1.0 PURPOSE

The purpose of this Standard Application Procedure (SAP) is to explain the basic investigative process and outline the minimum document requirements necessary to initiate an investigation leading to the issuance of a Refuge Alternative Approval, Extension of Approval, or Subsequent Approval under 30 CFR Part 7.

2.0 SCOPE

This SAP applies to all applications for Refuge Alternative Approval, Extension of Approval, or Subsequent Approval under Part 7, Subpart L.

3.0 REFERENCES

This SAP refers to "Application Cancellation Policy", APOL1009.

4.0 DEFINITIONS

4.1. Approval- A document issued by MSHA which states that a product has met the requirements of this part and which authorizes an approval marking identifying the product as approved.

4.2. Extension Of Approval- A document issued by MSHA which states that the change to a product previously approved by MSHA under this part meets the requirements of this part and which authorizes the continued use of the approval marking after the appropriate extension number has been added.

4.3. Subsequent Approval – A product that is similar to one for which the applicant already holds an approval.

5.0 APPLICATION PROCEDURE

5.1. All applications must include the following information:

5.1.1. Application Letter - Each application letter for approval of a product should include a brief description of the product, and, if appropriate, a statement indicating whether, in the applicant's opinion, testing is

required. If testing is not required, the applicant should explain the reasons for not testing. The application letter must be signed by the person responsible for answering any questions regarding the subject application. (Refer to Enclosures A, B, and C for completed samples.)

5.1.2. Certified Statement(s), as required by Part 7. (Refer to Enclosure D.)

5.1.3. A checklist (Refer to Enclosure E). The sections of the checklist that need to be addressed should include the corresponding page number(s) of where the material can be found.

Note: Each applicable item on the checklist should include the corresponding document or drawing number (including the page number) submitted in the application documentation

5.1.4. One copy of all documentation required to show details of the design and construction of the Refuge Alternative per 30 CFR, Subpart L, Paragraph 7.503, including test data, test results, calculations, and other information to support how requirements have been met. This documentation is outlined in the checklist, Enclosure E.

Note: Documents previously accepted in refuge alternative and component approvals do not need to be resubmitted unless modified.

5.2. Upon receipt of the application package by the Approval and Certification Center, a fee estimate letter is prepared and sent to the applicant, unless the applicant has a blanket authorization on file. The fee estimate letter includes an estimate of the maximum anticipated fee to complete the investigation and a tentative starting date.

5.2.1. An authorization response form is included with the fee estimate. The authorization response form indicates agreement to pay expenses up to the maximum estimated fee for the investigation or requests cancellation of the application. This form must be completed and returned by the applicant before any further action is taken on the application. If the form is not returned within thirty days from the date of the letter, the application is canceled.

5.2.2. When unforeseen circumstances encountered during the investigation result in exceeding the estimated fee, the applicant is contacted (either by

phone or email) and given the option of canceling the action or accepting the new estimated fee.

5.3. During the investigation, applicants are notified if MSHA elects to observe any product testing in accordance with Section 7.4(c), and of any discrepancies or additional information needed to process the application. Applicants are notified by mail and telephone. If an email address is provided, the discrepancy letter may be emailed.

5.4. After all the technical documents are evaluated and any changes required as a result of the viewing of any tests and inspection is finalized, the formal Approval, Subsequent Approval or Extension of Approval letter is issued. An invoice for the total cost of the investigation is sent after final approval issuance.

5.5. Submit the application to MSHA by one of the following methods:

5.5.1. Mail to: MSHA Approval and Certification Center

Attention: IPSO 765 Technology Drive, Triadelphia, WV 26059

5.5.2. FAX to: 304-547-2044

5.5.3. Electronically: For information and instructions on setting up an account with MSHA go to:
http://www.msha.gov/techsupp/acc/application/online.htm

Contact the Applied Engineering Division at 304-547-0400 for additional information concerning these procedures.

(SAMPLE)
PART 7 REFUGE ALTERNATIVE
APPROVAL APPLICATION LETTER

Chief, Approval and Certification Center
765 Technology Drive
Triadelphia, WV 26059

Company and Address:
ABC Refuge, Inc.
2 Starlake Avenue
Wheeling, WV 26003

Date: 01-01-2009

Subject: New Approval of the Refuge Alternative Model 1XXXX

Company Application Code No.: 123456

Gentlemen:

We are requesting approval of the subject refuge alternative built according to drawing 1XXXX-1. A brief description of the refuge alternative is as follows:

This refuge alternative is an inflatable, mobile, 10 occupant, 96 hour rated refuge chamber. We are asking for approval with the following:

- Structural Components, per dwg. 1XXXX-2
- Breathable Air Components, per dwg. 1XXXX-3
- Air–Monitoring Components, per dwg. 1XXXX-4
- Harmful Gas Removal Components, per dwg. 1XXXX-5

Please advise us when an MSHA representative will be available to witness the tests. Enclosed are all drawings and specifications pertinent to this application. If there are any questions, please contact John Doe at 304-555-1234.

Sincerely,

John Doe
President

(SAMPLE)
PART 7 REFUGE ALTERNATIVE
EXTENSION OF APPROVAL APPLICATION LETTER

Chief, Approval and Certification Center
765 Technology Drive
Triadelphia, WV 26059

Company and Address:
ABC Refuge, Inc.
2 Starlake Avenue
Wheeling, WV 26003

Date: 01-01-2009

Subject: Extension of Approval of the Refuge Alternative Model 1XXXX
Company Application Code No.: 123457

Gentlemen:

We are requesting approval of the subject refuge alternative built according to drawing 2XXXX-1. A brief description of the subject refuge alternative is as follows: The subject refuge alternative is similar to the refuge alternative under 07-LAA09XXXX-0, in that it is rated for 10 persons, for 96 hours; however, the existing CO2 scrubbing component has been replaced with a motor powered soda lime system, as documented on Harmful Gas Removal Components drawing #2XXXX-5,. In addition, oxygen supply system was altered by the addition of an alternate manifold system, as documented on Breathable Air Components drawing #1XXXX-3.

Enclosed are all of the new or revised drawings and specifications pertinent to this application. If there are any questions, please contact John Doe at 304-555-1234.

Testing of this mobile chamber is/is not necessary, based on the testing conducted and witnessed by an MSHA representative under Approval 07-LAA09XXXX-0.

Sincerely,

John Doe
President

(SAMPLE)
PART 7 REFUGE ALTERNATIVE
SUBSEQUENT APPROVAL APPLICATION LETTER

Chief, Approval and Certification Center
765 Technology Drive
Triadelphia, WV 260592

Company and Address:
ABC Refuge, Inc.
2 Starlake Avenue
Wheeling, WV 26003

Date: 01-01-2009

Subject: Subsequent Approval of the Refuge Alternative Model 3XXXX
Company Application Code No.: 123457

Gentlemen:

We are requesting a subsequent approval of the subject refuge alternative built according to drawing 1XXXX. The subject refuge alternative is similar to the 10 person, 96 hour chamber built according to drawing 1XXXX-1, Approval No. 07- LAA09XXXX-0, except as follows:

The refuge alternative has been rated for a 12 person, 96 hour chamber which require the following changes:

- Increasing breathable air components
- Increasing harmful gas removal components.
- Increase in food, water, first aid supplies, etc.

Structural testing of this chamber is/is not necessary, because the changes do not increase the dimensions of the chamber and volume requirement comply with Section 7.505.

Enclosed are all of the new or revised drawings and specifications pertinent to this application. If there are any questions, please contact John Doe at 304-555-1234.

Sincerely,

John Doe
President

PART 7 REFUGE ALTERNATIVES
CERTIFIED STATEMENTS

Company: Date:

Address:

Subject:

Company Application Code No.:

I, _____, as the responsible company official, hereby certify that:
(Signature)

(1) The subject refuge alternative will have Quality Assurance functions performed as specified in Title 30 Code of Federal Regulations 30 CFR Part 7, Subpart A (7.7).

(2) The subject refuge alternative and components have been designed to meet or exceed the general requirements set forth in 30 CFR Part 7, Subpart L (7.504).

(3) The subject refuge alternative component has been designed to meet or exceed the structural component criteria set forth in 30 CFR Part 7, Subpart L (7.505).

(4) The refuge alternative component has been designed to meet or exceed the breathable air components criteria set forth in 30 CFR Part 7, Subpart L (7.506).

(5) The subject refuge alternative component has been designed to meet or exceed air monitoring components criteria set forth in 30 CFR Part 7, Subpart L (7.507).

(6) The subject refuge alternative component has been designed to meet or exceed harmful gas removal components criteria set forth in 30 CFR Part 7, Subpart L (7.508).

(7) The subject refuge alternative and components have been tested and meet the performance portion of the technical requirements set forth in 30 CFR Part 7, Subpart L (7.504, 7.505, 7.506, 7.507, 7.508).

The proposed change cited in the application is the only change that affects the technical requirements (for subsequent and extensions of approval only)(30 CFR, Part 7, Subpart A, Section 7.3(f)). (If applicable)

Sincerely,

John Doe
President

PART 7 REFUGE ALTERNATIVE APPROVAL/SUBSEQUENT APPROVAL/EXTENSION OF APPROVAL CHECKLIST

Complete all of the following by adding a checkmark on the lines provided. The checkmark signifies the item has been positively addressed. N/A signifies the item is not applicable to the design of the refuge alternative.

Note: It is strongly recommended that the checklist is included with the application. Providing the document/drawing number with the associated checklist will streamline the process. (For example, blast overpressure passing test results, test sheet number 15)

ADMINISTRATIVE

_____ 1. The approval/subsequent approval or extension of approval application letter is enclosed.
_____ 2. All correspondence, specifications, and lettering on documents are in English and are legible.
_____ 3. All documents are titled, numbered, dated, include the company name, and show the latest revision level. If multiple pages are submitted, this information is on each page
_____ 4. There are no pencil or ink notations, or correction fluid (white-out) on the drawings and bills of material.
_____ 5. A certified statement is included that specifies that the refuge alternative will have Quality Assurance functions performed as specified in 30 CFR, Part 7, Subpart A (Section 7.7)
_____ 6. A certified statement is included that specifies that the refuge alternative assembly has been designed to meet the design portion of the technical requirements set forth in 30 CFR, Part 7, Subpart L (Section 7.504, Section 7.505, Section 7.506, Section 7.507 and Section 7.508).
_____ 7. A certified statement is included that specifies that the refuge alternative and components have been tested and meet the performance portion of the technical requirements set forth in 30 CFR Part 7, Subpart L (Section 7.504, Section 7.505, Section 7.506, Section 7.507, and Section 7.508).

TECHNICAL

APPLICATION REQUIREMENTS (Section 7.503)	**Drawing or Document No.**
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.(Section 7.503 (a) (1)) _____ 2. A list of the refuge alternative's or component's parts that includes: (Section 7.503 (a) (2)) _____ a. The MSHA approval number for electric-powered equipment;(Section 7.503 (a) (2) (i)) _____ b. Each component's or part's in-mine shelf life, service life, and recommended replacement schedule; (Section 7.503 (a) (2) (ii)) _____ c. Materials that have a potential to ignite used in each component or part with their MSHA approval number (Section 7.503 (a) (2) (iii)); and _____ d. A statement that the component or part is compatible with other components and upon replacement, is equivalent to the original component or part (Section 7.503 (a) (2) (iv)) _____ 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. (Section 7.503 (a) (3)) _____ 4. The length, width, and height of the space required for storage of each component. (Section 7.503 (a) (4)) _____ 5. A description of the breathable air component, including drawings, air-supply sources, piping, regulators, and controls.(Section 7.503 (b) (1)) _____ 6. 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.(Section 7.503 (b) (2)) _____ 7. 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.(Section 7.503 (b) (3)) _____ 8. The maximum allowable apparent temperature of the interior space and the airlock and the means to control the apparent temperature. (Section 7.503 (b) (4))	.

	Drawing or Document No.
_____ 9. The maximum mine air temperature under which the refuge alternative is designed to operate when the unit is fully occupied. (Section 7.503 (b) (5)) _____ 10. Drawings that show the features of each component and contain sufficient information to document compliance with the technical requirements. (Section 7.503 (b) (6)) _____ 11. A manual that contains sufficient detail for each refuge alternative or component addressing in-mine transportation, operation, and maintenance of the unit. (Section 7.503 (b) (7)) _____ 12. A summary of the procedures for deploying refuge alternatives. (Section 7.503 (b) (8)) _____ 13. A summary of the procedures for using the refuge alternative. (Section 7.503 (b) (9)) _____ 14. The results of inspections, evaluations, calculations, and tests conducted under this subpart. (Section 7.503 (b) (10)) **The application for approval of the air-monitoring component shall specify the following:** _____ 15. 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. (Section 7.503 (c) (1)) _____ 16. The procedure for operation of the individual devices so that they function as necessary to test gas concentrations over a 96 hour period. (Section 7.503 (c) (2)) _____ 17. Procedures for monitoring and maintaining breathable air in the airlock, before and after purging. (Section 7.503 (c) (3)) _____ 18. 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. (Section 7.503 (c) (4)) **The application for approval of the harmful gas removal component shall specify the following:** _____ 19. The volume of breathable air available for removing harmful gas both at start-up and while persons enter through the airlock (Section 7.503 (d) (1)).	

	Drawing or Document No.
_____ 20. The maximum volume of each gas that the component is designed to remove on a per-person per-hour basis. (Section 7.503 (d) (2))	
REFUGE ALTERNATIVES AND COMPONENTS; GENERAL REQUIREMENTS. (Section 7.504)	
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 (Section 7.504 (a) (1)) _____ 2. Shall not produce continuous noise levels in excess of 85 dBA in the structure's interior. (Section 7.504 (a) (2)) _____ 3. Shall not liberate harmful or irritating gases or particulates into the structure's interior or airlock. (Section 7.504) (a) (3)) _____ 4. Shall be designed so that the refuge alternative can be safely moved with the use of appropriate devices such as tow bars. (Section 7.504 (a) (4)) _____ 5. Shall be designed to withstand forces from collision of the refuge alternative structure during transport or handling. (Section 7.504 (a) (5))	
The apparent temperature in the structure shall be controlled as follows: _____ 6. 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). (Section 7.504 (b) (1)) _____ 7. 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. (Section 7.504 (b) (2))	

The refuge alternative shall include:	**Drawing or Document No.**
_____ 8. 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. (Section 7.504 (c) (1)) _____ 9. Lighting sufficient for persons to perform tasks; (Section 7.504 (c) (2)) _____ 10. A means to contain human waste effectively and minimize objectionable odors; (Section 7.504 (c) (3)) _____ 11. First aid supplies; (Section 7.504 (c) (4)) _____ 12. Materials, parts, and tools for repair of components; (Section 7.504 (c) (5)) and _____ 13. A fire extinguisher that: _____ a. Meets the requirements for portable fire extinguishers used in underground coal mines under part 75; (Section 7.504 (c) (6) (i)); _____ b. Is appropriate for extinguishing fires of chemicals used for harmful gas removal; (Section 7.504 (c) (6) (ii)) and _____ c. Uses a low-toxicity extinguishing agent that does not produce a hazardous by-product when deployed. (Section 7.504 (c) (6) (iii)) **Containers used for storage of refuge alternative components or provisions shall be:** _____ 14. Airtight, waterproof, and rodent-proof (Section 7.504 (d) (1)) _____ 15. Easy to open and close without the use of tools; (Section 7.504 (d) (2)) and _____ 16. Conspicuously marked with an expiration date and instructions for use. (Section 7.504 (d) (3)) **<u>STRUCTURAL COMPONENTS (Section 7.505)</u>** 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. (Section 7.505 (a) (1))	

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.

Drawing or Document No.

_____ 2. Include storage space that secures and protects the components during transportation and that permit ready access to components for maintenance examinations. (Section 7.505 (a) (2))

_____ 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. (Section 7.505) (a) (3))

_____ a. The airlock shall be designed for multiple uses to accommodate the structure's maximum occupancy. (Section 7.505) (a)(3) (i))

_____ b. The airlock shall be configured to accommodate a stretcher without compromising its function. (Section 7.505) (a) (3) (ii))

_____ 4. Be designed and made to withstand 15 pounds per square inch (psi) overpressure for 0.2 seconds prior to deployment. (Section 7.505) (a) (4))

_____ 5. Be designed and made to withstand exposure to a flash fire of 300°F for 3 seconds prior to deployment. (Section 7.505 (a) (5))

_____ 6. Be made with materials that do not have a potential to ignite or are MSHA-approved. (Section 7.505 (a) (6))

_____ 7. Be made from reinforced material that has sufficient durability to withstand routine handling and resist puncture and tearing during deployment and use. (Section 7.505) (a) (7))

_____ 8. Be guarded or reinforced to prevent damage to the structure that would hinder deployment, entry, or use. (Section 7.505) (a) (8))

_____ 9. Permit measurement of outside gas concentrations without exiting the structure or allowing entry of the outside atmosphere. (Section 7.505) (a) (9))

Inspections or tests shall be conducted as follows:	**Drawing or Document No.**
_____ 10. A test shall be conducted to demonstrate that trained persons can fully activate the structure, without the use of tools, within 10 minutes of reaching the refuge alternative; (Section 7.505) (b) (1))	
_____ 11. 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; (Section 7.505) (b) (2))	
_____ 12. 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; (Section 7.505) (b) (3))	
_____ 13. 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; (Section 7.505 (b) (4))	
_____ 14. 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; (Section 7.505 (b) (5))	
_____ 15. 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; (Section 7.505 (b) (6))	
_____ 16. 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; (Section 7.505 (b) (7)) and	
_____ 17. 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. (Section 7.505 (b) (8))	

If pressurized air is used to deploy the structure or maintain its shape, the structure shall—	**Drawing or Document No.**
_____ 18. Include a pressure regulator or other means to prevent over pressurization of the structure, (Section 7.505 (c) (1)) and _____ 19. Provide a means to repair and re-pressurize the structure in case of failure of the structure or loss of air pressure. (Section 7.505 (c) (2)) **The refuge alternative structure shall provide a means—** _____ 20. To conduct a preshift examination, without entering the structure, of components critical for deployment; (Section 7.505 (d) (1)) and _____ 21. To indicate unauthorized entry or tampering. (Section 7.505 (d) (2)) **<u>BREATHABLE AIR COMPONENTS (Section 7.506)</u>** _____ 1. 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. (Section 7.506 (a)) **Mechanisms shall be provided and procedures shall be included so that, within the refuge alternative (Section 7.506 (b))** _____ 2. The breathable air sustains each person for 96 hours, (Section 7.506 (b) (1)) _____ 3. The oxygen concentration is maintained at levels between 18.5 and 23 percent, (Section 7.506 (b) (2)) and _____ 4. The average carbon dioxide concentration is 1.0 percent or less and excursions do not exceed 2.5 percent. (Section 7.506 (b) (3)) _____ 5. 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. (Section 7.506 (c))	

Fans or compressors shall meet the following: (Section 7.506 (c) (1))	**Drawing or Document No.**
_____ 6. 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). (Section 7.506 (c) (1) (i)) _____ 7. 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. (Section 7.506 (c) (1) (ii) _____ 8. 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. (Section 7.506 (c) (1) (iii) _____ 9. Include warnings to assure that only uncontaminated breathable air is supplied to the refuge alternative. (Section 7.506 (c) (1) (iv) _____ 10. Include air lines to supply breathable air from the fan or compressor to the refuge alternative. (Section 7.506 (c) (1) (v) _____ a. Air lines shall be capable of preventing or removing water accumulation. (Section 7.506 (c) (1) (v) (A) _____ 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. (Section 7.506 (c) (1) (v) (B) _____ 11. Assure that harmful or explosive gases, water, and other materials cannot enter the breathable air. (Section 7.506 (c) (1) (vi) _____ 12. Redundant fans or compressors and power sources shall be provided to permit prompt re-activation of equipment in the event of failure. (Section 7.506 (c) (2) **Compressed breathable oxygen shall—(Section 7.506 (d))** _____ 13. Include instructions for deployment and operation; (Section 7.506 (d) (1))	

_____ 14. Provide oxygen at a minimum flow rate of 1.32 cubic feet per hour per person; (Section 7.506 (d) (2)) _____ 15 . Include a means to readily regulate the pressure and volume of the compressed oxygen; (Section 7.506 (d) (3)) _____ 16. Include an independent regulator as a backup in case of failure; (Section 7.506 (d) (4)) and _____ 17. Be used only with regulators, piping, and other equipment that is certified and maintained to prevent ignition or combustion. (Section 7.506 (d) (5)) _____ 18. The applicant shall prepare and submit an analysis or study demonstrating that the breathable air component will not cause an ignition. (Section 7.506 (e)) _____ a. The analysis or study shall specifically address oxygen fire hazards and fire hazards from chemicals used for removal of carbon dioxide. (Section 7.506 (e) (1)) _____ b. The analysis or study shall identify the means used to prevent any ignition source. (Section 7.506 (e) (2) **AIR-MONITORING COMPONENTS (Section 7.507)** _____ 1. 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. (Section 7.507 (a)) _____ 2. 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. (Section 7.507 (b)) _____ 3. The air-monitoring component shall be inspected or tested and the test results shall be included in the application. (Section 7.507 (c)) _____ 4. The air-monitoring component shall meet the following: (Section 7.507 (d))	**Drawing or Document No.**

	Drawing or Document No.
_____ a. 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. (Section 7.507 (d) (1)) _____ b. 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. (Section 7.507 (d) (2)) _____ c. Calibration gas values shall be traceable to the National Institute for Standards and Technology (NIST) "Standard Reference Materials" (SRMs). (Section 7.507 (d) (3)) _____ d. The analytical accuracy of the calibration gas and span gas values shall be within 2.0 percent of NIST gas standards. (Section 7.507 (d) (4)) _____ e. The detectors shall be capable of being kept fully charged and ready for immediate use. (Section 7.507 (d) (5)) **HARMFUL GAS REMOVAL COMPONENTS (Section 7.508)** _____ 1. Each refuge alternative shall include means for removing harmful gases. (Section 7.508(a)) _____ a. 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. (Section 7.508 (a) (1)) _____ b. 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. (Section 7.508 (a) (2))	

	Drawing or Document No.
_____ i. Carbon dioxide removal components shall be used with breathable air cylinders or oxygen cylinders. (Section 7.508 (a) (2) (i)) _____ ii. Carbon dioxide removal components shall remove carbon dioxide at a rate of 1.08 cubic feet per hour per person. (Section 7.508 (a) (2) (ii)) _____ c. Instructions shall be provided for deployment and operation of the harmful gas removal component. (Section 7.508 (a) (3)) _____ 2. The harmful gas removal component shall meet the following requirements: Each chemical used for removal of harmful gas shall be - (Section 7.508 (b)) _____ a. Contained such that when stored or used it cannot come in contact with persons, and it cannot release airborne particles. (Section 7.508(b) (1)) _____ b. Provided with all materials; parts, such as hangers, racks, and clips; equipment; and instructions necessary for deployment and use. (Section 7.508 (b) (2)) _____ c. Stored in an approved container that is conspicuously marked with the manufacturer's instructions for disposal of used chemical. (Section 7.508 (b) (3)) _____ 3. Each harmful gas removal component shall be tested to determine its ability to remove harmful gases. (Section 7.508 (c)) _____ a. 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. (Section 7.508 (c) (1)) _____ 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. (Section 7.508 (c) (1) (i)) _____ ii. The structure shall be sealed airtight. (Section 7.508 (c) (1) (ii))	

	Drawing or Document No.
_____ iii. The operating gas sampling instruments shall be placed inside the structure and continuously exposed to the test atmosphere. (Section 7.508 (c) (1) (iii)) _____ iv. Sampling instruments shall simultaneously measure the gas concentrations at the three sampling points. (Section 7.508 (c) (1) (iv)) _____ b. 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. (Section 7.508 (c) (2)) _____ 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. (Section 7.508 (c) (2) (i)) _____ ii. Carbon monoxide concentration readings from each of the three sampling instruments shall be recorded every 2 minutes. (Section 7.508 (c) (2) (ii)) _____ 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. (Section 7.508) (c) (2) (iii)) _____ c. 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: (Section 7.508 (c) (3))	

	Drawing or Document No.
_____ i. At 55° F (±4° F), 1 atmosphere (±1 percent), and 50 percent (±5 percent) relative humidity. (Section 7.508 (c) (3) (i)) _____ ii. At 55° F (±4° F), 1 atmosphere (±1 percent), and 100 percent (±5 percent) relative humidity. (Section 7.508 (c) (3) (ii)) _____ iii. At 90° F (±4° F), 1 atmosphere (±1 percent), and 50 percent (±5 percent) relative humidity. (Section 7.508 (c) (3) (iii)) _____ iv. At 82° F (±4° F), 1 atmosphere (±1 percent), and 100 percent (±5 percent) relative humidity. (Section 7.508 (c) (3) (iv)) _____ d. 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. (Section 7.508 (c) (4)) _____ 4. 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. (Section 7.508 (d)) **APPROVAL MARKINGS (Section 7.509)** _____ 1. 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. (Section 7.509 (a)) _____ 2. The approval marking shall be inscribed with the component's MSHA approval number and any additional markings required by the approval. (Section 7.509 (b)) _____ 3. The refuge alternative structure shall provide a conspicuous means for indicating an out-of-service status, including the reason it is out of service. (Section 7.509 (c))	

_____ 4. The airlock shall be conspicuously marked with the recommended maximum number of persons that can use it at one time. (Section 7.509 (d))	**Drawing or Document No.**