Hazard Control Technologies, Inc.

F-500

Training and Suggested Operating Guideline Manual

Edition 6
Revised 01/23/03

HAZARD CONTROL TECHNOLOGIES, INC.

THE NEW CHEMISTRY IN FIRE, VAPOR AND CONTAMINATION CONTROL

SUGGESTED OPERATING GUIDELINES (SOG)
FOR FIRE AND EMERGENCY RESPONSE DEPARTMENTS

Utilizing UL and $_{C}UL_{US}$ Listed
F-500 Class A and B Fire Suppressant Agent

F-500 Training Manual
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General Use Section

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HAZARD CONTROL TECHNOLOGIES, INC.

F-500 Micelle Encapsulator Technology

The Multi-Purpose Agent When Life Safety is the Issue

General Use

F-500 is a hi-tech, Underwriters Laboratories, Inc. (UL) listed fire suppression agent used to extinguish Class A and B fires, eliminate hazardous spills, and reduce explosive vapors. By combining the benefits of a wetting agent and micelle encapsulator technology[1] into one product, F-500 has set the new standard for fire and hazardous materials control. In addition to its superior effectiveness and efficiency, F-500 is environmentally safe, non-toxic, non-corrosive, 100% biodegradable, and requires no specialized equipment.

Class A Fires

F-500 is used on Class A fires in mixture ratios from 0.5% to 1%. F-500 can be introduced into the water stream through any type of liquid concentrate proportioning device such as an in-line eductor, on-board proportioner, around-the-pump proportioner or balance pressure concentrate metering system. F-500 is also effective if pre-mixed in a pumping apparatus booster tank, portable ground tank or other water supply source. Basically, any means by which you can achieve a 0.5% mixture ratio in the water stream will provide enhanced extinguishing capabilities and faster cooling than plain water.

When attacking Class A fires with F-500, it is important to use an aggressive sweeping or circular motion to cover as much surface area of the burning material as possible. Power cone water stream patterns are the most effective because this allows for good surface area coverage, in addition to providing improved extinguishing capabilities from a greater distance, which increases the safety of the firefighter.

Class B Fires

You can fight Class B fires by introducing F-500 into the water stream through conventional concentrate eductors, proportioners and mixing devices. Class B fires are extinguished with F-500 at either a 1% or a 3% mixture concentration. Use a 1% F-500 concentrate on Class B fires up to and including 50 gallons of Class B material. On anything over 50 gallons of Class B material, use a 3% F-500 concentrate.

It is very important to note that F-500 extinguishes Class B fires by reacting with the heat, fuel, and free radical portions of the fire tetrahedron. F-500 does not create a mechanical foam blanket to "smother" the fire or prevent fuel from exposure to air. Given the difference in extinguishment mechanics, it is helpful to know that once a fire is extinguished and neutralized, there is no blanket to protect from wind, rain or physical disturbance. In fact, the more water you add to the Class B material, the more effective F-500 becomes. The more agitation between the fuel, water and F-500, the better the neutralization.

[1] Micelle Encapsulator - When a cluster of molecules forms a "chemical cocoon" around other molecules (usually hydrocarbon molecules)

F-500 must be applied to the surface of a fire in a sweeping motion covering as much surface area as possible. A 30° fog pattern should be used to sweep the F-500 mixture across the surface of a Class B fire. Do not try to form and spread a blanket across the surface, as this is not an effective application technique of F-500. Rather, the technique requires a faster, more aggressive application that results in a more rapid knockdown and extinguishment. Never apply the product into burning fuel using a straight stream or "plunging" technique. This type of application will result in a longer extinguishment time. However, if you have extinguished the fire and are attempting to neutralize the Class B materials, you can plunge the F-500 mixture into the fuel to accomplish neutralization or non-flammability.

Spill Control

When applied at the proper rates, F-500's chemical encapsulation of hydrocarbon fuels renders flammable liquids nonflammable. This has applications to highway fuel spills; refinery, chemical, and industrial spills; and neutralization of fuels in storm drains.

One major benefit of F-500 as compared to foam is that during cleanup and subsequent disposal of the hazardous material, the fuel remains encapsulated and nonflammable.

Explosive Vapor Reduction

F-500's chemical encapsulation of the hydrocarbon molecule occurs not only in the liquid state, making it the clear choice for spill control, but also encapsulates the vapors reducing explosive vapors below the lower explosive limit (LEL). This has application to tank cleaning and degassing, petrochemical pipeline cleaning, and valve box degassing.

Soil Washing/Bioremediation Enhancement

F-500 chemically encapsulates the hydrocarbon molecules and suspends them in an aqueous solution making the hydrocarbon molecules more readily available for biodegradation from naturally occurring or synthetic microorganisms. This process essentially washes the soil while speeding up the bioremediation process. Specific microorganisms to meet your requirements can be added to F-500 or applied separately.

Notes:

Hazard Control Technologies, Inc. does not advocate improper disposal of neutralized fuel spills. Consult your local or state regulatory agency for proper guidelines.

See the "Suggested Operating Guidelines" for more detailed information on specific F-500 applications.

Suppression Mechanics

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Fundamentals and Chemistry of F-500

Fire Suppression Mechanics

F-500 extinguishes fires by reacting with the heat, fuel and free radical components of the fire tetrahedron. F-500 reacts with Class A materials by penetrating into the materials, cooling them and preventing the propagation of combustion. During the extinguishment of both Class A and Class B materials, F-500 interrupts the free radical chain reaction. In the extinguishment of Class B materials, the burning liquid is cooled and the flammability of the fuel is reduced by the formation and maintenance of micelles. Most other extinguishing agents (foams) work by forming and maintaining a mechanical "blanket" or film to deprive oxygen from the fuel and heat source. Unlike most other extinguishing agents, when applying F-500 to a Class B fire, it is important to sweep the water/F-500 stream across the surface area allowing the product to **cool the fire**, **neutralize the fuel** and **inhibit the formation of free radicals**.

Surface Tension Reduction (Cooling)

When attacking both Class A and B fires, heat is reduced more effectively through the enhanced cooling effects of the water/F-500 mixture. The product cools better because F-500 reduces surface tension of the water, thus providing a 1000% increase in the wetted area. The addition of F-500 reduces the water's surface tension from 72 dynes/cm^2 to less than 30 dynes/cm^2. This results in faster extinguishment and cooling, and is particularly noticeable in structure, automobile, rubber, coal, and paper fires. When combating fires using F-500, it is important to apply the product aggressively, attempting to cover as much surface area as possible. A broken fog pattern is used with a sweeping/circular motion to accomplish increased coverage of surface area.

Micelle Formation (Neutralization)

When attacking Class B fires, fuel is rendered non-flammable as the product makes contact and mixes with the burning liquid forming chemical micelles. Micelles are "chemical cocoons" that form around hydrocarbons preventing the release of flammable vapors. The micelle formation in conjunction with the cooling and free radical inhibition act to extinguish Class B fires while preventing re-ignition. When the proper mix ratios are achieved (Refer to "Hydrocarbon Fuel Lockup/Hydrocarbon Fuel Neutralization Table," pages 21-22), the hydrocarbon fuel will be rendered non-flammable or "locked-up." It is important to note that once a Class B fire hazard has been neutralized, there is no harm in adding water or agitating the mixture. In fact, additional water and mixing is beneficial. An important point to remember for fuel neutralization is that you cannot use too much water when applying F-500.

Free Radical Interruption

Free radicals are uncharged molecular fragments with high energy. Free radicals collide with Class A or Class B fuel sources at high speeds releasing heat and more free radicals. This sets up a chain reaction, which propagates the combustion process. F-500, because of its high molecular weight, acts as an inhibitor to the chain reaction by simply absorbing the energy of the free radicals during the collisions. By comparison, water has a molecular weight of 18; whereas,

F-500's molecular weight is slightly over 500; hence, where F-500 gets its name. As the energy of the combustion system is reduced via absorption of the high energy free radicals, the fire is extinguished.

NFPA 18

F-500 has been examined by UL and found to comply with the applicable requirements in the Standard for Foam Equipment and Liquid Concentrates, UL 162, and the NFPA Standard for Wetting Agents, NFPA 18.

Key excerpts from NFPA 18 include:

Page 18-4 Forward ***"Both experience and tests have indicated that the addition of a proper wetting agent to water will, when properly applied, increase the extinguishing efficiency of that water by reducing the quantity of water needed and the amount of time needed to effectively fight the fire."***

Page 18-4 Forward ***"As a result, the treated water acquires the ability to penetrate into small openings and recesses that water would flow over by the simple bridging action of the surface film. It is to be noted that such solutions exhibit not only penetrating and spreading qualities, but also exhibit increased absorptive speed and superior adhesion to solid surfaces."***

Page 18-5, 1-4.4 ***"Class C Fires. Wet water solutions can conduct electricity and have limitations similar to water in fighting fires involving energized electrical equipment so far as safety to fire-fighting personnel are concerned. Spray or fog pattern shall be permitted, but only while adhering to the usual precautions. Application as a straight stream shall be prohibited."***

Page 18-7, 3-1.1 ***"Equipment. Wetting agents that comply with the specifications herein set forth shall be allowed for use with standard equipment provided said equipment is primarily designed to utilize water or foam as a medium of fire control and extinguishment in accordance with 1-3.3 and 1-3.5. Permissible use with new types of equipment shall be determined by the authority having jurisdiction."***

Hazard Control Technologies, Inc. will make available to purchasers any information or documents relative to NFPA compliance, UL Listing Reports, Factory Mutual Research Corporation ISO 9000 Registration documentation. We encourage all training personnel and purchasing entities to become familiar with these testing agencies and test criteria as each relates to the safe, effective use of F-500. Any questions regarding approvals, certifications or specialized uses of F-500 should be directed to Hazard Control Technologies, Inc., Support Services Division at (770) 719-5112.

Mechanics Comparison

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Fundamental Fire Suppression Mechanics Differences between Wetting Agents, Foam, and Micelle Encapsulators

It is important to understand the chemistry of fire and the fire suppression mechanics (i.e., how a product acts on the fire to accomplish fire suppression). There are fundamental differences in the fire suppression mechanics of NFPA 18-Wetting Agents, NFPA 11-Foams, and NFPA "Proposed New Standard - Water Additives for Fire Suppression and Vapor Mitigation."

In the early 1980s, a fourth leg of the fire tetrahedron, known as free radicals, was identified. Today it is well documented that the chemistry of fire is based on the fire tetrahedron which consists of oxygen, fuel, heat, and the newly-emphasized fourth leg, the free radical. For fire propagation to continue, all four components of the fire tetrahedron must be present. Fire suppression is accomplished through the elimination of one or more legs of the fire tetrahedron. Below is a summary of the fire suppression mechanics of NFPA 18-Wetting Agents, NFPA 11-Foam, and NFPA "Proposed New Standard - Water Additives for Fire Suppression and Vapor Mitigation" (Micelle Encapsulators). Upon closer inspection of fire suppression mechanics, one can see that the formation of a new standard is absolutely necessary.

NFPA 18 - Wetting Agents

Wetting Agent Fire Suppression Mechanics rely on one main mechanism:

A) *Reduction of Surface Tension* - The surface tension reduction of water is reduced from 72 dynes/cm^2 to less than 33 dynes/cm^2. This provides for an increase in wetted surface area and increased penetration. Wetting agents do not form foam blankets or micelles.

NFPA 11 - Foam

Foam Fire Suppression Mechanics rely on two main mechanisms:

A) Reduction of Surface Tension - Like a wetting agent, foams reduce the surface tension of water. This feature of foam aids in bubble formation and spreading of the foam blanket over the fuel surface.

B) Formation and Maintenance of a Blanket - What differentiates foam from wetting agents is the ability to form and maintain bubbles (i.e., foam blanket) over the fuel. The blanket insulates the fuel leg from the oxygen leg, mechanically depriving the fire of oxygen. The blanketing properties of both Class A and B foams insulate the fuel relinquishing heat slowly.

NFPA "New Standard - Water Additives for Fire Control and Vapor Mitigation"

Micelle Encapsulator Fire Suppression Mechanics Rely on three main mechanisms:

A) *Reduction of Surface Tension* - Like a wetting agent, "micelle encapsulators" reduce the surface tension of water from 72 dynes/cm^2 to less than 33 dynes/cm^2. Like foam, the wetting agent component acts as a carrier for the micelles. This is the only component that micelle encapsulators have in common with foam. However, unlike foam, there is no standard on index test criteria to quantify "micelle distribution time."

B) *Micelle Formation and Maintenance* - The fact that micelle encapsulators have the ability to form and maintain micelles, essentially encapsulating the fuel leg of the fire tetrahedron (i.e., encapsulation occurs to both liquid and vapor phases), separates them from wetting agents. Currently there are no NFPA Standards and subsequent UL index test criteria to quantify micelle formation and maintenance (i.e., critical micelle concentration, micelle bonding strength, and quarter life micelle holding time).

C) *Interruption of Free Radical Chain Reaction* - Early testing indicates that some micelle encapsulators interrupt the free radical chain reaction much like Halon without the adverse environmental impact. There are no NFPA standards or subsequent UL index test criteria to quantify this aspect of the Micelle Encapsulators Fire Suppression Mechanics.

Note:

Effective December 1998, the NFPA Standards Council formed a new technical committee titled, "Water Additive for Fire Suppression and Vapor Mitigation." The formation of this new technical committee was at the request of the Foam Technical Committee in recognition of the fact that there are other products in the marketplace that are more than wetting agents; however, they do not form blankets. Therefore, these agents do not fall into the existing foam standards and test protocols. This new technical committee is tasked with the responsibility of developing a new standard and subsequent test protocols for this emerging class of agents. **F-500 is one of these products.**

Application Procedures/Rates

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Application Procedures/Application Rates

It is never a recommended practice to enter any flammable or combustible liquid. Always evaluate the threat of fire to personnel, equipment, or property when initiating the use of F-500. Always adhere to your department's operating and safety procedures when using F-500 to fight fires, neutralize spills or reduce flammable vapors. Do not risk harm to personnel by placing them in situations outside the parameters of standard, approved departmental training. Always use appropriate protective clothing, breathing apparatus, and safety gear in compliance with standard department policy.

It is important to know exactly what type of fuel hazard you are dealing with. In the case of Class A fires, the burn hazard is somewhat predictable and the procedures for fighting this type of fire with F-500 are similar to water fire fighting procedures. Again, it is important to emphasize that Hazard Control Technologies, Inc. strongly recommends that all standard departmental operating procedures and safety standards are strictly followed during the use of F-500. When combating Class B fires or neutralizing spills, it is important to know the fuel type to understand the volatility of the hazard. Knowing the type fuel is also very important in calculating application rates of F-500.

Application Techniques

A) **Class A Fires** - The key to rapid, effective extinguishment is based on surface area coverage. The recommended application technique is an aggressive, straight stream (10^o-20^o) pattern at the base of the flames or apparent heat source. As you move forward to go from firefighting to overhaul, change to a 30^o-45^o pattern. Remember, the faster you spread the F-500, the faster you will achieve total extinguishment. As you attack a Class A fire with F-500, you are cooling the fire and penetrating deeper into the material pores, extinguishing faster and preventing re-ignition. Following the extinguishment of a Class A fire, make sure to conduct a standard "cool down" salvage or overhaul operation within standard departmental guidelines.

Example 1: Wood, pallets, rubber tires or structures, usually can be attacked with a straight stream, followed by a 30° - 45° fog pattern for final extinguishment. Basically, Class A firefighting tactics with F-500 will be similar to the tactics you have been taught for using plain water. The difference is that the F-500 allows the water to spread over a greater surface area faster and penetrate deeper into pores which are inaccessible to plain water. This will provide ten to twenty times more firefighting effectiveness than plain water.

Example 2: In the case of fires of baled cardboard, baled cotton, baled hay, hay rolls or paper rolls, you will quickly gain control of the surface fire with a fog pattern. Once you have extinguished and cooled the surface of these types of fires, you must work to direct the F-500 straight stream into the center of tightly compacted materials to cool and extinguish the coals or embers that have become "deep seated." Cooling deep-seated fires in baled products or tightly compacted materials is accomplished by one of three methods: directing a straight stream pattern, using a piercing nozzle, or unrolling baled rolls after the surface fire has been extinguished or controlled.

B) **Class B Fires** - Once you have determined the size (in gallons) of the Class B fire, adjust the metering device on the proportioner to 1% or 3% (1% F-500 concentrate for 50 gallons or less; 3% F-500 concentrate for over 50 gallons). Reference the F-500 Class B Application Rate Chart (page 27) to determine the proper proportioning rate.

Application Rates - Once you have identified the type of fuel and cross-referenced the Class B Application Rate Chart, you must calculate the square footage of the fuel surface area. After you have the square footage calculated, simply multiply the square feet by the Class B application rate to calculate the amount of total solution flow rate (i.e., nozzle flow rate) required to extinguish a hazard. To determine the required product amount, multiply the previously determined nozzle flow rate times the proportioning setting.

Example 1: You have determined your fuel is gasoline and it is covering an area 100 ft. long by 100 ft. wide. Follow the following steps:

1) Determine the surface area
   - Area = Length x Width
   - Area = 100 ft x 100 ft
   - Area = 10,000 ft^2
2) Determine the required nozzle flow rate
   - Flow Rate = Area x Application Rate (See page 27; Class B Application Rate)
   - Flow Rate = 10,000 ft^2 x 0.1 gal/min/ft^2 (Gasoline = 0.1 gal/min/ft^2)
   - Flow Rate = 500 gal/min (for minute extinguishment)
   - Use any combination of 2 @ 500 gal/min, 4 @ 250 gal/min, or 8 @ 125 gal/min nozzles.
3) Calculate the required F-500 product
   - Product = Flow Rate x Proportioning Rate
   - Product = 1000 gal/min x 3%
   - Product = 30 gallons

Using the F-500 application rate chart, you can calculate that you will require a 1000 gpm flow rate, a 3% eductor setting and 30 gallons of F-500 to extinguish a 10,000 sq. ft. gasoline fire in one minute.

When attacking Class B fires, it is extremely important to initiate your attack with a fog pattern (20° to 30°) while adjusting the nozzle to a straight stream, if necessary, to assist in cooling an obstacle. As with Class A materials, you must sweep the pattern across the source of the burning liquid in a rapid, side-to-side motion. Do not straight-stream or plunge the F-500 into the burning liquid as this will stir fresh fuel to the surface causing additional fresh fuel to ignite. Once an area of control (or extinguishment) is established in the burning liquid, move out away from that point with a tighter pattern to give you greater distance in applying the F-500 mixture to the surface of the fire. If possible, initiate your attack from the upwind direction to allow greater visibility, and thus, a safer fire ground and firefighting operation. Also, make sure you have calculated the surface area of the Class B hazard and cross-referenced it to the application rate chart to ensure you have adequate F-500 to accomplish full extinguishment.

C) **Spill Control/Fuel Neutralization and Vapor Suppression**

1) Pooled Fuels/Spills - Never confuse spill control or fuel neutralization rates with those used for extinguishment. F-500 can achieve extinguishment at application rates of 0.05 to 0.075 gal/min/ft^2. The ratio to achieve neutralization is based on mixing a ratio of 1 part F-500 to each 8 parts of fuel volume to 32 parts of water (i.e., 1 gallon of F-500 to 8 gallons of fuel to 32 gallons of water). Note that the ratio of F-500 to water is 1:32 which is roughly 3%. Therefore, set the proportioner to 3%. Now note that the ratio of fuel to water is 8 parts fuel to 32 parts water (i.e., 1:4). Therefore, thoroughly agitating the fuel with approximately four times the amount of water with the proportioner set at 3%. In deep pooled Class B fuels it is very important to mix and agitate very thoroughly so the fuel, F-500, and water become a homogenous mixture. Adding more, rather than less, than four times the amount of water will benefit the neutralization process. Therefore, rainy, wet conditions actually aids in the fuel neutralization process.
2) Flat Surface Spills - In the case where you have a flat surface spill resulting from a ruptured fuel tank, automobile collision or leaking pump, neutralization can be achieved by agitating the F-500 through a handline, into the spilled fuel at a 3% eduction rate. Washing the F-500 mixture into the spill will normally neutralize the hydrocarbons on contact, thus providing a safer environment to begin extrication of victims, contain spilled materials or begin collecting hazardous materials.

   Note:

   Firefighters/hazardous materials response teams must contain and collect neutralized hydrocarbons and polar solvents in strict compliance with local state and federal environment regulatory authority guidelines.

It is important to ensure that the entire spill is covered with the F-500 water mixture to achieve total neutralization. When neutralizing a flat surface spill or deep pool spill, a firefighter cannot add too much water.

Note:

See the "Suggested Operating Guidelines" for more detailed information on specific F-500 applications.

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Class A
Application Rates

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Class A Application Rates

F-500 is UL and $_{C}UL_{US}$ listed for Class A fire suppression.

Typical Class A – F-500, when mixed or proportioned at 0.05% to 1%, provides quick extinguishment and effective burnback resistance for most common Class A materials. Typical Class A materials are shown below:

- **wood**
- **paper**
- **cotton**
- **hay / straw**
- **fiberglass**
- **rubber tires**
- **brush / wildland**
- **coal**
- **structure**
- **car**
- **landfill/refuse**

History has shown that a 0.5% F-500 solution is effective on trash, landfill, dumpster, refuse, and wildland fires. Additionally, a 0.5% F-500 solution can be used to set up a simple and economical fire break.

Rubber Tires – Due to the nature of rubber tires to degrade into a Class B flammable liquid during the combustion process, a minimum of 1% F-500 solution is recommended.

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Class B
Application Rates

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Class B Application Rates

Fuel Group	Specific Fuel	Proportion %	Application Rate	
			Gal/min/Ft^2	Liters/min/M^2
Alcohols	Isopropyl Alcohol	3	0.15	6.2
Ethanol	Ethanol	3	0.10	4.0
Methanol	Methanol	3	0.10	4.0
Ketones	Acetone	3	0.15	6.2
Methyl Ethyl Ketone	Methyl Ethyl Ketone	3	0.10	4.4
Esters	Normal Butyl Acetate	3	0.10	4.4
Ethers	Isopropyl Ether	3	0.15	6.2
MTBE	Methyl Tertiary Butyl Ether	3	0.10	6.2
MTBE/Gasoline Blends	(17.5% MTBE/82.5% Gasoline)	3	0.10	4.0
Hydrocarbons	Heptane	3	0.10	4.0

Notes:

1) Application rates are based on flat spill fuel fire applications using standard handline nozzle devices.
2) For fuel-in-depth applications, contact your local Hazard Control Technologies representative for a copy of the F-500 UL and/or $_{C}UL_{US}$ Listing Reports.
3) A 30° - 60° fog pattern recommended.
4) F-500 can be used at these application and proportion rates with both fresh and salt water.
5) History has shown that a Class B hazard of 50 gallons or less can be extinguished with a 1% solution of F-500.

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Spill Control
Application Rates

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Hydrocarbon Fuel Lockup

Hydrocarbon Fuel Neutralization Table F-500 @ 3% Eduction System							
			Time (min/sec) @ GPM				
Spill (gal)	Product (gal)	Water (gal)	50	70	95	125	250
25	3.13	104	2 min 5 sec	1 min 29 sec	1 min 5 sec	0 min 50 sec	0 min 25 sec
50	6.25	208	4 min 10 sec	2 min 58 sec	2 min 11 sec	1 min 40 sec	0 min 50 sec
75	9.38	313	6 min 15 sec	4 min 27 sec	3 min 17 sec	2 min 30 sec	1 min 15 sec
100	12.50	417	8 min 20 sec	5 min 57 sec	4 min 23 sec	3 min 20 sec	1 min 40 sec
200	25.00	833	16 min 40 sec	11 min 54 sec	8 min 46 sec	6 min 40 sec	3 min 20 sec
300	37.50	1,250	25 min 0 sec	17 min 51 sec	13 min 9 sec	10 min 0 sec	5 min 0 sec
400	50.00	1,667	33 min 20 sec	23 min 48 sec	17 min 32 sec	13 min 20 sec	6 min 40 sec
500	62.50	2,083	41 min 40 sec	29 min 45 sec	21 min 55 sec	16 min 40 sec	8 min 20 sec
600	75.00	2,500	50 min 0 sec	35 min 42 sec	26 min 18 sec	20 min 0 sec	10 min 0 sec
700	87.50	2,917	58 min 20 sec	41 min 40 sec	30 min 42 sec	23 min 20 sec	11 min 40 sec
800	100.00	3,333	66 min 40 sec	47 min 37 sec	35 min 5 sec	26 min 40 sec	13 min 20 sec
900	112.50	3,750	75 min 0 sec	53 min 34 sec	39 min 28 sec	30 min 0 sec	15 min 0 sec
1,000	125.00	4,167	83 min 20 sec	59 min 31 sec	43 min 51 sec	33 min 20 sec	16 min 40 sec
2,000	250.00	8,333	166 min 40 sec	119 min 2 sec	87 min 43 sec	66 min 40 sec	33 min 20 sec
3,000	375.00	12,500	250 min 0 sec	178 min 34 sec	131 min 34 sec	100 min 0 sec	50 min 0 sec
4,000	500.00	16,667	333 min 20 sec	238 min 5 sec	175 min 26 sec	133 min 20 sec	66 min 40 sec
5,000	625.00	20,833	416 min 40 sec	297 min 37 sec	219 min 17 sec	166 min 40 sec	83 min 20 sec
6,000	750.00	25,000	500 min 0 sec	357 min 8 sec	263 min 9 sec	200 min 0 sec	100 min 0 sec
7,000	875.00	29,167	583 min 20 sec	416 min 40 sec	307 min 1 sec	233 min 20 sec	116 min 40 sec
8,000	1,000.00	33,333	666 min 40 sec	476 min 11 sec	350 min 52 sec	266 min 40 sec	133 min 20 sec
9,000	1,125.00	37,500	750 min 0 sec	535 min 42 sec	394 min 44 sec	300 min 0 sec	150 min 0 sec
10,000	1,250.00	41,667	833 min 20 sec	595 min 14 sec	438 min 35 sec	333 min 20 sec	166 min 40 sec

Notes: 1 part F-500 to 8 parts fuel to a minimum 32 parts water

Hydrocarbon Fuel Lockup

Hydrocarbon Fuel Neutralization Table F-500 @ 3% Eduction System							
			Time (min/sec) @ LPM				
Spill (L)	Product (L)	Water (L)	115	230	475	950	1325
25	3.13	104	0 min 54 sec	0 min 27 sec	0 min 13 sec	0 min 6 sec	0 min 4 sec
50	6.25	208	1 min 48 sec	0 min 54 sec	0 min 26 sec	0 min 13 sec	0 min 9 sec
75	9.38	313	2 min 43 sec	1 min 21 sec	0 min 39 sec	0 min 19 sec	0 min 14 sec
100	12.50	417	3 min 37 sec	1 min 48 sec	0 min 52 sec	0 min 26 sec	0 min 18 sec
200	25.00	833	7 min 14 sec	3 min 37 sec	1 min 45 sec	0 min 52 sec	0 min 37 sec
300	37.50	1,250	10 min 52 sec	5 min 26 sec	2 min 37 sec	1 min 18 sec	0 min 56 sec
400	50.00	1,667	14 min 29 sec	7 min 14 sec	3 min 30 sec	1 min 45 sec	1 min 15 sec
500	62.50	2,083	18 min 6 sec	9 min 3 sec	4 min 23 sec	2 min 11 sec	1 min 34 sec
600	75.00	2,500	21 min 44 sec	10 min 52 sec	5 min 15 sec	2 min 37 sec	1 min 53 sec
700	87.50	2,917	25 min 21 sec	12 min 40 sec	6 min 8 sec	3 min 4 sec	2 min 12 sec
800	100.00	3,333	28 min 59 sec	14 min 29 sec	7 min 1 sec	3 min 30 sec	2 min 30 sec
900	112.50	3,750	32 min 36 sec	16 min 18 sec	7 min 53 sec	3 min 56 sec	2 min 49 sec
1,000	125.00	4,167	36 min 13 sec	18 min 6 sec	8 min 46 sec	4 min 23 sec	3 min 8 sec
2,000	250.00	8,333	72 min 27 sec	36 min 13 sec	17 min 32 sec	8 min 46 sec	6 min 17 sec
3,000	375.00	12,500	108 min 41 sec	54 min 20 sec	26 min 18 sec	13 min 9 sec	9 min 26 sec
4,000	500.00	16,667	144 min 55 sec	72 min 27 sec	35 min 5 sec	17 min 32 sec	12 min 34 sec
5,000	625.00	20,833	181 min 9 sec	90 min 34 sec	43 min 51 sec	21 min 55 sec	15 min 43 sec
6,000	750.00	25,000	217 min 23 sec	108 min 41 sec	52 min 37 sec	26 min 18 sec	18 min 52 sec
7,000	875.00	29,167	253 min 37 sec	126 min 48 sec	61 min 24 sec	30 min 42 sec	22 min 0 sec
8,000	1,000.00	33,333	289 min 51 sec	144 min 55 sec	70 min 10 sec	35 min 5 sec	25 min 9 sec
9,000	1,125.00	37,500	326 min 5 sec	163 min 2 sec	78 min 56 sec	39 min 28 sec	28 min 18 sec
10,000	1,250.00	41,667	362 min 19 sec	181 min 9 sec	87 min 43 sec	43 min 51 sec	31 min 26 sec

Notes: 1 part F-500 to 8 parts fuel to a minimum 32 parts water

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Equipment Operation

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Operation of Liquid Concentrate Delivery Equipment

F-500 can be introduced into a water stream by any conventional eductor, proportioner or pre-mix method. If you currently have an eductor in service, you can use it to properly proportion F-500 provided the nozzle matches the rated GPM of the eductor. F-500 is most effective when used with the most common conventional water nozzles. A special or aspirating nozzle is not required to deliver F-500. F-500 can be stored in apparatus liquid concentrate storage tanks and used with around-the-pump proportioners, in-line eductors and balance pressure proportioning systems. F-500 can also be pre-mixed in apparatus booster tanks at 0.5%, 1%, and 3%.

A) **Eductors:** The most convenient delivery method for applying F-500, particularly at different percentages, is an in-line eductor. F-500 is compatible with all makes and models of in-line eductors. The benefit of using an in-line eductor to deliver F-500 is the eductor's simplicity. An in-line eductor is a very basic piece of equipment with only two moving parts; a check ball and a metering valve. The metering valve adjusts the percentage of product in the hose line, whereas the check ball prevents "back-flow" through the eductor. The check ball is the first point to check before placing an eductor in operation. The check ball can be tested by shaking the eductor and listening for the "rattle" inside. The "rattling" sound indicates that the check ball is in working order and can be placed in operation.

Step-by-step F-500 eductor operation

1) Make sure nozzle GPM matches eductor GPM.
2) Connect eductor to discharge outlet.
3) Set metering valve to desired setting.
4) Open discharge and set pump pressure at manufacturer's recommended pressure
5) Insert pick-up tube into F-500 container.
6) Visually inspect pick-up tube to ensure it is flowing product by fully opening nozzle.
7) Open nozzle fully.
8) Visually check water stream for "white" color of water stream.

Pump pressures of 200 psi are recommended by most eductor manufacturers for proper operation of eductors. You will learn through training and practice that, depending on the type of eductor, you can operate at lower pump pressure settings. The key to fast, efficient, eductor operation set-up is training and practice. Note: Be aware of the pressure drop across the eductor. Most eductors will reduce pressure by 30%. That is important information when calculating pressure requirements for adequate nozzle flow. Additionally, *hose lay* and *change in elevation* are factors that might drop the operating pressure below that required for proper eductor operation.

B) **Troubleshooting Eductor Shut-Down**

1) Make sure nozzle is always FULLY opened during operation.
2) Assure that nozzle and eductor GPM settings are equal.
3) Check for kinks in hose lines.
4) Check for adequate pump pressure.
5) Check for air-tight seal around pick-up tube/hose connections.
6) Check for kinks or blockage in pick-up tube and hose lines
7) Check metering valve to make sure it is open
8) Check for clogged nozzle.
9) Is nozzle elevated too high above eductor
10) Check the check ball (listen for rattle, look for flow into concentrate bucket).

C) **On-board Proportioners, Pre-plumbed Eductors, and Pre-mixing**

1) F-500 can be educted into water streams through on-board proportioners, pre-plumbed eductors and pre-mixed in booster tanks. Normally, on-board proportioners and pre-plumbed eductors are controlled at the pump panel where the metering device regulates flow of F-500 from a concentrate storage tank into a designated discharge line. This procedure usually involves:

    a) First, charging the designated discharge, and

    b) Second, opening the concentrate supply valve and metering the flow. Given the various types and numerous manufacturers of these systems, Hazard Control Technologies, Inc. recommends that you incorporate the use of F-500 into your existing operating procedures. There should be very little, if any, difference in the proportioning procedures you currently use and those necessary to flow F-500. If you have any questions regarding a type of proportioning device and its compatibility with F-500, call Hazard Control Technologies, Inc. at (770) 719-5112.

Note: If foam was previously used in the concentrate storage tank, the system should be flushed clean prior to adding F-500 to the concentrate storage tank. This is accomplished by first draining the concentrate, and second, flushing the tank with water through the drainage tube. Then, fill the concentrate storage tank with water, setting the metering device to the maximum setting and proportioning the water in the concentrate storage tank through the system.

2) Pre-mixing F-500 in an apparatus booster tank is a fast and easy way to ensure you have an F-500 mixture immediately upon opening a discharge valve. If your department chooses to pre-mix in the station, simply add F-500 by pouring directly into the tank fill opening. The following table is a “quick reference” guide that indicates the amount of F-500 necessary to achieve the listed percentages:

F-500 Booster Tank Premix Table

Tank Size (Gallons)	F-500 Premix Rate (Gallons)		
	0.25%	0.5%	1.0%
300	.75	1.50	3.00
500	1.25	2.50	5.00
750	1.875	3.75	7.50
1000	2.50	5.00	10.00
1250	3.125	6.25	12.50
1500	3.75	7.50	15.00
2000	5.00	10.00	20.00
2500	6.25	12.50	25.00
3000	7.50	15.00	30.00

F-500 Booster Tank Premix Table

Tank Size (Liters)	F-500 Premix Rate (Liters)		
	0.25%	0.5%	1.0%
500	1.25	2.50	5.00
1000	2.50	5.00	10.00
1500	3.75	7.50	15.00
2000	5.00	10.00	20.00
2500	6.25	12.50	25.00
3000	7.50	15.00	30.00
3500	8.75	17.50	35.00

F-500 SOGs

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F-500 Suggested Operating Guidelines
for
Fire and Emergency Departments

SUGGESTED OPERATING GUIDELINES

(SAMPLE SOG #1 for the Use of F-500 in Fire Department Operations)

GUIDELINES MANUAL

To: All Personnel

Objective: To Establish a Manner for the Storage and Handling of F-500

Responsibility: As Directed by Department Policy

Procedure: **Handling**: F-500 liquid concentrate is a non-corrosive, non-hazardous, synthetic concentrate for use by dilution with water in firefighting equipment, fixed or mobile systems. But, as with all chemicals, protective equipment is recommended such as eye protection, gloves, etc. As with all concentrates, rinse thoroughly with water if spilled.

Storage: Recommended storage temperatures are 35°F - 120°F, 1.7°C - 48.9°C, if stored in the manufacturer's shipping containers. The F-500, when pre-mixed with water at 1%, 3%, or 6% should be protected from freezing, the same as you would for plain water.

Note: This information is submitted as a recommended guide to establish a Departmental SOG when using F-500 as part of your emergency response procedures, and should in no way be considered a replacement for existing, established protocol. Hazard Control Technologies, Inc. is responsible for the quality of the product F-500 only, and will not assume responsibility for any other problem areas encountered when the product is being used.

(SAMPLE SOG #2 for the Use of F-500 in Fire Department Operations)

GUIDELINES MANUAL

To:	All Personnel
Objective:	To Establish a Manner for the Use of F-500 - Filling On-Board Agent Tank
Responsibility:	As Directed by Department Policy
Guideline:	Due to the potential for incompatibility of agents or products, NFPA recommends not mixing any two agents. HCT recommends that the agent tank is drained of any foam or wetting agent prior to filling with F-500. F-500 will NOT create a violent or hazardous situation if it comes in contact with other water additives or foams; however, it is always a good practice to drain and thoroughly rinse the tank with fresh water before filling with F-500. To fill the tank with F-500, simply pour from the 5 gallon container directly into the agent tank while assuring all valves to the tank are closed prior to filling. 55 gallon drums and 250 gallon totes can be pumped off into the truck/tank directly by use of a suction pump, or by using a drain valve to fill smaller containers that will be used to service the tank.

Note: This information is submitted as a recommended guide to establish a Departmental SOG when using F-500 as part of your emergency response procedures, and should in no way be considered a replacement for existing, established protocol. Hazard Control Technologies, Inc. is responsible for the quality of the product F-500 only, and will not assume responsibility for any other problem areas encountered when the product is being used.

(SAMPLE SOG #3 for the Use of F-500 in Fire Department Operations)

GUIDELINES MANUAL

To: All Personnel

Objective: To Establish a Manner for the Use of F-500 for Pre-Mixing the Booster Tank

Responsibility: As Directed by Department Policy

Guideline: This guideline is recommended when using F-500 to pre-mix the booster tank. The quantity of F-500 will be determined by the ratio of F-500 to the amount of water in the tank.

$$\text{F-500 (gallons)} = \frac{\text{Desired Proportion (\%)}}{100} \times \text{Tank Size (gallons)}$$

For example, to achieve a 1% solution in a 500 gallon booster tank, you must add 5 gallons of F-500.

Mixing Procedure for Booster Tanks

Pour the calculated amount of F-500 into the tank water to achieve the desired concentration of water and F-500. If this is done at the station, n**o mixing or agitation is necessary**. The agitation of the water during transportation to the scene is sufficient to form a stable F-500/water solution with no separation occurring. If re-servicing the tank water at the scene, follow the "Re-Servicing Tank Water at the Scene" instruction on the next page.

Measuring Percentage of F-500 Concentrate After Booster Tank Usage

After the pre-mixed booster tank is used and the engine is to be re-serviced, we recommend that a measurement be made that indicates the remaining level of water and F-500. Once you determine the amount of water used from the booster tank, the crew will know how much F-500 and water are required to refill the booster tank.

Example: If you have 250 gallons remaining from a 500 gallon booster tank that had a 1% finished mix, you will need to add 2.5 gallons of F-500 to the newly added 250 gallons of water to be in full service again. You will now have 500 gallons of water with a 1% mixture of F-500.

Re-Servicing Tank Water at the Scene

For this example, a 500 gallon water (booster) tank is used.

While operating at a fire where the F-500/booster tank water (500 gallons) has been used for the attack line and is now depleted, the following procedure can be used to quickly re-service at the scene from the hydrant, and again pre-mix the booster tank with F-500 to achieve your desired concentration.

Once the initial attack is made on the fire using the pre-mixed F-500/ water from the booster tank:

1) While hooked up to the hydrant supply line, continue feeding the attack lines with water.
2) Open (½ gate opening) the tank fill valve and fill the tank with water.
3) Close tank fill valve.
4) Open circulator valve.
5) With the tank now filled with 500 gallons of water and the circulator valve open, add **5 gallons of F-500** directly into the water tank to achieve the desired 1% pre-mixed solution.
6) **Optional:** Depending upon departmental policy, circulator valve may remain open or be closed 5 to 15 seconds after F-500 is added to the booster tank.
7) The tank solution is now ready for use through all the attack lines. Open the tank to pump valve to supply the 1% F-500/water solution to the handlines.

Note:

There is no cause for alarm if some bubbles appear from the top of the tank water. **Remember, F-500 is non-corrosive, non-toxic, non-hazardous, and 100% biodegradable**. Those bubbles will almost instantly go away without any additional wash-down needed.

F-500 Booster Tank Premix Table

Tank Size (Gallons)	F-500 Premix Rate (Gallons)		
	0.25%	0.5%	1.0%
300	.75	1.50	3.00
500	1.25	2.50	5.00
750	1.875	3.75	7.50
1000	2.50	5.00	10.00
1250	3.125	6.25	12.50
1500	3.75	7.50	15.00
2000	5.00	10.00	20.00
2500	6.25	12.50	25.00
3000	7.50	15.00	30.00

F-500 Booster Tank Premix Table

Tank Size (Liters)	F-500 Premix Rate (Liters)		
	0.25%	0.5%	1.0%
500	1.25	2.50	5.00
1000	2.50	5.00	10.00
1500	3.75	7.50	15.00
2000	5.00	10.00	20.00
2500	6.25	12.50	25.00
3000	7.50	15.00	30.00
3500	8.75	17.50	35.00

(SAMPLE SOG #4 for the Use of F-500 in Fire Department Operations)

GUIDELINES MANUAL

To: All Personnel

Objective: To Establish a Manner for the Use of F-500 on Fuel Spills

Responsibility: As Directed by Department Policy

Procedure: When responding to reports of fuel spills, upon arrival it is necessary to size-up the incident, determine the conditions, and establish command. Once an evaluation is made that the fuel is approachable and can be mitigated with a water-based agent, F-500 can be used as a vapor control/mitigation agent.

Note:

Experience has shown that spills up to 35 gallons (on a flat surface) can be mitigated successfully with a 2½ gallon pressurized water extinguisher at 100% F-500 concentrate. Follow treatment immediately with water.

Application From a 2½ Gallon Extinguisher

A) Dike/block drains and entrances to waterways before applying F-500 or water to the spill area.

B) F-500 is applied to the spill as 100% concentrate from the pressurized water (PW) extinguisher covering as much area as possible. (The F-500 concentrate is poured in to fill the 2½ gallon PW extinguisher and then pressurized.) Once F-500 is applied, a **booster line or handline with tank or hydrant water** can be used to wash or agitate the F-500 into the spill. It is **important to remember** that water is the medium for activation of F-500. As more water is applied, the quicker and more effective F-500 will work to neutralize and suppress flammability of the spill.

Clean-Up of Spill After F-500 Use

A) Utilize department policy in accordance with government environmental regulations. (It is never recommended to wash any substance into the drainage system.)

B) History has shown that when a spill is mitigated with F-500, and the liquid on the ground is allowed to evaporate the spill is not detectable.

Large Spill Applications

When faced with surface spills in excess of 25 gallons, it is recommended that F-500 be proportioned at 3% through a handline to mitigate the surface of the spill. F-500 should be applied until visually apparent (milky white), over the entire area of the spill. Same precautions are used to assure that spilled liquid, F-500 and water do not enter the drainage system. Again, history has shown that with a large flat spill, once mitigated with F-500, the solution can evaporate into the atmosphere without applying absorbents to the spill.

Pooled Spills

When confronted with a spill (not involving fire) resulting in a large quantity of pooled or puddled fuel, a determination is to be made by the Incident Commander (IC) whether to completely neutralize the fuel or to secure the scene and call for a hazardous materials removal company to vacuum off the spill. Most often, the latter procedure is used when the fuel is not creating an imminent danger to the public. **Always follow established Environmental Procedures as dictated by your Local, State, and Federal Regulations, as well as established Department SOGs.**

Note: This information is submitted as a recommended guide to establish a Departmental SOG when using F-500 as part of your emergency response procedures, and should in no way be considered a replacement for existing, established protocol. Hazard Control Technologies, Inc. is responsible for the quality of the product F-500 only, and will not assume responsibility for any other problem areas encountered when the product is being used.

(SAMPLE SOG #5 for the Use of F-500 in Fire Department Operations)

GUIDELINES MANUAL

To: All Personnel

Objective: To Establish a Manner for the Use of F-500 to Neutralize and Suppress Flammability of the Hydrocarbon Liquid Vapors

Responsibility: As Directed by Department Policy

Procedure: This guideline is recommended when using F-500 to render Class B hydrocarbon liquids non-flammable.

Application Rate and Procedure to Neutralize and Suppress Flammability of Class B Hydrocarbon Liquids

A) When vapor suppression is desired, it is **imperative** to apply **1 pint (16 ounces) of F-500 for every 1 gallon of Class B hydrocarbon liquid and agitate with a minimum of 4 gallons of water (1:8:32 ratio).**

B) When this procedure is followed, it has been consistently proven that the fuel becomes non-flammable and unable to support combustion. The vapor levels are reduced significantly and now the hydrocarbon molecules are in a chemical cocoon as provided by the F-500 molecules. Verification of vapor suppression should be confirmed by use of a field lower explosive limit (LEL) meter.

Note:

The ratios stated herein must be present in order to accomplish complete neutralization of the hydrocarbon liquid. The HCT Fuel Neutralization Table should be used when there is a need to neutralize and suppress flammability of Class B hydrocarbon liquids (as provided in the HCT F-500 Training Manual).

Note: This information is submitted as a recommended guide to establish a Departmental SOG when using F-500 as part of your emergency response procedures, and should in no way be considered a replacement for existing, established protocol. Hazard Control Technologies, Inc. is responsible for the quality of the product F-500 only, and will not assume responsibility for any other problem areas encountered when the product is being used.

(SAMPLE SOG #6 for the Use of F-500 in Fire Department Operations)

GUIDELINES MANUAL

To: All Personnel

Objective: To Establish a Manner for the Use of F-500 on Vehicle Fires

Responsibility: As Directed by Department Policy

Procedure: This guideline is recommended when using F-500 to extinguish vehicle fires. The size and type of vehicle, as well as the cargo on board, will determine the firefighting appliances used [e.g. booster lines, handlines (1.5 1.75), deck guns, etc.].

Automobile Fire (Typical Scenario) Pre-Mixed in Booster Tank at 1%

Depending upon your current SOG for automobile fires, some departments are still using a booster line to attack a car fire, others are using a 1.5, 1.75 jump, or trash lines, some are using a pre-connect crosslay etc. When F-500 is pre-mixed in the booster tank, and the engine company is on the scene, the tank valve is opened and the attack line valve is opened and charged. The line supplies a 1% solution through the handline to attack the vehicle fire.

Note:

It has been found, on a consistent basis, that the attack line crew can extinguish a fully involved vehicle from a safe distance. It has also been noted that a fully involved vehicle is extinguished in a matter of a few seconds with minimal use of water and F-500 (up to 100 gallons for complete extinguishment and overhaul has been the standard).

Automobile Fire (Typical Scenario) Using In-Line F-500 Tank with Pump Panel Proportioners and Valve Control

When the attack line is the dedicated F-500 in-tank proportioned line, the proportioner at the pump is set at 1% and the valves are opened to provide that flow of F-500. The pump operator is familiar with the sequencing of the in-tank, pump proportioning system. Manufacturer's recommendations and manual for that system should be followed in order to achieve proper rates and flows.

Automobile Fires (Typical Scenarios) - Use of In-Hose Line Eductors 95gpm/125gpm/250gpm

A mechanical eductor can be used to introduce the F-500 into a handline for fighting vehicle fires. In most cases, the eductor is placed at the discharge line outlet that will be supplying the attack line.

1) It is imperative that the GPM rating of the eductor match the GPM setting of the nozzle being used. Example: If you are using a 125 GPM eductor, the nozzle must be set to 125 GPM. If the nozzle selection is 95 GPM, you will not achieve eduction of the product from the container. This is the #1 reason for failure to educt product through a handline.
2) It is also imperative that the gate on the nozzle, or the nozzle itself be completely open in order to achieve proper eduction and flow of product through the handline. Pressure of 200 psi at the pump is a standard recommended by most eductor manufacturers. Sufficient pressure at the eductor is required for the F-500 to be picked up through the tube and displaced through the handline.

(SAMPLE SOG #7 for the Use of F-500 in Fire Department Operations)

GUIDELINES MANUAL

To: All Personnel

Objective: To Establish a Manner for the Use of F-500 on Large Scale Class B Transport Vehicles

Responsibility: As Directed by Department Policy

Procedure: This guideline is recommended when using F-500 to extinguish and control a large scale, large quantity Class B liquid fire in a transport vessel (truck, rail car, etc.).

Attack and Appliance Procedure

In a Class B tank truck (i.e., 8500 gallon) fire, a recommended procedure for initial attack and extinguishment would be as follows:

A) Deck gun or master stream with a 2½" supply line of F-500 at 3% concentrate. Deck guns can be used from their mounted position on the engine company or in a portable operation on the ground. For a portable operation, a 2½" eductor is required to supply the feeder line to the deck gun. For a mounted operation an F-500 in-truck tank in conjunction with a large supply nozzle with a proportioner/pick up tube must be used. **Tank water can be used to make the initial attack followed by a supply line to the attack engine.**

B) A straight stream application on the side of the tank structure will achieve the following:

1) Heat reduction of the tank metal.
2) Initial knock down of the bulk of the fire.
3) Safer atmosphere in which handline operations can take place with a 3% concentrate of F-500 to complete extinguishment.

Note:

The application rate table should be consulted for different types of polar and non-polar solvents.

Note: This information is submitted as a recommended guide to establish a Departmental SOG when using F-500 as part of your emergency response procedures, and should in no way be considered a replacement for existing, established protocol. Hazard Control Technologies, Inc. is responsible for the quality of the product F-500 only, and will not assume responsibility for any other problem areas encountered when the product is being used.

(SAMPLE SOG #8 for the Use of F-500 in Fire Department Operations)

GUIDELINES MANUAL

To: All Personnel

Objective: To Establish a Manner for the Use of F-500 on Structure Fires

Responsibility: As Directed by Department Policy

Procedure: This guideline is recommended when using F-500 to extinguish structure fires. We will consider all buildings (small, medium, and large) to be structures. The quantities and types of attack lines and appliances used will be determined by the size and type of structure.

Attack Line and F-500

A) Departments using F-500 in truck tanks that are proportioned at the pump panel usually dedicate that line as the initial fire attack line. This way, the FAO/Engineer can dial in the desired percentage (%) of F-500 (usually 1%) . That line is used as the initial attack line. It can be a 1.5/1.75, or a 2½" handline. Important: The eductor GPM must match the nozzle GPM to achieve the proper finished product. Also, pump pressure must be per the recommendation of the eductor manufacturer (usually 200 psi at the pump).

B) Mechanical eductors can be placed at the discharge outlet at the pump panel with the attack line attached to the eductor as the attack line. This procedure will allow for the eduction of F-500 from a 5 gallon container using the pick-up tube procedure. Matching GPM rates and pump pressures are required here as if you are running off the in-truck proportioning system.

C) Mechanical eductors can be placed in between two handline sections to achieve F-500 introduction to that handline. It is important to note that 200 feet of hose is the maximum length that can be used without losing some of the flow concentrate. (e.g., You can place a 125 gpm eductor after the first, second, or third section of hose line to conserve product usage; however, NFPA and IFSTA recommend that when using a mechanical in line eductor, 100 feet is the maximum distance between the nozzle and the eductor to achieve maximum performance.)

(SAMPLE SOG #9 for the Use of F-500 in Fire Department Operations)

GUIDELINES MANUAL

To: All Personnel

Objective: To Establish a Manner for the Use of F-500 to Supply Fixed Extinguishing Systems (e.g., Sprinkler, Deluge Systems)

Responsibility: As Directed by Department Policy

Procedure: This guideline is recommended when using F-500 to supply fixed extinguishing systems. As an example, we will use a warehouse with a fixed sprinkler system that has fire department connections on the outside of the building.

APPLICATION PROCEDURE

A) **Pumper Hook Up and Supply**

1) The Incident Commander (IC) can instruct an arriving engine company to connect into the fire department connection to feed the sprinkler system. If the pumper has an in-truck F-500 tank, a 2½" supply line can be connected to the sprinkler system connection. Then the proportioner and valve controls are set to flow F-500 from the tank through the hoseline that is supplying the sprinkler system. The percent concentrate would be determined by the type of materials burning, quantity, etc.
2) For those pumpers without an in-truck F-500 tank, a mechanical eductor can be placed at the discharge outlet at the pump panel. Using a pick-up tube and F-500 containers, the F-500 can be introduced into the handline currently supplying the sprinkler system with F-500 and water.
3) Pre-mixed booster tanks on engine companies or pre-mixed tankers containing large quantities of water and F-500 can be used to supply the sprinkler system from the outside.

B) **Pre-Mixed and Attached F-500 Tanks Supplied to Sprinkler Systems**

1) F-500 can be pre-mixed in above or below ground water supply/distribution tank systems and used for the water supply of the fixed system.
2) F-500 concentrate tanks can be installed adjacent to the sprinkler system utilizing an eductor system for proportioning. The water supply passes by the eductor/proportioner thus introducing F-500 into the sprinkler piping system and discharging at the sprinkler heads.

(<u>SAMPLE SOG #10</u> for the Use of F-500 in Fire Department Operations)

GUIDELINES MANUAL

To: All Personnel

Objective: To Establish a Manner for the Use of F-500 with Aerial and Master Stream Appliances

Responsibility: As Directed by Department Policy

Procedure: This guideline is recommended when using F-500 through Aerial and Master Stream appliances. Aerial equipment and master streams can be used to introduce F-500 for large scale offensive and defensive attacks. **<u>Example: Consider a commercial strip mall with a collapsed tar and gravel roof. Assume the contents of the mall, and the roof material is burning.</u>**

<u>Aerial Attack and Application Procedure Using Master Stream/ Monitor and F-500</u>

A) F-500 can be educted from the inlet of the waterway via a 2½" eductor. A 2½" or 3" hose line can be used as the feeder line to the aerial monitor. It may be necessary at times to use more than one water supply line to achieve the total flow rate of the monitor. Depending on the size of the fire and building(s), additional aerial units may be needed to achieve extinguishment. A stubborn tar/roof fire or a burning flammable liquids storage facility can be brought under control with F-500 through a safer, defensive mode attack. As long as F-500 is applied with water to the surface of the burning material, extinguishment can be achieved.

B) F-500 can be introduced through Master streams such as deck guns and large diameter handlines. F-500 is educted through mechanical or truck proportioning systems at rates to achieve desired percent concentrate. Good results can be achieved from a defensive attack while providing for a safer extinguishment environment.

(SAMPLE SOG #11 for the Use of F-500 in Fire Department Operations)

GUIDELINES MANUAL

To: All Personnel

Objective: To Establish a Manner for the Use of F-500 on Class A and Class B Fires

Responsibility: As Directed by Department Policy

Procedure: This guideline gives an overview on the use of F-500 on Class A and Class B fires.

F-500 Use on Class A Fires

Generally speaking, F-500 is recommended for use at 1% on all Class A fires (e.g., wildland, automobiles, structures, tires, wood, paper, hay, straw, cotton, fiberglass, trash compactors, dumpsters, etc.).

F-500 Use on Class B Fires

F-500 can be used (as recommended in the F-500 brochure) at 3% and 6% on Class B Polar and Non-polar liquids. Application rates should be followed as outlined in the F-500 Training Manual. As a general rule, liquids such as gasoline, jet fuel, and heptane can be extinguished using a 3% concentrate application, while methanol, MTBEs, and MEKs can be extinguished using a 6% proportioning rate of F-500 (in accordance with the published Class B application rates).

Note: This information is submitted as a recommended guide to establish a Departmental SOG when using F-500 as part of your emergency response procedures, and should in no way be considered a replacement for existing, established protocol. Hazard Control Technologies, Inc. is responsible for the quality of the product F-500 only, and will not assume responsibility for any other problem areas encountered when the product is being used.

(SAMPLE SOG #12 for the Use of F-500 in Fire Department Operations)

GUIDELINES MANUAL

To: All Personnel

Objective: To Establish a Manner for the Use of F-500 on Coal Bunker Fires

Responsibility: As Directed by Department Policy

Guideline:

1) Coal fires are also recommended to be extinguished using a 3% concentration rate. This rate is recommended so that a minimal amount of water will have to be introduced into the coal storage area (i.e., bunker, silo).
2) Most coal bunker fires are fought from the top of the bunker.
3) Usually the most readily available water supply will be from the power plant standpipe system.

Note:

HCT recommends never attacking the fire from the bottom of the hopper to try to extinguish a coal bunker fire. This procedure could lead to a coal dust explosion.

Procedure:

1) In order to prevent a possible coal dust explosion, wash down the Tripper Room with 3% F-500 solution prior to extinguishment procedures.
2) Locating the seat of the coal bunker fire can be difficult. The fire may be located many feet below the surface of the coal, the bunker and bunker room may be filled with smoke, or the bunker may be obstructed by numerous steel cross beams. Use of a laser pyrometer or thermal imaging camera will greatly improve the ability to quickly locate the seat of the fire.
3) Once the seat of the fire has been located, HCT recommends use of a fog pattern which will allow an immediate reduction in the explosive hazard created by coal dust.
4) Once the fire area has been thoroughly covered using a fog pattern, the water stream should be tightened to a straight stream to facilitate penetration to the seat of the fire. The straight stream should also be used to cool the interior steel work of the bunker.
5) Teamwork between the pyrometer/imager operator and the nozzleman should be used to intermittently identify the hotspots and complete the extinguishment.

6) Care should be taken to prevent the introduction of excessive amounts of water to the bunker. Large water flows will result in coal sludge accumulating in the bottom cone of the bunker, and may render the tripper lines located below the bunker inoperable.

Typical Hardware:

1) 95 gpm in-line eductor with 1 ½" hose connections connected directly to the standpipe system
2) 100 feet of 1 ½" fire hose connected to the in-line eductor
3) 1 ½" 95 gpm nozzle connected to the fire hose
4) 40 - 50 gallon of F-500 located so that the pick up tube from the eductor can be easily placed in the F-500 container

Since coal fired generating plants are built in a wide variety of configurations, more detailed preplanning than is outlined here may be required to properly prepare for a bunker fire at your facility. Contact HCT Headquarters at (770) 719-5112 for more information.

Note: This information is submitted as a recommended guide to establish a Departmental SOG when using F-500 as part of your emergency response procedures, and should in no way be considered a replacement for existing, established protocol. Hazard Control Technologies, Inc. is responsible for the quality of the product F-500 only, and will not assume responsibility for any other problem areas encountered when the product is being used.

(SAMPLE SOG #13 for the Use of F-500 in Fire Department Operations)

GUIDELINES MANUAL

To: All Personnel

Objective: To Establish a Manner for the Use of F-500 on Rolled Bales of Hay, Paper, and Other Class A Materials

Responsibility: As Directed by Department Policy

Procedure: This guideline is recommended when using F-500 to extinguish rolled bales of hay, paper, and other Class A materials. The quantities and types of attack lines and appliances used will be determined by the number of bales and their location.

APPLICATION PROCEDURE

Departments using F-500 through mechanical eduction equipment (i.e., inline eductors, onboard proportioners, round-the-pump proportioners, etc.) must follow guidelines set forth in the "Operation of Liquid Concentrate Delivery Equipment," page 35 of this manual.

Departments using F-500 pre-mixed in their booster tank should follow SOG #9, page 53 of this manual.

Note:

Piercing nozzles are an effective way of delivering F-500 solution into the core of the bail.

Bailed Material Located Outside a Structure

Using ½% of F-500, extinguish and cool the surface of the bailed materials. This is accomplished using a fog pattern of 30^{o}-60^{o}. Then shut down the nozzle, find the seated fires, and then work to direct the F-500 straight stream into the center of tightly compacted materials to cool and extinguish the coals or embers that have become "deep seated." Use caution during this procedure to prevent the dispersion of burning embers.

Note: Experience has shown that unrolling the bailed material is the most effective way to confirm that the fire is completely extinguished. F-500's cooling properties have proven to speed up this process as compared with plain water and Class A foams.

Bailed Material Located Inside a Structure

When bailed material is located inside a structure, you are using both structural and bailed material firefighting techniques. Always use departmental SOG's in fighting structural fires. The method below is strictly for extinguishing bailed materials.

Using 1% of F-500, extinguish and cool the surface of the fire. You must work to direct the F-500 straight stream into the center of tightly compacted materials to cool and extinguish the coals or embers that have become "deep seated."

Note:

Experience has shown that use of F-500 inside a structure fire will reduce the heat six times faster than plain water or Class A foams, which allows a quicker removal of bailed materials. Upon removal of bailed materials, follow procedure as written above.

Note: This information is submitted as a recommended guide to establish a Departmental SOG when using F-500 as part of your emergency response procedures, and should in no way be considered a replacement for existing, established protocol. Hazard Control Technologies, Inc. is responsible for the quality of the product F-500 only, and will not assume responsibility for any other problem areas encountered when the product is being used.

(SAMPLE SOG #14 for the Use of F-500 in Fire Department Operations)

GUIDELINES MANUAL

To: All Personnel

Objective: To Establish a Manner for the Use of F-500 - Decontamination of Personal Protective Clothing

Responsibility: As Directed by Department Policy

Procedure: Turnout gear, gloves, boots, etc., when soiled with hydrocarbon-based chemicals (including soot), should be cleaned promptly to decontaminate and enhance the health and safety of the firefighter. This will also preserve the length of time required before replacing the equipment.

Decontamination of Gear on the Scene

A booster, 1½" or 1¾" handline set at 3% can be used to neutralize the hydrocarbon-based materials, as well as soot and dirt, from the complete set of personal protective gear. The F-500 will not harm hardware such as PASS devices, SCBA masks or packs, flashlights, etc. that will be carried and worn by the firefighter. Once the F-500 solution is used to decontaminate the gear, rinsing with fresh water is recommended to complete the process. (Remember: F-500 is **NON-CORROSIVE AND NON-HAZARDOUS;** therefore, minimizing any threat of injury or health risk to the firefighter.

F-500 Used in Turnout Gear Extractors

Place 4 ounces of F-500 in the extractor with the turnout gear. This process will remove the contaminants that reduce wear life while enhancing the firefighter's personal health and safety.

Note: This information is submitted as a recommended guide to establish a Departmental SOG when using F-500 as part of your emergency response procedures, and should in no way be considered a replacement for existing, established protocol. Hazard Control Technologies, Inc. is responsible for the quality of the product F-500 only, and will not assume responsibility for any other problem areas encountered when the product is being used.

(SAMPLE SOG #15 for the Use of F-500 in Fire Department Operations)

GUIDELINES MANUAL

To: All Personnel

Objective: To Establish a Manner for Use of F-500 on Wildland Firefighting

Responsibility: As Directed by Department Policy

Procedure: This guideline is recommended when using F-500 to extinguish wildland fires. The quantities and types of attack lines and appliances used will be determined by the size of the incident.

Wildland Firefighting

A) Departments using F-500 in truck tanks that are proportioned at the pump panel usually dedicate that line as the initial fire attack line. This way, the FAO/Engineer can dial in the desired percentage (%) of F-500 (usually ½% - 1%) . That line is used as the initial attack line. It can be a 1", 1.5", or a 1 ¾" handline. Important: The eductor GPM must match the nozzle GPM to achieve the proper finished product. Also, pump pressure must be per the recommendation of the eductor manufacturer (usually 200 psi at the pump).

B) Mechanical eductors can be placed at the discharge outlet at the pump panel with the attack line attached to the eductor as the attack line. This procedure will allow for the eduction of F-500 from a 5 gallon container using the pick-up tube procedure. Matching GPM rates and pump pressures are required here as if you are running off the in-truck proportioning system.

C) Pre-mixing the F-500 for wildland firefighting is recommended by Hazard Control Technologies at a ½%. For information regarding premixing F-500 in booster tanks, please refer to HCT SOG #3.

NOTE: HCT recommends applying F-500 to deep-seated fires (i.e., muck or peat fires) and then making a second application of the F-500 to allow for greater penetration to the substrate material.

Note: This information is submitted as a recommended guide to establish a Departmental SOG when using F-500 as part of your emergency response procedures, and should in no way be considered a replacement for existing, established protocol. Hazard Control Technologies, Inc. is responsible for the quality of the product F-500 only, and will not assume responsibility for any other problem areas encountered when the product is being used.

Supporting Material

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