



Foam Lines

Combat Support Products
Division Of Cottrell Associates, Inc.

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Foam Tests In The Field

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Since the fluorine free foam movement has been picking up speed, I've been pinged lately by special ops. officers and dealers about proper procedures for testing or comparing Underwriters Laboratory Listed, fluorine free foams, of which there are two: NFPA 11 (U.L. GFGV) Standard for Low-Medium and Hi-Expansion Foams and NFPA 18 (U.L. GOHR) Standard on Wetting Agents. Listed agents will identify container contents as "FOAM LIQUID CONCENTRATE (NFPA 11) or WETTING AGENT CONCENTRATE (NFPA 18).

The fact that there are two performance standard tends to throw confusion in the comparison process since WETTING AGENT CONCENTRATES are tested on heptane, floated on two-inches of water (hydrocarbon test fuel) at a three to five times higher application rates than FOAM LIQUID CONCENTRATES. This is often overlooked by specification writers and FD testers in the field.

Underwriters Laboratory Standard 162 have fire test application rates for both classes of agents. Both are tested in fifty square foot steel test pans on 62.5 gallons of heptane, floating on two-inches of water. (Heptane flash point 20 °F)

WETTING AGENT CONCENTRATES are tested at 10 gpm (0.2 gpm/ ft²) and AFFF FOAM LIQUID CONCENTRATES are tested at a five time lower rate, 2 gpm (0.04 gpm/ ft²) . Synthetic Fluorine Free

Foam (SFFF or F3) are tested at a three times lower rate, 3 gpm (0.06 gpm/ ft²). There are no alcohol resistant WETTING AGENT CONCENTRATES as are with FOAM LIQUID CONCENTRATES. Note: water, which is 94 parts of wetting solution will extinguish most alcohols at a dilution rate of five to eight times dilute as long as fuel is in confinement.



Extinguishing hydrocarbons with wetting agents rely on fuel in confinement. An air foam blanket will follow and spread on a fuel spill fire. This real world fact is often overlooked in sales demonstrations.

Since gasoline blended with ethanol (flash point -45 °F) is the most common, and frankly the most dangerous fuel fire department responders are likely to face, it makes sense that any field comparison tests be done on E-10 or E-15 gasoline with no water bottom, since water will pull ethanol out of the gasoline. Wetting Agents are not likely to extinguish gasoline in a water bottom free test - <https://www.youtube.com/watch?v=9kCCoNBPwFE>

A small scale U.L. test pan (10 ft²) a properly scaled nozzle and pump are available for rent. Email author at info@combatsupportproducts.com/ See page 2 for more.

Many fire service professionals are not aware there is a difference between foam, and wetting agents or emulsifiers. Understanding the basic performance parameters and limitations of each will help the user determine the applicability of each agent for the intended use. Foam is generally intended for use on Class B fires only. Wetting agents are applicable to Class A and non water-soluble Class B combustibles.

Foam and wetting agents are not the same, as evidenced by the development of separate NFPA standards.

NFPA-11, Standard for Low, Medium, and High Expansion Foam defines foam as a stable aggregation of bubbles of lower density than oil or water. Foam also exhibits a tenacity for covering horizontal surfaces. It flows freely over a burning liquid surface and forms a tough air-excluding, continuous blanket that seals volatile combustible vapors from access to air.

The basic mechanism foam utilizes for extinguishment is to separate the fuel from oxygen eliminating one leg of the fire tetrahedron, thus interrupting the combustion process. In situations where a fire has been extinguished or ignition has not occurred, foam also serves to provide a visual confirmation that the surface of the fuel has been covered.

NFPA-18, Standard on Wetting Agents defines a wetting agent as a concentrate that when added to water reduces its surface tension and increases its ability to penetrate and spread, extending the efficiency of water and the extinguishment of Class A and Class B fires in ordinary combustibles and flammable or combustible liquids that are not soluble in water.

Wetting agents generally contain a surfactant or emulsifying ingredient which enables them to mix with hydrocarbon fuels (emulsify) similar to oil and water in salad dressing. This is sometimes referred to as "encapsulating" or "locking up" the fuel.

The basic chemistry dilutes the fuel which increases the flash point and reduces the fuel's ability to vaporize at ambient temperatures or when heated. Over time, the fuel and wetting agent will eventually separate. This time frame is dependent on several variables, such as fuel type, fuel temperature, amount of wetting agent, etc. Generally, these agents require diluting the hydrocarbon fuel with about 6% of solution (emulsifying agent plus water) by volume.

This means a fire in a 10,000-gallon fuel oil storage tank would require about 600 gallons of wetting agent solution to effect extinguishment. The oil tank must have sufficient extra capacity to contain the fuel oil and emulsifying agent, since the two must mix.

As with many other pieces of firefighting equipment, Underwriters Laboratories (U.L.) Listings are accepted as a reputable and dependable third party testing agency for the public good. Quite often U.L. Listings are a requirement of bid specifications. Just as the listing criteria for fire hose and ground ladders are different, so too are the listing criteria for foam and wetting agents. In considering the use of wetting agents as a primary agent to extinguish Class B fires, the U.L. test standards should be consulted as a comparison of each agent's ability to perform.

There is a difference in the testing each type of concentrate undergoes to receive U.L. Listing for Class B applications. Foam is tested for five major areas of performance:

- **Rate of Application**
- **Extinguishing Time**
- **Sealability**
- **Burnback Resistance**
- **Foam Quality (Expansion and Drainage)**

Also, foam is typically investigated in combination with specific devices such as proportioning equipment and foam discharge equipment.

Wetting agents are tested for extinguishing only. There is no sealability test, burnback resistance test, or foam quality requirements. Also, wetting agents are not tested for use in combination with proportioning or discharge equipment. The chart on the following page compares the differences in UL testing for Class B applications for foams and wetting agents.



Since 1988, Jim Cottrell has been National Foam's eastern factory agent. He chaired the IFSTA Foam Technical Committee and is a member of Underwriters Laboratories 162, Foam Standards Panel. Jim is an accomplished investigator, speaker and a nationally recognized instructor /lecturer. Jim's Combat Support Products division manufactures specialty firefighting trailers and skids.

**U.L. CLASS “B” FIRE TEST COMPARISON
NFPA 18 Wetting Agent and NFPA 11 Foam.
ANSI is American National Standards Institute**

U.L. Classification	Wetting Agent (GOHR) NFPA 18	Foam Liquid Concentrates (GFGV) NFPA 11	Notes
Test Standard	ANSI/NFPA 18 Standard for Wetting Agents	ANSI/UL 162 Foam Equipment & Liquid Concentrate	Not comparable agents as indicated by separate listings and test criteria
Fire Test Fuel	62.5 gal. Heptane	62.5 gal. Heptane	-
Fire Test Flow and Application Rate on 50 ft ² Fire	10 gpm (0.20 gpm/ft ²)	2 gpm (0.04 gpm/ft ²) (film-forming foam concentrates) 3 gpm (0.06 gpm/ft ²) (all other foam concentrates)	> 3 to 5 times higher application rate for the same test criteria
Fire Test Extinguishing Time Limit	</=5 minutes for full extinguishment @ 0.20 gpm/ft ²	</=3 minutes @ 0.04 gpm/ft ² </=5 minutes @ 0.06 gpm/ft ²	-
Sealability Test	None	2 tests during a 9 minute waiting period at 0.04 gpm/ft ² 2 tests during a 15 minute waiting period at 0.06 gpm/ft ²	Confirms the ability to seal against hot metal and prevent vapor migration
Burnback Resistance Test	None	Required after 9 minutes waiting period at 0.04 gpm/ft ² Required after 15 minutes waiting period at 0.06 gpm/ft ²	Critical for post fire security
Alcohol Resistance	None	Alcohol resistant foam concentrates are tested by ANSI/UL 162 for use on alcohols and other polar solvent fuels	Oxygenated gasoline additives are polar solvents and may require alcohol resistant foam*