summary of the procedures related to deploying refuge alternatives. This requirement applies to all types of refuge alternatives in approved ERPs. The final rule contains an editorial change. It changes the term ''activating'' to ''deploying.'' In addition, the proposed requirement for a summary of procedures related to ''constructing'' refuge alternatives is moved to final paragraph (c)(11).

Final paragraph (c)(11) redesignates and clarifies proposed paragraph (c)(10). Final paragraph (c)(11) requires a summary of construction methods for 15 psi stoppings constructed prior to an event. Final paragraph (c)(11) clarifies MSHA's intent that a summary of procedures related to ''constructing'' refuge alternatives applies to refuge alternatives consisting of 15 psi stoppings that will be built prior to an event that traps miners.

Final paragraph (c)(12) is redesignated from proposed paragraph (c)(11), and requires a summary of the procedures related to refuge alternative use.

The summaries required under final paragraphs (c)(10) through (12) provide the information necessary for the miners to review during training. The summaries should include all of the step-by-step procedures in a manner easily understood by miners. For easy availability, mine operators should consider laminated cards or other equally durable forms of summaries for use by miners during training. Several commenters supported the proposal.

Section 75.1504 Mine Emergency Evacuation Training and Drills

Final § 75.1504(b)(3)(ii), like the proposal, requires that in quarterly training and drills, miners locate refuge alternatives. In addition, final paragraph (b)(4)(ii), like the proposal, requires that in quarterly training and drills, miners review locating refuge alternatives on the mine and escapeway maps, the firefighting plan, and the mine emergency evacuation plan. Both requirements provide necessary information to miners in the event of an emergency.

Final paragraph (b)(6) changes and clarifies the proposal and requires that, in quarterly training and drills, miners review the procedures for deploying refuge alternatives and components. This requirement applies to all types of refuge alternatives in approved ERPs. This final rule makes editorial changes. It changes the term ''activating'' to ''deploying'' and the term ''checklist'' to ''procedures.''

Final paragraph (b)(7) redesignates and clarifies proposed paragraph (b)(6). Final paragraph (b)(7) requires that, for miners who will be constructing the 15 psi stoppings prior to an event, miners review the procedures for constructing them. Miners constructing a 15 psi stopping must receive training for the correct materials and procedures to be used prior to construction. Final paragraph (b)(7) clarifies MSHA's intent that the quarterly training on refuge alternatives consisting of 15 psi stoppings constructed prior to an event applies to miners who will be constructing these types of units. These types of refuge alternatives will be built prior to an event that traps miners. Comments on types of refuge alternatives permitted under this final rule are discussed elsewhere in this preamble under § 75.1507(a)(1).

Final paragraph (b)(8), redesignated from proposed paragraph (b)(7), requires that in quarterly training and drills, miners review the procedures related to use of refuge alternatives and components. Miners need to be aware of how to use a refuge alternative safely in the event of an emergency. This information will be critical for miners who need to spend a sustained period in a refuge alternative. Procedures should include the step-by-step process necessary for miners to use the refuge alternative or component and be easily understood by miners. Manufacturers generally provide information on the safe use of their products.

As with any non-routine task, knowledge and skill diminish rapidly. This final rule assures that miners are able to deploy and use the refuge alternative and components safely in an emergency. MSHA's Office of Educational Policy and Development will assist mine operators with the development of job task analysis and training materials such as videos to improve the quality and effectiveness of programs of instruction. In addition, NIOSH is developing a refuge alternative training program that is expected to be available the first quarter of calendar year 2009.

Final paragraph (b)(9), redesignated from proposed § 75.1508, requires that in quarterly training and drills, miners receive task training in proper transportation of refuge alternatives and components. To minimize potential damage when they are moved, miners need to be aware of the safe procedures necessary to transport refuge alternatives and components. This training should include information on all connections necessary for transportation, such as tow bars, clevises, and hitches.

This final rule, like the proposal, adopts a training approach that consists of both quarterly training and drills under final § 75.1504(b) and annual expectations training, i.e., simulated hands-on training, under final § 75.1504(c). The best refuge technology, equipment, and emergency supplies are of little benefit if they are misused or not used at all.

MSHA has identified problems related to skill degradation in emergency evacuations of mines. In a series of studies from 1990 through 1993, the U.S. Bureau of Mines, University of Kentucky, and MSHA researchers measured skills degradation. In one study, the proficiency rates dropped about 80 percent in follow-up evaluations conducted about 90 days after training. MSHA recognizes that with any non-routine task, such as deploying and using a refuge alternative or component, knowledge and skill diminish rapidly. The final rule reflects MSHA's conviction that frequent and effective refuge alternative training is necessary to assure miner proficiency.

Emergencies can result in miner disorientation and panic. Using sound judgment in a given emergency can be critical for survival. Based on MSHA's knowledge and experience, MSHA believes that quarterly training and drills together with annual expectations training is a reasonable approach to instill the discipline, confidence, and skills necessary to survive a mine emergency. This final rule improves miner training and helps assure that underground coal miners know when to use a refuge alternative and know how to deploy and use the various components to sustain life until rescued. During each quarterly drill, miners would be required to locate the refuge alternatives and review the deployment and use of the refuge alternative for the area where the miners normally work and travel.

Final § 75.1504(c)(1) and (2), like the proposal, make editorial changes to existing paragraph (c)(1). Final paragraph (c) requires that over the course of each year, each miner must participate in expectations training. Under final paragraph (c)(1), annual expectations training must include donning and transferring SCSRs in smoke, simulated smoke, or an equivalent environment. Under final paragraph (c)(2), annual expectations training must include breathing through a realistic SCSR training unit that provides the sensation of SCSR airflow resistance and heat.

Final § 75.1504(c)(3)(i) and (ii) make an editorial change, but are substantively the same as the proposal, and require annual expectations training on deployment and use of refuge alternatives similar to those in use at the mine, including deployment and operation of component systems and emphasizing that refuge alternatives are the last resort when escape is impossible. This requirement is consistent with the NIOSH report.

In addition, final paragraph (c)(4), redesignated from existing § 75.1504(c)(2) and like the proposal, requires that a miner participate in expectations training within one quarter of being employed at the mine. This could be accomplished during new miner or newly employed miner training.

Under this final rule, the expectations training requires an annual realistic experience of deploying and using a refuge alternative in a simulated emergency situation. This training could be combined with existing expectations training.

During the rulemaking process and at each of the public hearings, MSHA solicited comment on the proposed strategy and the proposed elements of training, and asked that commenters be specific including alternatives, rationale, safety benefits to miners, technological and economic feasibility, and supporting data. Some commenters supported the annual expectations training requirements, agreeing with MSHA that such training is necessary to assure miner proficiency in the deployment and use of refuge alternatives. Other commenters either opposed expectations training or stated that the training should be limited and

should not include actual activation or miners' exposure to heat and humidity. Other commenters generally supported the provisions on training and drills, but some expressed concern that all aspects of deploying and maintaining a refuge alternative be covered during hands-on training and that this hands-on training should occur every 90 days.

Based on MSHA's knowledge and experience, the Agency believes that expectations training will help minimize panic and anxiety associated with using refuge alternatives and components. NIOSH supports expectations training to reduce the level of panic and anxiety associated with the use of refuge alternatives.[4] Properly deploying a refuge alternative or component can be a relatively complex procedure that must be done correctly to establish a breathable air environment in a smoke-filled mine. Miners would have to deploy the refuge alternative, purge the atmosphere, and turn on the breathable air and maintain a viable atmosphere. In addition, the operation of most refuge alternatives and components requires periodic monitoring of and adjustments to the gases to assure a breathable atmosphere. Failure to correctly perform these tasks may imperil the lives of persons within the refuge alternative. MSHA envisions the use of a reusable training model of the refuge alternative in the mine for this purpose when they become available.

In addition, training must include deployment of the refuge alternative and components within it, including adjustments to the breathable air and harmful gas removal components. The training must emphasize that, in the event of an emergency, miners should first try to evacuate the mine and that refuge alternatives are the option of last resort when escape is impossible. Although this final rule does not include a minimum time for this training, the training should provide miners with adequate time to perform all of the necessary tasks and give them a realistic experience of deploying and using the refuge alternatives and components.

Section 75.1505 Escapeway Maps

Final § 75.1505(a), like the proposal, requires that an escapeway map include refuge alternatives and SCSR storage locations. In addition, paragraph (a)(3), like the proposal, requires that the escapeway map be posted or readily accessible for all miners at the refuge alternative. Commenters supported the proposal.

Inclusion of refuge alternatives and SCSR storage locations on the escapeway map and requiring the map to be posted or readily accessible at the refuge alternatives can be vital to the survival of miners during mine emergencies. Escapeway maps form the basis for decisions made during mine evacuation. Having escapeway maps on hand for miners will facilitate important decision making.

Final § 75.1505(b), like the proposal, requires that all escapeway maps be kept up-to-date, and that any change in the location of refuge alternatives be shown on the map by the end of the shift on which the change is made. Commenters supported the proposal.

Escapeway maps are the primary source of information needed by miners as they are evacuating the mine. Locations of refuge alternatives are critical to decisions made during evacuation efforts and must be kept current on the escapeway map.

Section 75.1506 Refuge Alternatives

This section requires that mine operators provide refuge alternatives to accommodate all persons working underground and specify criteria for the use and maintenance of refuge alternatives. MSHA believes that refuge alternatives will provide a refuge of last resort for miners unable to evacuate the mine during an emergency. By providing the essential elements of survival (breathable air, water, food, communications, etc.) the likelihood of miners surviving an inhospitable post-emergency environment would be increased. MSHA realizes that a flexible approach to providing refuge alternatives is necessary due to the wide range of mining conditions (mining height, pitch, mining method, and mine layout) that exist in underground coal mines. To address these widely varying conditions, in the final rule, MSHA has taken a performance-based approach to refuge alternatives. For example, the refuge alternative has to provide for essential needs of occupants, but the final rule does not require specific methods, equipment, or devices.

Final paragraph (a) clarifies MSHA's intent in the proposal that refuge alternatives and components must be approved as specified in paragraphs (a)(1) and (a)(2). Final paragraph (a)(1) requires that prefabricated self-contained refuge alternatives, including the structural, breathable air, air monitoring, and harmful gas removal components of the unit, must be approved under 30 CFR part 7. Paragraph (a)(2) requires that the structural components of refuge alternatives consisting of 15 psi stoppings constructed prior to an event must be approved by the District Manager, and the breathable air, air monitoring, and harmful gas removal components of these units must be approved under 30 CFR part 7.

A few commenters expressed concern regarding the approval requirements for the types of refuge alternatives and components. One commenter stated that the proposal did not specify which components needed approval concerning the different types of refuge alternatives. Final § 75.1506(a)(1) and (a)(2) clarifies the types of refuge alternatives and components and the approval requirements applicable to each unit. These requirements are consistent with MSHA's statement in the preamble to the proposal that, as appropriate, MSHA would approve the refuge alternatives and components under either part 7 or by the District Manager depending on the type of refuge alternative and components (73 FR 34160). MSHA will accept, as good faith evidence of compliance with final § 75.1506(a)(1) and (a)(2), a copy of a valid, bona fide, written purchase order with a confirmed delivery date for an approved unit.

Final paragraph (a)(3) is new and provides that prefabricated refuge alternative structures that states have approved and those that MSHA has accepted in approved Emergency Response Plans (ERPs) that are in service prior to the effective date of the rule (60 days after date of publication), are permitted until December 31, 2018, or until replaced, whichever comes first.

In addition, breathable air, air-monitoring, and harmful gas removal components of either a prefabricated self-contained unit or a unit consisting of 15 psi stoppings constructed prior to an event in a secure space and an isolated atmosphere that states have approved and those that MSHA has accepted in approved ERPs that are in use prior to the effective date of the rule (60 days after date of publication), are permitted until December 31, 2013, or until replaced, whichever comes first.

Further, refuge alternatives consisting of materials pre-positioned for miners to deploy in a secure space with an isolated atmosphere that MSHA has accepted in approved ERPs that are in use prior to the effective date of the rule (60 days after date of publication), are permitted until December 31, 2010, or until replaced, whichever comes first.

MSHA received several comments regarding the grandfathering of refuge alternatives and components that states have approved or that MSHA has

[4] NIOSH, Research Report on Refuge Alternatives for Underground Coal Mines (2008), p. 14.

accepted in approved ERPs. Some commenters stated that MSHA should unconditionally accept state-approved units. Most of these commenters stated that MSHA should accept state-approved refuge alternatives based on the manufacturer's suggested service life, or for as long as they function effectively, and not limit use to 10 years. A commenter stated that manufacturers who have successfully completed an approval by a state mine health and safety agency should be allowed to submit those materials in support of the proposal and that the results be treated as those from an approved third-party testing laboratory.

Other commenters, however, stated that MSHA should not accept previously approved refuge alternatives if they do not meet the requirements of the proposal. In addition, several commenters stated that some items such as permissible mine phone and flashlight batteries, food packets, and water either have no specified shelf life or a shelf life longer than 5 years. Other commenters stated that some components such as a harmful gas removal component can last longer than 5 years.

MSHA considered different periods for allowing approved refuge alternatives and components that do not meet the approval requirements of the final rule. MSHA is aware that some prefabricated refuge alternative structures may last longer than 10 years and that some components may last longer than 5 years. However, MSHA has determined that it must evaluate the commenters' suggestions on the service life of the prefabricated refuge alternative's structure and the other components within the context of establishing a reasonable time for manufacturers to meet the safety and approval requirements of this final rule. Accordingly, the final rule allows prefabricated refuge alternative structures that states have approved and those that MSHA has accepted in approved ERPs that are in service prior to the effective date of the rule (60 days after date of publication), to be used until replaced or 10 years after date of publication, whichever comes first.

The final rule also allows breathable air, air monitoring, and harmful gas removal components of either a prefabricated self-contained unit or a unit consisting of 15 psi stoppings constructed prior to an event in a secure space and an isolated atmosphere that states have approved and those that MSHA has accepted in approved ERPs that are in use prior to the effective date of the rule (60 days after date of publication), to be used until replaced or 5 years after date of publication, whichever comes first. Provisions such as communications, lighting, food, water, sanitation, first aid, parts and materials for repair, and tools, etc., must be replaced within 5 years, if shelf life limits so require.

Regarding refuge alternatives consisting of materials pre-positioned for miners to deploy in a secure space with an isolated atmosphere that have been approved in ERPs, MSHA has determined that these units need to be phased out due to potential issues associated with deploying these units in a secure space with an isolated atmosphere after an event. MSHA has determined that 2 years from the date of publication of the rule is a reasonable time to replace these units.

Under this final rule, a refuge alternative structure that has been approved and is in service or components that have been approved and are in use, but require replacement due to damage, must be replaced with a unit or components that meet the requirements of the final rule.

For prefabricated refuge alternative structures that states have approved and those that MSHA has accepted in approved Emergency Response Plans (ERPs) that are in service, *i.e.*, in the mine, prior to the effective date of the rule, March 2, 2009, the District Manager may accept, in lieu of the ''in service'' requirement of this grandfathering provision, a copy of a valid, bona fide, written purchase order entered into by the effective date of the rule, March 2, 2009, provided that the purchase order contains a confirmed delivery date prior to December 31, 2009. MSHA expects first year approvals to be completed by December 31, 2009, and refuge alternatives delivered after this date must be approved units.

Final § 75.1506(b), redesignated from proposed paragraph (a), requires that, except as permitted under paragraph (a)(3) of this section, each operator must provide refuge alternatives with sufficient capacity to accommodate all persons working underground.

Commenters generally supported the proposal. One commenter stated, however, that an operator can easily address the capacity of refuge alternatives for its employees, but that the operator has no control over the number of state and federal inspectors that may be present at any time in the mines. Another commenter questioned the need to accommodate all persons in refuge alternatives.

As the Agency has stated many times during this rulemaking process, MSHA believes that escape to the surface is more protective than using a refuge alternative. However, when escape is impossible, a refuge alternative must be available for all persons working underground. Under the final rule, refuge alternatives must have sufficient capacity to accommodate state and federal inspectors who can reasonably be expected to be working underground.

Final paragraph (b)(1), is redesignated from proposed paragraph (a)(1), and like the proposal requires that refuge alternatives provide at least 15 square feet of floor space per person. It modifies the proposed 60 cubic feet of volume per person to 30 to 60 cubic feet per person, which takes entry height into consideration according to the following chart. It also provides that the airlock can be included in the space and volume if waste is disposed outside the refuge alternative.

Mining height (inches)	Unrestricted volume (cubic feet) per person*
36 or less	30
>36 − ≤42	37.5
>42 − ≤48	45
>48 − ≤54	52.5
>54	60

*Includes an adjustment of 12 inches for clearances.

The volume per person includes an adjustment of 12 inches based on two factors: (1) 6 inches is necessary to allow for clearance of the refuge alternative to be moved; and (2) the usable interior height of the refuge alternative is reduced by 6 inches for the roof and floor beams resulting in a minimum of 60 cubic feet of available volume per person for mining heights above 54 inches with gradually decreasing minimum volume requirements for mining heights in between.

As an example, a 36-inch mine height is reduced by 6 inches for clearance and 6 inches for inside beams leaving 24 inches or 2 feet. The 24 inches or 2 feet multiplied by 15 square feet of floor space equals a minimum of 30 cubic feet of volume per person in the lowest mining conditions, *i.e.*, 36 inches or less. The requirements are intended to mean that persons would have free space without obstruction from components or stored items.

During the rulemaking process and at each of the public hearings, MSHA requested comments on the proposed requirement of at least 15 square feet of floor space and 60 cubic feet of volume per person, particularly in low mining heights, and asked that commenters be specific including alternatives, rationale, safety benefits to miners, technological and economic feasibility,

and supporting data. Comments on the proposed space and volume requirements, including MSHA's rationale for its decision in the final rule are addressed elsewhere in this preamble under final § 7.505(a)(1) concerning structural components.

Final paragraph (b)(2) is redesignated from proposed paragraph (a)(2), and like the proposal, requires that refuge alternatives for working sections accommodate the maximum number of persons that can be expected on or near the section at any time.

During the rulemaking process and at each of the public hearings, MSHA solicited comments on the proposed approach to refuge alternative capacity, and asked that commenters be specific including alternatives, rationale, safety benefits to miners, technological and economic feasibility, and supporting data. Some commenters stated that it is impossible to determine, in advance, how many inspectors, vendors, or other persons may be present, and therefore, the normal number of miners exposed should be the standard. One commenter supported the proposal stating that using the maximum number of persons to determine capacity, such as occurs during ''hot seat'' changeover of shifts, is appropriate. The commenter stated:

> The concept of using the shift change to determine the maximum number of occupants of a shelter was established by the West Virginia rules. It was recognized as not only practical but it provided an almost 100% safety margin for those most likely to be using a shelter.

Under the final rule, refuge alternatives for the working sections must accommodate the maximum number of persons working near the section. This includes all miners that join those working at the section during a shift change. For example, if a mine has a practice of ''hot seat'' change-out of crews at the face, the refuge alternative would need to accommodate both crews and any other persons who would routinely work near the section, such as managers, surveyors, vendors, and state and Federal inspectors.

Final paragraph (b)(3), is redesignated from and changed from proposed paragraph (a)(3). It requires that each refuge alternative in an outby area accommodate persons reasonably expected to use it.

During the rulemaking process and at each of the public hearings, MSHA solicited comments on the proposed requirement that refuge alternatives for outby areas accommodate persons assigned to work in the outby area, and asked that commenters be specific including alternatives, rationale, safety benefits to miners, technological and economic feasibility, and supporting data. Some commenters supported the proposed requirement for refuge alternatives for outby areas, but stated that these refuge alternatives should either be sized for section miners working near the belt drive outby or be adequate to house all personnel that are working in that area and not just those who are regularly assigned to that area.

Other commenters opposed the proposal. Some stated that, based on 12 past mining disasters, refuge alternatives for outby areas would not have been beneficial to the outcome of the tragedy. Others stated that the presence of escape shafts or other means of exiting the mine could eliminate the requirement for outby refuge alternatives, or that the need for refuge alternatives for outby areas should be determined on a case-by-case, site-specific basis.

Under this final rule, if persons work in an outby area that is within 30 minutes travel time (walking or crawling) from a portal or surface escape facility, an outby refuge alternative would not be required. Otherwise, MSHA has determined that refuge alternatives are necessary in outby areas of the mine to protect persons who may be working in the outby areas. MSHA's accident data support providing breathable air in the event someone cannot escape. If a person is in an outby area that is further than 30 minutes travel time from a portal or surface escape facility, then they cannot escape in accordance with the placement of their SCSR caches, and need a refuge alternative. MSHA believes that persons working or located outby must be afforded the same protection or refuge as those in the face areas.

Under the final rule, outby refuge alternatives must accommodate the number of persons reasonably expected to use it. These persons would include supply persons, locomotive operators, examiners, state and Federal inspectors, pumpers, maintenance persons, belt persons, and other persons who may be working in the outby areas. Because § 75.1506(c)(2) of the final rule requires that outby refuge alternatives be spaced so that persons in outby areas are never more than a 30-minute travel distance from a refuge alternative or a safe exit, the final rule does not require that outby refuge alternatives accommodate all section miners working near the belt drive outby. In the event that a fire or explosion occurs in an outby area and evacuation is not possible, section miners working near the belt drive outby would have access to the refuge alternative located at the nearest working face.

Another commenter said that MSHA should eliminate existing § 75.1100–2(i), which requires emergency materials, because no one would use them when refuge alternatives are available. The emergency materials listed in this existing standard are required for firefighting and would not affect this final rule.

Final paragraph (c), redesignated from proposed paragraph (b), addresses locations for placement of refuge alternatives. Final paragraph (c)(1) requires that refuge alternatives be located within 1,000 feet from the nearest working face and from locations where mechanized mining equipment is being installed or removed, except that for underground anthracite coal mines that have no electrical face equipment, refuge alternatives must be provided if the nearest working face is greater than 2,000 feet from the surface.

During the rulemaking process and at each of the public hearings, MSHA requested comments on the proposed requirement that refuge alternatives be located between 1,000 feet and 2,000 feet from the working face and from areas where mechanized mining equipment is being installed or removed, and asked that commenters be specific including alternatives, rationale, safety benefits to miners, technological and economic feasibility, and supporting data. MSHA received numerous comments on the proposal. Some commenters supported the proposal stating that a minimum distance of 1,000 feet decreases the chance of damage to the refuge alternative from an explosion and provides more space for maneuvering. Some commenters stated that a greater distance from the working face would decrease the potential damage from transporting the unit by reducing the number of times the refuge alternative would need to be moved.

Many commenters opposed the proposal because it conflicted with West Virginia's state law. Some of these commenters suggested that the final rule require refuge alternatives within 2,000 feet of the working face to eliminate conflict with the West Virginia law. Other commenters stated that MSHA should specify a maximum distance from the face, rather than a minimum, and that the distance should be based on regional conditions, allowing ''within 1,000 feet'' for refuge alternatives in West Virginia mines and ''within 2,000 feet'' for western mines. Several commenters suggested that refuge alternatives be located closer to the working face, within a few hundred feet. Some commenters stated that miners would not be able to travel much

over 1,000 feet through smoke and debris, and that the primary refuge chamber must be within 1,000 feet with other refuge alternatives spaced along the escapeway.

In its report, NIOSH recommended that the refuge alternative be located at least 1,000 feet from the working face to limit damage from explosions at the working face; but, NIOSH also indicated that it would be advantageous to place the refuge alternative as close to the face as possible to minimize the time and effort required for miners to reach it. The NIOSH report noted that lower seam heights, difficult bottom conditions, and the presence of smoke, among other factors, would affect travel times.

The highest concentration of miners underground will be at the working face; therefore, a refuge alternative capable of accommodating these miners must be positioned close to the working section. In the final rule, MSHA changed the location requirement based on testimony and comments regarding the inability of miners on the working section to travel over 1,000 feet through smoke and debris to reach the refuge alternative, especially if injured or exhausted. MSHA also took into consideration that the final rule requires the structural component of refuge alternatives to be designed to withstand an explosion.

MSHA is aware that underground anthracite coal mines have unique mining conditions. These conditions include the lack of available locations to place a refuge alternative due to crosscuts on extreme angles. The unique conditions in underground anthracite coal mines make compliance with the ''within 1,000 feet'' requirement of the final rule regarding location problematic. Therefore, the final rule requires that, for underground anthracite coal mines with no electrical face equipment, refuge alternatives must be provided if the nearest working face is greater than 2,000 feet from the surface.

MSHA also requested comments on an alternative addressed in the preamble to the proposal that would allow refuge alternatives with boreholes to be located up to 4,000 feet from the working face. Some commenters stated that this proposed alternative may complement, but should never be allowed in place of, a refuge alternative near the working face. Other commenters stated that the prescriptive distances unnecessarily limit the use of refuge alternatives with a borehole.

After evaluating all comments and data, MSHA determined that it is more protective to have a refuge alternative close to the working face so that persons can reach it more quickly. However, MSHA recognizes that refuge alternatives with pre-connected boreholes are superior to other types of refuge alternatives, even though it may not be practical or feasible to locate them close to the working face that advances daily, and may not be feasible at all for certain mining conditions. MSHA appreciates that some aspects of refuge alternatives involve developing and innovative technology. Therefore, the Agency encourages mine operators to connect each refuge alternative located along the escapeway to a borehole, where feasible and appropriate.

Final paragraph (c)(2), redesignated from proposed paragraph (b)(2), requires that outby refuge alternatives be spaced within 1-hour travel distances in outby areas where persons work such that persons in outby areas are never more than a 30-minute travel distance from a refuge alternative or safe exit. In addition, it provides that the operator may request and the District Manager may approve a different location in the ERP.

The operator's request must be based on an assessment of the risk to persons in outby areas, considering the following factors: proximity to seals; proximity to potential fire or ignition sources; conditions in the outby areas; location of stored SCSRs; and proximity to the most direct, safe, and practical route to an intake escapeway. MSHA recognizes that the different locations approved in the ERP may require persons in outby areas to travel farther than 30 minutes to reach a refuge alternative. The Agency believes that the availability of additional SCSRs, as required in MSHA's Emergency Mine Evacuation standard, further assures that persons in outby areas will be able to reach a refuge alternative if necessary.

During the rulemaking process and at each of the public hearings, MSHA solicited comments on locating refuge alternatives in outby areas, including the minimum and maximum distances, and asked that commenters be specific including alternatives, rationale, safety benefits to miners, technological and economic feasibility, and supporting data. Some commenters stated that the distance between refuge alternatives in outby areas should not be specified; but generally supported the proposal, including allowing the operator the option of requesting a different location in the ERP. These commenters stated that the distance between refuge alternatives in outby areas is best addressed in the ERP approval process. Other commenters opposed allowing operators the option of requesting different locations for refuge alternatives to be approved in the ERP. Another commenter stated that refuge alternatives should be 30 minutes walking distance from each other and in the primary escapeway that miners would use in the event of an evacuation. One commenter stated that the distance between refuge alternatives should be much shorter than 30 minutes, especially when miners are traveling under emergency conditions.

MSHA believes that it is necessary to specify distances for locating outby refuge alternatives for purposes of consistency and training. Specifying distances will improve miners' awareness of the location of these refuge alternatives. Miners are already aware of SCSR storage locations under the Emergency Mine Evacuation final rule.

In 2006, in developing the Emergency Mine Evacuation final rule (71 FR 71430), MSHA examined how far miners could travel during 30 minutes. Existing § 75.1714–4(c)(2) provides two methods for determining the 30-minute spacing of SCSR storage locations in escapeways. The first method is based on a sample of typical miners walking a selected length of each escapeway. The second method is based on average entry height, specified in the following table, except for escapeways with uphill grades over 5 percent.

Average entry height	Maximum distance between SCSR storage locations
<40 in. (Crawl)	2,200 ft.
>40–<50 in. (Duck Walk).	3,300 ft.
>50–<65 in. (Walk Head Bent).	4,400 ft.
>65 in. (Walk Erect) ..	5,700 ft.

The table could be used to determine the locations of the outby refuge alternatives based on 30-minute travel time.

According to the table above, SCSR storage locations are at 60-minute intervals. Based on the spacing of SCSR storage locations, outby refuge alternatives may be situated at every other SCSR storage location along the escapeway. The final rule does not change the proposed 30-minute travel distance because the final rule requires refuge alternatives to be within 1,000 feet of the working face. Persons needing to access outby refuge alternatives are assisted by escapeway lifelines and SCSR caches.

Final paragraph (d) is redesignated from proposed paragraph (c) and, like the proposal, requires that roof and rib support for refuge alternative locations

be specified in the mine's roof control plan. MSHA addresses this requirement elsewhere in this preamble under final § 75.221 concerning roof control plan information. MSHA included this requirement in this standard to assure that mine operators adequately prepare locations for refuge alternatives.

Final paragraph (e) is redesignated from proposed paragraph (d) and, like the proposal, requires that the operator protect the refuge alternative and contents from damage during transportation, installation, and storage. Some commenters supported the proposal; one commenter opposed it. The final requirement assures that care will be taken to avoid damage to the refuge alternative and contents at all times. When transporting a refuge alternative from one location to another, attention needs to be paid to procedures such as the use of proper connections and devices, such as tow bars, clevises, and hitches, for transportation.

Final paragraph (f) is redesignated from proposed paragraph (e) and, like the proposal, requires that a refuge alternative be removed from service if examination reveals damage or tampering that could interfere with the functioning of the refuge alternative or any component. Refuge alternatives may be damaged by persons, mining equipment, or the mine environment. The final rule requires that damage must be evaluated and, as noted above, if damage or tampering could interfere with the functioning of the refuge alternative or its components, it must be removed from service. For the safety of the persons who would need to use the refuge alternative, removal should occur immediately. For example, if a preshift examination reveals a leak in a compressed gas storage system, the refuge alternative must be removed from service since it would be unable to provide breathable air in an emergency.

MSHA did not receive comments on this proposal and the final rule is the same as proposed.

Final paragraph (f)(1) is redesignated from proposed paragraph (e)(1) and, like the proposal, requires the operator to withdraw all persons from the area serviced by the refuge alternative if the refuge alternative is removed from service, except those persons referred to in § 104(c) of the Mine Act.

Some commenters supported the proposed requirement. Other commenters opposed the proposal stating that MSHA should allow miners to continue working in the area if the operator provides an alternative that provides equivalent protection.

Because an inoperable or damaged refuge alternative does not provide the protection intended, the operator must withdraw persons from any area when the refuge alternative serving that area is removed from service. This does not include persons performing repairs, who should be provided with additional SCSRs to assure that they can reach another refuge alternative. If, however, an approved refuge alternative is provided and maintained as a back-up, persons do not have to be withdrawn because a functional replacement refuge alternative is readily available.

Final paragraph (f)(2) is redesignated from proposed paragraph (e)(2) and, like the proposal, requires that refuge alternative components removed from service be replaced or repaired in accordance with manufacturer's specifications. This requirement assures that the refuge alternative is maintained in its approved condition to provide the protection afforded by approved refuge alternatives at all times. MSHA did not receive comments on this requirement and the final rule is the same as proposed.

Final paragraph (g) is redesignated from proposed paragraph (f). It includes an editorial change, but is substantively the same as the proposal, and requires that, at all times, the site and area around the refuge alternative be kept clear of machinery, materials, and obstructions that could interfere with the deployment or use of the refuge alternative.

One commenter stated that it may be impractical to keep materials from blocking access to or use of the refuge alternative. To protect persons during an emergency, the site and area around the refuge alternative must be easily accessible. Areas around refuge alternatives must be maintained without obstructions that hinder access to the refuge alternative. This requirement is necessary to assure the availability of the refuge alternative and the survivability of persons who need to use it.

Final paragraph (h) is redesignated from proposed paragraph (g) and, like the proposal, requires that each refuge alternative be conspicuously identified with a sign or marker. Under final paragraph (h)(1), like the proposal, the sign or marker must be made of reflective material with the word ''REFUGE'' and must be posted conspicuously at each refuge alternative. Under final paragraph (h)(2), like the proposal, a directional sign must be made of reflective material and must be posted leading to each refuge alternative location.

This requirement provides a quick way for persons not in escapeways and therefore not able to use the lifeline system to locate the refuge alternative in an emergency. Reflective material greatly increases the visibility of the sign. This requirement is the same as existing § 75.1714–4(f), which requires reflective signs on SCSR storage locations. As noted above, miners may not be located in escapeways when an emergency occurs. For them, a system of directional signs may be critical during an emergency. Signs should be posted at intersections of the escapeway and the crosscut leading to the refuge alternative. Persons traveling in adjacent entries would have signs directing them to the refuge alternative.

Some commenters opposed the proposed requirement that the sign or marker use the word ''REFUGE.'' They stated that operators should have flexibility to use different terminology that is more appropriate, such as, ''rescue chamber,'' or ''escape shelters.'' A standardized sign or marker with the word ''REFUGE'' will reduce the possibility of confusion in an emergency, and will provide an additional safety benefit to persons who work in different mines because they would not have to become familiar with new terminology. Use of the word ''REFUGE,'' however, does not preclude the use of additional terms on the sign or marker to identify the refuge alternative. Therefore, the final rule makes no change to the proposal.

Final paragraph (i) has been added to make part 75 consistent with § 7.506(b)(2) of the approval requirements. It requires that, during use of the refuge alternative, the atmosphere within the refuge alternative must be monitored. It further requires that changes or adjustments must be made to reduce the concentration of methane to less than 1 percent; to reduce the concentration of carbon dioxide to 1 percent or less, and excursions not to exceed 2.5 percent; and to reduce the concentration of carbon monoxide to 25 ppm or less. Oxygen must be maintained at 18.5 to 23 percent.

The occupants of the refuge alternative must follow the monitoring procedures included with the air-monitoring component. This requirement was proposed in the approval requirements and is included in the safety standards to clarify MSHA's intent that operators take appropriate actions to assure that persons will operate the refuge alternative safely and properly.

Final paragraph (j) has been added to make part 75 consistent with § 7.504(c)(6) of the approval requirements. It requires that refuge alternatives contain a fire extinguisher

that meets the requirements for portable fire extinguishers used in underground coal mines under this part; that the fire extinguisher is appropriate for fires involving the chemicals used for harmful gas removal; and that it uses a low-toxicity extinguishing agent that does not produce a hazardous by-product when activated. This requirement was proposed in the approval requirements and is included in the safety standards to clarify MSHA's intent that operators provide appropriate firefighting protection for refuge alternatives.

Section 75.1507 Emergency Response Plan; Refuge Alternatives

Final § 75.1507(a), like the proposal, contains the information on refuge alternatives that the operator must include in the ERP. One commenter stated that MSHA should not require that the ERP document include all the specifications that the manufacturer has had certified by MSHA.

The requirement in this final rule assists the District Manager in determining whether the refuge alternative or component meets the approval requirements. For refuge alternatives approved under 30 CFR part 7, the ERP would only need to include the information provided by the approval holder.

Final § 75.1507(a)(1), like the proposal, requires that the mine operator specify the types of refuge alternatives and components used in the mine. The type of refuge alternative is not dependent upon mining height. The final rule provides flexibility in the type of refuge alternatives that will meet the requirements.

One type of refuge alternative allowed under the final rule is a prefabricated self-contained unit. The unit is portable and may be used near the working face or in outby areas. Prefabricated units may consist of structures that are sealed to protect against contamination. Refuge alternatives contain structural, breathable air, air monitoring, and harmful gas removal components. The structural component of prefabricated units may consist of steel enclosures that contain tents that are inflated upon deployment. Prefabricated self-contained units are evaluated under MSHA's approval requirements.

Some commenters expressed concern regarding the refuge alternative in the proposal consisting of a secure space constructed in place, with an isolated atmosphere. These commenters stated that the term ''constructed'' implies the use of a post-event barricade, which has not been demonstrated as effective. The final rule clarifies the Agency's intent; this type of refuge alternative is a unit consisting of 15 psi stoppings constructed prior to an event in a secure space and an isolated atmosphere. It is important to note that under the final rule, MSHA's intent is that these refuge alternatives would be built and in place prior to an emergency. The breathable air, air monitoring, and harmful gas removal components of this unit are placed in a cross-cut or dead-end entry and stoppings create a secure area with an isolated atmosphere. The approved components should be ready to be deployed when miners reach the secure area. The stoppings and doors are built prior to an emergency and must be able to resist a 15 psi overpressure.

The doors should have a tamper-evident seal or other means to indicate unauthorized entry. The structural components of these units must be approved by the District Manager, and the breathable air, air monitoring, and harmful gas removal components of these units must be approved under part 7.

Refuge alternatives consisting of 15 psi stoppings constructed prior to an event would typically be used in outby areas. If used near the working section, the stoppings could be removed to allow the components to be moved periodically to the next location and new stoppings would be needed.

Some commenters supported, while others opposed the proposed refuge alternative consisting of ''materials pre-positioned for miners to construct a secure space with an isolated atmosphere.'' Commenters who supported all three types of proposed refuge alternatives stated that there are benefits and drawbacks to each type, but that all three should be allowed because there is no ''one-size-fits-all'' solution. They noted that the size of a unit consisting of ''materials pre-positioned'' may be preferable under some circumstances because the size of the unit would not be constrained by the size of the inflatable tent or metal structure. Commenters opposed to the refuge alternative consisting of ''materials pre-positioned'' stated that constructing a unit during or after an emergency is not a viable solution for persons who cannot evacuate because crosscuts cannot be successfully purged after a fire or explosion. Some of these commenters stated that construction is too difficult because of dust, chaos, injury, inability to see, disorientation, and fatigue.

Because of potential issues associated with miners constructing a secure space with an isolated atmosphere after an emergency, the final rule does not include this type of refuge alternative. MSHA has determined, based on further analysis, and the testimony and comments, that using pre-positioned materials to construct a secure space after a fire or explosion could be problematic.

Final paragraph (a)(2), like the proposal, requires that the ERP include procedures or methods for maintaining approved refuge alternatives and components. One commenter stated that repair capability is limited during emergencies.

This final rule assures that the refuge alternative will be maintained during storage so that it is available for deployment and use in an emergency. Maintenance procedures or methods should include frequent maintenance checks and replacement schedules for components. The final rule is the same as proposed.

Final paragraph (a)(3), like the proposal, requires that the rated capacity of each refuge alternative, the number of persons expected to use each refuge alternative, and the duration of breathable air provided per person by the approved breathable air component of each refuge alternative be included in the ERP.

MSHA received comments on the proposed rated capacity and 96-hour duration for breathable air. Those comments are addressed elsewhere in this preamble under final §§ 7.505(a)(1) and 7.506(b)(1). The final rule is the same as proposed.

Final paragraph (a)(4) is changed from the proposal and requires that the ERP include the methods for providing breathable air with sufficient detail of the component's capability to provide breathable air over the duration stated in the approval. The proposed requirement to include the methods for removing carbon dioxide is moved to final § 75.1507(a)(8) addressing harmful gas removal.

MSHA received comments on the proposed methods for providing breathable air and removing carbon dioxide. They are addressed elsewhere in this preamble under final §§ 7.506 and 7.508.

Final paragraph (a)(5), like the proposal, requires that the ERP include methods to provide ready backup oxygen controls and regulators. The term ''ready'' means pre-connected valves and regulators. Backup oxygen controls and regulators are necessary to assure that miners will always have breathable air available in case of component failures.

MSHA received comments on back-up oxygen controls and regulators. Those comments are addressed elsewhere in

this preamble under final § 7.506. The final rule is the same as proposed.

Final paragraph (a)(6), like the proposal, requires that the ERP include the methods for providing an airlock and the methods for providing breathable air in the airlock, except where adequate positive pressure is maintained. The ERP must provide specific information regarding how the airlock will provide and maintain breathable air. When miners enter the refuge alternative through the airlock, sufficient purge air is necessary to clear the airlock of contaminants to minimize contamination inside the refuge alternative. Purging or other effective methods would be necessary, within 20 minutes of miners deploying the refuge alternative, for the airlock to dilute the carbon monoxide concentration to 25 ppm or less and the methane concentration to 1.0 percent or less.

The positive pressure relief should be set at 0.18 psi for refuge alternatives consisting of 15 psi stoppings constructed prior to an event.

MSHA received comments on the proposed methods for providing an airlock and the methods for providing breathable air in the airlock. Those comments are addressed elsewhere in this preamble under final § 7.508(a)(1). The final rule is the same as proposed with one editorial change.

Final paragraph (a)(7), like the proposal, requires that the ERP include methods for providing sanitation facilities. Under the approval requirements, prefabricated units are required to be designed to provide a means to contain human waste effectively and minimize objectionable odors. Information on sanitation facilities in prefabricated units must be contained in the manufacturer's operations manual. For units consisting of 15 psi stoppings constructed prior to an event, the operator should provide comparable information in the ERP. The final rule assists MSHA in verifying that the refuge alternative has an adequate means for containing or disposing of waste.

MSHA received comments on the proposed requirement dealing with a means to contain human waste effectively and minimize objectionable odors. They are addressed elsewhere in this preamble under final § 7.504. The final rule is the same as proposed.

Final paragraph (a)(8), like the proposal, requires that the ERP include the methods for harmful gas removal if necessary. Information on harmful gas removal is essential for MSHA to determine the ability of the refuge alternative to sustain occupants for 96 hours. Sufficient purge air is necessary to clear the refuge alternative of smoke, carbon monoxide, carbon dioxide, and other toxic and irritant gases, fumes, mists, and dusts that may enter the refuge alternative through the airlock.

MSHA received comments on the proposal dealing with harmful gas removal. They are addressed elsewhere in this preamble under final § 7.508. The final rule is the same as proposed.

Final paragraph (a)(9), like the proposal, requires that the ERP include methods for monitoring gas concentrations, including charging and calibration of equipment. This information is essential for MSHA to determine that persons inside the refuge alternative will be aware of the concentrations of carbon dioxide, carbon monoxide, methane, oxygen and, if necessary, other harmful gases specific to the mine, inside and outside the structure, including the airlock. It also assists MSHA in evaluating whether the air-monitoring component meets the requirements for sustaining persons for 96 hours.

MSHA received comments on the proposal addressing monitoring gas concentrations, and charging and calibrating equipment. They are addressed elsewhere in this preamble under final § 7.507 addressing air monitoring components. The final rule is the same as proposed.

Paragraph (a)(10) is substantively the same as the proposal and requires that the ERP include the method for providing lighting sufficient for persons to perform tasks. This requirement assists MSHA in evaluating whether persons have adequate light to read instructions, warnings, and gauges; operate gas monitoring detectors; and perform other activities related to the operation of the refuge alternatives. MSHA received comments on the proposal. They are addressed elsewhere in this preamble under final § 7.504. The final rule includes a non-substantive change, adding the term ''for persons'' to the requirement.

Final paragraphs (a)(11)(i) and (ii), like the proposal, require that the ERP include suitable locations for the refuge alternatives and that the ERP specify that refuge alternatives are not within direct line of sight of the working face and, where feasible, not in areas directly across from, nor closer than 500 feet radially from, belt drives, take-ups, transfer points, air compressors, explosive magazines, seals, entrances to abandoned areas, and fuel, oil, or other flammable or combustible material storage. In the preamble to the proposal, MSHA stated that it would consider exceptions if it was not feasible to locate the refuge alternative according to the proposal.

In response to comments, final paragraph (a)(11)(ii) contains a new provision that the operator may request and the District Manager may approve an alternative location in the ERP if mining involves two-entry systems or yield pillars in a longwall that would prohibit locating the refuge alternative out of direct line of sight of the working face.

Some commenters supported the proposal stating that it minimizes damage from the direct forces from an explosion. Many commenters, however, opposed the proposed limitations on positioning of refuge alternatives. Some commenters stated that the mining plan and conditions at each mine need to be considered and that positioning should be assessed on a mine-by-mine basis by the District Manager in the ERP. Some commenters stated that the proposal on positioning of refuge alternatives is unnecessary because the units are required to withstand an overpressure of 15 psi under the proposal. Other commenters stated that the proposal creates the potential for unnecessary risk of: Damaging a prefabricated unit, because of the difficulty in maneuvering refuge alternatives in and out of crosscuts; and injuring miners when the unit is moved, because moves in and out of crosscuts require a lot more handling.

The final rule assures the availability and survivability of the refuge alternative and its occupants. Refuge alternatives must be positioned so that they are easily accessible. In addition, positioning refuge alternatives so that they are located away from potential hazards, such as an explosion or fire at the working face, minimizes the heat or explosive forces that could affect the safety of persons in the refuge alternative.

The final rule is consistent with the NIOSH report, which recommended that refuge alternatives be positioned in crosscuts, rather than entries, or located in dead-end cuts to decrease the possibility of damage from overpressure or flying debris from an explosion. NIOSH also recommended that refuge alternatives be located away from potential sources of fires, such as belt drives.

Final paragraph (a)(12) is new and is included in the final rule to complement the Agency's proposal on apparent temperature and to clarify the Agency's intent that apparent temperature be achieved in all mining conditions. It requires that the ERP include the maximum mine air temperature at each of the locations

where refuge alternatives are to be placed.

During the rulemaking process and at each of the public hearings, MSHA asked for comment on how best to achieve apparent temperature, and asked that commenters be specific including alternatives, rationale, safety benefits to miners, technological and economic feasibility, and supporting data. This provision is added in response to commenters' concerns regarding the effect that the mine temperature would have on the internal apparent temperature in the refuge alternative. These commenters stated that the temperature outside of the unit must be taken into consideration because of heat transfer. The final rule also includes a corresponding provision under final § 7.503(b)(5) requiring that the application for approval specify the maximum mine air temperature under which the refuge alternative is designed to operate when the unit is fully occupied.

Final paragraph (b) contains requirements for ERPs for refuge alternatives consisting of 15 psi stoppings constructed prior to an event in a secure space and an isolated atmosphere. As stated previously, the final rule clarifies the Agency's intent regarding this type of refuge alternative. Final paragraph (b)(1), like the proposal, requires that the ERP specify that the breathable air components are approved by MSHA. MSHA received comments on the proposed breathable air provisions and those comments are addressed elsewhere in this preamble under final § 7.506. The final rule is the same as proposed.

Final paragraph (b)(2), like the proposal, requires that the ERP specify that the refuge alternative can withstand exposure to a flash fire of 300 °F for 3 seconds and a pressure wave of 15 psi overpressure for 0.2 seconds. Because the stoppings must protect persons and the components of the refuge alternative, they must be able to withstand both flash fires and explosive overpressures. MSHA received comments on both the proposal's flash fire and overpressure requirements. They are addressed elsewhere in this preamble under final § 7.505(a)(4) and (a)(5). The final rule is the same as proposed.

Proposed § 75.1507(c) is not included in the final rule. The proposal addressed requirements for ERPs for refuge alternatives that consist of materials pre-positioned for miners to deploy in a secure space with an isolated atmosphere. The Agency's rationale for not including this refuge alternative in the final rule is discussed in the preamble under § 75.1506(a).

Final paragraph (c), redesignated from proposed paragraph (d), requires that, if the refuge alternative sustains persons for only 48 hours, the ERP must detail advanced arrangements that have been made to assure that persons who cannot be rescued within 48 hours will receive additional supplies to sustain them until rescue. MSHA expects that a borehole would be drilled near the location of the refuge alternative. A method for supplying breathable air from the surface through the borehole would need to have the capability to provide a sufficient quantity of air to dilute any harmful gases in and around the refuge alternative.

Final paragraph (c) also requires that the ERP include the following advance arrangements. Final paragraph (c)(1) requires pre-surveyed areas for refuge alternatives with closure errors of less than 20,000:1. This requirement assures that the survey that is done on the surface and the one performed underground are closed. The surface survey could be done with global positioning satellite equipment. When a survey connects back to itself, it is called a loop. The loop in this provision would begin with the surface survey of the location above the location of the refuge alternative and along a route to the underground location of the refuge alternative and back to the beginning survey location on the surface. If a loop is surveyed perfectly, the survey should come back to the exact point at which it started. If the loop does not come back to the exact starting point, it is called a closure error. Closure errors indicate that some or all of the survey measurements within a loop have errors. This provision assures accuracy in getting the borehole to the correct location underground.

Final paragraph (c)(2) requires an analysis of the surface terrain, the strata, the capabilities of the drill rig, and all other factors that could affect drilling. This analysis must demonstrate that a hole can be drilled within 48 hours of an emergency and that the hole will be able to provide required supplies and materials to trapped persons. This requirement assures that the operator will discover and repair any conditions that could interfere with or delay drilling. The drill rig capabilities should be examined to assure that the appropriate drill model is selected. This allows planning so that correct equipment and supplies are available when needed.

Final paragraph (c)(3) requires that the operator secures permissions to cross properties, build roads, and construct drill sites. It assures that delays are minimized or eliminated and that drilling can proceed immediately upon arrival of the drill rig.

Final paragraph (c)(4) requires an arrangement with a drilling contractor or other supplier of drilling services to provide a suitable drilling rig, personnel, and support so that a hole can be completed to the refuge alternative within 48 hours. This arrangement should include details concerning mobilization, availability, ancillary services, backup plans, drill-hole specifications, completion schedules, and spare parts.

Final paragraph (c)(5) requires the capability to promptly transport a drill rig to a pre-surveyed location so that a drilled hole would be completed and located near a refuge alternative structure within 48 hours of an emergency at a mine. If the pre-surveyed location is not easily accessible, the operator should have advance arrangements to have the appropriate equipment to transport the drill rig to the location. The operator should consider and prepare for potential delays.

Final paragraph (c)(6) requires specifications of the pipes, air lines, approved fans, or approved compressors that will be used. This information decreases the possibility that an inappropriate or inadequate source of breathable air would be connected to the borehole.

Final paragraph (c)(7) requires a method for assuring that breathable air is provided within 48 hours. This provision assures that the means to provide breathable air, i.e., compressors, fans, and blowers, is designed for the planned conditions. The design should include consideration of pipe resistance, volumes and velocities needed, connections required on the surface, power needs, and required supplies. The system should be on hand and ready to provide breathable air after the borehole is completed.

Final paragraph (c)(8) requires a method for assuring the immediate availability of a backup source for supplying breathable air and a backup power source for surface installations. This information assists MSHA in evaluating the continued availability of breathable air.

Some commenters opposed the proposal. These commenters stated that storing only 48 hours of breathable air is not sufficiently protective because it is unlikely that enough additional supplies could be provided to sustain persons. These commenters also stated that the alternative leaves too much to chance given the availability of refuge

alternatives that are able to provide 96 hours of breathable air.

Other commenters supported the proposal. These commenters stated that operators have made arrangements under MSHA's Program Information Bulletin No. P07–03 and that these provisions need to be maintained in the final rule. One commenter requested that the ERP include additional provisions, such as contracts between the operator and drilling contractor and access to earth-moving equipment, etc., to demonstrate advance preparation and help assure that trapped persons receive additional supplies as early as possible.

Based on MSHA's experience and information provided from mine operators, MSHA believes that most operators will provide refuge alternatives with 96 hours of breathable air. However, based on Agency knowledge and experience, MSHA also believes that there can be advantages to providing breathable air through a borehole. Once a borehole is established in proximity to the refuge alternative, the supply of breathable air at the location of the refuge alternative would be unlimited. The final rule requires that the ERP contain enough information to allow the District Manager to evaluate the adequacy of the operator's advanced arrangements to provide breathable air to sustain trapped persons for 96 hours.

During the rulemaking process and at each public hearing, MSHA requested comments on whether the rule should contain a provision that the advanced arrangements specified in the ERP include a method for assuring that there will be a suitable means to connect the drilled hole to the refuge alternative and that the connection be made within 10 minutes, and asked that commenters be specific including alternatives, rationale, safety benefits to miners, technological and economic feasibility, and supporting data. Commenters opposed the proposed requirement. They expressed concern regarding the safety of persons leaving the refuge alternative to connect it to a borehole. Accordingly, the final rule does not include the proposed requirement. As stated above, a method for supplying breathable air from the surface through the borehole would need to have the capability to provide a sufficient quantity of air to dilute any harmful gases in and around the refuge alternative.

Final paragraph (d) is redesignated from proposed paragraph (e). Like the proposal, it requires the ERP to specify that the refuge alternative is stocked with essential supplies or provisions.

Final paragraph (d)(1) requires that the ERP specify a minimum of 2,000 calories of food and 2.25 quarts of potable water per person per day to sustain the maximum number of persons reasonably expected to use the refuge alternative at one time. Commenters generally supported the proposal. Commenters suggested including a range of caloric intake, electrolyte substitutes as a fluid requirement, and individual disposable packages. One commenter said that some survival companies are providing sterile water and M.R.E. food packets with a shelf life of as much as 12 years and that MSHA should allow them to be used for their entire service life. Another commenter noted that, in the NIOSH report, providing for the most basic human needs, *e.g.*, water, food, and waste disposal, is crucial for survival.

The final rule is consistent with NIOSH's recommendations and is intended to meet the basic nutritional needs of trapped miners. Food and water should be replaced upon expiration. Additional calories and fluids, such as electrolyte substitutes, may be provided. The final rule is the same as proposed.

Final paragraph (d)(2), redesignated from proposed paragraph (e)(2), amends and clarifies the proposed provision. Final paragraph (d)(2) requires the ERP to specify that the refuge alternative be stocked with a manual that contains sufficient detail for each refuge alternative or component addressing in-mine transportation, operation, and maintenance of the unit. The final rule clarifies MSHA's intent that the refuge alternative contain a manual that provides information in a simpler, more straightforward manner for ease of understanding by the persons using it. The manual should contain step-by-step or pictorial instructions or checklists for ease of understanding and necessary information in sufficient detail for the safe and effective operation and maintenance of the refuge alternative and components. MSHA did not receive comments on this proposal.

Final paragraph (d)(3), like the proposal, requires the ERP to specify that the refuge alternative is stocked with sufficient quantities of materials and tools to repair components. Materials and tools should include metal repair materials, fiber material, adhesives, sealants, tapes, and general hardware (*i.e.*, screws, bolts, rivets, wire, zippers, and clips). MSHA did not receive comments on the proposal. The final rule is the same as proposed.

Final paragraph (d)(4), like the proposal, requires the ERP to specify that the refuge alternative is stocked with first aid supplies. This requirement assures that adequate first aid supplies are provided for persons injured in an emergency situation. Although MSHA received comments on the proposal, the comments are discussed in this preamble under final § 7.504(c)(4), which includes the general requirements for a refuge alternative's approval. The final rule is the same as proposed.

Section 75.1508 Training and Records for Examination, Maintenance, and Repair of Refuge Alternatives and Components

Final paragraph (a), like the proposal, requires that persons examining, maintaining, or repairing refuge alternatives and components be instructed in how to perform this work. This final rule addresses training for examination, maintenance, and repair of refuge alternatives and components in addition to quarterly training and drills under final § 75.1504(b) and annual expectations training under final § 75.1504(c). Final paragraph (a) does not include training on transportation of refuge alternatives or components as proposed. Task training for persons transporting refuge alternatives or components is required quarterly in mine emergency evacuation training and drills under final § 75.1504(b)(10).

Under final paragraph (a)(1), the operator must assure that all persons assigned to examine, maintain, and repair refuge alternatives and components are trained. This requirement assures that persons assigned to these tasks are capable so that refuge alternatives and components are available and usable when needed. All units and components should be maintained using the manufacturer's specifications and procedures. The examiner should be trained in the aspects critical to the deployment and use of the refuge alternative. For some non-routine maintenance and repair work, persons may need on-the-job training just before or as they conduct the maintenance or repair. For example, a manufacturer's representative or other knowledgeable person may need to be contacted for instructions. The training can vary given the scope of the tasks and the interval since the last training in that same task.

Under final paragraph (a)(2), the operator must certify, by signature and date, the training of persons who examine, maintain, and repair refuge alternatives and components. The training certifications help MSHA and the operator assure that the appropriate

personnel have received the required training.

Under final paragraph (b), the person conducting the maintenance or repair must make a record of all corrective action taken at the completion of each repair. Records of corrective action taken help identify defective parts and design flaws so they can be addressed appropriately to better assure the effective operation of the unit.

Under final paragraph (c), the mine operator must keep training certifications and repair records at the mine for one year. Certifications and repair records are necessary to help MSHA and the operator identify any systemic defects or problems with the refuge alternative and assure that they are corrected.

Commenters generally supported the training requirements. Commenters supported training that is comprehensive and practical. One commenter suggested that hands-on training be used whenever possible. Another commenter supported training in accordance with manufacturers' recommendations. Comments concerning quarterly training and annual expectations training are discussed elsewhere in this preamble under final § 75.1504(b) and (c). The final rule is the same as proposed.

Section 75.1600–3 Communications Facilities; Refuge Alternatives

Final § 75.1600–3 requires that refuge alternatives be provided with a communications system. Paragraph (a)(1) requires a two-way communication facility that is a part of the mine communication system, which can be used from inside the refuge alternative. Paragraph (a)(2) requires an additional communication system and other requirements as defined in the communications portion of the operator's approved ERP. The additional communications system should be independent of the mine communication system and continuous to the surface. An additional means of communication will improve the survivability of communications post-accident. When hardwired systems are used to meet the MINER Act requirement for redundant communication between surface and underground personnel, wires should be routed through separate entries or boreholes continuous to the surface.

Commenters generally supported the proposal. Commenters agreed that a means of two-way communications from the refuge alternative to the surface should be available at all times. One commenter asked MSHA to add language to the rule clarifying that, as soon as it becomes commercially available, a two-way wireless communications system will be required in the ERP and, shortly thereafter, in all underground refuge alternatives.

Communications with the persons in refuge alternatives are vital to mine rescue efforts. The knowledge of where miners are in refuge alternatives, their condition, and the conditions in the mine may make the difference between life-and-death in a post-accident crisis. The MINER Act requires that, by June 15, 2009, for an Emergency Response Plan to be approved, it must include a two-way wireless communication system and an electronic tracking system that permits surface personnel to determine the location of any persons trapped underground. If these systems cannot be adopted, the MINER Act requires that ERPs set forth an alternative means of compliance that approximates ''as closely as possible, the degree of functional utility and safety protection provided by the wireless two-way medium and tracking system.'' MSHA is working with NIOSH on this emerging technology and will provide further guidance to the mining community with respect to the Agency's expectations for ''wireless communication'' systems in ERPs. Because the ''fully wireless'' communications technology is not fully developed at this time, and it is not likely to be technically achievable for all mines in the foreseeable future, the final rule does not include a requirement for fully wireless communications. MSHA is aware that alternatives are being developed that would improve the communications for trapped miners. Manufacturers may need to provide other accommodations for these systems. The final rule uses the language ''additional communications'' systems as defined in the communications portion of the operator's ERP. When a wireless system becomes available, the Agency will require mine operators to include them in their ERPs. The final rule makes an editorial change, but is the same as the proposal.

III. Executive Order 12866

Executive Order (E.O.) 12866 requires that regulatory agencies assess both the costs and benefits of regulations. To comply with E.O. 12866, MSHA has prepared a Regulatory Economic Analysis (REA) for the final rule. The REA contains supporting data and explanation for the summary materials presented in this preamble, including the covered mining industry, costs and benefits, feasibility, small business impacts, and paperwork. The REA can be found at MSHA's Web site at *http://www.msha.gov/REGSINFO.HTM.* A copy of the REA can be obtained from MSHA's Office of Standards, Regulations and Variances at the address in the **ADDRESSES** section of this preamble.

Under E.O. 12866, a significant regulatory action is one meeting any of a number of specified conditions, including the following: having an annual effect on the economy of $100 million or more, creating a serious inconsistency or interfering with an action of another agency, materially altering the budgetary impact of entitlements or the rights of entitlement recipients, or raising novel legal or policy issues. Based on the REA, MSHA has determined that the final rule will have an effect of $100 million or more on the economy in the first year that the final rule is in effect and that, therefore, it is an economically significant regulatory action.

Congressional Review Act

Under the Congressional Review Act (CRA), a major rule generally cannot take effect until 60 days after the rule is published. The term ''major rule'' is defined under the CRA as any rule that results in or is likely to result in ''an annual effect on the economy of $100,000,000 or more. The costs in the REA represent what MSHA believes to be the upper bound of the range of estimated compliance costs: $129 million first year and $53 million yearly. MSHA has presented these upper-bound estimates as a conservative approach to estimating compliance costs.

The final rule allows existing prefabricated refuge alternative structures that states have approved and those that MSHA has accepted in approved ERPs that are in service prior to the effective date of the rule (60 days after date of publication) to be used until December 31, 2018, or until replaced, whichever comes first. It also allows existing breathable air, air monitoring, and harmful gas removal components of either a prefabricated self-contained unit or a unit consisting of 15 psi stoppings constructed prior to an event in a secure space and an isolated atmosphere that states have approved and those that MSHA has accepted in approved ERPs that are in use prior to the effective date of the rule (60 days after date of publication) to be used until December 31, 2013, or until replaced, whichever comes first. Refuge alternatives consisting of materials pre-positioned for miners to deploy in a secure space with an isolated

atmosphere that MSHA has accepted in approved ERPs that are in use prior to the effective date of the rule (60 days after date of publication) may be used until December 31, 2010, or until replaced, whichever comes first. First year costs could be lower because of use of existing refuge alternatives as described above.

A. Population at Risk

The final rule applies to all underground coal mines in the United States. As of 2007, there were 624 underground coal mines, employing approximately 42,200 miners, of which 613 mines employed miners working underground. These 613 mines employed approximately 37,800 miners and 5,100 contractors working underground, for a total of approximately 42,900 underground employees.

B. Benefits

1. Introduction

One of the goals of the MINER Act is to improve emergency response capability in underground coal mines. MSHA has published a number of standards in the last several years and has stated in them that, in the event of a mine emergency in an underground coal mine, the miner should be trained to evacuate the mine. In addition, over the years, MSHA has published a number of standards that address the safety of miners in the event of explosions, fires, or inundations in underground coal mines. These standards include requirements concerning escape from a mine, such as: 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.

The final rule will increase miners' safety and improve mine operators' preparedness for mine emergencies by requiring refuge alternatives underground to protect and sustain miners trapped when a life-threatening event occurs that prevents escape.

2. 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. MSHA has estimated that recent MSHA standards could have saved the lives of 43 of these miners. Thus, for purposes of estimating benefits, this final rule could potentially have saved the lives of 221 miners over the 107 year period. If refuge alternatives had been available, MSHA estimates that the range of lives saved would have been between a low of 25 percent and a high of 75 percent. Using these estimates, the final rule potentially could save an average of from one to three lives every two years.

C. Compliance Costs

MSHA estimates that the total yearly cost of the final rule is approximately $53 million: $3 million for manufacturers and $50 million for underground coal mine operators. The first-year cost of the final rule is approximately $129 million. The costs in the REA 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. Costs could be lower as mine operators evaluate their situation for using existing refuge alternatives under the requirements of the final rule.

By mine size, the estimated yearly cost is $4 million for operators with 1–19 employees; $41 million for operators with 20–500 employees; and $5 million for operators with 501+ employees.

The $53 million of yearly costs consist of approximately: $2.6 million for refuge alternative and component application and approval costs; $4 million for roof control plan information; $6 million for additional time for preshift examinations; $13 million for revisions to the mine emergency evacuation program of instruction, mine emergency evacuation training and drills; $27 million for refuge alternatives and emergency response plan and $0.5 million for revisions to maps, training and records for examination, maintenance and repair of refuge alternatives and components, and communication facilities.

Table 1 presents a summary of the yearly costs of the final rule by mine size and by cost category. In some cases the totals may deviate from the sum of the components due to rounding.

TABLE 1—SUMMARY OF YEARLY COSTS OF FINAL RULE

Requirement				Yearly cost
Cost to Manufacturers				
Application and Approval Costs				$2.6 million.
Cost to Mine Operators				
	Mine Size			
	1–19 employees	20–500 employees	501+ employees	Total
Roof Control Plan Information	$438,000	$3.2 million	$297,000	$4.0 million.
Preshift Examination	$235,000	$5.0 million	$923,000	$6.1 million.
Mine Emergency Evacuation and Firefighting Program of Instruction, Mine Emergency Evacuation Training and Drills.	$515,000	$10.3 million	$1.9 million	$12.8 million.
Refuge Alternatives and Emergency Response Plan.	$3.0 million	$21.9 million	$2.0 million	$26.9 million.
Other Provisions*	$60,000	$400,000	$30,000	$0.5 million.
Total Yearly Cost to Mine Operators	$4.3 million	$40.8 million	$5.2 million	$50.3 million.

* Includes Mine Ventilation Map; Mine Map; and Escapeway Maps; Training and Records for Examination, Maintenance, and Repair of Refuge Alternatives and Components; and Communication Facilities.

IV. Feasibility

MSHA has concluded that the requirements of the final rule are both technologically and economically feasible. MSHA, however, recognizes that not all refuge alternatives will be appropriate for all mining conditions. In addition, MSHA recognizes that some aspects of refuge alternatives involve developing technology; for example, wireless communications facilities and means of controlling the temperature inside refuge alternatives.

A. Technological Feasibility

Refuge alternatives are technologically feasible. They use commercially available technology that can reasonably be integrated into most coal mining operations. Refuge alternatives are currently being manufactured for, and some are currently in place, in underground coal mines. In addition, 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 final rule.

MSHA recognizes that using refuge alternatives in mines with low seam heights could be problematic. However, the final rule has changed the proposed volume requirements to take seam height into consideration.

MSHA also recognizes that research on some requirements of the final rule is ongoing. For example, the final rule requires additional communication systems in the operator's approved Emergency Response Plan (ERP). MSHA is aware that these additional systems may not yet be available, but as they are developed, mine operators will be required to include them in their ERPs. The MINER Act requires, by June 15, 2009, that ERPs contain wireless communication systems. MSHA is working with NIOSH on this emerging technology and will provide further guidance to the mining community with respect to the Agency's expectations for ''wireless communication'' systems in ERPs.

B. Economic Feasibility

The yearly compliance cost of the final rule to underground coal mine operators is $50.3 million, which is approximately 0.4 percent of the total annual revenue of $14.0 billion ($50.3 million/$14.0 billion) for all underground coal mines. MSHA concludes that the final rule will 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.

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

Under 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 final rule on small entities. Based on that analysis, MSHA has notified the Chief Counsel for Advocacy, Small Business Administration (SBA), and made the certification under the RFA at 5 U.S.C. 605(b) that the final rule does not have a significant economic impact on a substantial number of small entities. The factual basis for this certification is presented in the REA and summarized below.

A. Definition of a Small Mine

Under the RFA, in analyzing the impact of the final rule on small entities, MSHA must use the SBA definition for a small entity, or after consultation with the SBA Office of Advocacy, establish an alternative definition for the mining industry by publishing that definition in the **Federal Register** for notice and comment. MSHA has not established an alternative definition and is required to use the SBA 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 final rule on underground coal mines with fewer than 20 employees, which MSHA has 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, the cost of complying with MSHA's final rule and the impact of the final rule on mines with fewer than 20 employees will differ from the cost and impact on mines with 500 or fewer employees.

This analysis complies with the legal requirements of the RFA for an analysis of the impact on ''small entities'' while continuing MSHA's traditional concern for ''small mines.''

B. Factual Basis for Certification

MSHA initially evaluates the impact on small entities by comparing the estimated compliance cost of a rule for small entities in the sector affected by the rule to the estimated revenue of the affected sector. When the estimated compliance cost is less than one percent of the estimated revenue, the Agency believes it is generally appropriate to conclude that the rule will not have a significant economic impact on a substantial number of small entities. When the estimated compliance cost exceeds one percent of revenue, MSHA investigates whether further analysis is required.

Total underground coal production in 2007 was approximately 7.7 million tons for mines with 1 to 19 employees and 278 million tons for mines with 1 to 500 employees. Multiplying tons by the 2007 price of underground coal of $40.29 per ton, 2007 underground coal revenue was $310 million for mines with 1 to 19 employees and $11.2 billion for mines with 1 to 500 employees. The final rule will result in an average yearly cost per mine of approximately $19,000 for mines with 1 to 19 employees and $73,000 for mines with 1 to 500 employees. MSHA has provided in the REA to this final rule a complete analysis of the costs of the final rule for each size category of mines.

The estimated yearly cost of the final rule for underground coal mines with 1 to 19 employees is approximately $4.3 million, or approximately $19,000 per mine. This is equal to approximately 1.38 percent of annual revenues. 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.

Under the SBA's definition of a small mine, the estimated yearly cost of the final rule for underground coal mines with 1 to 500 employees is approximately $45 million, or approximately $73,000 per mine. This is equal to approximately 0.40 percent of annual revenue. Even though the analysis reflects a range of impacts for different mine sizes, from 0.40 percent to 1.38 percent of annual revenue, the Agency concludes that this is not a significant economic impact on a substantial number of small mines. Because the yearly cost of the final rule is less than one percent of annual revenues for small underground coal mines, as defined by SBA, MSHA has certified that the final rule will not have a significant impact on a substantial number of small mining entities, as defined by SBA.

VI. Paperwork Reduction Act

A. Summary

The information collection package for the final rule has been assigned OMB

Control Number 1219–0146. The final rule contains information collection requirements that will affect requirements in existing paperwork packages with OMB Control Numbers 1219–0004, 1219–0054, 1219–0066, 1219–0073, 1219–0088, and 1219–0141. The information collection requirements contained in the final rule are found in final §§ 7.503, 75.221, 75.360, 75.372, 75.1200, 75.1502, 75.1505, 75.1507, and 75.1508. The final rule will result in 87,732 burden hours and related costs of approximately $6.6 million in the first year the rule is in effect. In the second year the rule is in effect, and every year thereafter, the final rule will result in 75,681 burden hours and related costs of approximately $6.4 million.

For a detailed summary of the burden hours and related costs by provision, see the REA accompanying the final rule. The REA is posted on MSHA's Web site at *http://www.msha.gov/REGSINFO.HTM.* A copy of the REA can be obtained from MSHA's Office of Standards, Regulations, and Variances at the address provided in the **ADDRESSES** section of this preamble.

B. Procedural Details

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

Since the proposed rule was published, MSHA has not received any substantive comments on the information collection package.

VII. Other Regulatory Analyses

A. The Unfunded Mandates Reform Act of 1995

MSHA has reviewed the final rule under the Unfunded Mandates Reform Act of 1995 (2 U.S.C. 1501 *et seq.*). MSHA has determined that the final rule does not include any Federal mandate that may result in increased expenditures by State, local, or tribal governments or significantly or uniquely affect small governments. MSHA estimates that the final rule will 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 final rule in the REA.

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

The final rule has 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.

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

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

D. Executive Order 12988: Civil Justice Reform

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

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

The final rule has no adverse impact on children. Accordingly, Executive Order 13045 requires no further agency action or analysis.

F. Executive Order 13132: Federalism

The final rule does not have ''federalism implications'' because it does not ''have substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government.'' West Virginia and Illinois have laws on refuge alternatives and MSHA has drafted the final rule to minimize conflict with these laws.

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

The final rule does not have ''tribal implications'' because it does 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.

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

The final rule has been reviewed for its impact on the supply, distribution, and use of energy because it applies to the coal mining industry. Insofar as the final rule will result in yearly costs of approximately $50 million to the underground coal mining industry, relative to annual revenues of $14.0 billion in 2007, 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, Executive Order 13211 requires no further Agency action or analysis.

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

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

List of Subjects

30 CFR Part 7

Coal mines, Incorporation by reference, Mine safety and health, Reporting and recordkeeping requirements, Underground mining.

30 CFR Part 75

Coal mines, Mine safety and health, Reporting and recordkeeping requirements, Safety, Training programs, Underground mining.

Dated: December 19, 2008.

Richard E. Stickler,

Acting Assistant Secretary for Mine Safety and Health.

■ For the reasons set out in the preamble, and under the authority of the Federal Mine Safety and Health Act of 1977 as amended by the Mine Improvement and New Emergency Response Act of 2006, MSHA is amending chapter I of title 30 of the Code of Federal Regulations as follows:

PART 7—TESTING BY APPLICANT OR THIRD PARTY—[AMENDED]

■ 1. The authority citation for part 7 continues to read as follows:

Authority: 30 U.S.C. 957.

■ 2. Add new subpart L to read as follows:

Subpart L—Refuge Alternatives

Sec.
7.501 Purpose and scope.
7.502 Definitions.
7.503 Application requirements.
7.504 Refuge alternatives and components; general requirements.
7.505 Structural components.
7.506 Breathable air components.
7.507 Air-monitoring components.
7.508 Harmful gas removal components.
7.509 Approval markings.
7.510 New technology.

§ 7.501 Purpose and scope.

This subpart L establishes requirements for MSHA approval of refuge alternatives and components for use in underground coal mines. Refuge alternatives are intended to provide a life-sustaining environment for persons trapped underground when escape is impossible.

§ 7.502 Definitions.

The following definitions apply in this subpart:

Apparent temperature. A measure of relative discomfort due to the combined effects of air movement, heat, and humidity on the human body.

Breathable oxygen. Oxygen that is at least 99 percent pure with no harmful contaminants.

Flash fire. A fire that rapidly spreads through a diffuse fuel, such as airborne coal dust or methane, without producing damaging pressure.

Noncombustible material. Material, such as concrete or steel, that will not ignite, burn, support combustion, or release flammable vapors when subjected to fire or heat.

Overpressure. The highest pressure over the background atmospheric pressure that could result from an explosion, which includes the impact of the pressure wave on an object.

Refuge alternative. A protected, secure space with an isolated atmosphere and integrated components that create a life-sustaining environment for persons trapped in an underground coal mine.

§ 7.503 Application requirements.

(a) An application for approval of a refuge alternative or component shall include:

(1) The refuge alternative's or component's make and model number, if applicable.

(2) A list of the refuge alternative's or component's parts that includes—

(i) The MSHA approval number for electric-powered equipment;

(ii) Each component's or part's in-mine shelf life, service life, and recommended replacement schedule;

(iii) Materials that have a potential to ignite used in each component or part with their MSHA approval number; and

(iv) A statement that the component or part is compatible with other components and, upon replacement, is equivalent to the original component or part.

(3) The capacity and duration (the number of persons it is designed to maintain and for how long) of the refuge alternative or component on a per-person per-hour basis.

(4) The length, width, and height of the space required for storage of each component.

(b) The application for approval of the refuge alternative shall include the following:

(1) A description of the breathable air component, including drawings, air-supply sources, piping, regulators, and controls.

(2) The maximum volume, excluding the airlock; the dimensions of floor space and volume provided for each person using the refuge alternative; and the floor space and volume of the airlock.

(3) The maximum positive pressures in the interior space and the airlock and a description of the means used to limit or control the positive pressure.

(4) The maximum allowable apparent temperature of the interior space and the airlock and the means to control the apparent temperature.

(5) The maximum mine air temperature under which the refuge alternative is designed to operate when the unit is fully occupied.

(6) Drawings that show the features of each component and contain sufficient information to document compliance with the technical requirements.

(7) A manual that contains sufficient detail for each refuge alternative or component addressing in-mine transportation, operation, and maintenance of the unit.

(8) A summary of the procedures for deploying refuge alternatives.

(9) A summary of the procedures for using the refuge alternative.

(10) The results of inspections, evaluations, calculations, and tests conducted under this subpart.

(c) The application for approval of the air-monitoring component shall specify the following:

(1) The operating range, type of sensor, gas or gases measured, and environmental limitations, including the cross-sensitivity to other gases, of each detector or device in the air-monitoring component.

(2) The procedure for operation of the individual devices so that they function as necessary to test gas concentrations over a 96-hour period.

(3) The procedures for monitoring and maintaining breathable air in the airlock, before and after purging.

(4) The instructions for determining the quality of the atmosphere in the airlock and refuge alternative interior and a means to maintain breathable air in the airlock.

(d) The application for approval of the harmful gas removal component shall specify the following:

(1) The volume of breathable air available for removing harmful gas both at start-up and while persons enter through the airlock.

(2) The maximum volume of each gas that the component is designed to remove on a per-person per-hour basis.

§ 7.504 Refuge alternatives and components; general requirements.

(a) Refuge alternatives and components:

(1) Electrical components that are exposed to the mine atmosphere shall be approved as intrinsically safe for use. Electrical components located inside the refuge alternative shall be either approved as intrinsically safe or approved as permissible.

(2) Shall not produce continuous noise levels in excess of 85 dBA in the structure's interior.

(3) Shall not liberate harmful or irritating gases or particulates into the structure's interior or airlock.

(4) Shall be designed so that the refuge alternative can be safely moved with the use of appropriate devices such as tow bars.

(5) Shall be designed to withstand forces from collision of the refuge alternative structure during transport or handling.

(b) The apparent temperature in the structure shall be controlled as follows:

(1) When used in accordance with the manufacturer's instructions and defined limitations, the apparent temperature in the fully occupied refuge alternative shall not exceed 95 degrees Fahrenheit (°F).

(2) Tests shall be conducted to determine the maximum apparent temperature in the refuge alternative when used at maximum occupancy and in conjunction with required components. Test results including calculations shall be reported in the application.

(c) The refuge alternative shall include:

(1) A two-way communication facility that is a part of the mine communication system, which can be

used from inside the refuge alternative; and accommodations for an additional communication system and other requirements as defined in the communications portion of the operator's approved Emergency Response Plan.

(2) Lighting sufficient for persons to perform tasks.

(3) A means to contain human waste effectively and minimize objectionable odors.

(4) First aid supplies.

(5) Materials, parts, and tools for repair of components.

(6) A fire extinguisher that—

(i) Meets the requirements for portable fire extinguishers used in underground coal mines under part 75;

(ii) Is appropriate for extinguishing fires involving the chemicals used for harmful gas removal; and

(iii) Uses a low-toxicity extinguishing agent that does not produce a hazardous by-product when deployed.

(d) Containers used for storage of refuge alternative components or provisions shall be—

(1) Airtight, waterproof, and rodent-proof;

(2) Easy to open and close without the use of tools; and

(3) Conspicuously marked with an expiration date and instructions for use.

§ 7.505 Structural components.

(a) The structure shall—

(1) Provide at least 15 square feet of floor space per person and 30 to 60 cubic feet of volume per person according to the following chart. The airlock can be included in the space and volume if waste is disposed outside the refuge alternative.

Mining height (inches)	Unrestricted volume (cubic feet) per person *
36 or less	30
>36–≤42	37.5
>42–≤48	45
>48–≤54	52.5
>54	60

* Includes an adjustment of 12 inches for clearances.

(2) Include storage space that secures and protects the components during transportation and that permits ready access to components for maintenance examinations.

(3) Include an airlock that creates a barrier and isolates the interior space from the mine atmosphere, except for a refuge alternative capable of maintaining adequate positive pressure.

(i) The airlock shall be designed for multiple uses to accommodate the structure's maximum occupancy.

(ii) The airlock shall be configured to accommodate a stretcher without compromising its function.

(4) Be designed and made to withstand 15 pounds per square inch (psi) overpressure for 0.2 seconds prior to deployment.

(5) Be designed and made to withstand exposure to a flash fire of 300 °F for 3 seconds prior to deployment.

(6) Be made with materials that do not have a potential to ignite or are MSHA-approved.

(7) Be made from reinforced material that has sufficient durability to withstand routine handling and resist puncture and tearing during deployment and use.

(8) Be guarded or reinforced to prevent damage to the structure that would hinder deployment, entry, or use.

(9) Permit measurement of outside gas concentrations without exiting the structure or allowing entry of the outside atmosphere.

(b) Inspections or tests shall be conducted as follows:

(1) A test shall be conducted to demonstrate that trained persons can fully deploy the structure, without the use of tools, within 10 minutes of reaching the refuge alternative.

(2) A test shall be conducted to demonstrate that an overpressure of 15 psi applied to the pre-deployed refuge alternative structure for 0.2 seconds does not allow gases to pass through the structure separating the interior and exterior atmospheres.

(3) A test shall be conducted to demonstrate that a flash fire of 300 °F for 3 seconds does not allow gases to pass from the outside to the inside of the structure.

(4) An inspection shall be conducted to determine that the overpressure forces of 15 psi applied to the pre-deployed refuge alternative structure for 0.2 seconds does not prevent the stored components from operating.

(5) An inspection shall be conducted to determine that a flash fire of 300 °F for 3 seconds does not prevent the stored components from operating.

(6) A test shall be conducted to demonstrate that each structure resists puncture and tearing when tested in accordance with ASTM D2582–07 *Standard Test Method for Puncture-Propagation Tear Resistance of Plastic Film and Thin Sheeting.* This publication is incorporated by reference. The Director of the Federal Register approves this incorporation by reference in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. A copy may be obtained from the American Society for Testing Materials (ASTM), 100 Barr Harbor Drive, West Conshohocken, Pennsylvania 19428–2959. A copy may be inspected at any MSHA Coal Mine Safety and Health district office,; or at MSHA's Office of Standards, 1100 Wilson Blvd., Room 2353, Arlington, Virginia 22209 (phone: 202–693–9440); or at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, call 202–741–6030, or go to: *http://www.archives.gov/federal_register/code_of_federal_regulations/ibr_locations.html.*

(7) A test shall be conducted to demonstrate that each reasonably anticipated repair can be completed within 10 minutes of opening the storage space for repair materials and tools.

(8) A test shall be conducted to demonstrate that no harmful gases or noticeable odors are released from nonmetallic materials before or after the flash fire test. The test shall identify the gases released and determine their concentrations.

(c) If pressurized air is used to deploy the structure or maintain its shape, the structure shall—

(1) Include a pressure regulator or other means to prevent over pressurization of the structure, and

(2) Provide a means to repair and re-pressurize the structure in case of failure of the structure or loss of air pressure.

(d) The refuge alternative structure shall provide a means—

(1) To conduct a preshift examination, without entering the structure, of components critical for deployment; and

(2) To indicate unauthorized entry or tampering.

§ 7.506 Breathable air components.

(a) Breathable air shall be supplied by compressed air cylinders, compressed breathable-oxygen cylinders, or boreholes with fans installed on the surface or compressors installed on the surface. Only uncontaminated breathable air shall be supplied to the refuge alternative.

(b) Mechanisms shall be provided and procedures shall be included so that, within the refuge alternative,—

(1) The breathable air sustains each person for 96 hours,

(2) The oxygen concentration is maintained at levels between 18.5 and 23 percent, and

(3) The average carbon dioxide concentration is 1.0 percent or less and excursions do not exceed 2.5 percent.

(c) Breathable air supplied by compressed air from cylinders, fans, or compressors shall provide a minimum flow rate of 12.5 cubic feet per minute of breathable air for each person.

(1) Fans or compressors shall meet the following:

(i) Be equipped with a carbon monoxide detector located at the surface that automatically provides a visual and audible alarm if carbon monoxide in supplied air exceeds 10 parts per million (ppm).

(ii) Provide in-line air-purifying sorbent beds and filters or other equivalent means to assure the breathing air quality and prevent condensation, and include maintenance instructions that provide specifications for periodic replacement or refurbishment.

(iii) Provide positive pressure and an automatic means to assure that the pressure is relieved at 0.18 psi, or as specified by the manufacturer, above mine atmospheric pressure in the refuge alternative.

(iv) Include warnings to assure that only uncontaminated breathable air is supplied to the refuge alternative.

(v) Include air lines to supply breathable air from the fan or compressor to the refuge alternative.

(A) Air lines shall be capable of preventing or removing water accumulation.

(B) Air lines shall be designed and protected to prevent damage during normal mining operations, a flash fire of 300 °F for 3 seconds, a pressure wave of 15 psi overpressure for 0.2 seconds, and ground failure.

(vi) Assure that harmful or explosive gases, water, and other materials cannot enter the breathable air.

(2) Redundant fans or compressors and power sources shall be provided to permit prompt re-activation of equipment in the event of failure.

(d) Compressed breathable oxygen shall—

(1) Include instructions for deployment and operation;

(2) Provide oxygen at a minimum flow rate of 1.32 cubic feet per hour per person;

(3) Include a means to readily regulate the pressure and volume of the compressed oxygen;

(4) Include an independent regulator as a backup in case of failure; and

(5) Be used only with regulators, piping, and other equipment that is certified and maintained to prevent ignition or combustion.

(e) The applicant shall prepare and submit an analysis or study demonstrating that the breathable air component will not cause an ignition.

(1) The analysis or study shall specifically address oxygen fire hazards and fire hazards from chemicals used for removal of carbon dioxide.

(2) The analysis or study shall identify the means used to prevent any ignition source.

§ 7.507 Air-monitoring components.

(a) Each refuge alternative shall have an air-monitoring component that provides persons inside with the ability to determine the concentrations of carbon dioxide, carbon monoxide, oxygen, and methane, inside and outside the structure, including the airlock.

(b) Refuge alternatives designed for use in mines with a history of harmful gases, other than carbon monoxide, carbon dioxide, and methane, shall be equipped to measure the harmful gases' concentrations.

(c) The air-monitoring component shall be inspected or tested and the test results shall be included in the application.

(d) The air-monitoring component shall meet the following:

(1) The total measurement error, including the cross-sensitivity to other gases, shall not exceed ± 10 percent of the reading, except as specified in the approval.

(2) The measurement error limits shall not be exceeded after start-up, after 8 hours of continuous operation, after 96 hours of storage, and after exposure to atmospheres with a carbon monoxide concentration of 999 ppm (full-scale), a carbon dioxide concentration of 3 percent, and full-scale concentrations of other gases.

(3) Calibration gas values shall be traceable to the National Institute for Standards and Technology (NIST) ''Standard Reference Materials'' (SRMs).

(4) The analytical accuracy of the calibration gas and span gas values shall be within 2.0 percent of NIST gas standards.

(5) The detectors shall be capable of being kept fully charged and ready for immediate use.

§ 7.508 Harmful gas removal components.

(a) Each refuge alternative shall include means for removing harmful gases.

(1) Purging or other effective procedures shall be provided for the airlock to dilute the carbon monoxide concentration to 25 ppm or less and the methane concentration to 1.0 percent or less as persons enter, within 20 minutes of persons deploying the refuge alternative.

(2) Chemical scrubbing or other effective procedures shall be provided so that the average carbon dioxide concentration in the occupied structure shall not exceed 1.0 percent over the rated duration, and excursions shall not exceed 2.5 percent.

(i) Carbon dioxide removal components shall be used with breathable air cylinders or oxygen cylinders.

(ii) Carbon dioxide removal components shall remove carbon dioxide at a rate of 1.08 cubic feet per hour per person.

(3) Instructions shall be provided for deployment and operation of the harmful gas removal component.

(b) The harmful gas removal component shall meet the following requirements: Each chemical used for removal of harmful gas shall be—

(1) Contained such that when stored or used it cannot come in contact with persons, and it cannot release airborne particles.

(2) Provided with all materials; parts, such as hangers, racks, and clips; equipment; and instructions necessary for deployment and use.

(3) Stored in an approved container that is conspicuously marked with the manufacturer's instructions for disposal of used chemical.

(c) Each harmful gas removal component shall be tested to determine its ability to remove harmful gases.

(1) The component shall be tested in a refuge alternative structure that is representative of the configuration and maximum volume for which the component is designed.

(i) The test shall include three sampling points located vertically along the centerlines of the length and width of the structure and equally spaced over the horizontal centerline of the height of the structure.

(ii) The structure shall be sealed airtight.

(iii) The operating gas sampling instruments shall be placed inside the structure and continuously exposed to the test atmosphere.

(iv) Sampling instruments shall simultaneously measure the gas concentrations at the three sampling points.

(2) For testing the component's ability to remove carbon monoxide, the structure shall be filled with a test gas of either purified synthetic air or purified nitrogen that contains 400 ppm carbon monoxide, ±5 percent.

(i) After a stable concentration of 400 ppm, ±5 percent, carbon monoxide has been obtained for 5 minutes at all three sampling points, a timer shall be started and the structure shall be purged or carbon monoxide otherwise removed.

(ii) Carbon monoxide concentration readings from each of the three sampling instruments shall be recorded every 2 minutes.

(iii) The time shall be recorded from the start of harmful gas removal until

the readings of the three sampling instruments all indicate a carbon monoxide concentration of 25 ppm or less.

(3) For testing the component's ability to remove carbon dioxide, the carbon dioxide concentration shall not exceed 1.0 percent over the rated duration and excursions shall not exceed 2.5 percent under the following conditions:

(i) At 55 °F (±4 °F), 1 atmosphere (±1 percent), and 50 percent (±5 percent) relative humidity.

(ii) At 55 °F (±4 °F), 1 atmosphere (±1 percent), and 100 percent (±5 percent) relative humidity.

(iii) At 90 °F (±4 °F), 1 atmosphere (±1 percent), and 50 percent (±5 percent) relative humidity.

(iv) At 82 °F (±4 °F), 1 atmosphere (±1 percent), and 100 percent (±5 percent) relative humidity.

(4) Testing shall demonstrate the component's continued ability to remove harmful gases effectively throughout its designated shelf-life, specifically addressing the effects of storage and transportation.

(d) Alternate performance tests may be conducted if the tests provide the same level of assurance of the harmful gas removal component's capability as the tests specified in paragraph (c) of this section. Alternate tests shall be specified in the approval application.

§ 7.509 Approval markings.

(a) Each approved refuge alternative or component shall be identified by a legible, permanent approval marking that is securely and conspicuously attached to the component or its container.

(b) The approval marking shall be inscribed with the component's MSHA approval number and any additional markings required by the approval.

(c) The refuge alternative structure shall provide a conspicuous means for indicating an out-of-service status, including the reason it is out of service.

(d) The airlock shall be conspicuously marked with the recommended maximum number of persons that can use it at one time.

§ 7.510 New technology.

MSHA may approve a refuge alternative or a component that incorporates new knowledge or technology, if the applicant demonstrates that the refuge alternative or component provides no less protection than those meeting the requirements of this subpart.

PART 75—MANDATORY SAFETY STANDARDS–UNDERGROUND COAL MINES—[AMENDED]

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

Authority: 30 U.S.C. 811.

■ 4. Amend § 75.221 by adding paragraph (a)(12) to read as follows:

§ 75.221 Roof control plan information.

(a) * * *

(12) A description of the roof and rib support necessary for the refuge alternatives.

* * * * *

■ 5. Amend § 75.313 by adding paragraph (f) to read as follows:

§ 75.313 Main mine fan stoppage with persons underground.

* * * * *

(f) Any electrical refuge alternative components exposed to the mine atmosphere shall be approved as intrinsically safe for use during fan stoppages. Any electrical refuge alternative components located inside the refuge alternative shall be either approved as intrinsically safe or approved as permissible for use during fan stoppages.

■ 6. Amend § 75.360 by redesignating paragraphs (d) through (g) as paragraphs (e) through (h) and adding a new paragraph (d) to read as follows:

§ 75.360 Preshift examination at fixed intervals.

* * * * *

(d) The person conducting the preshift examination shall check the refuge alternative for damage, the integrity of the tamper-evident seal and the mechanisms required to deploy the refuge alternative, and the ready availability of compressed oxygen and air.

* * * * *

■ 7. Amend § 75.372 by revising paragraph (b)(11) to read as follows:

§ 75.372 Mine ventilation map.

* * * * *

(b) * * *

(11) The location of all escapeways and refuge alternatives.

* * * * *

■ 8. Amend § 75.1200–1 by adding paragraph (n) to read as follows:

§ 75.1200–1 Additional information on mine map.

* * * * *

(n) The locations of refuge alternatives.

■ 9. Amend § 75.1202–1 by revising paragraph (b)(4) to read as follows:

§ 75.1202–1 Temporary notations, revisions, and supplements.

* * * * *

(b) * * *

(4) Escapeways and refuge alternatives designated by means of symbols.

§ 75.1500 [Reserved]

■ 10. Remove and reserve § 75.1500.

■ 11. Amend § 75.1501 by revising paragraph (a)(1) to read as follows:

§ 75.1501 Emergency evacuations.

(a) * * *

(1) The responsible person shall have current knowledge of the assigned location and expected movements of miners underground, the operation of the mine ventilation system, the locations of the mine escapeways and refuge alternatives, the mine communications system, any mine monitoring system if used, locations of firefighting equipment, the mine's Emergency Response Plan, the Mine Rescue Notification Plan, and the Mine Emergency Evacuation and Firefighting Program of Instruction.

* * * * *

■ 12. Amend § 75.1502 as follows:

■ A. Redesignating paragraphs (c)(3) through (c)(8) as paragraphs (c)(4) through (c)(9).

■ B. Add paragraph (c)(3).

■ C. Revise paragraphs (c)(4)(iv) and (v).

■ D. Add paragraph (c)(4)(vi).

■ E. Revise paragraph (c)(8).

■ F. Add paragraphs (c)(10) through (c)(12).

The revisions read as follows:

§ 75.1502 Mine emergency evacuation and firefighting program of instruction.

* * * * *

(c) * * *

* * * * *

(3) The deployment, use, and maintenance of refuge alternatives.

(4) * * *

(iv) Switching escapeways, as applicable;

(v) Negotiating any other unique escapeway conditions; and

(vi) Using refuge alternatives.

* * * * *

(8) A review of the mine map; the escapeway system; the escape, firefighting, and emergency evacuation plan in effect at the mine; and the locations of refuge alternatives and abandoned areas.

* * * * *

(10) A summary of the procedures related to deploying refuge alternatives.

(11) A summary of the construction methods for 15 psi stoppings constructed prior to an event.

(12) A summary of the procedures related to refuge alternative use.

* * * * *

■ 13. Amend § 75.1504 by revising paragraphs (b)(3)(ii), (b)(4)(ii), and (c), and adding paragraphs (b)(6), (b)(7), (b)(8), and (b)(9) to read as follows:

§ 75.1504 Mine emergency evacuation training and drills.

* * * * *

(b) * * *

(3) * * *

(ii) Physically locates and practices using the continuous directional lifelines or equivalent devices and tethers, and physically locates the stored SCSRs and refuge alternatives;

* * * * *

(4) * * *

(ii) Locating escapeways, exits, routes of travel to the surface, abandoned areas, and refuge alternatives.

* * * * *

(6) Reviewing the procedures for deploying refuge alternatives and components.

(7) For miners who will be constructing the 15 psi stoppings prior to an event, reviewing the procedures for constructing them.

(8) Reviewing the procedures for use of the refuge alternatives and components.

(9) Task training in proper transportation of the refuge alternatives and components.

(c) *Annual expectations training.* Over the course of each year, each miner shall participate in expectations training that includes the following:

(1) Donning and transferring SCSRs in smoke, simulated smoke, or an equivalent environment.

(2) Breathing through a realistic SCSR training unit that provides the sensation of SCSR airflow resistance and heat.

(3) Deployment and use of refuge alternatives similar to those in use at the mine, including—

(i) Deployment and operation of component systems; and

(ii) Instruction on when to use refuge alternatives during a mine emergency, emphasizing that it is the last resort when escape is impossible.

(4) A miner shall participate in expectations training within one quarter of being employed at the mine.

* * * * *

■ 14. Amend § 75.1505 by revising paragraphs (a) and (b) to read as follows:

§ 75.1505 Escapeway maps.

(a) *Content and accessibility.* An escapeway map shall show the designated escapeways from the working sections or the miners' work stations to the surface or the exits at the bottom of the shaft or slope, refuge alternatives, and SCSR storage locations. The escapeway map shall be posted or readily accessible for all miners—

(1) In each working section;

(2) In each area where mechanized mining equipment is being installed or removed;

(3) At the refuge alternative; and

(4) At a surface location of the mine where miners congregate, such as at the mine bulletin board, bathhouse, or waiting room.

(b) *Keeping maps current.* All maps shall be kept up-to-date and any change in route of travel, location of doors, location of refuge alternatives, or direction of airflow shall be shown on the maps by the end of the shift on which the change is made.

* * * * *

■ 15. Add § 75.1506 to subpart P of this part to read as follows:

§ 75.1506 Refuge alternatives.

(a) Each operator shall provide refuge alternatives and components as follows:

(1) Prefabricated self-contained units, including the structural, breathable air, air monitoring, and harmful gas removal components of the unit, shall be approved under 30 CFR part 7; and

(2) The structural components of units consisting of 15 psi stoppings constructed prior to an event shall be approved by the District Manager, and the breathable air, air monitoring, and harmful gas removal components of these units shall be approved under 30 CFR part 7.

(3) Prefabricated refuge alternative structures that states have approved and those that MSHA has accepted in approved Emergency Response Plans (ERPs) that are in service prior to March 2, 2009 are permitted until December 31, 2018, or until replaced, whichever comes first. Breathable air, air-monitoring, and harmful gas removal components of either a prefabricated self-contained unit or a unit consisting of 15 psi stoppings constructed prior to an event in a secure space and an isolated atmosphere that states have approved and those that MSHA has accepted in approved ERPs that are in use prior to March 2, 2009 are permitted until December 31, 2013, or until replaced, whichever comes first. Refuge alternatives consisting of materials pre-positioned for miners to deploy in a secure space with an isolated atmosphere that MSHA has accepted in approved ERPs that are in use prior to March 2, 2009 are permitted until December 31, 2010, or until replaced, whichever comes first.

(b) Except as permitted under paragraph (a)(3) of this section, each operator shall provide refuge alternatives with sufficient capacity to accommodate all persons working underground.

(1) Refuge alternatives shall provide at least 15 square feet of floor space per person and 30 to 60 cubic feet of volume per person according to the following chart. The airlock can be included in the space and volume if waste is disposed outside the refuge alternative.

Mining height (inches)	Unrestricted volume (cubic feet) per person*
36 or less	30
>36–≤42	37.5
>42–≤48	45
>48–≤54	52.5
>54	60

* Includes an adjustment of 12 inches for clearances.

(2) Refuge alternatives for working sections shall accommodate the maximum number of persons that can be expected on or near the section at any time.

(3) Each refuge alternative for outby areas shall accommodate persons reasonably expected to use it.

(c) Refuge alternatives shall be provided at the following locations:

(1) Within 1,000 feet from the nearest working face and from locations where mechanized mining equipment is being installed or removed except that for underground anthracite coal mines that have no electrical face equipment, refuge alternatives shall be provided if the nearest working face is greater than 2,000 feet from the surface.

(2) Spaced within one-hour travel distances in outby areas where persons work such that persons in outby areas are never more than a 30-minute travel distance from a refuge alternative or safe exit. However, the operator may request and the District Manager may approve a different location in the ERP. The operator's request shall be based on an assessment of the risk to persons in outby areas, considering the following factors: proximity to seals; proximity to potential fire or ignition sources; conditions in the outby areas; location of stored SCSRs; and proximity to the most direct, safe, and practical route to an intake escapeway.

(d) Roof and rib support for refuge alternative locations shall be specified in the mine's roof control plan.

(e) The operator shall protect the refuge alternative and contents from damage during transportation, installation, and storage.

(f) A refuge alternative shall be removed from service if examination

reveals damage that interferes with the functioning of the refuge alternative or any component.

(1) If a refuge alternative is removed from service, the operator shall withdraw all persons from the area serviced by the refuge alternative, except those persons referred to in § 104(c) of the Mine Act.

(2) Refuge alternative components removed from service shall be replaced or be repaired for return to service in accordance with the manufacturer's specifications.

(g) At all times, the site and area around the refuge alternative shall be kept clear of machinery, materials, and obstructions that could interfere with the deployment or use of the refuge alternative.

(h) Each refuge alternative shall be conspicuously identified with a sign or marker as follows:

(1) A sign or marker made of a reflective material with the word ''REFUGE'' shall be posted conspicuously at each refuge alternative.

(2) Directional signs made of a reflective material shall be posted leading to each refuge alternative location.

(i) During use of the refuge alternative, the atmosphere within the refuge alternative shall be monitored. Changes or adjustments shall be made to reduce the concentration of methane to less than 1 percent; to reduce the concentration of carbon dioxide to 1 percent or less and excursions not exceeding 2.5 percent; and to reduce the concentration of carbon monoxide to 25 ppm or less. Oxygen shall be maintained at 18.5 to 23 percent.

(j) Refuge alternatives shall contain a fire extinguisher that—

(1) Meets the requirements for portable fire extinguishers used in underground coal mines under this part;

(2) Is appropriate for extinguishing fires involving the chemicals used for harmful gas removal; and

(3) Uses a low-toxicity extinguishing agent that does not produce a hazardous by-product when activated.

■ 16. Add § 75.1507 to subpart P of this part to read as follows:

§ 75.1507 Emergency Response Plan; refuge alternatives.

(a) The Emergency Response Plan (ERP) shall include the following for each refuge alternative and component:

(1) The types of refuge alternatives used in the mine, *i.e.*, a prefabricated self-contained unit or a unit consisting of 15 psi stoppings constructed prior to an event in a secure space and an isolated atmosphere.

(2) Procedures or methods for maintaining approved refuge alternatives and components.

(3) The rated capacity of each refuge alternative, the number of persons expected to use each refuge alternative, and the duration of breathable air provided per person by the approved breathable air component of each refuge alternative.

(4) The methods for providing breathable air with sufficient detail of the component's capability to provide breathable air over the duration stated in the approval.

(5) The methods for providing ready backup oxygen controls and regulators.

(6) The methods for providing an airlock and for providing breathable air in the airlock, except where adequate positive pressure is maintained.

(7) The methods for providing sanitation facilities.

(8) The methods for harmful gas removal, if necessary.

(9) The methods for monitoring gas concentrations, including charging and calibration of equipment.

(10) The method for providing lighting sufficient for persons to perform tasks.

(11) Suitable locations for the refuge alternatives and an affirmative statement that the locations are—

(i) Not within direct line of sight of the working face; and

(ii) Where feasible, not placed in areas directly across from, nor closer than 500 feet radially from, belt drives, take-ups, transfer points, air compressors, explosive magazines, seals, entrances to abandoned areas, and fuel, oil, or other flammable or combustible material storage. However, the operator may request and the District Manager may approve an alternative location in the ERP if mining involves two-entry systems or yield pillars in a longwall that would prohibit locating the refuge alternative out of direct line of sight of the working face.

(12) The maximum mine air temperature at each of the locations where refuge alternatives are to be placed.

(b) For a refuge alternative consisting of 15 psi stoppings constructed prior to an event in a secure space and an isolated atmosphere, the ERP shall specify that—

(1) The breathable air components shall be approved by MSHA; and

(2) The refuge alternative can withstand exposure to a flash fire of 300 degrees Fahrenheit (°F) for 3 seconds and a pressure wave of 15 pounds per square inch (psi) overpressure for 0.2 seconds.

(c) If the refuge alternative sustains persons for only 48 hours, the ERP shall detail advanced arrangements that have been made to assure that persons who cannot be rescued within 48 hours will receive additional supplies to sustain them until rescue. Advance arrangements shall include the following:

(1) Pre-surveyed areas for refuge alternatives with closure errors of less than 20,000:1.

(2) An analysis to demonstrate that the surface terrain, the strata, the capabilities of the drill rig, and all other factors that could affect drilling are such that a hole sufficient to provide required supplies and materials reliably can be promptly drilled within 48 hours of an accident at a mine.

(3) Permissions to cross properties, build roads, and construct drill sites.

(4) Arrangement with a drilling contractor or other supplier of drilling services to provide a suitable drilling rig, personnel and support so that a hole can be completed to the refuge alternative within 48 hours.

(5) Capability to promptly transport a drill rig to a pre-surveyed location such that a drilled hole would be completed and located near a refuge alternative structure within 48 hours of an accident at a mine.

(6) The specifications of pipes, air lines, and approved fans or approved compressors that will be used.

(7) A method for assuring that within 48 hours, breathable air shall be provided.

(8) A method for assuring the immediate availability of a backup source for supplying breathable air and a backup power source for surface installations.

(d) The ERP shall specify that the refuge alternative is stocked with the following:

(1) A minimum of 2,000 calories of food and 2.25 quarts of potable water per person per day in approved containers sufficient to sustain the maximum number of persons reasonably expected to use the refuge alternative for at least 96 hours, or for 48 hours if advance arrangements are made under paragraph (c) of this section;

(2) A manual that contains sufficient detail for each refuge alternative or component addressing in-mine transportation, operation, and maintenance of the unit;

(3) Sufficient quantities of materials and tools to repair components; and

(4) First aid supplies.

■ 17. Add § 75.1508 to subpart P of this part to read as follows:

§ 75.1508 Training and records for examination, maintenance and repair of refuge alternatives and components.

(a) Persons examining, maintaining, or repairing refuge alternatives and components shall be instructed in how to perform this work.

(1) The operator shall assure that all persons assigned to examine, maintain, and repair refuge alternatives and components are trained.

(2) The mine operator shall certify, by signature and date, the training of persons who examine, maintain, and repair refuge alternatives and components.

(b) At the completion of each repair, the person conducting the maintenance or repair shall make a record of all corrective action taken.

(c) Training certifications and repair records shall be kept at the mine for one year.

■ 18. Add § 75.1600–3 to subpart Q of this part to read as follows:

§ 75.1600–3 Communications facilities; refuge alternatives.

(a) Refuge alternatives shall be provided with a communications system that consists of—

(1) A two-way communication facility that is a part of the mine communication system, which can be used from inside the refuge alternative; and

(2) An additional communication system and other requirements as defined in the communications portion of the operator's approved Emergency Response Plan.

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