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.

4. Each harmful gas removal component shall be tested to determine its ability to remove harmful gases.

5. 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.

6. 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.

7. The structure shall be sealed air-tight.

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

9. 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:

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

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

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

4. 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.
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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 14—REQUIREMENTS FOR THE APPROVAL OF FLAME-RESISTANT CONVEYOR BELTS

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