

- 1 Chapter 12
2 Suppression Chemicals & Delivery Systems
3
4 Policy for Use of Fire Chemicals
5 Use only products qualified and approved for intended use. Follow safe
6 handling procedures and use personal protective equipment recommended on
7 the product label and Material Safety Data Sheet (MSDS).
8
9 A current list of qualified products and approved uses can be found on the
10 Wildland Fire Chemical Systems website:
11 <http://www.fs.fed.us/rm/fire/wfcs/index.htm>
12 Click on Wildland Fire Chemicals
13 Click the appropriate Qualified Products List
14
15 Refer to local jurisdictional policy and guidance related to use of wildland fire
16 chemicals for protection of historic structures.
17
18 Retardant Policy
19 Using approved long-term retardants in wildland fire suppression efforts is
20 standard in fire management and planning. The retardants are most often
21 delivered ~~in~~by fixed or rotor-wing aircraft. Some products are formulated
22 specifically for delivery from ground sources.
23
24 Foam Policy
25 Standard operating procedures for fire management and suppression activities
26 involving water as the suppression or protection agent delivered by engines and
27 portable pumps, ~~shall~~may include the use of Class A fire suppressant to improve
28 the efficiency of water. The exception is near watercourses where accidental
29 spillage or over spray of the chemical could be harmful to the aquatic ecosystem
30 (see Environmental Guidelines page 12-03). Helicopters and Single Engine
31 Airtankers (SEATs) can also deliver foam. Some agencies also allow
32 application of foam from fixed-wing water scoopers.
33
34 Water Enhancer Policy
35 These products may be used in structure protection within the wildland interface
36 or on wildland fuels. These products are qualified for use in helicopter buckets
37 and ground engines.
38
39 Types of Fire Chemicals
40
41 Long-Term Retardant
42 Long-term retardants contain fertilizer salts that change the way fuels burn.
43 They are effective even after the water has evaporated.
44
45 Principles of application and coverage levels are outlined in Recommended
46 Retardant Coverage Levels NFES 2048, PMS 440-2. Retardant mixing,

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12-1

Style Definition: 1st letter: Indent: Left: 0 pt,
Hanging: 21.6 pt, No bullets or numbering,
Tab stops: 21.6 pt, List tab

1 blending, testing, and sampling requirements can be found in Lot Acceptance,
2 Quality Assurance and Field Quality Control for Fire Retardant Chemicals,
3 NFES 1245, PMS 444-1.

4 Fire Suppressant Foam

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

8
9
10 Technical guidelines for equipment operations and general principles of foam
11 application are discussed in Foam vs. Fire, Class A Foam for Wildland Fires,
12 NWCG, PMS 446-1, NFES 2246, 2nd ed., October 1993, and Foam vs. Fire,
13 Aerial Applications, NWCG, PMS 446-3, NFES 1845, October 1995.

14 Water Enhancers for Wildland Fire Suppression

15 Water enhancers, such as fire fighting gels, are products added to water to
16 improve one or more of the physical properties of water. ~~These products are
17 suited for exposure protection for vertical surfaces.~~ They are not effective once
18 the water has evaporated. Water enhancers are typically applied from ground
19 equipment and are especially suited to exposure protection for vertical surfaces.
20 They are fully approved for use in helicopter bucket and engine application. See
21 the Qualified Product List for updated uses.

22 General Safety Criteria

23 All wildland fire chemicals must meet minimum requirements with regard to
24 aquatic and mammalian toxicity, which includes acute oral toxicity, acute
25 dermal toxicity, primary skin irritation, and primary eye irritation (~~International
26 Specification for Fire Suppressant Foam for Wildland Fires, Aircraft or Ground
27 Application, July 2000.~~ Current- Specifications for Wildland Fire Chemicals
28 [Long-Term Retardants, Fire Suppression Foams, and Water Enhancers], June
29 2007. See the Wildland Fire Chemical Systems website: www.fs.fed.us/rm/fire
30

31 Personnel involved in handling, mixing, and applying fire chemicals or solutions
32 ~~will~~shall be trained in proper procedures to protect their health and safety, as
33 well as that of the environment.

34 Personnel must follow the manufacturer's recommendations, including use of
35 PPE (i.e. goggles, gloves, eyewash kits on site) as found on the product label
36 and product Material Safety Data Sheet (MSDS). Approved fire chemicals ~~are
37 mildly to severely~~can be irritating to the eyes. Anyone involved with or
38 working in the vicinity of fire chemical concentrates should use protective
39 splash goggles.

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

1 Containers of any fire chemical, including backpack pumps and engine tanks,
2 should be labeled to alert personnel that they do not contain plain water, and that
3 the contents must not be used for drinking purposes. Slickness is a hazard at
4 storage areas and unloading and mixing sites. Because all fire chemical
5 concentrates and solutions contribute to slippery conditions, all spills must be
6 cleaned up immediately, preferably with a dry absorbent pad or granules.

7
8 Personnel applying foam should stand in untreated areas. A foam blanket can be
9 dangerous to walk through because it conceals ground hazards. Foam readily
10 penetrates and deteriorates leather boots, resulting in wet feet and potentially
11 ruined leather.

12
13 All safety precautions associated with ground crews near retardant drops also
14 apply to aerial foam drops.

15 Aerial Application Safety

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

18
19
20 Persons near retardant drops should be alert for objects (tree limbs, rocks, etc.)
21 that the drop could dislodge.

22
23 During training or briefings, inform field personnel of environmental guidelines
24 and requirements for fire chemicals application and to avoid contact with natural
25 bodies of water.

26
27 Notify incident or host authorities promptly of any fire chemicals applied within
28 300 feet of, or spilled into, a body of water. The incident or host authorities
29 must immediately contact appropriate regulatory agencies and specialists within
30 the local jurisdiction. ~~Also spills will be~~ Spills must immediately be reported to
31 Wildland Fire Chemicals Systems in Missoula, Montana at phone 406-329-3900
32 or to individuals listed in the website ~~referenced above:~~ www.fs.fed.us/rm/fire

33
34 Avoid dipping from rivers or lakes with a helicopter bucket containing residual
35 fire chemicals. Set up an adjacent reload site and manage the fire chemicals in
36 portable tanks, or terminate the use of chemicals for that application.

37
38 Quality control maintenance and safety requirements dictate that mixing or
39 blending of retardants be accomplished by standard approved methods.
40 Powdered or liquid retardants must be blended or mixed at the proper ratio prior
41 to being loaded into the aircraft.

42
43 Environmental Guidelines for Delivery of Fire Chemicals near Waterways

44
45 Definition

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

3
4 Aerial Application Guidelines

5 Avoid aerial or ground application of fire chemicals within 300 feet of
6 waterways.

7
8 These guidelines do not require the pilot-in-command to fly in such a way as to
9 endanger his or her aircraft, other aircraft, structures, or compromise ground
10 personnel safety.

11
12 Exceptions

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

19
20 Deviations from these guidelines are acceptable when life or property is
21 threatened, and the use of fire chemicals can be reasonably expected to alleviate
22 the threat. When potential damage to natural resources outweighs possible loss
23 of aquatic life, the agency administrator may approve a deviation from these
24 guidelines.

25
26 Environmental Procedures for Application of Fire Chemicals

27
28 Threatened and Endangered (T&E) Species

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

33
34 Where aquatic T&E species or their habitats are potentially affected by aerial
35 application of retardant or foam, the following additional procedures apply:

36 As soon as practical after the aerial application of fire chemicals near
37 waterways, determine whether the aerial application has caused any adverse
38 effect on T&E species or their habitat using the following criteria:

39 Aerial application of fire chemicals outside 300 feet of a waterway is presumed
40 to avoid adverse effects to aquatic species and no further consultation for aquatic
41 species is necessary.

42 Aerial application of fire chemicals within 300 feet of a waterway requires that
43 the unit administrator determine whether there have been any adverse effects to
44 T&E species within the waterway.

45 If the action agency determines that there were adverse effects on T&E species
46 or their habitats, then the agency must consult with Fish and Wildlife Service

1 (FWS) or National Marine Fisheries Service (NMFS) as required by 50 CFR
2 402.05 (Emergencies). Procedures for emergency consultation are described in
3 the Interagency Consultation Handbook, Chapter 8 (March 1998). In the case of
4 a long duration incident, emergency consultation should be initiated as soon as
5 practical during the event. Otherwise, post-event consultation is appropriate.
6 The initiation of the consultation is the responsibility of the unit administrator.
7 These procedures shall be documented in a Biological Assessment (BA). All
8 occurrences of adverse effects will be immediately reported to Wildland Fire
9 Chemicals Systems in Missoula, Montana at phone 406-329-3900 or to
10 individuals listed in website referenced ~~above~~-below: www.fs.fed.us/rm/fire
11 Each agency is responsible for ensuring that their appropriate agency specific
12 guides and training manuals reflect these standards.

13 14 Ground Application of Fire Suppressant Foams

15 16 Proportioners

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

22
23 Agency standards for foam proportioners on engines are an automatically
24 regulated proportioners, such as Robwen Flowmix 500, or FoamPro 1600.

25 These devices are available as a foam kit for use with portable pumps.

26 Automatic proportioners are required for compressed air foam systems to
27 prevent slug flow.

28 FS - Manually regulated proportioners, such as around-the-pump proportioners,
29 in-line and by-pass eductors, and suction-side regulators, are acceptable for
30 remote portable pump use when the operator understands the device limitations.

31 32 Wet Water

33 Using foam concentrates at a mix ratio of 0.1 percent will produce a wet water
34 solution.

35 36 Conventional Nozzles and Backpack Pumps

37 Mix ratio is 0.1 - 0.3%. Hydraulic considerations are the same as water.

38 39 Aspirating Nozzles

40 Mix ratio is 0.2 - 1.0%. But generally 0.5%, depending on nozzle, "foaminess"
41 of concentrate used, and type of application. Adjust the ratio to best meet needs
42 and objectives. Foam production and delivery should occur as readily as water
43 delivery.

44 Compressed Air Foam Systems (CAFS) Operating Standards

45 Keep static air and water pressures equal.

46 Start with a 0.3% mix ratio; adjust if necessary.

- 1 Typical operation with 1 cfm of air for every gpm of water; adjust if necessary.
- 2 Employ a motionless mixer or 100 feet of hose to develop foam in the hose.
- 3 Foam production and delivery should occur as readily as water delivery.
- 4 Recommended minimum hose diameter is 1.5 inches when using foam on
- 5 wildland/urban interface and vehicle fires.
- 6 CAFS Safety - Mandatory training for personnel operating a CAFS includes:
- 7 operating the nozzle, working around charged hoselays, and how to prevent slug
- 8 flow.
- 9