



Advisory Information for Aqueous Film Forming Foam (AFFF) Containing Per- and Polyfluorinated Alkyl Substances (PFAS)

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Department of Energy and Environmental Protection
Department of Emergency Services and Public Protection, Commission on Fire Prevention and Control

Background

Recent toxicological studies have indicated there is a health concern when people are exposed to Per- and Polyfluoroalkyl Substances (PFAS), of which there are over 4,000 PFAS chemical compounds in manufacture. PFAS are very stable and impart resistance from water, oil, grease, dirt, and heat to items on which they are applied. They have wide-ranging applications, such as in grease-resistant microwave popcorn bags and pizza boxes, waterproof clothing and boots, carpets that resist stains, and pipes and wires that resist corrosion. Additionally, they are excellent in resisting heat, which is why they are used in certain firefighting foams (Ross, R.).

Because of their stability, PFAS don't break down in the environment or in the human body, and that may cause health problems, such as low infant birth weights, effects on the immune system, cancer (for PFOA), and thyroid hormone disruption (for PFOS). (Ross, R.) Two of the most studied PFAS are perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS), which are considered "long-chain" PFAS. As of 2015, neither PFOA nor PFOS are manufactured in the U.S., due to health and environmental concerns, according to the rules of the EPA's stewardship program for the substances, signed in 2006. However, other PFAS, including "short-chain," have been developed as replacements for PFOA and PFOS in manufacturing that are less well studied.

In May 2016, EPA issued a Lifetime Health Advisory for drinking water polluted with PFOA and PFOS, individually or together, of 70 parts per trillion (ppt) or nanograms per liter (ng/L), because of health effects. That's the equivalent of about 70 drops in an Olympic-sized swimming pool. Currently, EPA is evaluating if PFOA and PFOS should be formally regulated in public drinking water supplies nationwide and is beginning the process to list PFOA and PFOS as hazardous substances under Superfund law. Other states have already set enforceable drinking water standards or more restrictive advisories in advance of EPA, including those in New England, New York, and New Jersey. In Connecticut, the Department of Public Health established a Drinking Water Action Level of 70 ppt for the total of 5 PFAS chemicals – PFOA, PFOS, perfluororonanoic acid (PFNA), perfluoroheptanoic acid (PFHpA), and perfluorohexane sulfonate (PFHxS). However, state toxicologists are continuing to evaluate new health studies and may include other PFAS in the Action Level or lower the target level in the future.

PFAS and Firefighting Foam

Firefighting foam can be broken down into two main categories: Class A and Class B.

Class A foams do not contain PFAS and are safe to use for their intended purpose. They are covered under NFPA 1150 (Standard on Foam Chemicals for Fires in Class A Fuels). The intended purpose is to reduce the surface tension of the water to allow for more water to burning material surface contact, which allows for faster fire extinguishment. There are no restrictions on the use of Class A foams.

Class B foams often contain PFAS, in addition to many different natural and chemical precursors. These different types of foams can be divided into numerous tactical categories with respect to expansion rates (low, medium and high) and compatibility with different types of fuel (polar and non-polar flammable liquids). **Importantly, all Aqueous Film Forming Foam (AFFF) products contain PFAS** (ITRC 2018). So far as this guidance document is concerned, the focus is on PFAS-containing AFFF, Alcohol Resistant AFFF (AR-AFFF), and fluoroprotein foam; the foam's potential to be a hazard to

responders who use the foam; and its ability to create an adverse environmental impact if released uncontrolled to the environment. This is particularly the case if the PFAS foam solutions reach drinking water sources, groundwater, or surface waters. With regard to health and environmental concerns, the Class B foams are broken down into four categories:

- Legacy PFOS Foams, which contain long-carbon-chain fluorinated compounds (C8), specifically PFOS and PFOA, manufactured prior to 2003 by 3M and sold under the brand name “Lightwater” (ITRC 2018).
- Legacy Fluorotelomer Foams (contain some long-chain PFAS) manufactured from the 1970s until 2016 and include all other brands of AFFF. These foams contain polyfluorinated precursors that break down to PFOA and other PFAS in the environment and contain PFOA as a by-product of manufacturing (ITRC 2018).
- Modern Fluorotelomer Foams which were manufactured from around 2010 to present, contain almost exclusively short-chain (C6) fluorotelomers or short-carbon-chain fluorinated compounds that may still have trace levels of PFOA and PFOA precursors as a byproduct of manufacturing (ITRC 2018).
- Fluorine-Free Foams, which do not contain fluorinated compounds.

The recommendations from DESPP and DEEP are:

- **Discontinue the use of legacy PFOS and legacy fluorotelomer foams.**
- **Use modern fluorinated foams only when absolutely tactically necessary.** Some examples include, but are not limited to:
 - For vapor suppression of unignited flammable liquids at an incident with a life safety hazard, such as a motor vehicle accident with patient entrapment with a gasoline spill.
 - For vapor suppression of unignited or burning flammable and combustible liquids to protect significant property.
 - For vapor suppression of unignited flammable liquids at an incident where ignition sources cannot be controlled.
 - For vapor suppression of highly evaporative toxic liquids where the vapor plume may cause health issues to the public and/or responders.
 - Extinguishment of ignited flammable liquids. Note: AFFF and AR-AFFF (ATC-AFFF) foams are NOT intended for use on three dimensional fires; those that are sprayed as a mist/droplet or flowing liquids. As such, the use of foam in this application will prove to be ineffective.
 - If there is no life hazard or significant property at risk and ignition sources can be controlled, do no use firefighting foam.
 - At a fire, such as a car fire, where the fuel is burning plastics rather than the flammable or combustible liquid, the use of straight water or water with a fluorine free additive that meets NFPA 1150 or NFPA 18A (Water Additives for Fire Control and Vapor Mitigation) additive is recommended.
- **Discontinue the use of modern fluorinated foam for training.**
 - There are fluorine free training foam concentrates available.
 - During Connecticut’s 2019 Legislative Session, H.B. 5910 was proposed to ban the use of fluorinated firefighting foams for the purpose of training and uncontrolled discharge during equipment maintenance, testing and calibration. While this legislation was not adopted, it is anticipated that new and similar proposals will be debated in 2020.
- **When PFAS firefighting foam is used, notify the CT DEEP Emergency Dispatch Center at 860-424-3338 to report the release.** Per CGS 22a-450, it is required to report the discharge of chemical liquids.

A committee has been formed to address the need to find a replacement Class B foam that is fluorine-free and meets UL-162, the Standard for Foam Equipment and Liquid Concentrates. This committee is comprised of members from the Connecticut Commission on Fire Prevention and Control, the Connecticut Department of Energy and Environmental Protection, the Petroleum Industry, and Fire Service Leaders. The work of this committee is ongoing. In addition to

recommending a replacement foam, funds are being requested to support a program for collection and proper disposal of both legacy and modern foams at no cost to the local fire departments. However, at this time, it likely will be the responsibility of the local department to purchase the replacement foam.

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References:

Ross, Racheal (April 30, 2019 02:57 pm ET). <https://www.livescience.com/65364-pfas.html> May 3, 2019

Interstate Technology and Regulatory Council (ITRC) Fact Sheet “Aqueous Film-Forming Foam (AFFF)”, October 2018.
<https://pfas-1.itrcweb.org/wp-content/uploads/2019/03/pfas-fact-sheet-afff-10-3-18.pdf>