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An Analysis of Firefighter Breathing Air Replenishment Systems

Firefighter Breathing-Air Replenishment Systems (FARS) is a breathing air replenishment system permanently installed within a structure. The system is designed to provide an ability to refill the air-bottles closer to the fire location instead of allocating resources to carry air-bottles to the fire-staging area designated by the Incident Commander (also referred to as "bottle-brigading").

The criteria for the installation of Firefighter Breathing-Air Replenishment Systems (FARS) are contained in the Uniform Plumbing Code. The 2018 edition of NFPA 1 added Annex F which references the Appendix F provisions of the Uniform Plumbing Code.

The goal of this project is to analyze and review the existing code requirements and literature to provide guidance on the use and effectiveness of these firefighter breathing air replenishment systems. This project is comprised of the following tasks:

- Literature review to provide a background on firefighter breathing air replenishment systems, their use, cost, and inspection, testing, and maintenance requirements, specifically addressing the following: What is firefighter breathing air replenishment systems? What are the needs and use cases for these systems in specific buildings? What are the current code requirements for their installation? What are the current code requirements for their ITM requirements? What are the costs of installation and ITM for these systems?
- Based on the findings from literature review conducting a cost-benefit analysis for at least two scenarios in which firefighting breathing air replenishment systems may be installed.
- Developing a final report based on the information produced from the above tasks.

LEARN MORE: Download the final report here.

Summary Observations:

The primary goal of this project was to review and analyze the existing code requirements and literature, as well as collect, analyze, and summarize stakeholder input to provide informational guidance to the concerned NFPA committee on the use of Firefighter Air Replenishment Systems (FARS). In brief, the present study included data collection and analysis to provide an understanding of FARS, their use, cost, inspection, testing, and maintenance requirements, and benefits. The study provides an understanding of various components of FARS and its operations by firefighters. Data from a questionnaire survey of 200 fire departments across the nation was collected and analyzed to quantify the benefits of FARS for fire service, the concerns of firefighters, the need for training, and the applicability for various structures. Various real-life cases depicting the issues of FARS were identified and discussed with several fire service officials and the leading FARS technology provider. As air quality, testing, and maintenance were found to be a major concern raised by the participants, current standards and procedures for air quality testing and maintenance of the system have been investigated. Costs of installation and maintenance of FARS have been described and compared with other substitutes and their benefits.

Review of existing code requirements indicate a scope to improve the current code requirements for FARS, the system configurations, its deployment, applicability for various types of structures, testing, and maintenance procedures. The system should be tested, inspected, and maintained on frequent basis. Additionally, the costs of new installation, retrofitting of FARS, and their testing and maintenance have been provided. This cost varies based on the location of construction, size of the structure, cost of the local labor and materials, AHJ requirements, and cost of conducting business in the area. Based on the information gathered during this effort, this preliminary study implies that making compressed breathing air available to firefighters inside the structures to avoid bottle-brigading can be advantageous to fire departments, if properly installed, tested, and maintained. This is also the basic concept and application of FARS. AHJs interested in adopting this system should carefully self-evaluate their resources, requirements, available alternatives, pros, and cons of the system before making necessary changes to their codes. When adopted regionally, the AHJ must allocate proper resources to ensure that the system is installed, inspected, tested, and maintained in accordance with local code requirements.

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