

MANAGE YOUR RISK

Firefighting Foam - Class B Foams and PFAS

There has been a significant amount of research into the hazards of per- and polyfluoroalkyl substances (PFAS) to the environment and to the people that use them. PFAS are the active ingredient in fluorosurfactants. ¹ In simple fire terms, PFAS' are the active ingredient in Class B foams that are fluorine based. The vast majority of the Class B firefighting foam in stock or service in the United States is aqueous film-forming foam (AFFF) or alcohol-resistant aqueous film-forming foam (AR-AFFF). ¹ These foams contain PFAS. Class B foams that are fluorine-free do NOT contain PFAS.

What are PFAS?

Per- and polyfluoroalkyl substances (PFAS) are a group of man-made chemicals that include perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS). PFAS have been manufactured and used in a variety of industries around the globe, including in the United States since the 1940s. PFOA and PFOS have been the most extensively produced and studied of these chemicals. Both chemicals are very persistent in the environment and in the human body – meaning they don't break down and they can accumulate over time. There is evidence that exposure to PFAS can lead to adverse human health effects. ² This is a concern in fire and emergency services because fluorine based Class B foams contain PFAS.

What is the concern?

While all Class B foams have the potential to create adverse environmental impact if they are released, fluorinated foams, including AFFF, are a greater concern because they contain PFAS. PFAS pose a risk to groundwater and surface water quality. They are highly mobile and bioaccumulate (i.e. they don't go away) in organisms. ¹ The wide use of AFFF at military installations and in commercial aviation has made these facilities a priority for the federal government, but the same health effects could be present to a lesser extent wherever these foams have been or are used or stored including small community fire departments and training centers.

While there has been research into the effects of PFAS on humans, there have been no in-depth studies of human health effects related to use of AFFF and other foams containing PFAS. ³ Fire and emergency services should be aware of the potential health threats posed by fluorinated chemical exposure and contamination.

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Excessive exposure to PFAS is thought to affect the following in humans: ⁴

- The immune system
- Cancer (for PFOA)
- Thyroid hormone distribution (for PFOS)
- Hormone production and regulation
- Cholesterol levels

What should we be doing?

1. Identify the type of Class B foam on hand
 - a. Legacy AFFF - (manufactured prior to 2003 by 3M under the brand name “Lightwater”). These contain PFOS.
 - b. Legacy fluorotelomer AFFF - (manufactured and sold in the U.S. from the 1970s until 2016 and encompass all brands of AFFF besides 3M Lightwater). These contain chemicals that degrade to PFOA.⁵
 - c. Modern fluorotelomer AFFF - (contains almost exclusively short chain PFAS). This can be confirmed with the supplier or by reviewing the Safety Data Sheet or label.
 - d. Fluorine free foams - These do not contain PFAS.
2. Develop and implement SOPs/SOGs for the storage, use and disposal of firefighting foam. ¹
 - a. Foam Selection
 - i. Consider alternative agents
 - ii. Limit use of AFFF by using fluorine free foams for training
 - b. Storage
 - i. Follow manufacturer’s guidelines
 - ii. Mitigation plans for uncontrolled releases
 - c. Use
 - i. Evaluate the need for Class B foam
 - ii. Provide containment, treatment and proper disposal of foam containing solutions. (Preventing releases to the environment that can lead to soil, groundwater, surface water and potentially drinking water contamination should be considered, especially when used near sensitive environmental areas.)
 - iii. Keep records of when and where foam is used
 - iv. Developing SOPs/SOGs prior to an emergency allows firefighters to train on the equipment and the potential environmental and physical effects of the use.
 - d. Disposal
 - i. Dispose of at Resource Conservation and Recovery Act (RCRA permitted facility
 - iii. Some states (MA, ME, VT for example) have programs in place to help organizations exchange PFAS containing foams for non-PFAS containing foams, or help them dispose of it properly via takeback programs. This helps assure proper disposal.
 - e. Personal Protective Equipment
 - i. PPE should be selected and worn when handling PFAS containing materials

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Summary

Class B foams have been beneficial in helping suppress fires where flammable liquids are burning. The legacy products (namely AFFF and AR-AFFF) contain long chain PFAS that are an environmental, and likely, a human health concern. To help mitigate the exposure to our community and responders, it is important to identify the foam being stored and used and develop SOPs to minimize the exposure to responders and the environment.

References

¹Interstate Technology Regulatory Council (2018). Aqueous film-forming foam (AFFF). Retrieved from <https://pfas-1.itrcweb.org/wp-content/uploads/2019/03/pfas-fact-sheet-aff-10-3-18.pdf>

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⁵Backe, W. J., Day, T. C., and Field, J. A. (2013). Zwitterionic, cationic, and anionic fluorinated chemicals in aqueous film forming foam formulations and groundwater from U.S. military bases by nonaqueous large-volume injection HPLC-MS/MS. *Environmental Science and Technology*, 47(10), 5226-5234. doi:10.1021/es3034999

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