Lexington County Fire Service

Standard Operating Guidelines
CAFS Apparatus Operations and Maintenance OPS-017

EFFECTIVE: March 1, 2010 **ISSUED BY**: Russell R. Rawl, Fire Service Coordinator

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RECINDS: All Previous Policies

SCOPE: All Lexington County Fire Service Personnel

PURPOSE: The purpose of this policy is to ensure the safe use of Class A Foam and Compressed Air Foam Systems (CAFS) in firefighting as well as to implement a standardized maintenance program for all CAFS outfitted apparatuses operated by the Lexington County Fire Service in effort to maximize the operational life of and to ensure the operational readiness of CAFS outfitted apparatuses at all times.

POLICY:

I. *TERMINOLOGY*

A. Class A Foam – is a synthetic detergent that affects the physical properties of water, thereby enhancing its ability to extinguish fires. Foam solution is created when0.1% or greater foam concentrate is added to water. The concentrate acts by reducing the surface tension of water and enabling it to penetrate materials more effectively.

B. Compressed Air Foam System – Is a balanced volume of compressed air into the foam solution while it is still in the plumbing of the apparatus, the foam then goes through the hose line which provides the mechanical agitation or scrubbing, thus creating what is called a “high energy” hose stream. The bubbles produced enhance the firefighter’s capabilities of water by increasing the surface area of water, thereby, increasing the steam conversion and allowing for greater absorption of heat.

C. Wet Foam – Created by increasing the amount of water introduced into the foam solution will yield wet, sudsy foam with a quicker drain time. Wet foam is high in

water content and will provide greater protection against thermal insult. This shall be used during any interior firefighting operations.

D. Dry Foam – Created by decreasing the amount of water introduced into the foam solution will yield dry "shaving cream" foam with a slower drain time. Dry foam is desirable for pre-treating or protecting exposures. Dry foam will cling to vertical surfaces and remain in place longer and act as an insulation blanket against thermal exposure. **Dry foam will not provide adequate thermal protection to crews who are attempting to fight structure fires from offensive, interior positions.**

II. *CAFS OPERATIONS PROCEDURE*

A. System Setup Procedure:

1. Put truck in **Pump Gear**
2. Turn on **Air Compressor** (30 PSI)
3. Flip **Auto Sync** from **Unload** to **Auto** (80 PSI)
4. Ensure **Tank to Pump** is fully **OPEN (This is to remain open at all times)**
5. Turn Foam System **On**
6. Ensure **Panel** Position **Switch** is in appropriate **Position (CAB or PANEL)**

B. Pump Operations Procedure:

1. Make sure you know which lines or lines you will be flowing.
2. To flow CAFS water supply should be in the **DIRECT TANK FILL ONLY.**
3. Charge line that will be used. Pull valve approximately 1/3 open.
4. **OPEN AIR VALVE ALL THE WAY**. You will adjust the thickness of the foam by the water valve.
5. Throttle up engine to the pressure you want. (No less than 100 psi)
6. Watch your gauges and hose line or lines.
7. Watch water and foam levels and fill accordingly.

C. System Shut Down Procedure:

1. Turn off the air valve
2. Turn **OFF FOAM SYSTEM** by pushing red button.
3. Flow line until clean water is flowing
4. Close water valve once line is clean.
5. Switch the Auto Sync to unload.
6. Turn off the compressor.

**When you are going to be flowing CAFS there is no need to turn on the pump cooler. A valve has been installed that will automatically open when the

compressor has been activated. ONLY when you are **NOT** flowing CAFS is the pump cooler valve on the pump to be opened. **

ADDING FOAM VIA THE AUTO LOAD SYSTEM

The fill wand and hose is located in the passenger side front compartment behind the tool shelf.

When adding foam to the truck via the auto refill system a person should be placed in the cab of the truck watching the foam level lights and advise when the tank is full. Enough buckets of foam should be OPEN and ready to be used when this process is going on. When the Auto fill is selected the filling process should stop. During the manual operation the fill process will not stop when the foam level is full.

After the foam is refilled the selector switch should be placed in FLUSH position and water should be run through the wand and hose to flush them out. This will keep the foam from stopping up the hose.

III. CAFS *OPERATIONS CONSIDERATIONS*

A. Upon the decision of first arriving personnel to use CAFS during operations the Apparatus Operator of the CAFS engine shall establish a positive water source. When connecting to the water source the apparatus operator shall connect the supply line to the "Direct Tank Fill" for CAFS operations.

B. During interior operations the minimum pump pressure shall be no less than 100p.s.i. for any hand lines. This is the minimum pressure recommended by the manufacturer to prevent hose line kinking.

C. Foam concentrate percentage (%) shall be no less than 0.2 as displayed on the Advantus control unit located in the cab and on the pump panel. Default settings are 0.3%

D. Nozzle shall be a smooth bore type. A fog nozzle distributes the CAFS production by crushing the bubbles produced. Lines equipped with CAFS shall have the following:

1. 1¾" hand lines, the nozzle shall be of no less than a 1" tip.
2. 2½" hand lines, the nozzle shall be no less than a 1¼" inch tip.

E. The first arriving personnel shall make the decision to use CAFS based upon his/her initial size-up, training, and experience.

F. Engines equipped with CAFS shall maintain the foam tank to its full capacity by both LED panel lights and visual inspection into the tank.

G. Engines equipped with CAFS will also carry no less than three (3) five- gallon buckets of Class A foam on the apparatus as reserve.

H. Class B foam **WILL NOT BE USED IN THE CLASS A FOAM TANK**

IV. *CAFS TACTICS*

Class A foam should be considered the primary extinguishing agent for any fire involving Class A materials (brush, debris, vehicles, agricultural products and recycled materials). Offensive attacks being mounted on structure fires should utilize Class A foam solution with the initial and subsequent hose streams.

CAFS is an adjunct to Class A foam its encapsulating qualities can suppress pre and post fire products of combustion significantly reducing toxic exposure to personnel. Consideration should be given to a brief, well placed exterior attack on structure fires, prior to making entry. This may give personnel time to assemble an RIC while allowing a single firefighter the opportunity to impact interior conditions from a safe location. A CAFS stream has the potential to remotely affect the fire and reduce heat and smoke levels throughout the structure, making the subsequent entry safer.

CAFS is appropriate for large defensive fires, but incidents that produce significant thermal columns may present a challenge to the use of CAFS. Thermal columns have the tendency to rapidly consume CAFS streams if they are applied on the main body of fire. Crews should direct CAFS streams to the perimeter sections of the fire and wok their way in towards the main body of fire.

A. WILDLAND APPLICATION**:** Defined in two categories, direct attack and indirect attack

1. DIRECT WILDLAND applications will use compressed air foam streams for better reach and penetration. As the intensity of the fire lessens, the use of medium expansion foams can be used to blanket smoldering area and reduce smoke generation.

2. INDIRECT WILDLAND applications will use low and medium expansion foams for pretreatment of fuels in the path of an incoming wild land fire. This will saturate dry fuels with longer evaporation rate Barriers of foam can be set up using medium expansion foams that lead to interface areas. Low expansion to medium expansion foams can be used to create fire breaks.

B. WILDLAND AND URBAN INTERFACE APPLICATION usually consists of exposure protection to structures to from oncoming wild land fires. Interface protection is done with a two step process; the first application to the exposed structure will be done with a wet foam application (0.3%) and then coated with a second layer of fluid foam (0.3-0.8%). Advantages of using compressed air foam for interface operations include extended capability of water and personnel, creating foam lines and barriers, raising the fuel moisture of wild land and structural fuels, and coating existing structures with a protective layer of foam.

C. Interior Structural Attack

Wet CAFS will be used for all interior structure attack. Minimum recommended flows for 1 ¾ hand lines are 100gpm and 40-45 cfm with 0.3% class A concentrate. The nozzle shall be either a smooth bore pistol grip quarter turn ball valve with a 1-3/8 water way and no smaller than a 15/16 detachable tip, or approved nozzle. When using 2 ½ inch lines minimum flows are 150gpm and 70cfm. Flows will be at 0.3% concentrate and 100psi through a smooth bore play pipe with a 2" water way and 1¼" tip.

Application method will be determined by conditions upon arrival. For pre-flashover conditions the applications should begin prior to crews being forced to the floor by heat. The objective is to paint all surfaces on the upper 2/3 of the walls and ceiling white to absorb radiant and convected heat. Crews should advance through the treated area for search and rescue and fire extinguishment. If the seat of the fire is unknown CAFS should be applied continuously until the seat is identified and extinguished.

For post flashover conditions paint all surfaces including the floor and contents utilizing a box pattern for extinguishment and cooling. Ensure crews utilize the reach of the stream and advance through the foam treated areas as conditions allow. Utilizing these application methods will reduce heat by absorbing BTU's and will improve visibility and enhance safety by removing carbon from the atmosphere.

Under all conditions crews should avoid using dry foam or premature shutting off of the nozzle as this will cause under application of foam.

D. Exterior Structural Attack

Exterior structural applications of CAFS can be made effectively without pushing the fire due to the use of solid streams and the effectiveness of the foam. Because of the high energy and reach of the stream, crews can begin application from a safe distance outside the collapse zone. Transitional attack is an effective tool beginning exterior and moving interior as conditions allow. Use of wet to very wet CAFS for penetration through the thermal column is highly recommended. Match flow rate to building and fire conditions, big fire = big foam. When choosing lines consider the

maximum air volume limitations of the compressor to assure that each line maintains the proper foam consistency.

E. Standpipe Operations

CAFS can be used effectively in dry standpipes. Utilize the same pressures and flow rates as for ground level attack lines. There is little friction loss or head pressure affect associated with CAFS. CAFS is **NOT** recommended for wet standpipes due to the fact that the standing column of water will dilute the initial foam and that compressible agents will not easily lift the water column.

F. Vehicle Fires

When using CAFS for a vehicle fire a two-step process is used. The initial attack on a vehicle fire will consist of a 1-1/2 or 1-3/4 CAFS line from a safe distance to knock down the fire. Once the fire is suppressed a medium expansion foam nozzle will be used to extinguish the fire at a closer distance to the vehicle.

G. Flammable Liquids

Class A foam **SHALL NOT** be used on commercial quantity Class B fires. Class A foam may be used to extinguish small quantities of class B fuels but will not provide a vapor seal.

V. *CAFS Apparatus Maintenance:*

A. Annual Maintenance

Hydraulic oil filter and the separator filter should be changed annually by Fleet Services. They will maintain the records for this and should change during service.

B. Monthly Maintenance

On the first Monday of every month the "Y" strainer for the foam system should be checked and cleaned. This is located on the passenger side of the pump. You will need to remove all discharge connections and the steamer cap and open the left side of the pump panel. A quarter turn valve is located on the top to the strainer and it should be shut off. The cap will then be removed and the strainer taken out and cleaned.

C. Weekly Maintenance

Monday of every week the truck should have an air flow done to ensure that all trash is removed from the air system. This is done by turning on the air compressor only and opening both valves on the gated wye on the front jump line and the air valve **ONLY** for that discharge and allow the air to flow for 15 minutes. This allows the

trash in the system to dry out and be blown out of the lines to ensure they work properly.

D. Daily Maintenance

Every shift all fluid levels for the truck should be checked. The compressor oil should be in the middle of the site glass located on the driver's side of the pump in the lower left hand side. It should be filled with ISO 68 hydraulic low foaming oil.

The foam proportioner is located on the passenger side of the pump in the lower right hand corner. This level should also be checked daily. The oil level should be seen when the cap is removed. A 30W non detergent should be used when adding oil to this unit.

All other fluids should be checked daily prior to cranking apparatus and only add appropriate fluids when needed.

Foam level should be checked by both the panel lights and a visual inspection into the foam tank. Tank shall be kept full at all times.

All other equipment should be checked daily to ensure proper operation.