



CAFS RATED HOSE—YES OR NO?

Lois P. Sicking, Mechanical Engineer

The following article was published in the *"Foam Applications for Wildland and Urban Fire Management,"* Volume 7, No. 2, September 1995 by the National Wildfire Coordinating Group and sponsored by the United States Department of Agriculture, Department of the Interior, National Association of State Foresters, in cooperation with the Petawawa National Forestry Institute and Canadian Forest Service. The USDA Forest Service is reprinting this article at the request of the wildland firefighting community. The original article is reproduced here for your use.

CAFS RATED HOSE—YES OR NO?

Pressure is pressure, whether created by a liquid or a gas. Fire hose constructed to the USDA Forest Service Specification 5100-186 or 5100-187 is rated for a working pressure of 450 psi and can be used for any water or foam application, including Compressed Air Foam Systems (CAFS), and maintain firefighter safety.

Some firefighters have expressed concern about the need to use only "CAFS rated hose." Typically, CAFS hose lines are operated at a pump discharge pressure of 75 to 150 psi, substantially below the working pressure of 450 psi for forestry hose constructed to the USDA Forest Service specifications. In addition, there have been no "pulsations" or water hammer noted with the CAFS use of forestry hose when the CAFS unit is operated properly.

The Fire Equipment Manufacturer's Association (FEMA) has issued a Safety Alert Technical Bulletin stating that "FEMA strongly recommends that no hose be used on a CAFS system unless such use is recommended by the manufacturer on the system and the hose manufacturer. Use of non-approved hose can be dangerous and may cause hose and or coupling failure, producing property damage, bodily injury, or death."

FEMA has also requested that the NFPA Technical Committee on Fire Department Apparatus expand on the section regarding CAFS rated hose in the proposed document, NFPA 1906, Standard for Wildland Apparatus.

The current NFPA 1906, 1995 edition, refers to hose used in CAFS, in Section A-8-2(f) in Appendix A, Explanatory Material. This section reads, "If the hose is intended to be used with CAFS, the user should check with the manufacturer of the hose to ensure that the hose has been approved for use with CAFS."

The FEMA Safety Alert further notes that "Standard commercial fire hose carried on apparatus is not designed to transport air and may react violently under those conditions." SDTDC has reviewed technical information, solicited input from firefighters and fire hose manufacturers, and has determined that there are no known incidents where forestry hose has failed when used with a CAFS system, where the hose would not have also failed with the use of water only.

Furthermore, there have been no known incidents where hose has reacted violently under those conditions. Fire hose manufacturers have not designed any hose specifically for CAFS use due to there being no standards at this time.

Air is a compressible substance. Unlike water, air will compress. Water is a noncompressible substance, associated with water hammer when it is used alone.

A mixture of water and the amount of air typically used in CAFS will not cause water hammer. To the contrary, the air will compress, preventing water hammer and any violent reaction.



One important consideration in the use of fire hose with CAFS is that, if the user introduces 100 percent air into fire hose and if the air is compressed to a high enough pressure, the air temperature will go up high enough to melt the hose. If 100 percent compressed air at 150 psi is introduced into the fire hose, the temperature can go up to a theoretical 590 degrees Fahrenheit for single stage compression. This loss of integrity by the hose is due to the high temperature generated by the compressed air, not the structure of the hose.

An article in *Firefighter's News*, April-May, 1995, states that, "The best hose to be used with CAFS is the extruded or the rubber-lined double jacket types. However, some firefighters feel that conventional hose is not rated to be used with CAFS. This is pure nonsense. Pressure is pressure;

hydraulic or pneumatic. If the hose is rated at 250 psi, it will perform no better or worse with CAFS. Of all the departments using CAFS, none have reported hose failures. The exception is a piece of bad hose that would have broken if only water had been used. Basically, if the hose is weak, it is not safe to be used with CAFS or with water."

There are no known incidents where forestry hose has failed when used with a CAFS, where the hose would not have failed with the use of water only. In addition, an informal survey of CAFS users did not find any unusual problems with fire hose when using CAFS. USDA Forest Service Specification 5100-186 and 5100-187 fire hose is rated for a working pressure of 450 psi and can be used for any water or foam application, including CAFS, and still maintain firefighter safety.

UPDATE SEPTEMBER, 1998

The Safety Alert Technical Bulletin issued in June 1994, by the Fire Equipment Manufacturer's Association, was reissued in March 1998. The Forest Service revisited the issues described in this Bulletin and discovered that, again, there were no known incidents where forestry hose failed when used with a CAFS unit, where the hose would not have also failed with the use of water only. Concerned firefighters requested the reprinting of this article for the benefit of the wildland firefighting community.

In addition, it is worthy to note that Forest Service Specifications 5100-186 and 5100-187 were revised in October 1996. Current technology and changes in practice were considered in these revisions by reviewers, consisting of fire equipment manufacturers, fire engine personnel and technical staff. No changes were requested by reviewers regarding the aforementioned concerns described in the FEMA Safety Alert Technical Bulletin.

For further information contact the Project Leader, Lois Sicking at 909-599-1267 x294, or IBM address: lsicking/wo,sdt dc, or Internet E-mail address: lsicking/wo_sdt dc@fs.fed.us



The Forest Service, U.S. Department of Agriculture has developed this information for the guidance of its employees, its contractors, and its cooperating Federal and State agencies, and is not responsible for the interpretation or use of this information by anyone except its own

employees. The use of trade, firm, or corporation names in this publication is for the information and convenience of the reader and does not constitute an endorsement by the U.S. Department of Agriculture of any product or service to the exclusion of others that may be suitable.