

**MIL-C-3539**

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**SUPERSEDING**

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## MILITARY SPECIFICATION

# CALCIUM PHOSPHIDE

*This specification was approved by the Departments of the Army, the Navy, and the Air Force for use of procurement services of the respective Departments.*

### 1. SCOPE

1.1 This specification covers calcium phosphide for use in charging life buoys and in torpedo-torch pots.

1.2 Classification. — Calcium phosphide shall be of the following types, as specified (see 6.2):

Type A—Uncoated

Type B—Coated.

### 2. APPLICABLE SPECIFICATIONS AND OTHER PUBLICATIONS

2.1 Specifications.—The following specifications, of the issue in effect on date of invitation for bids, form a part of this specification:

#### FEDERAL SPECIFICATIONS

NN-B-591 —Boxes, Wood-Cleated Fiberboard.

NN-B-601 —Boxes, Wood-Cleated-Plywood (For Domestic Shipment).

NN-B-621 —Boxes, Wood, Nailed and Lock-Corner.

NN-B-631 —Boxes, Wood, Wirebound, (For Domestic Shipment).

RR-S-366 —Sieves, Standard, Testing.

LLL-B-631—Boxes, Fiber, Corrugated (For Domestic Shipment).

LLL-B-636—Boxes, Fiber, Solid (For Domestic Shipment).

#### MILITARY SPECIFICATIONS

JAN-P-105—Packaging and Packing for Overseas Shipment—Boxes, Wood, Cleated, Plywood.

JAN-P-106—Packaging and Packing for Overseas Shipment—Boxes, Wood, Nailed.

JAN-B-107—Boxes, Wood, Wirebound (Overseas Type).

JAN-P-108—Packaging and Packing for Overseas Shipment—Boxes, Fiberboard (V-Board and W-Board), Exterior and Interior.

JAN-P-110—Packaging and Packing for Overseas Shipment — Drums, Metal, 55-Gallon (For Other than Petroleum Products).

JAN-P-124—Packaging and Packing for Overseas Shipment — Containers (Cans, Pails, and Drums), Metal (For Other than Subsistence Items).

JAN-P-138—Packaging and Packing for Overseas Shipment—Boxes, Wood, Fiberboard-Lined.

#### NAVY DEPARTMENT SPECIFICATIONS

General Specifications for Inspection of Material.

(Navy.—Copies of Federal, Military, and Navy Department specifications may be obtained upon application to the Bureau of Supplies and Accounts, Department of the Navy, Washington 25, D. C., except that activities of the Armed Forces should make application to the Commanding Officer, Naval Supply Depot, Scotia 2, N. Y. Both the title and identifying number or symbol should be stipulated when requesting copies.)

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**2.2 Other publications.**— The following publication, of the issue in effect on date of invitation for bids, forms a part of this specification:

BUREAU OF SUPPLIES AND ACCOUNTS PUBLICATION

Navy Shipment Marking Handbook.

(Copies of the Navy Shipment Marking Handbook may be obtained upon application to the Bureau of Supplies and Accounts, Department of the Navy, Washington 25, D. C., except that activities of the Armed Forces should make application to the Commanding Officer, Naval Supply Depot, Scotia 2, N. Y.)

**3. REQUIREMENTS**

**3.1 Material.**—Calcium phosphide shall be of the best quality, shall be stable, and shall not evolve gas when packed in air-tight containers kept in a cool place.

**3.2 Form.**—Calcium phosphide shall be furnished in the form of solid sticks or lumps  $\frac{1}{4}$  to 1 inch in diameter. Not more than 5 percent of the material shall pass through a No. 16 U. S. Standard sieve. Sieves shall conform to Specification RR-S-366.

**3.3 Reaction with water.**

**3.3.1 Type A.**—Type A calcium phosphide when immersed in sea water shall immediately produce a vigorous reaction with a strong bright flame.

**3.3.2 Type B.**—Type B calcium phosphide when immersed in sea water shall give a maximum evolution of smoke and flames at approximately 15 minutes after contact with the water. The reaction shall be vigorous with a strong bright flame.

**3.4 Gas evolution.**—When tested as specified in 4.4.3, a 10-gm. sample shall give not less than the following amounts of gas within 4 hours:

Type A—675 cc.

Type B—610 cc.

**3.5 Coating.**—Each lump of type B calcium phosphide shall be completely and sufficiently coated with potassium bichromate so as to produce the delayed action specified in 3.3.2.

**4. SAMPLING, INSPECTION, AND TEST PROCEDURES**

**4.1 Size of lot.**—A lot shall consist of not more than 1,000 pounds of calcium phosphide of the same type, received in one shipment on the same contract or order.

**4.2 Sampling.**

**4.2.1 Containers.**—Six containers in the lot shall be selected by the Government inspector in such a manner as to be representative of the lot. Extreme care shall be used to minimize exposure of the contents or sample to the air. The first container opened shall be inspected by visual examination for uniformity of the material from top to bottom. If there is no indication of selective packing, the samples from the other containers may be taken without removing more of the material from the container than is necessary to secure samples made up of pieces of the sizes specified in 4.2.2, notwithstanding segregation by sizes may have resulted from shaking in transportation. In the event that selective packing is detected on examination of the first container opened, the whole of the contents of each of the 6 containers shall be sampled so as to obtain samples representative of the average of the material.

**4.2.2 Samples for chemical tests.**—Six samples of approximately 10 gm. each shall be taken. Two of the samples shall consist of single pieces, 2 shall consist of material of small size, and 2 shall consist of pieces of intermediate size. All pieces shall be as found in the container and not obtained by breaking larger pieces. One sample of small and 1 of medium sized pieces shall be taken from 3 of the containers, approximately the same amount from each, and the other sample of each size shall be taken similarly from

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the other 3 containers. The 2 samples which consist each of a single large piece shall be taken from separate containers. One container at a time shall be opened, the sample portions transferred to air-tight receptacles which previously have been tared and the sampled container resealed. A record of the source of each sample shall be kept together with an estimate of the proportions of fine, medium, and coarse material in the containers sampled. This estimate shall be made by observation of the contents of each container, taking into consideration the distribution indicated by examination of the first container opened.

4.2.3 *Samples for screening.*—(See 4.4.1.)

4.3 *Inspection.*—Unless otherwise specified inspection shall be at the point of delivery.

4.3.1 *Inspection procedures.*—For Naval purchases, the general inspection procedures shall be in accordance with General Specifications for Inspection of Material.

#### 4.4 Test methods.

4.4.1 *Form.*—Screening of calcium phosphide to determine compliance with the requirements of 3.2 shall be dispensed with if, on visual examination, the material appears to be acceptable as to size of pieces and proportion of fines. Screening shall be undertaken when it appears that the material should be rejected because of the presence of more than 5 percent of fines. Every reasonable precaution shall be taken to avoid preventable exposure of the material to the air while screening. The sample for the determination of the percentage of fines shall be the total amount of calcium phosphide in the 6 containers sampled. To minimize the amount of material which will need to be screened before a decision as to acceptability is made, the portions of the materials in which the highest proportion of fines appear shall be screened first, and sieving shall be discontinued when it becomes apparent the 5 percent of fines will not be obtained by screening

the whole quantity from the 6 containers or when a weight of fines slightly greater than 5 percent of the weight in the 6 containers is obtained.

4.4.2 *Reaction with water.*—One or more unbroken sticks or 1 or more unbroken coarse, medium, and fine lumps of material shall be dropped into a vessel filled to a depth of 6 inches with sea water at a temperature of 70° F. The performance of samples shall be judged in accordance with 3.3.1 and 3.3.2 for types A and B, respectively. Adequate safety precautions shall be taken in performing this test, which preferably should be performed outdoors with a breeze away from occupied buildings or areas.

#### 4.4.3 *Gas evolution.*

4.4.3.1 *Apparatus.*—The apparatus used to determine the gas generated shall include a 1,000 ml. dispensing burette (E. H. Sargent & Co.—No. S-10825 or equivalent) and a cork float assembly, both as shown on figure 1. The burette shall be calibrated to indicate the volume between the graduations and the stopcock. The inner wall of the burette shall be cylindrical and not tapered or restricted except at the closed end. The float shall be from 0.02 to 0.033 inch smaller in diameter than the bore of the burette and shall be approximately 2½ inches high. The wicks shall fit the wick holes closely and shall be washed with soap and water, rinsed, and dried before first being used. The wicks and all other members of the float assembly shall be thoroughly dried in preparation for each test.

4.4.3.2 *Procedure.*—Each sample shall be weighed accurately without opening the receptacle and the net weight recorded. All apparatus having been made ready for the gas evolution test, the sample shall be removed from the receptacle, wrapped closely in 2 or 3 thicknesses of filter paper and placed in the cavity of the cork float. The wire gauze cover shall be secured over it, and the assembly immediately introduced into

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the open end of the burette, which shall be lowered promptly into the water as shown on figure 1. Suction through the burette shall have been started by means of an aspirator tube attached to its outlet prior to the introduction of the sample. The apparatus and procedure shall be adjusted so that the water is drawn up smartly with the float riding smoothly to the top of the burette. As an alternative the float may be placed and lodged at the closed upper end of the burette before introducing the water, and loosened by the thread or similar means after gas evolution is under way. In either case the wicks and other parts of the float assembly and sample wrappings shall be dry until introduced into the burette and no water shall reach the filter paper wrappings of the sample until the float has brought up against the top of the burette. The water then overflows the float and the speed of suction should be sufficient to bring the water to the stopcock and the stopcock then should be closed before gas evolution begins. The water shall be at a temperature between 24 and 27° C. at the beginning of the test, which shall be conducted at a room temperature not lower than 20° C. nor higher than 27° C. Exposure to strong sunlight shall be avoided. After 4 hours, during which the apparatus shall be watched and the float dislodged by pulling the thread if it hangs up in the burette instead of floating down on the water, the float assembly shall be removed from the burette by means of the thread, the burette lowered to bring the surface of the water inside the burette to the same level as that outside, and the volume of gas read promptly. The volume of gas shall be corrected to dry gas at 760 mm. pressure and 20° C. To remove the phosphine from the burette the stopcock outlet shall be connected to an aspirator, the discharge from which is immersed in a vessel of water. The aspirator should be turned on full and the stopcock of the aspirator opened slightly so as to allow the phosphine to be slowly absorbed in the water. Each of the 6 samples selected as specified in 4.2.1 shall be tested for gas evolution and the results calculated individu-

ally to give the volume evolved from 10 gms. of each sample. In the event that the individual results indicate materially greater differences among samples representative of the 3 sizes than between samples of pieces of the same size, the gas evolution shall be calculated by multiplying the average of the 2 samples of each size by the estimated proportion of that size in the lot, and adding the 3 products to obtain a weighted average. If the individual samples do not indicate definite superiority or inferiority of the samples of any size classification, the average of the 6 samples shall be taken as the result for the lot.

**5. PREPARATION FOR DELIVERY**

**5.1 Packaging.**—Calcium phosphide shall be packaged in soldered tins, containing 1 or 25 pounds, conforming to Specification JAN-P-124, or in steel drums conforming to Specification JAN-P-110. Contents of drum shall not exceed 100 pounds.

**5.2 Packing.**

**5.2.1 For domestic shipment.**—Tins of calcium phosphide shall be packed in wood-created-fiberboard, wood-created-plywood, nailed wood, wirebound wood, corrugated fiber, or solid fiber boxes conforming to Specification NN-B-591, NN-B-601, NN-B-621, NN-B-631, LLL-B-631 or LLL-B-636, respectively. The gross weight of wood boxes shall not exceed approximately 200 pounds. The gross weight of fiberboard boxes shall be subject to the limitation of the box specification.

**5.2.1.1 Steel drums** will require no further packing.

**5.2.2 For overseas shipment.**—Tins of calcium phosphide shall be packed in cleated-plywood, nailed wood, wirebound, fiberboard, or fiber-lined wood boxes, conforming to Specifications JAN-P-105, JAN-P-106, JAN-B-107, JAN-P-108 and JAN-P-138, respectively. The gross weight of wood boxes shall not exceed approximately 200 pounds; of fiberboard boxes, approximately 70 pounds.

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5.2.2.1 Steel drums will require no further packing.

### 5.3 Marking.

5.3.1 *Packages.*— Each package shall be labeled with the following information completed:

MATERIAL -----  
 TYPE -----  
 MANUFACTURER -----  
 QUANTITY -----

5.3.2 *Shipping containers.*— Each shipping container shall be marked with the following information completed:

MATERIAL -----  
 TYPE -----  
 SPECIFICATION NO. -----  
 MANUFACTURER -----  
 CONTRACTOR -----  
 CONTRACT NO. -----  
 QUANTITY -----  
 GROSS WEIGHT -----

In addition to the foregoing and any special marking required by the contract or order, shipments shall be marked in accordance with the Navy Shipment Marking Handbook.

## 6. NOTES

6.1 *Ordering data.*— Invitations for bids and contracts or orders should specify the following:

- a. Title, number, and date of this specification.
- b. Type required. (See 1.2.)
- c. Size of container required. (See 5.1.)

- d. Whether domestic or overseas shipment and marking are required. (See 5.2 and 5.3.)

6.2 Calcium phosphide is an inflammable solid material, burning with a strong bright flame when immersed in water. It may ignite spontaneously if exposed to a humid atmosphere.

6.3 Calcium phosphide should be stored in a cool, dry place.

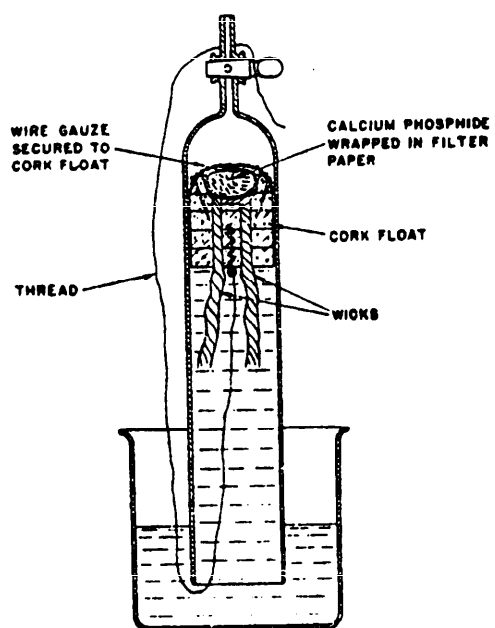
6.4 Particular attention is invited to the fact that the requirements as to gas evolution in paragraph 3.4 are for performance in test under the conditions as to sampling and test specified in section 4. The greater the disparity in gas-evolving capacity among the several sizes of the material furnished, the greater the average capacity must be to assure that the required minimum quantity of gas will be evolved in test.

*Notice.*—When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

Custodian:  
 Navy—Bureau of Ordnance

Other interest:  
 Navy—S.

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**FIGURE 1.—Apparatus.**