

**OCCUPATIONAL SAFETY  
AND HEALTH STANDARDS BOARD**

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**PROPOSED PETITION DECISION OF THE  
OCCUPATIONAL SAFETY AND HEALTH STANDARDS BOARD  
(PETITION FILE NO. 533)****INTRODUCTION**

The Occupational Safety and Health Standards Board (Board) received a petition on March 19, 2013, from Mr. Rob Frashefski, North American Sales Manager of MineARC Systems America LLC (Petitioner). The Petitioner requests the Board to amend Title 8, California Code of Regulations, regarding the requirement to provide a refuge chamber if there is no alternate escape route in a tunnel that is classified as gassy or extra-hazardous.

Labor Code section 142.2 permits interested persons to propose new or revised regulations concerning occupational safety and health and requires the Board to consider such proposals, and render a decision no later than six months following receipt. Further, as required by Labor Code section 147, any proposed occupational safety or health standard received by the Board from a source other than the Division of Occupational Safety and Health (Division) must be referred to the Division for evaluation, and the Division has 60 days after receipt to submit a report on the proposal.

**SUMMARY**

The Petitioner seeks clarification regarding the requirement to provide a refuge chamber if there is no alternate escape route in a tunnel that is classified as gassy or extra-hazardous. The Petitioner contends that the current standard does not list technical specifications regarding design, structural and breathable air requirements for a refuge chamber.

Furthermore, the Petitioner recommends that refuge chambers with the following specifications be provided in ALL tunnel types where a secondary escape route is not available:

1. Occupancy- refuge chambers sized according to the maximum number of crews and visitors.
2. Entrapment Duration-employees and visitors must have the means to survive in a chamber for 36 hours with no assistance from external compressed air supply or main power supply.
3. Primary Life Support-compressed air system capable of providing minimum 3 cubic feet per minute per occupant, with means of regulating flow and isolating systems during emergencies. Systems should include filter or other means of ensuring air quality with the ability to remove moisture (condensation) prior to introduction into the refuge.

4. Positive Pressure-include automatic means to ensure that internal pressure is relieved at maximum 0.18 psi.
5. Secondary Life Support-include secondary breathing air cache in the form of medical grade or aviator style oxygen cylinder. The cache is to be sized accordingly to provide minimum 0.02 cubic feet of oxygen per minute, per occupant, for the intended duration of refuge (36 hours). Delivery should be capable of being regulated consistently to maintain oxygen concentrations between 18.5% and 23%.
6. Carbon Dioxide Removal-equipped with carbon dioxide removal systems removing no less than 0.85 cubic feet of carbon dioxide per hour per occupant for intended duration (36 hours). The system must be able to maintain concentration at 1% or less within the chamber at all time.
7. Carbon Monoxide Removal-equipped with carbon monoxide removal system capable of maintaining carbon monoxide below the long term exposure limit of 30 ppm within the chamber for intended duration (36 hours).
8. Cooling & Dehumidifying-include a cooling/dehumidifying system with minimum capacity of 400 BTU/occupant, for removal of moisture (humidity) and reduction of heat sources within the chamber (i.e., metabolic heat, electrical equipment, air scrubbing, etc).
9. Atmospheric Monitoring-equipped with means of monitoring interior concentrations of oxygen, carbon monoxide, and carbon dioxide.

#### DIVISION'S EVALUATION

The Division's evaluation report dated May 17, 2013, states that since 1972, California has rigorously enforced standards designed to prevent tunnel fires and explosions. California requires metal ventilation lines, which stand up much longer in a tunnel fire; a minimum of 60 feet-per-minute air flow velocity at all times, which keeps flammable vapor concentrations to a minimum; and, when a gassy or extra-hazardous tunnel exceeds 5,000 feet in length, either a second exit (usually a shaft) or a refuge chamber. The Division believes that this petition should be granted to the extent that a representative advisory committee be convened.

#### STAFF'S EVALUATION

A refuge chamber is a portable chamber that is intended to provide water, food, breathable air, and a seal to protect occupants from the outside hazardous environment for a finite period of time until employees can escape or be rescued. This type of emergency structure or equipment is used in underground mining and tunneling operations.

The existing standards require employers to provide a refuge chamber that is acceptable to the Division if the tunnel is gassy or extra-hazardous, longer than 5,000 feet and there is no alternate

escape route. The standard does not provide a detailed explanation as to what is acceptable, aside from the basic requirement to provide air supply, telephone, and means of isolating the chamber from tunnel atmosphere. For example, the standard is silent as to the quantity and quality of air supply.

The State of California acknowledges the relevance and importance of safe refuge or chambers in emergencies. It is noteworthy that the standards in the Tunnel Safety Orders and Mine Safety Orders, which predate the MINER Act of 2006 (this federal legislation updated federal law regarding mine safety), explicitly mention the provision for refuge chambers or refuge stations. However, both sets of safety orders do not define refuge stations or refuge chambers.

Existing standards need further clarification by establishing baseline requirements. This would provide clarity to the employers and State inspectors. Further discussion with industry, labor, subject matter experts, and safety professionals is needed to consider at least the following, as it applies to tunnels:

- Definition of a refuge chamber which should include reference to its intended use (refuge outby or refuge chamber or both)
- When is it needed (diameter, length, and classification of tunnels)?
- How should the criteria for refuge chamber or refuge station be different in tunnels vs. mines?
- Structural design, life support requirements (food, water, first aid, sanitation)
- Acceptable breathable air criteria inside the refuge chamber
- Where should it be located and how should it be setup?
- How should it be incorporated in the emergency procedures?
- How should it be maintained?
- What are the training requirements?

Board staff has a concern about the operational viability and economic feasibility of the Petitioner's request to require employers to provide refuge chambers in all tunnels without an alternate escape route regardless of the classification of the tunnel. Further research and discussions are needed to determine if this is warranted and if so, under what parameters (for example, diameter, length, depth, seismic location of the tunnels).

In response to the criteria listed by the Petitioner, 30 CFR 7.504, 7.505, and 7.506 detail the criteria and equipment approval process of the Mining Safety and Health Administration. These sections may serve as a starting point for California to develop or update existing safety standards in the Mining Safety Orders and Tunnel Safety Orders. New standards are needed to clarify to the Division and industry stakeholders the minimum requirements for refuge chambers because the existing standard does not provide enough specificity.

CONCLUSION AND ORDER

The Board has considered the Petition and the recommendations of the Division and Board staff. For reasons stated in the preceding discussion, the petition is hereby GRANTED to the extent the Division's Mining and Tunneling Unit is requested to convene a representative advisory committee. The Petitioner should be invited to participate in this advisory committee.