Jake

# NAVAL RESEARCH LABORATORY

WASHINGTON, D.C. 20375

IN REPLY REFER TO:
6180-291:EJJ:jlp
NRL Prob 61C05-19J

26 Apr. 1979

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 Ansul Co.; results of

Ref: (a) NAVSHIPENGCEN ltr 6124B/PAP 4123/74385 Ser 2174 of 20 September 1978

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 304G)

6180-291A:EJJ:jlp
18 April 1979

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

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

1. An AFFF concentrate manufactured by the Ansul Co. designated AFC-3 Lot 1-6-096 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.

5. No fluorine test procedure was supplied.

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Encl (1) to NRL ltr.
6180-291:EJJ:jlp
Prob. No. C05-19J

NAVAL RESEARCH LABORATORY
FIRE SUPPRESSION SECTION
WASHINGTON, D.C. 20375

# TABLE I

Test Results for MIL-F-24385B Qualification

| PARAG | REQUIREMENT | | VALUE | ANSUL AFC-3 LOT 1-6-096 |
|---|---|---|---|---|
| 3.3 | Refractive Index | | 1.3580 | 1.3581 |
| | Viscosity | 5° | <30 | 4.3 |
| | | 25° | >2 | 2.1 |
| | pH | | 7.0-8.5 | 7.8 |
| | Spreading coefficient | | >3 | 7.46 |
| | Foamability | | | |
| | fresh water | expansion | >6.0 | 8.0 |
| | | drain time | >2.5 | 5.2 |
| | sea water | expansion | >6.0 | 7.5 |
| | | drain time | >2.5 | 5.1 |
| | Corrosion rate | | | |
| | general | steel | <1.5 | 0.57 |
| | | copper-nickel | <1.0 | 0.36 |
| | | nickel-copper | <1.0 | 0.004 |
| | | bronze | <100 | 7.0 |
| | localized | CRES | no pits | no pits |
| | Total halides | | <100 | 64 |
| | Dry Chemical compatibility | | >320 | 330 |
| | Environmental impact | | | |
| | | toxicity | >1500 | >1800 |
| | | COD | <500K | 378K |
| | | BOD/COD | >0.85 | 0.98 |
| 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 | ANSUL AFC-3 LOT 1-6-096 |
|---|---|---|---|
| 3.3.2 | Stability | | |
| | (a) spreading coefficient | | |
| | concentrate | > 3 | 6.43 |
| | fresh premix | > 3 | 7.35 |
| | sea premix | > 3 | 6.54 |
| | (b) foamability | | |
| | fresh water exp | > 6.0 | 7.6 |
| | drain time | > 2.5 | 4.5 |
| | sea water exp | > 6.0 | 7.0 |
| | drain time | > 2.5 | 3.6 |
| | (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 | 45 |
| | burnback | >240 | 420 |
| | 3% sea water ext time | <65 | 62 |
| | burnback | >240 | 310 |
| | 6% fresh premix ext | <30 | 30 |
| | burnback | >320 | 345 |
| | 6% sea premix ext | <30 | 28 |
| | burnback | >320 | 375 |
| | (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 | ANSUL AFC-3 LOT 1-6-096 |
|---|---|---|---|---|
| 3.3.3 | Compatibility (see attached sheets) | | | |
| 3.3.4 | Total fluorine content | | report | 0.51 % |
| 3.4 | Fire performance | | | |
| | 28 ft$^2$ | | | |
| | 3% fresh water | ext | <65 | 55 |
| | | burnback | >240 | 360 |
| | 3% sea water | ext | <65 | 60 |
| | | burnback | >240 | 408 |
| | 6% fresh water | ext | <30 | 28 |
| | | burnback | >320 | 342 |
| | 6% sea water | ext | <30 | 30 |
| | | burnback | >320 | 378 |
| | 50% sea water | ext | <55 | 50 |
| | | burnback | >150 | 150 |
| | | | | |
| | 50 ft$^2$ | | | |
| | 6% sea water | ext | <50 | 49 |
| | | bb | >300 | 320 |
| | | $\Sigma_{40\ s}$ | >300 | 329 |
| | | | | |
| | 1260 ft$^2$ | | | |
| | 3% sea water | 85% ext | <40 | 30 |
| | | $\Sigma_{40\ s}$ | >285 | 290 |
| | | | | |
| | 6% fresh water | 85% ext | <30 | 20 |
| | | $\Sigma_{40\ s}$ | >300 | 333 |
| | 6% sea water | 85% ext | <30 | 20 |
| | | $\Sigma_{40\ s}$ | >300 | 319 |
| | 50% sea water | 85% ext | <55 | 20 |
| | | $\Sigma_{40\ s}$ | >225 | 332 |
| 4.17.2 | Cap removal torque | | <50 | 77 Ave (59-101) |

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

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

| 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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