Ltr. Report File

NAVAL RESEARCH LABORATORY

WASHINGTON, D.C. 20375

IN REPLY REFER TO:
6180-292:EJJ:jlp
NRL Prob 61C05-19J
4/27/79

From: Commanding Officer, Naval Research Laboratory
To: Commander, Naval Ship Engineering Center (6124B)

Subj: Qualification testing of aqueous film forming foam liquid concentrate fire extinguishing agent manufactured by the 3M Co.; results of

Ref: (a) NAVSHIPENGCEN ltr Ser 6124B/PAP 4123/24385 06N2 Ser 610

Encl: (1) Two copies of subject report

1. In accordance with reference (a), the subject product has been tested in order to determine compliance with the requirements of MIL-F-24385B. A report covering the work is forwarded herewith as enclosure (1).

Copy to: (w/1 cy encl (1))
NAVSHIPENGCEN, (SEC6101F)
NAVSEASYSCOM (09G3, 06N2)
Naval Weapons Support Center,
Crane, IN. (Code 304E)

6180-292A:EJJ:jlp
18 April 1979

Subj: Qualification testing of aqueous film forming foam liquid concentrate fire extinguishing agent manufactured by the 3M Co., results of

Ref: (a) Military Specification MIL-F-24385B dated 25 May 1978

1. An AFFF concentrate manufactured by the 3M Co. designated FC-780B Lot 501 was tested in accordance with the requirements of reference (a).

2. The test results obtained are summarized in Table I.

3. From the test data, it was concluded that the product met the stipulated requirements.

4. The torque required to remove the 5-gallon container caps exceeded the specified limit, paragraph 4.17.2. It is strongly recommended that the torque test be included in the quality conformance testing wherein random containers coming off the production line are tested for cap removal torque.

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Encl (1) to NRL ltr.
6180-292:EJJ:jlp
Prob. No. CO5-19J

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FIRE SUPPRESSION SECTION
WASHINGTON, D.C. 20375

TABLE I

Test Results for MIL-F-24385B Qualification

PARAG	REQUIREMENT		VALUE	3M FC-78OB LOT 501
3.3	Refractive Index		1.3580	1.3615
	Viscosity	5°	<30	3.8
		25°	>2	2.02
	pH		7.0-8.5	7.7
	Spreading coefficient		>3	6.82
	Foamability			
	fresh water	expansion	>6.0	8.2
		drain time	>2.5	5.9
	sea water	expansion	>6.0	8.2
		drain time	>2.5	5.8
	Corrosion rate			
	general	steel	<1.5	1.39
		copper-nickel	<1.0	0.005
		nickel-copper	<1.0	0.004
		bronze	<100	3.1
	localized	CRES	no pits	no pits
	Total halides		<100	.79
	Dry Chemical compatibility		>320	460
	Environmental impact			
		toxicity	>1500	>1800
		COD	<500K	387K
		BOD/COD	>0.85	0.96
3.3.1	Film formation & sealability			
	fresh water		no ignit	no ignit
	sea water		no ignit	no ignit

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Test Results for MIL-F-24385B Qualification (cont)

PARAG	REQUIREMENT	VALUE	3M FC-780B LOT 501
3.3.2	Stability		
	(a) spreading coefficient		
	concentrate	>3	4.80
	fresh premix	>3	6.87
	sea premix	>3	7.46
	(b) foamability		
	fresh water exp	>6.0	8.5
	drain time	>2.5	4.4
	sea water exp	>6.0	8.5
	drain time	>2.5	5.3
	(c) film formation		
	6% fresh water	no ignit	no ignit
	6% sea water	no ignit	no ignit
	3% fresh water	no ignit	no ignit
	3% sea water	no ignit	no ignit
	6% fresh premix	no ignit	no ignit
	6% sea premix	no ignit	no ignit
	(d) fire performance		
	3% fresh water ext time	<65	65
	burnback	>240	245
	3% sea water ext time	<65	44
	burnback	>240	370
	6% fresh premix ext	<30	30
	burnback	>320	345
	6% sea premix ext	<30	28
	burnback	>320	450
	(e) stratification		
	concentrate	none	none
	fresh premix	none	none
	sea premix	none	none
	(f) precipitation		
	concentrate	<0.05	<0.05
	fresh premix	<0.05	<0.05
	sea premix	<0.05	<0.05

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Test Results for MIL-F-24385B Qualification (cont)

PARAG	REQUIREMENT		VALUE	3M FC-780B Lot 501
3.3.3	Compatibility (see attached sheets)			
3.3.4	Total fluorine content		report	0.791%
3.4	Fire performance			
	28 ft^2			
	3% fresh water	ext	<65	59
		burnback	>240	340
	3% sea water	ext	<65	53
		burnback	>240	492
	6% fresh water	ext	<30	28
		burnback	>320	516
	6% sea water	ext	<30	28
		burnback	>320	480
	50% sea water	ext	<55	48
		burnback	>150	150
	50 ft^2			
	6% sea water	ext	<50	47
		bb	>300	350
		$\Sigma_{40\ s}$	>300	317
	1260 ft^2			
	3% sea water	85% ext	<40	25
		$\Sigma_{40\ s}$	>285	295
	6% fresh water	85% ext	<30	20
		$\Sigma_{40\ s}$	>300	342
	6% sea water	85% ext	<30	18
		$\Sigma_{40\ s}$	>300	354
	50% sea water	85% ext	<55	18
		$\Sigma_{40\ s}$	>225	347
4.17.2	Cap removal torque		<50	95 Ave (68-105)

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Test Results for MIL-F-24385B
Qualification (cont)

MIXTURE: 50/50 Ansul AFC-3 1-6-096 / 3M FC-780B 501

PARAG	REQUIREMENT	VALUE	CONC	CONC/ FRESH	CONC/ SEA	FRESH PREMIX	SEA PREMIX
3.3.3	Compatibility						
	(a) foamability						
	exp	>6.0	X	7.1	6.6	6.7	6.7
	drain	>2.5	X	4.7	3.9	3.8	3.7
	(b) film formation	no ignit	X	no ignit	no ignit	no ignit	no ignit
	(c) fire performance						
	ext	<30	X	30	30	30	29
	burnback	>320	X	370	405	340	360
	(d) stratification	none	none	X	X	none	none
	(e) precipitation	<0.05	<0.05	X	X	<0.05	<0.05

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