

## Chapter 12 Suppression Chemicals & Delivery Systems

### A. Policy For Use Of Fire Chemicals

Use only products qualified and approved for intended use. Follow safe handling procedures and use personal protective equipment recommended on the product label and Material Safety Data Sheet (MSDS).

A current list of qualified products and approved uses can be found on the Wildland Fire Chemical Systems website:

[www.rs.fed.us/rm/fire](http://www.rs.fed.us/rm/fire)

Click on Wildland Fire Chemicals

Click on Qualified Products List

Refer to local jurisdictional policy and guidance related to use of wildland fire chemicals for protection of historic structures.

1. **Retardant Policy** – Using approved long-term retardants in wildland fire suppression efforts is standard in fire management and planning. The retardants are most often delivered in fixed or rotor-wing aircraft. Some products are formulated specifically for delivery from ground sources.
2. **Foam Policy** - Standard operating procedures for fire management and suppression activities involving water as the suppression or protection agent delivered by engines and portable pumps, shall include the use of Class A fire suppressant to improve the efficiency of water – except near watercourses where accidental spillage or over spray of the chemical could be harmful to the aquatic ecosystem (see Environmental Guidelines page 12-04). Helicopters and Single Engine Airtankers (SEATs) can also deliver foam. Some agencies also allow application of foam from fixed-wing water scoopers.

### B. Types of Fire Chemicals

#### 1. Long-Term Retardant

Long-term retardants contain fertilizer salts that change the way that fuels burn. They are effective even after the water has evaporated.

Principles of application and coverage levels are outlined in *Recommended Retardant Coverage Levels NFES 2048, PMS 440-2*. Retardant mixing, blending, testing and sampling requirements can be found in *Lot Acceptance, Quality Assurance and Field Quality Control for Fire Retardant Chemicals, NFES 1245, PMS 444-1*.

**2. Fire Suppressant Foam**

Fire suppressant foams are combinations of wetting and foaming agents, added to water to improve the effectiveness of the water. They are not effective once the water has evaporated.

Technical guidelines for equipment operations and general principles of foam application are discussed in *Foam vs. Fire, Class A Foam for Wildland Fires, NWCG, PMS 446-1, NFES 2246, 2nd ed., October 1993, and Foam vs. Fire, Aerial Applications, NWCG, PMS 446-3, NFES 1845, October 1995.*

**3. Water Enhancers for Wildland Fire Suppression**

Water enhancers, such as fire fighting gels, are products added to water to improve one or more of the physical characteristics of water. They are not effective once the water has evaporated. Water enhancers are typically applied from ground equipment and especially suited to exposure protection for vertical surfaces. Be careful when using water enhancers as they can be extremely slippery.

**C. General Safety Criteria**

Foam concentrates and solutions must meet minimum requirements with regard to aquatic and mammalian toxicity, which includes acute oral toxicity, acute dermal toxicity, primary skin irritation, and primary eye irritation (*International Specification for Fire Suppressant Foam for Wildland Fires, Aircraft or Ground Application, July 2000.*)

Personnel involved in handling, mixing, and applying foam concentrates or solutions will be trained in proper procedures to protect their health and safety, as well as that of the environment.

Personnel must follow the manufacturer's recommendations, including use of PPE (i.e. goggles, gloves, eyewash kits on site) as found on the product label and product material safety data sheet (MSDS). Approved foam concentrates are mildly to severely irritating to the eyes. Anyone involved with or working in the vicinity of foam concentrates should use protective splash goggles.

Human health risk from accidental drench with retardant can be mitigated by removing any residue from exposed skin by washing with water.

Containers of foam concentrate or solutions, including backpack pumps and engine tanks, should be labeled to alert personnel that they do not contain plain water, and that the contents must not be used for drinking purposes.

Slickness is a hazard at storage areas and unloading and mixing sites. Because foam concentrates, water enhancers, and solutions contribute to slippery conditions, all spills must be cleaned up immediately, preferably with a dry absorbent pad or granules.

Personnel applying foam should stand in untreated areas. A foam blanket can be dangerous to walk through because it conceals ground hazards. Foam readily penetrates and deteriorates leather boots, resulting in wet feet and potentially ruined leather.

All safety precautions associated with ground crews near retardant drops also apply to aerial foam drops.

#### **D. Aerial Application Safety**

Persons downrange, but in the flight path of intended retardant drops, should move to a location that will decrease the possibility of being hit with a drop.

Persons near retardant drops should be alert for objects (tree limbs, rocks, etc.) that the drop could dislodge.

During training or briefings, inform field personnel of environmental guidelines and requirements for fire chemicals application.

Locate foam and retardant mixing and loading areas and dip-tank sites to eliminate contact with natural bodies of water.

Notify incident or host authorities promptly of any accidental foam or retardant drop within 300 feet of or spill into a water body. The incident or host authorities must immediately contact appropriate regulatory agencies and specialists within the local jurisdiction.

Avoid dipping from river or lakes with a helicopter bucket containing residual foam or retardant. Set up an adjacent reload site and manage the foam and retardant in portable tanks, or terminate the use of chemicals for that application.

Quality control maintenance and safety requirements dictate that mixing or blending of retardants be accomplished by standard approved methods. Powdered or liquid retardants must be blended or mixed at the proper ratio prior to being loaded into the aircraft.

**E. Environmental Guidelines for Delivery of Retardant or Foam Near Waterways****1. Definition**

*Waterway* - Any body of water including lakes, rivers, seeps, intermittent streams and ponds whether or not they contain aquatic life.

**2. Aerial Application Guidelines**

Avoid aerial or ground application of retardant or foam within 300 feet of waterways.

These guidelines do not require the pilot-in-command to fly in such a way as to endanger his or her aircraft, other aircraft, structures, or compromise ground personnel safety. Guidance to pilots can be found in Aviation Chapter 17.

**3. Exceptions**

When alternative line construction tactics are not available due to terrain constraints, congested area, life and property concerns, or lack of ground personnel, it is acceptable to anchor the foam or retardant application to the waterway. When anchoring a retardant or foam line to a waterway, use the most accurate method of delivery in order to minimize placement of retardant or foam in the waterway.

Deviations from these guidelines are acceptable when life or property is threatened and the use of retardant or foam can be reasonably expected to alleviate the threat. When potential damage to natural resources outweighs possible loss of aquatic life, the agency administrator may approve a deviation from these guidelines.

**F. Environmental Procedures for Application of Fire Chemicals****1. Threatened and Endangered (T&E) Species**

The following provisions are guidance for complying with the emergency Section 7 consultation procedures of the Endangered Species Act (ESA) with respect to aquatic species. These provisions do not alter or diminish an agency's responsibilities under ESA.

Where aquatic T&E species or their habitats are potentially affected by aerial application of retardant or foam, the following additional procedures apply:

- a. As soon as practical after the aerial application of retardant or foam near waterways, determine whether the aerial application has caused any adverse effect on T&E species or their habitat using the following criteria:

- 1) Aerial application of retardant or foam outside 300 feet of a waterway is presumed to avoid adverse effects to aquatic species and no further consultation for aquatic species is necessary.
- 2) Aerial application of retardant or foam within 300 feet of a waterway requires that the unit administrator determine whether there have been any adverse effects to T&E species within the waterway.
- 3) If the action agency determines that there were adverse effects on T&E species or their habitats, then the agency must consult with Fish and Wildlife Service (FWS) or National Marine Fisheries Service (NMFS) as required by 50 CFR 402.05 (Emergencies). Procedures for emergency consultation are described in the *Interagency Consultation Handbook*, Chapter 8 (March 1998). In the case of a long duration incident, emergency consultation should be initiated as soon as practical during the event. Otherwise, post-event consultation is appropriate. The initiation of the consultation is the responsibility of the unit administrator. These procedures shall be documented in a Biological Assessment (BA). All occurrences of adverse effects will be immediately reported to Wildland Fire Chemicals Systems in Missoula, Montana at phone 406-329-3900 or to individuals listed in website referenced above.
- 4) Each agency is responsible for ensuring that their appropriate agency specific guides and training manuals reflect these standards.

## G. Ground Application of Fire Suppressant Foams

### 1. Proportioners

Proportioners are designed to provide an appropriate mix of foam concentrate and water during pumping operations, rather than relying on batch mixing to prepare foam solutions. Both manual and automatic proportioner systems are available. Specific agency standards may require the use of a specific type of system. Proportioners should be flushed after every operational period of use.

Agency standards for foam proportioners on engines are an automatically regulated pressure bladder system, such as Robwen Flowmix 500, or FoamPro 1600. These devices are available as a foam kit for use with portable pumps. Automatic proportioners are required for compressed air foam systems to prevent slug flow.

- a. *USFS – Manually regulated proportioners, such as around-the-pump proportioners, in-line and by-pass eductors, and suction-*

*side regulators, are acceptable for remote portable pump use when the operator understands the device limitations.*

2. **Wet Water** – Using foam concentrates at a mix ratio of 0.1 percent will produce a wet water solution.
  - a. **Conventional Nozzles and Backpack Pumps** – Mix ratio is 0.1 – 0.3%. Hydraulic considerations are the same as water.
  - b. **Aspirating Nozzles** – Mix ratio is 0.2 – 1.0%, but generally 0.5%, depending on nozzle, “foaminess” of concentrate used, and type of application. Adjust the ratio to best meet needs and objectives. Foam production and delivery should occur as readily as water delivery.
  
3. **Compressed Air Foam Systems (CAFS) Operating Standards**
  - a. Keep static air and water pressures equal.
  - b. Start with a 0.3% mix ratio; adjust if necessary.
  - c. Typical operation with 1 cfm of air for every gpm of water; adjust if necessary.
  - d. Employ a motionless mixer or 100 feet of hose to develop foam in the hose.
  - e. Foam production and delivery should occur as readily as water delivery.
  - f. Recommended minimum hose diameter is 1.5 inches when using foam on wildland/urban interface and vehicle fires.
    - 1) CAFS Safety – Mandatory training for personnel operating a CAFS includes: operating the nozzle, working around charged hoselays, and how to prevent slug flow.