

Action Items for Refuge Alternative Manufacturers and Underground Coal Mine Operators

Underground coal mine operators must have MSHA approved (part 7) structural component associated with each prefabricated refuge alternative in service after December 31, 2018. Refuge alternative manufacturers have obtained MSHA approvals for three of the four required part 7 refuge alternative components – i.e., harmful gas removal, air-monitoring, and breathable air. There are no MSHA part 7 approved structural components to date.

Prefabricated refuge alternative structures currently in use are state-approved or grandfathered through MSHA's acceptance in mines' emergency response plans under §75.1506(a)(3). However, the state and grandfathering allowances expire after December 31, 2018. In order to obtain a structural component approval, manufacturers must conduct testing to determine compliance with internal temperature, over-pressure, flash fire, and other criteria specified in 30 C.F.R. part 7, subpart L and identified below.

Manufacturer Action Items

Tests Required for Structural Approval

1. **Temperature** – Internal apparent temperature when fully occupied cannot exceed 95°F (degrees Fahrenheit) at the specified maximum mine air temperature.
 - Apparent temperature is determined from heat and relative humidity.
 - The maximum mine air temperature for full occupancy use is tested and specified by the manufacturer in approval documentation.
2. **Over-pressure** – Pre-deployed structure must be able to withstand a 15 pounds per square inch pressure (psi) wave for 0.2 seconds and does not allow gases to pass through the structure separating the interior and exterior atmospheres.
3. **Flash fire** – A flame consisting of a temperature ranging from 1,000 to 1,900°F that cannot alter the structure nor allow gases to pass through to inside the unit. Also, all of the components, supplies and provisions must be functional after testing with a flash fire of 300°F for 3 seconds.
4. **Gases and odors** – No harmful gases or noticeable odors are released from inside the refuge alternative before or after the flash fire test.
5. **Deployment** - Demonstrate a trained miner is able to deploy the unit, which typically will include turning on valves, opening latches, unrolling and inflating a tent within 10 minutes.

6. **Rip and Tear** – Each structure must pass the puncture and tear resistance test as defined by ASTM D2582–07 *Standard Test Method for Puncture-Propagation Tear Resistance of Plastic Film and Thin Sheeting*.
7. **Repair** - Demonstrate that a reasonably anticipated repair can be completed within 10 minutes of opening the storage space for repair materials and tools.
8. **Stretcher** - Demonstrate that the airlock can accommodate an injured miner on a stretcher.

Manufacturer Design Requirements

Manufacturers are also required to submit design features to comply with 30 C.F.R. part 7 requirements. Drawings and documentation must address the following requirements.

1. **Space and volume** - 15 square feet of floor space as well as 30- 60 cubic feet per person depending on mining height.
2. **Isolation** - Include an airlock unless adequate positive pressure is maintained to isolate the interior livable space from the mine atmosphere.
3. **Preshift - Provide** the ability to conduct a preshift examination without entering the structure.
4. **Unauthorized entry** - Provide a means to indicate unauthorized entry or tampering.
5. **Pressure relief**– For pressurized air units; provide a pressure regulator or other means to prevent over pressurization.
6. **Human waste disposal** - Demonstrate that there is adequate storage room for human waste that minimizes objectionable odors.
7. **Exterior gas measurement** - Permit measurement of gases outside of the refuge alternative.
8. **Durability** - Must be made from reinforced material to withstand routine handling, preventing damage that would hinder deployment, and to resist puncture or tearing during deployment and use.
9. **Transport** - Made to withstand collision forces when being moved, also designed to be moved safely with the use of tow bars or other devices.
10. **Two way communication** – Provide the ability to utilize the existing mine communication system from inside the refuge alternative; also, an additional post-accident communication system as defined in the Emergency Response Plan.
11. **Flame resistant** – Structure is made of material that does not have the potential to ignite or is MSHA approved.
12. **Maintenance accessibility** – Storage space permits ready access for maintenance examinations.

13. **Loss of Pressure** – Provide a means to repair and re-pressurize the structure in case of failure or loss of air pressure.

Mine Operator Action Items

Underground coal mine operators are responsible for having MSHA-approved structural components associated with each refuge alternative in service after December 31, 2018. The maximum occupancy rating and/or maximum mine air temperature use rating may decrease for some existing prefabricated refuge alternative units as a result of MSHA structural component approval. Mine operators must ensure their refuge alternative rated capacity can accommodate miners (including during “hot seat” change-outs) and any other persons reasonably expected to use it. If manufacturers specify modifications in new approval documentation, mine operators may need to add refuge capacity at the working sections.