File EX4660
Project 94NK2487
Project 07NK11409

Issued: June 16, 1994
Revised: January 8, 2009

REPORT

on

WETTING AGENTS
Under the

Classification Program

Fire Freeze Worldwide, Inc.
Rockaway, NJ

D E S C R I P T I O N

PRODUCT COVERED:

Cold Fire wetting agent, when added with water in concentrations of not less than .15% for Class A fires and not less than 1.5% for non-water miscible Class B fires.

CONSTRUCTION DETAILS:

* **The product and storage container have been examined and found to comply with NFPA in effect as of the date of this report.**

USE:

The products covered by this Report are for use in accordance with the National Fire Protection Association Standard for Wetting Agents, NFPA 18 **and the manufacturer's installation instructions.**

TEST RECORD NO. 2

SAMPLES:

Representative samples of Cold Fire wetting agent concentrate, when added to water in concentrations of not less than 0.15% for Class A fires and not less than 1.5% for Class B fires, were submitted by the manufacturer for examination and test.

GENERAL:

The following tests were conducted:

Wetting Agents - Pour Point	NFPA 18-2006, 5.2.1 (ASTM D97-2004)
Wetting Agents - Miscibility	NFPA 18-2006, 5.2.2
Wetting Agents - Separation	NFPA 18-2006, 5.2.3
Wetting Agents - Impact Of Low Temperature On Surface Tension	NFPA 18-2006, 5.2.4
Wetting Agents - pH	NFPA 18-2006, 5.2.5
Wetting Agents - Viscosity	NFPA 18-2006, 5.2.6
Wetting Agent Solutions - Surface Tension	NFPA 18-2006, 5.3.1 (ASTM D1331-2001)
Wetting Agent Solutions - Separation On Standing	NFPA 18-2006, 5.3.2
Wetting Agent Solutions - Class A Fire Extinguishment Tests - Wood Crib Test	NFPA 18-2006, 5.3.4.1 (UL 711-6, 6 & 7)
Wetting Agent Solutions - Class A Fire Extinguishment Tests - Deep Seated Fire Test	NFPA 18-2006, 5.3.4.2
Wetting Agent Solutions - Class A Fire Extinguishment Tests - Wood Fiber Board Penetration	NFPA 18-2006, 5.3.4.3
Wetting Agent Solutions - Class B Fire Extinguishment Tests	NFPA 18-2006, 5.3.5 (UL 711-6, 6 & 8)

Test results relate only to the items tested.

The following tests were waived:

Test	Rationale for Waived Test[+]	File Reference	Report Date	Test Record No.
Packaging - Container Test - Accelerated Storage	1	EX4660	1994-06-16	1

1. The accelerated storage test described in NFPA 18-2006, 7.1.2 (UL 162-7, Section 22.3) is the same as that in effect as of the date of Test Record No. 1.

Test Record Summary:

The results of this investigation, including construction review and testing, indicate that the products evaluated comply with the applicable requirements in the National Fire Protection Association Standard on Wetting Agents, NFPA 18, 2006 Edition, Issued 2005-07-29, and, therefore, such products are judged eligible to bear UL's Mark as described on the Conclusion Page of this Report.

Test Record by: Reviewed by:

Jeffrey C. Britz Matthew D. Tennenbaum

Engineering Project Handler Staff Engineer

C O N C L U S I O N

Samples of the product covered by this Report have been found to comply with the requirements for pour point, miscibility, separation, impact of low temperature on surface tension, ph, and viscosity for wetting agent concentrates; surface tension, separation on standing, Class A fire extinguishment tests, and Class B fire extinguishment tests for wetting agent solutions; and accelerated storage container tests for wetting agent concentrates only covering the category and the product is judged to be eligible for Classification and Follow-Up Service. The manufacturer is authorized to use the UL Classification Marking on such products which comply with the Follow-Up Service Procedure and any other applicable requirements of Underwriters Laboratories Inc. Only those products which properly bear the UL Classification Marking are considered as Classified by Underwriters Laboratories Inc. Any information and documentation involving UL Mark services are provided on behalf of Underwriters Laboratories Inc. (UL) or any authorized licensee of UL.

Report by:

FRANK HUSAK
Engineering Associate

Reviewed by:

EMIL W. MISICHKO
Engineering Group Leader

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CERTIFICATE OF COMPLIANCE

CERTIFICATE NUMBER: 151096-EX4660
ISSUE DATE: October 15, 1996

Issued to: **FIRE FREEZE WORLDWIDE, INC.**
270 Route 46
Rockaway NJ 07866

Report Reference: EX4660, June 16, 1994

This is to Certify that representative samples of: Model cold fire wetting agent

Have been investigated by Underwriters Laboratories Inc. in accordance with the Standard(s) indicated on this Certificate.

Standard(s) for Safety: UL162- Standard for Foam Equipment and Liquid Concentrates

Additional Information:

Only those products bearing the UL Listing Mark should be considered as being covered by UL's Listing and Follow-Up Service.

The UL Listing Mark generally includes four elements as follows: the name "Underwriters Laboratories Inc." in various forms and type styles, or abbreviations such as "Und. Lab. Inc.", or the symbol "UL in a circle" - (UL) ; the word " Listed"; a control number (may be alphanumeric) assigned by UL; and the product or category name (product identifier), as indicated in the appropriate UL Directory.

LOOK FOR THE UL LISTING MARK ON THE PRODUCT

Engineer: Underwriters Laboratories Inc. **Review Engineer:** Underwriters Laboratories Inc.

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File Ex4660
Project 94NK2487

June 16, 1994

REPORT

on

WETTING AGENTS

Fire Freeze Worldwide, Inc.
Rockaway, NJ

FH/EWM:ms
PC lbry

G E N E R A L

INTRODUCTION:

This Report describes the investigation of wetting agents intended to be installed in accordance with the National Fire Protection Association Standard for Wetting Agents, NFPA 18.

OBJECT:

The object of this investigation was to determine compliance of the wetting agent with the NFPA Standard for Wetting Agents, NFPA 18 and the applicable portions of the Standard for Foam Equipment and Liquid Concentrates, UL 162.

PLAN:

The investigation of the wetting agent consisted of conducting a product conformance evaluation and performance testing as described in NFPA 18 and applicable portions of UL 162.

D E S C R I P T I O N

PRODUCT COVERED:

Model cold fire wetting agent.

CONSTRUCTION DETAILS:

The devices have been examined 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, in effect as of the date of this Report.

USE:

The products covered by this Report are for use in accordance with the National Fire Protection Association Standard for Wetting Agents, NFPA 18.

T E S T R E C O R D N O. 1

SAMPLES:

Representative samples of the Cold Fire wetting agent at a 0.15 percent concentration mixed with water were used in this investigation.

TEST METHOD REFERENCE:

The following tests were conducted in accordance with the requirements described in NFPA 18, UL 162 and UL 711:

1. Concentrate
   - A. Qualitative Infrared Analysis
   - B. pH Determination
   - C. Solubility
   - D. Separation Temperature
   - E. Separation on Standing
   - F. Action after Freezing
   - G. Viscosity
   - H. Surface Tension
2. Action on Fire Hose
3. Class A Fires
   - A. Fiber Board
   - B. Cotton
   - C. Crib
4. Class B Fires
5. Accelerated Storage (Container)
6. Tensile Strength (Container)

CONCENTRATE TESTS:

METHODS

A. Qualitative Infrared Analysis - An infrared spectrum was obtained by means of an infrared spectrophotometer.

B. pH Determination - The pH of the maximum use concentration of the solution was determined by means of a pH meter.

C. Solubility - Throughout the storage and use temperature range, the wetting agent was observed to determine that a true solution was formed with water, which was stable up to the maximum concentration recommended for use by the manufacturer.

D. Separation Temperature - Aqueous solutions of the wetting agent at maximum use concentration were observed to determine that there was no separation at any temperature between 32-120°F.

E. Separation on Standing - The wetting agent, in concentrations specified for use by the manufacturer, was tested to determine that there was no tendency to "layer out" or otherwise separate, on standing for 30 days.

F. Action after Freezing - Aqueous solutions of the wetting agent in concentrations specified for use by the manufacturer, were frozen for 1 h and then warmed to 60°F.

G. Viscosity - Viscosity was determined at 15.6°C by standard laboratory methods.

H. Surface Tension - Surface tension was determined by a Traube Stalagmometer in accordance with ASTM D-1331. A 3.0 percent solution of the sample was made with distilled water. The surface tension of only distilled water was determined before testing the concentrate solution. Three determinations were made in each case.

RESULTS

Test	Results
	Date of Spectrum
A. Infrared Analysis	N3-23-94
B. pH Determination	5.6
C. Solubility	Acceptable
D. Separation Temperature	Acceptable
E. Separation on Standing	Acceptable
F. Action after Freezing	Acceptable
G. Viscosity	15 (centipoise)

H. Surface Tension

Sample ID	Concentrate (dyne/cm @ 25°C)	0.0015 Blend (dyne/cm @ 25°C)
Trial #1	31	33
Trial #2	31	34
Trial #3	31	34
Average	31	33.6
Corrected Surface Tension	30.2	32.7

ACTION ON FIRE HOSE:

METHOD

Samples of fire hose were cut into 1 in. squares, weighed and placed into 100 cc of the prepared 0.15 percent concentrate solution of wetting agent. Similar samples were placed in distilled water for 30 days. At the end of the 30 days, the samples were dried and examined for signs of swelling or disintegration. Fifty additional samples of the fire hose were cut into 12 in. lengths. For a period of 24 h, 25 samples were immersed in distilled water at 23°C and 25 samples were immersed in prepared 0.15 percent concentrate solution of wetting agent at 23°C. After 24 h the samples were removed from the solutions, dried and conditioned for 48 h at 100°F. After the conditioning at 100°F, the samples were subjected to tensile strength tests in accordance with ASTM D2256 (Test for Breaking Load Strength and Elongation of Yarn by the Single-Strand Method).

RESULTS

ACTION ON FIRE HOSE

Sample	Hose Type	Weight, As-Received, g	Weight, After Conditioning, g	Exposure Conditions			Weight Change, Percent	Weight Change Average (Percent)
				Time (Days)	Temperature (°C)	Exposure		
1	Lined	0.9086	1.1237	30	23	Distilled Water	23.67	24.87
2	Lined	0.9296	1.1585	30	23	Distilled Water	24.60	
3	Lined	0.8943	1.1249	30	23	Distilled Water	25.79	
4	Lined	0.9150	1.1430	30	23	Distilled Water	24.92	
5	Lined	0.9086	1.1390	30	23	Distilled Water	25.36	
6	Lined	0.9092	1.1205	30	23	Distilled Water	23.24	22.37
7	Lined	0.8978	1.1040	30	23	Distilled Water	22.97	
8	Lined	0.9303	1.1444	30	23	Distilled Water	23.01	
9	Lined	0.8937	1.0895	30	23	Distilled Water	21.91	
10	Lined	0.9339	1.1508	30	23	Distilled Water	23.23	
11	Lined	0.8969	1.1088	30	23	Distilled Water	23.63	24.02
12	Lined	0.9378	1.1612	30	23	Distilled Water	23.82	
13	Lined	0.9061	1.1178	30	23	Distilled Water	23.36	
14	Lined	0.9313	1.1574	30	23	Distilled Water	24.28	
15	Lined	0.9207	1.1509	30	23	Distilled Water	25.00	

(Table Cont'd)

Sample	Hose Type	Weight, As-Received, g	Weight, After Conditioning, g	Exposure Conditions: Time (Days)	Exposure Conditions: Temperature (°C)	Exposure Conditions: Exposure	Weight Change, Percent	Weight Change Average (Percent)
16	Lined	0.8897	1.0906	30	23	Distilled water	22.58	23.88
17	Lined	0.9189	1.1391	30	23	Distilled water	23.96	
18	Lined	0.8900	1.1195	30	23	Distilled water	25.79	
19	Lined	0.8829	1.0885	30	23	Distilled water	23.29	
20	Lined	0.8903	1.1022	30	23	Distilled water	23.80	
21	Lined	0.9000	1.1273	30	23	Distilled water	25.26	25.41
22	Lined	0.9244	1.1593	30	23	Distilled water	25.41	
23	Lined	0.8999	1.1566	30	23	Distilled water	28.53	
24	Lined	0.9247	1.1391	30	23	Distilled water	23.18	
25	Lined	0.8881	1.1010	30	23	Distilled water	24.65	
1	Lined	0.9168	1.1621	30	23	0.15 percent	26.76	26.10
2	Lined	0.9146	1.1398	30	23	0.15 percent	24.62	
3	Lined	0.9272	1.1801	30	23	0.15 percent	27.28	
4	Lined	0.9153	1.1576	30	23	0.15 percent	26.47	
5	Lined	0.9061	1.1360	30	23	0.15 percent	25.37	
6	Lined	0.9227	1.1577	30	23	0.15 percent	25.47	25.55
7	Lined	0.9107	1.1269	30	23	0.15 percent	23.74	
8	Lined	0.9305	1.1593	30	23	0.15 percent	24.59	
9	Lined	0.9306	1.1844	30	23	0.15 percent	27.27	
10	Lined	0.9452	1.1973	30	23	0.15 percent	26.67	
11	Lined	0.9081	1.1923	30	23	0.15 percent	31.30	26.28
12	Lined	0.9058	1.1219	30	23	0.15 percent	23.86	
13	Lined	0.9130	1.1467	30	23	0.15 percent	25.60	
14	Lined	0.8893	1.1081	30	23	0.15 percent	24.60	
15	Lined	0.9291	1.1710	30	23	0.15 percent	26.04	
16	Lined	0.9070	1.1655	30	23	0.15 percent	28.25	26.35
17	Lined	0.9133	1.1579	30	23	0.15 percent	26.78	
18	Lined	0.9300	1.1630	30	23	0.15 percent	25.05	
19	Lined	0.9535	1.2003	30	23	0.15 percent	25.88	
20	Lined	0.9254	1.1623	30	23	0.15 percent	25.63	
21	Lined	0.9031	1.1645	30	23	0.15 percent	28.94	26.90
22	Lined	0.9086	1.2210	30	23	0.15 percent	34.38	
23	Lined	0.8946	1.0939	30	23	0.15 percent	22.28	
24	Lined	0.8858	1.1001	30	23	0.15 percent	22.97	
25	Lined	0.9042	1.1388	30	23	0.15 percent	25.95	

Sample	Hose Type	Tensile Strength Break Load, lb After Exposure	
		Distilled Water	3 Percent Wetting Agent Solution
1	Lined	25.7	27.7
2	Lined	30.6	32.4
3	Lined	32.0	28.5
4	Lined	24.6	24.9
5	Lined	25.5	23.0
6	Lined	26.0	21.5
7	Lined	25.5	21.0
8	Lined	27.5	26.5
9	Lined	23.6	37.0
10	Lined	23.5	26.3
11	Lined	19.4	25.7
12	Lined	27.5	23.5
13	Lined	33.4	22.3
14	Lined	30.3	22.8
15	Lined	33.5	26.1
16	Lined	21.4	27.0
17	Lined	23.5	23.8
18	Lined	28.5	22.8
19	Lined	35.2	22.8
20	Lined	26.5	23.2
21	Lined	23.7	26.0
22	Lined	33.0	28.0
23	Lined	28.5	29.8
24	Lined	19.5	25.7
25	Lined	23.5	30.5
		Avg. = 26.9	Avg. = 26.0

CLASS A FIRE - FIBER BOARD:

METHOD

Fiber boards measuring 12 by 12 by 1/2 in. were used for this test. Sample boards, one at a time, were placed on a steel grid and exposed to an alcohol flame from a burning pan for a period of 105 s. The burning pan was then removed and a clean dry pan was placed under the board to collect the water or agent runoff. 250 cc of water or wetting agent solution was then poured onto the board using a sprinkler bottle. Each sample board was weighed before and after the test to determine weight loss.

RESULTS

Sample	Agent	Weight Before, g	Weight After, g	Weight Loss, g	Weight Loss, Percent
1	+	266	302	0	0
2	+	285	355	0	0
3	+	293	306	0	0
4	++	280	318	0	0
5	++	279	312	0	0
6	++	290	412	0	0

\+ - Water.
++ - Wetting agent.

CLASS A FIRE TEST - COTTON:

METHOD

A cylindrical perforated steel basket 7 in. long and 4-1/2 in. diameter was filled with 50 g of cotton. A stainless steel rod preheated to approximately 1100°F was placed into the center of the basket on top of the cotton. The remaining 50 g of cotton was placed into the basket on top of the stainless steel rod. 250 cc of water or wetting agent solution was then poured onto the cotton in the basket. The runoff of water or wetting agent solution from the basket with cotton was collected and weighed.

RESULTS

Test	Fire Extinguished	Runoff Collected, cc
	Test 1 - Water	
1	No	20
2	No	16
3	No	24
		Avg. = 20

(Table Cont'd)

Test	Fire Extinguished	Runoff Collected, cc
	Test 2 - Wetting Agent	
1	Yes	3
2	Yes	8
3	Yes	4
		Avg. = 5

CLASS A FIRE TEST - CRIB:

METHOD

The construction and arrangement of the wood crib, and ignition and attack of the wood crib fire with the wetting agent are described in Pars. 5.8-5.19 UL 711.

For the tests a 2-1/2 gal extinguisher was charged with 2-1/2 gal of the premixed wetting agent and pressurized.

RESULTS

Test	Wetting Agent, Concentration Percent	Operating Pressure, psi	Preburn, min:s	Discharge Duration, seconds	Crib Size	Fire Extinguished
1	0.15	100	7:50	59:0	2A	Yes
2	0.15	100	7:48	58:5	2A	Yes

CLASS B FIRE TEST:

METHOD

Class B fire tests were conducted in a 50 ft^2 square steel pan as described in Pars. 6.7-6.13 of UL 711. A 2 in. layer of heptane was floated on a 4 in. depth of water. A 10 gpm nozzle was fixed in position to direct the wetting agent solution discharge across the pan onto the backboard for the entire duration of the discharge. The fuel was ignited and allowed to burn for 1 min prior to application of the wetting agent.

RESULTS

Wetting Agent Concentration, Percent	Application Rate, gpm	Nozzle Inlet Pressure, psi	Control Time, min:s	Extinguishment Time, min:s
0.15	0.2	122	8:25	8:48
0.15	0.2	122	8:45	9:00
0.15	0.2	122	12:05	12:20

AIR OVEN AGING TEST OF CONTAINER:

METHOD

Sample containers filled with cold fire wetting agent were conditioned at 50°C for 60 days. Following this conditioning each sample container was rinsed with tap water. Tensile strength specimens were prepared from the conditioned sample container and the "as received" sample container using the vertical side portions of the containers. Tensile strength was determined on both sets of specimens with a crosshead speed of 0.2 in./min as outlined in ASTM D638.

RESULTS

Results are shown in Table I.

TENSILE STRENGTH:

METHOD

Specimens were cut from containers as-received and after air oven aging testing as described in this Report. The specimens were then subjected to the tensile strength test in accordance with the Standard Test Method for Tensile Properties of Plastics, ANSI/ASTM D63.

RESULTS

Results are shown in Table I.

TABLE I

Sample	Break Load, lb	Container Wall Thickness, mils	Specimen Width, mils	Tensile Strength, psi
		As-Received		
1	116.0	0.090	0.486	2652
2	110.0	0.086	0.488	2621
3	132.5	0.095	0.504	2767
4	113.5	0.086	0.495	2666
5	118.0	0.086	0.518	2649
				Avg. = 2671
		After 60 Days at 50°C (Air Oven Aging)		
1	117.5	0.085	0.504	
2	105.0	0.080	0.486	
3	117.0	0.085	0.515	
4	126.0	0.086	0.519	
5	120.0	0.083	0.525	
	Break load; lb			Avg. = 2752
	Percent of original = 103			

C O N C L U S I O N

Samples of the products covered by this Report have been found to comply with the requirements covering the Class and the products are judged to be eligible for Listing and Follow-Up Service. The manufacturer is authorized to use the Laboratories' Mark on such products which comply with the Follow-Up Service Procedure and any other applicable requirements of Underwriters Laboratories Inc. Only those products which properly bear the Laboratories' mark are considered as Listed by Underwriters Laboratories Inc.

Report by:

Frank Husak

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