

Ask the experts why more
fire departments specify
LIGHT WATER® brand AFFF
than any other foam.

The AFFF Experts



**Exhibit
1164**

State of Minnesota v. 3M Co.,
Court File No. 27-CV-10-28862

*Light Water® is the Reg. TM of 3M Co. for Aqueous Film Forming Foam

3M_MN01048940

Ask the experts about the exceptional performance of LIGHT WATER AFFF.

From California to New Jersey... from Texas to Alaska, more fire chiefs insist on "LIGHT WATER" AFFF. Men with years of fire-fighting experience. Men with the enormous responsibility of protecting property and lives in their communities. They know "LIGHT WATER" AFFF takes care of flammable liquid fires fast. Because it forms a film that seals in volatile vapors. Reseals if it's broken. Prevents reignition. Provides a margin of safety that exceeds military specifications. And there's "LIGHT WATER" AFFF/Alcohol Type Concentrate (ATC) to handle alcohol and other polar solvent hazards. Fire chiefs know they can count on 3M, the AFFF experts. 3M pioneered the development of AFFF. Military and airport fire fighters have relied on "LIGHT WATER" AFFF for years. So have corporate safety managers in developing mutual aid AFFF banks with local fire departments. Expert technical assistance available on request. Ask us. 3M, the AFFF experts.

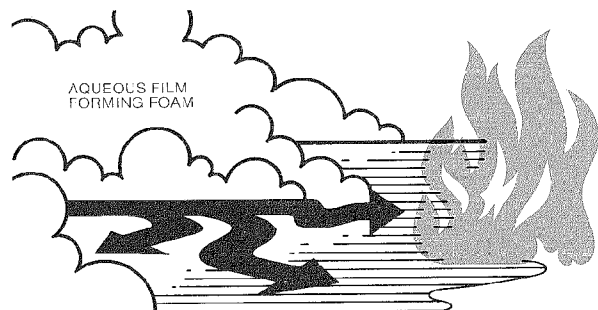
What Is "Light Water" Brand Aqueous Film Forming Foam?

"LIGHT WATER" AFFF is a synthetic foam-forming liquid designed for use with fresh, sea or brackish water. When proportioned with water and applied with conventional foam or water/fog equipment, it generates a white foam with the remarkable ability to make water float on flammable liquids which are lighter than water.

This double action—foam and aqueous film—enhances extinguishment of flammable liquid fires and prevents reflash. The action also takes place on spilled or leaking fuels which have not been ignited so they are secured and are not readily ignited.

The Most Effective Foaming Type Agent Ever Developed.

"LIGHT WATER" AFFF can extinguish a flammable liquid fire in less than half the time of conventional foams.



Aqueous film spreads across surface and extinguishes fire.



And keep it extinguished. The foam spreads over the surface of burning fuel forming a blanket in the manner of conventional foams. More important, an aqueous solution drains from the foam bubbles and forms a vapor-sealing film. This film floats on the fuel surface and suppresses volatile vapors. In addition, it has a reforming, self-healing action which prevents reflash should the foam be disrupted. "LIGHT WATER" AFFF also takes the fire hazard out of fuel spills because it seals and secures non-ignited areas and prevents ignition. The ability to form a vapor seal over flammable liquids permits "LIGHT WATER" AFFF to extend its performance well beyond that of ordinary foam. This performance is important in situations where there is limited or no access such as in storm sewers. The vapor-sealing film flows with the fuel and secures as it goes.

The Agent's low surface tension also provides excellent penetrating and wetting qualities when used on Class "A" materials. This is highly important when extinguishing deep-seated fires and for fires involving rubber materials.

Easy to Use

"LIGHT WATER" AFFF can be used with conventional foam equipment. Foam nozzles with pick-up tubes and line proportioners (in-line eductors) used with foam or water/fog nozzles are among the most common methods.

Unlike ordinary foams, "LIGHT WATER" AFFF may be used effectively with the water/fog nozzle and eductor combination.

"LIGHT WATER" AFFF is available in both 6% and 3% concentrations. To provide optimum foam solution, these should be used at their intended ratios.

6% Concentrate: 94% water and 6% concentrate.
(94 gallons water - 6 gallons concentrate = 100 gallons foam solution.)

3% Concentrate: 97% water and 3% concentrate.
(97 gallons water + 3 gallons concentrate = 100 gallons foam solution.)

Typical Properties of "Light Water" Concentrates

	6%	3% (Freeze Protected)
SPECIFIC GRAVITY		
77°F (25°C)	1.012	1.055
40°F (4.4°C)	1.025	1.066
10°F (-23.3°C)	—	1.084
VISCOSITY, CENTISTOKES		
77°F (25°C)	2.4	7.5
40°F (4.4°C)	4.8	16.3
-10°F (-23.3°C)	—	90
MINIMUM USE TEMPERATURE	35°F (1.7°C)	0°F (-18°C)
FREEZE POINT	25°F (-4°C)	-15°F (-26°C)
pH at 77°F	7.5	7.5

Excellent Long Term Storage

"LIGHT WATER" Concentrate may be stored in its shipping container without change in its original physical or chemical characteristics. It does not show significant sedimentation or precipitation in storage or after temperature cycling. Freezing and thawing have no effect on performance and the concentrate proportions satisfactorily in ordinary equipment at temperatures above 32°F. Freeze-thaw cycling may cause slight stratification which may be overcome with moderate agitation.

Premix solutions in fresh water may be stored long term for ready use at temperatures above freezing.

Environmentally Neutral

Standardized tests are conducted as an ongoing program to evaluate and assess the impact of "Light Water" Concentrate on humans and the natural environment. Based on these test results, "Light Water" Concentrate is biodegradable, low in toxicity, and it can be treated in biological treatment systems. In its concentrate form, "Light Water" AFFF was found to be a slight eye and skin irritant, but as a foam solution, there are no noticeable negative effects. Tests and actual use situations have shown that animal and aquatic life are not adversely affected.

"Light Water" AFFF Alcohol Type Concentrate

This special concentrate is available for hazards involving alcohol and other polar solvents. Underwriters' Laboratories lists "LIGHT WATER" ATC as an AFFF for flammable liquid hydrocarbons in addition to its primary UL listing as an alcohol type concentrate for alcohol and other polar solvent hazards.

For further information on "LIGHT WATER" AFFF ATC contact your nearest 3M branch office.



Application Methods

Mobile Systems

FOAM NOZZLES WITH PICK UP TUBES — handlines equipped with air aspirating nozzles and concentrate eductor tubes are efficient against Class B fires while enhancing Class A capabilities.

WATER/FOG NOZZLES — by using matched eductors, ordinary water/fog nozzles are very effective with "LIGHT WATER" Agent.

FOAM TRUCKS — mobile foam turret trucks using air aspirating equipment are several times more efficient using "LIGHT WATER" Agent.

COMBINED AGENT SYSTEMS — the effectiveness of both "LIGHT WATER" AFFF and dry chemicals is achieved in combination units in a wide range of sizes.

AERIAL MONITORS — elevated nozzles on booms or towers allow fast attack and extended reach for difficult situations such as storage tanks.

Fixed Systems

SUB-SURFACE APPLICATIONS FOR TANK FIRES — "LIGHT WATER" AFFF may be injected below the liquid level of a burning petroleum storage tank. It will float to the top and extinguish the blaze.

FOAM CHAMBERS — "LIGHT WATER" Agent can be applied topside through use of foam chambers.

STANDARD AND FOAM/WATER SPRINKLERS — "LIGHT WATER" AFFF offers increased protection over water and conventional foam systems. Existing sprinkler systems may be retrofitted to "LIGHT WATER" Agent use.

Proved in Tests and Fires in Anger.

"LIGHT WATER" AFFF has been tested for comparative and quantitative fire extinguishment efficiency in many situations. These tests have been conducted throughout the world by the fire equipment industry, municipal and airport fire departments, the U.S. Navy and Air Force, the petroleum refining industry, independent test laboratories, and governmental agencies. Among others, it has been tested against pooled fuel and fuel spill fires, flowing fuel into spill fires, storage tank fires, fuel fires on water, crashed aircraft fires, and on various chemical and solvent fires.

Data from these tests show that fire control time was as much as 5 to 1 in favor of "LIGHT WATER" AFFF over conventional agents while the amount of agent and concentrate used was as little as 1/3 as much.

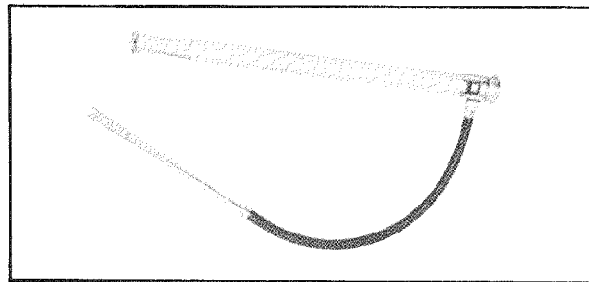
When combined with dry chemical agents, "LIGHT WATER" Agent demonstrated a great advantage in effectiveness (up to 1200%) over conventional foams on three dimensional fires.

"LIGHT WATER" Agent extinguished a petrochemical storage facility fire in California when nothing else worked.

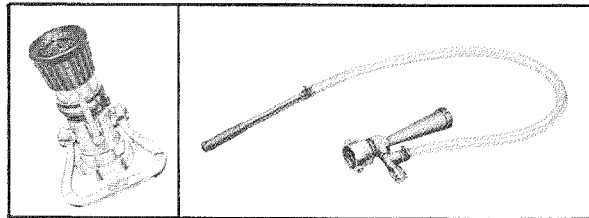
An oil tanker burned for three days in spite of all efforts to extinguish the blaze. "LIGHT WATER" AFFF put the fire out in approximately an hour, even though much of the blaze was below deck and could not be reached directly.

Numerous industrial fires have yielded to "LIGHT WATER" AFFF after conventional agents failed.

"LIGHT WATER" AFFF is listed by Underwriters'



Foam Nozzle with Pick Up Tube



Water/Fog Nozzle and Inline Eductor with Metering Valve.

Laboratories, Inc. and is approved by Factory Mutual. It is included in N.F.P.A. standards.

"LIGHT WATER" Agent exceeds the performance requirements of MIL-F-24385A.

The extra Margin of Safety — "Light Water" AFFF

Increased Safety to Life

Safety is inherent in rapid fire extinguishment. The faster the extinguishment the fewer the chances for dangerous incidents. "LIGHT WATER" Agent prevents reflash and burnback, major causes of injury. Reflash protection offered by the reforming action of "LIGHT WATER" AFFF is especially important to the safety of firefighters as they walk and drag hoselines through the danger area.

More Reliability

Because of its exceptional properties, "LIGHT WATER" Concentrate can be stored for a virtually indefinite period of time. Equipment reliability is also increased with "LIGHT WATER" AFFF since no sludge or sedimentation occurs. It is recognized throughout the world for its exceptional efficiency, and has been in use for years at most municipal and airport fire departments and the U.S. military services.

Improved Loss Prevention

"LIGHT WATER" AFFF gives your community or company greatly improved fire protection capability. Its proved rapid fire suppression results in reduced risk to property and equipment. The securing action of the Agent can take the fire hazard out of flammable liquid spills.

Simplicity of Use

"LIGHT WATER" AFFF is easy to use with conventional equipment — no special equipment or uncommon fire fighting techniques are required. The Agent can be used with foam and standard water/fog nozzles and eductors. Unlike ordinary foams, it is quite effective with the water/fog nozzle and eductor combination. "LIGHT WATER" AFFF adapts easily to existing apparatus.

Improved Economy

"LIGHT WATER" Agent offers faster extinguishment than conventional foams so less agent is used in training and actual fires. Its stability and securing action are effective on many solvents and chemicals which destroy ordinary foams, thus reducing or eliminating inventory of special type agents. The table shows a typical comparison example of agent usage and relative costs.

Extinguishment Comparison — Agent Usage Area: 1,000 ft² (with obstacles) Fuel: JP-5 400 gal.

	Detergent Foam	Protein Foam	"Light Water" AFFF
Proburn — seconds	40	40	40
Flow Rate — GPM	180	100	100
Extinguishment — Sec.	120	130	40
Solution Used — gal. (concentrate & water)	360	217	67
Concentrate Cost (approx.)	\$72.00	\$58.50	\$40.80

SAVINGS \$17.70 (30%)

(approx. compared to protein foam)

Advantages of "Light Water" AFFF Over Conventional Agents

The following general conclusions may be made when "LIGHT WATER" Concentrate is applied as a fire fighting agent:

1. "LIGHT WATER" AFFF shows efficiencies of over three times that of protein type foams on open surface gasoline fires.
2. "LIGHT WATER" AFFF protects nonignited spills from ignition and secures hazards during rescue and cleanup operations.
3. "LIGHT WATER" AFFF has been proved dramatically effective over a wide range of hazards:
 - Tanker trucks • Aircraft • Storage tanks
 - Refineries — offshore platforms • Industrial plants
 - Tanker ships and marine terminals
4. "LIGHT WATER" AFFF is neither toxic nor corrosive, having a neutral pH and excellent chemical stability. It is biodegradable.
5. "LIGHT WATER" AFFF may be applied to fires simultaneously with other foams, dry chemicals or CO², since the agents are mutually effective.
6. "LIGHT WATER" AFFF has shown utility on chemical and solvent fires. Higher solution application rates may be required for extinguishment.
7. "LIGHT WATER" AFFF discharged from automatic sprinklers is more effective than water or ordinary foam at controlling flammable fuel fires. It has been tested by Factory Mutual and U.L. for this application.
8. "LIGHT WATER" AFFF has excellent "Class A" fire extinguishing capabilities. Excellent wetting and penetrating qualities allow fast extinguishment of deep seated fires involving flammables such as wood, cloth, and even rubber tires.



NOTICE

All statements, technical information and recommendations contained herein are based on tests we believe to be reliable, but the accuracy of completeness thereof is not guaranteed, and the following is made in lieu of all warranties, express or implied:

Seller's and manufacturer's only obligation shall be to replace such quantity of the product proved to be defective. Neither seller nor manufacturer shall be liable for any injury, loss or damage, direct, incidental, or consequential, arising out of the use of or the inability to use the product. Before using, user shall determine the suitability of the product for his intended use, and user assumes all risk and liability whatsoever in connection therewith.

No statement or recommendation not contained herein shall have any force or effect unless in an agreement signed by officers of seller and manufacturer.

Product and use covered by U.S. Patent Numbers 3562156, 3772195 and foreign patents.



U.S. BRANCH OFFICES

- **ANCHORAGE**
3934 Spenard Road
Anchorage, Alaska 99503
Tel. (907) 279-6481
- **ATLANTA**
2860 Bankers Industrial Drive
Atlanta, Georgia 30360
Tel. (404) 447-7000
- **BOSTON**
155 Fourth Avenue
Needham Heights, Mass. 02194
Tel. (617) 449-0300
- **CHICAGO**
907 Elm St.
Hinsdale, Ill. 60521
Tel. (312) 325-9724
(312) 496-6623
- **CINCINNATI**
4835 Para Drive
Cincinnati, Ohio 45237
Tel. (513) 242-2313
- **CLEVELAND**
12200 Brookpark Road
Cleveland, Ohio 44130
Tel. (216) 267-1800
- **DALLAS**
2121 Santa Anna Avenue
P. O. Box 28158
Dallas, Texas 75228
Tel. (214) 324-8100
- **DETROIT**
23923 Research Drive
Farmington, Michigan 48024
Tel. (313) 477-5000
- **HONOLULU**
2880 Ualena Street
P.O. Box 30048
Honolulu, Hawaii 96820
Tel. (808) 841-0147
- **LOS ANGELES**
6023 South Garfield Avenue
Los Angeles, Calif. 90040
Tel. (213) 726-6300
- **NEW YORK**
135 West 50th Street
New York, NY 10020
Tel. (212) 977-8156 (N.Y.)
(201) 227-9100 (N.J.)
- **PHILADELPHIA**
5698 Rising Sun Avenue
Philadelphia, Pennsylvania 19120
Tel. (215) 728-5300
- **ST. LOUIS**
10725 Baur Boulevard
P. O. Box 510
St. Louis, Missouri 63132
Tel. (314) 991-1320
- **ST. PAUL**
3M Center
St. Paul, Minnesota 55101
Tel. (612) 733-9233
- **SAN FRANCISCO**
320 Shaw Road
South San Francisco, Calif. 94080
Tel. (415) 761-1155
- **SEATTLE**
100 Andover Park West
Andover Industrial Park
Seattle, Washington 98188
Tel. (206) 244-7200
- **WASHINGTON, D. C.**
1101 15th Street, N.W.
Washington, D. C. 20005
Tel. (202) 331-6900
- Available internationally;
contact local 3M office

Fire Protection Systems **3M**
COMPANY
3M CENTER • SAINT PAUL, MINNESOTA 55101