INCH-POUND
O-D-1380B
August 7, 1989
SUPERSEDING
O-D-1380A
December 1, 1972
(See 6.6)

FEDERAL SPECIFICATION

DRY CHEMICAL, FIRE EXTINGUISHING, MULTIPURPOSE PHOSPHATE

This specification is approved by the Commissioner, Federal Supply Service, General Services Administration, for the use of all Federal agencies.

1. SCOPE AND CLASSIFICATION

1.1 Scope. This specification covers one type of dry chemical fire extinguishing powder composed mainly of ammonium dihydrogen phosphate.

2. APPLICABLE DOCUMENTS

2.1 Government publications. The following documents, of the issue in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein:

Federal Specifications

RR-S-366 - Sieve, Test.
PPP-C-2020 - Chemicals, Liquid, Dry, and Paste: Packaging of.

Federal Standards

FED-STD-313 - Material Safety Data, Transportation Data and Disposal Data for Hazardous Materials Furnished to Government Activities.

(Activities outside the Federal Government may obtain copies of Federal specifications, standards, and Commercial Item Descriptions as outlined under General Information in the Index of Federal Specifications, Standards, and Commercial Item Descriptions. The Index, which includes cumulative bimonthly supplements as issued, is for sale on a subscription basis by the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.)

(Single copies of this specification, and other Federal specifications and commercial item descriptions required by activities outside the Federal Government for bidding purposes are available without charge from General Services Administration Business Service Centers in Boston, MA; New York, NY; Philadelphia, PA; Washington, DC, Atlanta, GA; Chicago, IL; Kansas City, MO, Fort Worth, TX; Houston, TX; Denver, CO; San Francisco, CA; Los Angeles, CA; and Seattle, WA.)

(Federal Government activities may obtain copies of Federal Specifications, Standards, and Commercial Item Descriptions from established distribution points in their agencies.)

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless a specific issue is identified, the issue in effect on date of invitation for bids or request for proposal shall apply.

American Society for Testing and Materials (ASTM)

D 5 - Standard Test Method for Penetration of Bituminous Materials. (DoD adopted)

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.)

(Non-Government standards and other publications are normally available from the organizations that prepare or distribute the documents. These documents also may be available in or through libraries or other informational services.)

3. REQUIREMENTS

3.1 Chemical and physical requirements. The dry chemical powder shall conform to the requirements of table I. Inert water insoluble ingredients and active water soluble ingredients added to increase the overall fire fighting effectiveness of the composition shall be nontoxic and shall not give off toxic vapors when subjected to intense heat.

TABLE I. Chemical and physical requirements.

Requirements	Value	Test
Ammonium dihydrogen phosphate ($NH_4H_2PO_4$) content percent by weight minimum.	75.0	4.4.1
Inert water insoluble ingredients percent by weight, maximum.	10.0	4.4.1
Active water soluble ingredients plus inert water insoluble ingredients, percent by weight, maximum.	25.0	4.4.1
Moisture content, percent by weight maximum.	0.20	4.4.2
Hygroscopicity, percent gain in weight maximum.	1.5	4.4.3
Apparent density, grams per milliliter minimum.	0.820	4.4.4
Caking and lumping tendency, minimum penetration.	15 mm or 150 units	4.4.5
Packed density, grams per milliliter, minimum.	1.10	4.4.6
Color identification.	yellow	4.4.7

3.1.1 Particle size. The particle size distribution of the dry chemical powder shall conform to the requirements of table II.

TABLE II. Particle size requirements.

U.S. screen size	Percent retained	
	Minimum	Maximum
40	0.0	0.0
100	0.0	10.0
200	12.0	25.0
325	12.0	25.0
Bottom pan	50.0	70.0

3.1.2 Material safety data sheet (MSDS). The contracting activity shall be provided a material safety data sheet at the time of contract award. The MSDS shall be provided in accordance with the requirements of FED-STD-313. The MSDS shall be included with each shipment of the material covered by this specification (see 6.3).

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements (examinations and tests) as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in this specification where such inspections are deemed necessary to ensure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items shall meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of the manufacturing operations, is an acceptable practice to ascertain conformance to requirements, however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material.

4.2 Quality conformance inspection. Quality conformance inspection shall consist of the examination of 4.2.2 and the tests of 4.3.

4.2.1 Sampling.

4.2.1.1 Inspection lot. An inspection lot shall consist of five batches or less when this fulfills the requirements of an order. When more than five batches are required to fill an order, the batches shall be grouped by weight to give not less than three nor more than five lots.

4.2.1.2 Acceptance test samples. Samples from a lot comprised of five batches or less shall consist of a 2-pound composite batch sample and shall immediately be placed in a clean, dry, air and watertight container which shall be sealed, marked, and sent to a testing laboratory. The sample shall be subjected to all the tests as specified in 4.3. When more than five batches are required to fulfill an order, the batches shall be grouped by weight to give not less than three nor more than five lots. A sufficient quantity shall be taken from each batch to make a 10-pound composite lot sample when the lot consists of more than five batches. Each lot composite sample shall be prepared for testing as above.

4.2.2 Examination of filled containers. A random sample of filled containers shall be selected from each lot in accordance with table III. The containers selected shall be weighed to determine the amount of the contents. Any container having under required fill shall be rejected and the lot represented by the sample shall be rejected according to table III.

TABLE III. Examination of filled containers.

Lot size	Sample size	Accept	Reject1/2/3/
2 - 50	5	0	1
51 - 90	7	0	1
91 - 150	11	0	1
151 - 280	13	0	1
281 - 500	16	0	1
501 - 1200	19	0	1
1201 - 3200	23	0	1
3201 - 10,000	29	0	1
10,000 - 35,000	35	0	1
35,001 - Over	40	0	1

1/ All defective items shall be replaced with acceptable items prior to lot acceptance.
2/ Inspect sample size until reject criteria is reached.
3/ Rejected lots may be screened and resubmitted for inspection and retest.

4.3 Tests. Samples selected in accordance with 4.2.1.2 shall be tested as specified in 4.4 through 4.4.8.1. If the test sample fails to pass one or more of these tests, the lot represented shall be rejected.

4.4 Test methods. Unless otherwise specified herein, tests shall be run in triplicate and the results averaged.

4.4.1 Composition. Standard analytical procedures for the analysis of ammonium dihydrogen phosphate may be used in determining $NH_4H_2PO_4$, percent by weight. Inert water insoluble ingredients shall also be determined in terms of percent by weight. The remainder of the composition shall be water soluble and shall make up the total of 100 percent of the composition.

4.4.2 Moisture content. In an atmosphere of 50 percent or less relative humidity, weigh accurately a sample of approximately 50 grams (plus or minus 1 milligram (mg)) into a tared aluminum dish. Place the dish in a desiccator using

H_2SO_4 (A.C.S. reagent grade, 95 percent to 98 percent by weight) as a drying agent. Maintain the closed desiccator and contents at a temperature of 70 ± 5 degrees Fahrenheit (°F) for 24 hours. At the end of this time period, remove the test sample and weigh accurately. The moisture content of the sample shall be calculated as follows:

$$M = \frac{100\ (W_1 - W_2)}{W_1}$$

Where:

M = moisture content, percent.
W_1 = original weight of sample.
W_2 = weight of sample after 24 hours drying.

4.4.3 Hygroscopicity. Using an aluminum moisture dish as a sample container, overfill with the material and then strike off with a straight edge. Cap the dish with its cover and weigh accurately. Remove the cover and place the sample in a humidifier with circulating air (see 6.4.1) maintained at 78 percent relative humidity (R.H.) and 70 ± 5°F for 48 hours. At the end of this period, cover the sample, remove and weigh it. Determine the gain in weight and calculate the percentage gain in weight in the sample.

4.4.4 Apparent density. Place 100 ± 0.1 grams of sample in a clean dry 250 milliliter (mL) glass-stoppered graduated cylinder, having an inside diameter of approximately 3.5 centimeters (cm). Stopper the cylinder and rotate slowly end over end for 10 complete cycles. After this rotation, set the cylinder upright on a surface and allow to settle for 3 minutes. Read the volume occupied by the sample and report as apparent density as follows:

$$\text{Apparent density (grams per mL)} \quad \frac{100 \text{ grams}}{\text{Volume of sample, mL}}$$

4.4.5 Caking and lumping tendency. Place 125-gram samples in a nickel crucible-shaped cups (100 mL capacity), then vibrate for 5 minutes on a Tyler Ro-Tap or equal sieve shaker using a holder. Then place the samples in a moving air stream humidifier of 78 percent R.H. for a period of 24 hours, after which time they shall be placed in a drying oven of 118°F for 24 hours (see 6.4.1). At the conclusion of the second period (total 48 hours), the degree of caking shall be determined with a penetrometer in accordance with ASTM D 5. Penetration shall be defined as the resistance of the material, expressed as the distance that a standard needle penetrates vertically into the sample under known conditions of load and time. The moving weight of the needle used shall be 50 grams and the time shall be 5 seconds. An average of six readings (three from each sample) shall be used.

4.4.6 Packed density. The packed density of a dry chemical shall be obtained by determining its weight per volume after a period of extreme packing produced by vibration. Equipment necessary for conducting the packed density analysis includes a conveniently shortened 250 mL graduated glass cylinder (approximately 1-11/32 inside diameter (id)) fitted with a number 8 rubber stopper and a Tyler Ro-Tap sieve shaking machine, or equivalent. A 100-gram sample of dry

chemical shall be poured into the graduate and placed in a convenient holder modified to fit the shaking machine. The graduate shall be shaken on the Ro-Tap machine for 30 minutes. After the shaking period, the volume of the powder shall be read directly in mL from the graduated cylinder. An average of three runs on one sample shall be used in making the packed density calculation which shall be as follows:

$$\text{Packed density (grams per mL)} = \frac{\text{(weight of sample) (grams)}}{\text{Packed volume of sample (mL)}}$$

4.4.7 Color identification. The powder sample shall be yellow in color when viewed in bulk in its container.

4.4.8 Particle size. The shaker employed in conducting particle-size tests shall operate with a single eccentric circular motion at 285 ± 10 revolutions per minute and with a tapping action of 150 strokes per minute to obtain dependable sieve analysis. To permit flexible operation, the shaker shall accommodate one to six 8-inch diameter sieves with one pan and cover. Screen sizes used for particle size analysis shall be in accordance with U.S. Standard Screen sizes as specified in RR-S-366 and shall be stainless steel, nonsupported.

4.4.8.1 Procedure. In an atmosphere of 50 percent R.H. or less, place an accurately weighed sample of approximately 50 grams in the top screen of a nested series of 8-inch U.S. Standard screens consisting of a 40-, 100-, 200-, and 325-mesh, with cover and bottom pan (see 6.4.2). Agitate the screen nest for 5 minutes on a shaker employing eccentric circular motion and tapping action such as is used in the Tyler Ro-Tap machine. Separate the screen nest and weigh accurately the amount remaining on each, expressing the results in percentage of the original sample.

4.5 Inspection of packaging. Sample packs and the inspection of preservation, packing and marking for shipment, stowage, and storage shall be in accordance with the requirements of section 5 and the documents specified therein.

5. PACKAGING

(The packaging requirements specified herein apply only for direct Government acquisition.)

5.1 Packaging requirements. The dry chemical shall be preserved level A, B or commercial, packed level A, B or commercial as specified (see 6.2), and marked in accordance with PPP-C-2020 and shall include bar codes and other applicable packaging acquisition options therein as specified (see 6.2). Unless otherwise specified (see 6.2), the dry chemical shall be furnished in type II, class 2 metal containers (pails or drums) in the unit quantity required.

5.2 Material safety data sheet. A copy of the material safety data sheet shall be attached to the shipping document for each destination (see 3.1.2).

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. The material covered by this specification is intended for use on class A, B, or C fires. This agent is not necessarily compatible with all types of aqueous film-forming foam.

6.2 Acquisition requirements. Acquisition documents must specify the following:

(a) Title, number, and date of this specification.
(b) Level of preservation and packing including packaging options required (see 5.1).
(c) Type container and unit quantity required (see 5.1).

6.3 Material safety data sheet (MSDS). Contracting officers must identify those activities requiring copies of MSDS's. Additional required Government information is contained in FED-STD-313. In order to obtain the MSDS, FAR clause 52.223-3 must be in the contract.

6.4 Test techniques. Experience suggests adhering to the following methods will produce more consistent results:

6.4.1 Effective desiccator use. It has been found that the stagnant air conditions found in the usual saturated solution desiccator compartments are not conducive to consistent results and precautions must be taken to insure air circulation if a desiccator is used as the humidifier. A 250 millimeter diameter desiccator with a saturated NH_4Cl solution in the lower compartment may be used. During operation, a circulating air supply of 5 liters per minute should be presaturated by bubbling through a saturated NH_4Cl solution and then introduced into the desiccator through a center tube with 6 millimeter id terminating 2 cm above the center hole in the desiccator plate. It is advisable to check the relative humidity of the exit air stream from time to time by some convenient means.

6.4.2 Screen cleaning. Care must be taken to remove all the residue from the screen between successive partical size tests. Sieves should be cleaned with a camels hair brush to insure complete removal of the fine particles.

6.5 Subject term (key word) listing.

Ammonium dihydrogen phosphate
Inert water insoluble ingredients
Active water insoluble ingredients
Particle size

6.6 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

MILITARY INTERESTS:

Custodians

Army - ME
Navy - SH
Air Force - 84

Review activities

Army - CE
Navy - AS, SH
Air Force - 50

User activities

Navy - MC, CG

CIVIL AGENCY COORDINATING ACTIVITIES:

GSA - FSS
NBS
TVA

PREPARING ACTIVITY:
Navy - SH
(Project 4210-0390)

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions – Reverse Side)

1. DOCUMENT NUMBER	2. DOCUMENT TITLE
O-D-1380B	Dry Chemical, Fire Extinguishing, Multipurpose Phosphate

3a. NAME OF SUBMITTING ORGANIZATION	4. TYPE OF ORGANIZATION *(Mark one)*
	☐ VENDOR
b. ADDRESS *(Street, City, State, ZIP Code)*	☐ USER
	☐ MANUFACTURER
	☐ OTHER *(Specify)*:

5. PROBLEM AREAS

a. *Paragraph Number and Wording:*

b. Recommended Wording:

c. Reason/Rationale for Recommendation:

6. REMARKS

7a. NAME OF SUBMITTER *(Last, First, MI)* – Optional	b. WORK TELEPHONE NUMBER *(Include Area Code)* – Optional
c. MAILING ADDRESS *(Street, City, State, ZIP Code)* – Optional	8. DATE OF SUBMISSION *(YYMMDD)*

(TO DETACH THIS FORM, CUT ALONG THIS LINE.)

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PREVIOUS EDITION IS OBSOLETE