MIL-P-3173B
31 January 1983
SUPERSEDING
MIL-P-3173A
5 February 1969

MILITARY SPECIFICATION

POTASSIUM BICARBONATE, TECHNICAL

This specification is approved for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers one technical grade of potassium bicarbonate ($KHCO_3$).

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications, standards, and handbooks. Unless otherwise specified, the following specifications, standards, and handbooks of the issue listed in that issue of the Department of Defense Index of Specifications and Standards (DoDISS) specified in the solicitation form a part of this specification to the extent specified herein.

STANDARDS

MILITARY

MIL-STD-105	-	Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-1188	-	Commercial Packaging of Supplies and Equipment
MIL-STD-1168	-	Ammunition Lot Numbering

: Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed: to: Commander, US Army Armament Research and Development Command, ATTN: DRDAR-TSC-S, Aberdeen Proving Ground, MD 21010 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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copies of specifications, standards, handbooks, drawings, and publications required by manufacturers in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting officer.)

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. The issues of the documents which are indicated as DoD adopted shall be the issue listed in the current DoDISS and the supplement thereto, if applicable.

ASTM STANDARDS

D1193 - Reagent Water
E11 - Wire-Cloth Sieves for Testing Purposes

(Application for copies should be addressed to ASTM, 1916 Race Street, Philadelphia, PA 19103.)

(Industry association specifications and standards are generally available for reference from libraries. They are also distributed among technical groups and using Federal agencies.)

2.3 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein, the text of this specification shall take precedence.

3. REQUIREMENTS

3.1 Chemical and physical characteristics. Potassium bicarbonate shall conform to the chemical and physical characteristics of table I when tested as specified therein.

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 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 the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

TABLE I. Chemical and physical characteristics

Characteristic	Requirement		Test paragraph
	Minimum	Maximum	
Assay (as $KHCO_3$), percent by weight	98.0	---	4.2.4.1
Moisture, percent by weight	----	1.0	4.2.4.2
Loss on heating, percent by weight	29.5	---	4.2.4.3
Carbonate (as meq per g)	----	0.5	4.2.4.4
Sodium salts	To pass test		4.2.4.5
Particle size, percent by weight retained:			4.2.4.6
250 micrometer sieve	0	5	
150 micrometer sieve	5	15	
75 micrometer sieve	45	55	

4.2 Quality conformance inspection.

4.2.1 Lotting. A lot shall consist of the potassium bicarbonate produced by one manufacturer, at one plant, from the same materials, and under essentially the same manufacturing conditions provided the operation is continuous. In the event the process is a batch operation, each batch shall constitute a lot (see 6.3). Each shall be identified and controlled in accordance with MIL-STD-1168.

4.2.2 Sampling.

4.2.2.1 For examination of packaging. Sampling shall be conducted in accordance with MIL-STD-105.

4.2.2.2 For test. Sampling for test shall be conducted in accordance with table II. A representative specimen of approximately 500 grams (g) shall be removed from each sample container and placed in a suitable clean, dry container labeled to identify the lot and container from which it was taken.

TABLE II. Sampling for test

Number of containers in batch or lot	Number of sample containers
3 to 150	3
151 to 1,200	5
1,201 to 7,000	8
7,001 to 20,000	10
Over 20,000	20

4.2.3 Inspection procedure.

4.2.3.1 For examination of packaging. The sample unit shall be one filled unit or shipping container, as applicable, ready for shipment. Sample unit and shipping containers shall be examined for the following defects using an AQL of 2.5 percent defective:

(a) Contents per container not as specified
(b) Container damaged or leaking
(c) Unitization not as specified
(d) Marking incorrect, missing, or illegible

4.2.3.2 For test. Each sample specimen taken in 4.2.2.2 shall be tested as specified in 4.2.4. Failure of any test by any specimen shall be cause for rejection of the lot represented.

4.2.4 Tests. Water in accordance with ASTM D1193 and reagent grade chemicals shall be used throughout the tests. Where applicable, blank determinations shall be run and corrections applied where significant. Tests shall be conducted as follows:

4.2.4.1 Assay. Dry approximately 1 g of the specimen over concentrated sulfuric acid for no less than 24 hours at room temperature. Weigh to the nearest milligram (mg) approximately 0.40 g of the dried specimen. Transfer to a 250-milliliter (mL) Erlenmeyer flask and dissolve in 50 mL of water. Slowly add 50 mL of 0.1N hydrochloric acid to the solution. When the reaction with the acid appears to be complete, boil the solution for 5 minutes. Cool. Add three to four drops of methyl red indicator solution. Titrate with 0.05N sodium hydroxide solution to a yellow end point. Calculate the percent by weight potassium bicarbonate as follows:

$$\text{Percent by weight potassium bicarbonate} = \frac{10.01\ (AB - CD)}{W}$$

where: A = Milliliters of hydrochloric acid used,
B = Normality of the hydrochloric acid solution,
C = Milliliters of sodium hydroxide used,
D = Normality of the sodium hydroxide solution, and
W = Weight of the specimen in grams.

4.2.4.2 Moisture. Transfer approximately 5 g of the specimen, weighed to the nearest 0.5 mg, to a tared moisture dish. Place the unstoppered dish in a vacuum desiccator over concentrated sulfuric acid for no less than 24 hours. Stopper and reweigh the dish. Calculate the loss in weight as percent moisture as follows:

$$\text{Percent by weight moisture} = \frac{100\ (A - B)}{W}$$

where: A = Weight in grams of the dish and contents before drying,
B = Weight in grams of the dish and contents after drying, and
W = Weight in grams of the specimen.

Retain the dried specimen for use in 4.2.4.3.

4.2.4.3 Loss on heating. Determine to the nearest milligram the tare weight of a porcelain evaporating dish which has been dried to a constant weight at 200° ± 5°C and cooled in a desiccator. Transfer the specimen retained from 4.2.4.2 to the dish and ignite at 200° ± 5°C to a constant weight. Cool in a desiccator and weigh. Calculate the percent by weight loss on heating as follows:

$$\text{Percent by weight loss on heating} = \frac{100\ (A - B)}{W}$$

where: A = Weight in grams of dish and contents before heating,
B = Weight in grams of dish and contents after heating, and
W = Weight in grams of the dried specimen from 4.2.4.2.

4.2.4.4 Carbonate. Transfer approximately 1 g of the specimen, weighed to the nearest 0.2 mg, to an Erlenmeyer flask containing approximately 30 mL of carbon dioxide-free water. Dissolve with a minimum of stirring. Add two drops of phenolphthalein indicator and titrate with 0.05N hydrochloric acid to the disappearance of the pink color. Calculate the alkalinity as milliequivalents (meq) of carbonate per gram as follows:

$$\text{Meq of carbonate per gram} = \frac{AB}{W}$$

where: A = Milliliters of hydrochloric acid used,
B = Normality of the hydrochloric acid, and
W = Weight of the specimen in grams.

4.2.4.5 Sodium salts. Dissolve a portion of the specimen in a small quantity of water to which a few drops of concentrated hydrochloric acid have been added. Stir to make a saturated solution. Heat a clean platinum wire in a Bunsen flame until there is no trace of yellow in the flame. Cool the loop, dip it into the saturated solution, and place it in the flame. No more than a trace of a yellow flash shall appear in the characteristic violet flame produced by the potassium salt.

4.2.4.6 Particle size. Nest tared sieves of the sizes specified and conforming to ASTM E11 in order of increasing fineness with the 250 micrometer sieve on top. Place on a bottom pan. Transfer 100 g of the specimen, weighed to the nearest 0.01 g, to the top sieve. Cover the assembly and place in a mechanical shaker geared to produce 300 ± 15 gyrations and 150 ± 10 striker taps per minute. Shake for 10 minutes. (The material may also be brushed through the sieves with a camel's-hair brush.) Weigh each sieve and its retained contents. Calculate the percent by weight retained on each sieve as follows:

$$\text{Percent by weight retained} = \frac{(A - B)\ 100}{W}$$

where: A = Weight in grams of the sieve and contents,
B = Tare weight of the sieve in grams, and
W = Weight of the specimen in grams.

5. PACKAGING

5.1 Unit packing, industrial. A specified quantity of potassium bicarbonate (see 6.2) shall be unit packed in accordance with MIL-STD-1188.

5.2 Packing. Potassium bicarbonate, unit packed as specified in 5.1, if required for carrier acceptance and protection, shall be packed for shipment in accordance with MIL-STD-1188.

5.3 Unitization. Uniform quantities of packs per unit of potassium bicarbonate shall be unitized in a manner to assure acceptance by common carrier and protection of contents and packing from supply source to first destination and for a minimum storage period of six months. In particular, provision shall be made to assure stable stackability.

5.4 Marking. Containers shall be marked in accordance with MIL-STD-1188. Unitized loads shall be marked to show date of manufacture and lot or batch number of the potassium bicarbonate.

6. NOTES

6.1 Intended use. Potassium bicarbonate is intended for use as an ingredient in colored smoke mixtures.

6.2 Ordering data. Acquisition documents should specify the title, number, and date of this specification and the unit quantity of potassium bicarbonate required (see 5.1).

6.3 Batch. A batch is defined as that quantity of material which has been manufactured by some unit chemical process or subjected to some physical mixing operation intended to make the final product substantially uniform.

6.4 Significant places. For the purpose of determining conformance with this specification, an observed or calculated value should be rounded off "to the nearest unit" in the last right-hand place of figures used in expressing the limiting value, in accordance with the rounding-off method of ASTM E29.

Custodians:

Army - EA
Navy - AS

Review activities:

Army - MD
Navy - OS
DLA - GS

Preparing activity:

Army - EA

Project No. 6810-B352

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions - Reverse Side)

1. DOCUMENT NUMBER	2. DOCUMENT TITLE

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

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	7b. WORK TELEPHONE NUMBER *(Include Area Code)* – Optional
b. MAILING ADDRESS *(Street, City, State, ZIP Code)* – Optional	8. DATE OF SUBMISSION *(YYMMDD)*

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