METRIC

MIL-A-175C
11 August 1983
SUPERSEDING
MIL-A-175B
9 December 1976

MILITARY SPECIFICATION

AMMONIUM NITRATE, TECHNICAL (METRIC)

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

1. SCOPE

1.1 Scope. This specification covers two classes of technical grade ammonium nitrate.

1.2 Classification. Ammonium nitrate shall be of the following classes as specified (see 6.2):

Class 1 - Medium grind
Class 3 - Coarse grind

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.

SPECIFICATIONS

FEDERAL

NN-P-71 - Pallets, Material Handling, Wood, Stringer Construction, 2-Way and 4-Way (Partial)
NNN-P-1475 - Paper, Filter, Analytical

: 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.

FSC 6810

MILITARY

JAN-A-183 - Acid, Nitric (For Ordnance Use)
MIL-Z-291 - Zinc Oxide, Technical

STANDARDS

MILITARY

MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-129 - Marking for Shipment and Storage
MIL-STD-147 - Palletized Unit Loads
MIL-STD-1168 - Ammunition Lot Numbering

2.1.2 Other Government documents, drawings, and publications. The following other Government documents, drawings, and publications form a part of this specification to the extent specified herein.

CODE OF FEDERAL REGULATIONS (CFR)

49 CFR 171 to 179 - Department of Transportation Hazardous Materials Regulations

(The Code of Federal Regulations is available from the Superintendent of Documents, US Government Printing Office, Washington, DC 20402. Orders for the above publications should cite "49 CFR 171 to 179.")

(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.

UNIFORM FREIGHT CLASSIFICATION RULES

(Application for copies should be addressed to the Uniform Classification Committee, Room 1106, 222 South Riverside Plaza, Chicago, IL 60606.)

NATIONAL MOTOR FREIGHT CLASSIFICATION RULES

(Application for copies should be addressed to the American Trucking Associations, Inc., Traffic Department, 1616 P Street, NW, Washington, DC 20036.)

anhydrous, analyzed reagent XXXIII Silver acetate

ASTM STANDARDS

D1193 - Reagent Water
E11 - Wire-Cloth Sieves For Testing Purposes
E203 - Water Using Karl Fischer Reagent

(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 Nitric acid. When nitric acid is used as a raw material in the manufacture of ammonium nitrate, the nitric acid shall conform to class D of JAN-A-183. The supplier shall certify that this requirement has been met.

3.2 Chemical characteristics. Ammonium nitrate shall conform to the chemical characteristics of table I when tested as specified therein.

TABLE I. Chemical characteristics

Characteristic	Percent by weight		Test paragraph
	Minimum	Maximum	
Ammonium nitrate	99.0	---	4.2.4.1
Moisture	---	0.15	4.2.4.2
Ether-soluble material	---	0.10	4.2.4.3
Water-insoluble material	---	0.18	4.2.4.4
Insoluble material retained on a 425-micrometer sieve	---	0.01	4.2.4.5
Acidity, as nitric acid	---	0.02	4.2.4.6
Nitrites	---	To pass test	4.2.4.7
Sulfates	---	0.02	4.2.4.8
Chlorides	---	0.02	4.2.4.9

3.3 Particle size characteristics.

3.3.1 Class 1. No less than 99.0 percent by weight class 1 ammonium nitrate shall pass through a 2.00-millimeter (mm) sieve when tested as specified in 4.2.4.10.

3.3.2 Class 3. No less than 99.9 percent by weight class 3 ammonium nitrate shall pass through a 63-mm sieve when tested as specified in 4.2.4.10.

3.4 Zinc oxide. When specified (see 6.2), 0.50 to 0.90 percent by weight zinc oxide conforming to MIL-Z-291 shall be added to the ammonium nitrate. The amount added shall be determined as specified in 4.2.4.11.

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.

4.2 Quality conformance inspection.

4.2.1 Lotting. A lot shall consist of the ammonium nitrate 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 lot shall be identified and controlled in accordance with MIL-STD-1168.

4.2.2 Sampling. See 6.7 for sampling and testing precautions.

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

4.2.2.2 For ammonium nitrate test. Sampling 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 ammonium nitrate

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

4.2.2.3 For container leakage test. Sampling shall be conducted in accordance with MIL-STD-105.

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 1.0 percent defective:

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

4.2.3.2 For ammonium nitrate tests. 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.

4.2.3.3 For container leakage test. The sample unit shall be one container. The sample containers selected in 4.2.2.3 shall be tested as specified in 4.2.5 using an AQL of 1.0 percent defective.

4.2.4 Ammonium nitrate tests. See 6.7 for sampling and testing precautions. Water in accordance with ASTM D1193, type as applicable, 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 Ammonium nitrate. To 100 milliliters (mL) of water in an Erlenmeyer flask add 25 mL of a 40-percent by weight solution of formaldehyde and a few drops of phenolphthalein indicator solution. Neutralize with 0.1N sodium hydroxide solution, add approximately 1 g of specimen weighed to the nearest 0.1 milligram (mg), heat the mixture to 60°C, and then cool to room temperature. Titrate the solution with 0.15N sodium hydroxide to an end point which persists for 30 seconds. Calculate the percent by weight ammonium nitrate as follows:

$$\text{Percent ammonium nitrate} = \frac{8.005AB}{W}$$

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

4.2.4.2 Moisture. In the absence of zinc oxide in the ammonium nitrate, use the alternate method. In the event of failure by the alternate method, or if zinc oxide is present, use the standard method. In case of dispute, the standard method shall govern.

(a) Standard method. Determine percent by weight moisture in the specimen in accordance with ASTM E203 using toluene as the sample solvent.

(b) Alternate method. Weigh to the nearest milligram approximately 10 g of specimen into a tared wide-form weighing dish. Heat at 100°C for 2 hours or at 70°C for 5 hours, cool to room temperature in a desiccator, and weigh to the nearest milligram. Calculate the percent by weight moisture as follows:

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

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

4.2.4.3 Ether-soluble material. Dry a clean 150-mL beaker in an oven at 100°C for 1 hour, cool to room temperature in desiccator, and weigh to the nearest milligram. Weigh to the nearest milligram approximately 25 g of the specimen and transfer to the thimble of a Soxhlet extractor containing anhydrous ether. Extract the specimen for 2 hours. Retain the extracted specimen for the water-insoluble material determination in 4.2.4.4. Evaporate the ether extract in the extraction flask to a volume of approximately 50 mL on a steam bath and transfer to the weighed beaker. Rinse out the extraction flask with several 5-mL portions of ether and add to the main extract in the beaker. Cover the beaker with a ribbed watch glass and evaporate on a steam bath. After the solvent is removed, heat the beaker and residue in an oven at 100°C for 1 hour, cool to room temperature in a desiccator, and weigh to the nearest milligram. Calculate the percent be weight ether-soluble material as follows:

$$\text{Percent ether-soluble material} = \frac{100A}{W}$$

where: A = Weight of specimen residue, in grams, and
W = Weight of specimen in grams.

4.2.4.4 Water-insoluble material. Weigh to the nearest milligram approximately 20 g of specimen into a beaker, dissolve in hot water, and filter through a tared filtering crucible. Wash the insoluble residue in the crucible with hot water until it is free from nitrate. Dry to constant weight at 100°C, cool to room temperature in a desiccator, and weigh to the nearest milligram. Calculate the percent by weight water-insoluble material as follows:

$$\text{Percent water-insoluble material} = \frac{100A}{W}$$

where: A = Weight of residue, in grams, and
W = Weight of specimen in grams.

4.2.4.5 Insoluble material retained on a 425-micrometer sieve. Weigh to the nearest 0.01 g approximately 100 g of the specimen, transfer to a beaker, and dissolve in hot water. Pour the solution through a tared 425-micrometer sieve conforming to ASTM E11. Transfer any insoluble material from the beaker to the sieve by means of a jet of water. Wash the insoluble material in the sieve thoroughly by means of a jet of hot water. When no more insoluble material passes through the sieve, dry the sieve and residue remaining on it at 100°C for 1 hour and weigh to the nearest 0.01 g. Calculate the percent by weight insoluble material retained on the sieve as follows:

$$\text{Percent insoluble material retained on a 425-micrometer sieve} = \frac{100A}{W}$$

where: A = Weight of material retained on the sieve, in grams, and
W = Weight of specimen in grams.

4.2.4.6 Acidity, as nitric acid. Weigh to the nearest 0.01 g approximately 100 g of the specimen and dissolve in 400 mL of water. Filter, add methyl red indicator, and titrate with 0.1N sodium hydroxide solution. Calculate the percent by weight acidity, as nitric acid as follows:

$$\text{Percent acidity} = \frac{6.3AB}{W}$$

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

4.2.4.7 Nitrites.

(a) Metaphenylenediamine hydrochloride solution. Dissolve 0.5 g of metaphenylenediamine hydrochloride solution in 100 mL of water. If the solution is colored when prepared, add some animal charcoal, shake thoroughly, and filter to decolorize.

(b) Procedure. Dissolve 1.0 g of the specimen in 20 mL of water. Add 1 mL of 10-percent by volume sulfuric acid and 1 mL of the metaphenylenediamine hydrochloride solution prepared in (a). No yellow or yellowish-brown color shall develop.

4.2.4.8 Sulfates.

(a) Specimen solution. Weigh 10 g of the specimen to the nearest 0.01 g and dissolve in 500 mL of water. Transfer a 40-mL aliquot of this specimen to a 50-mL Nessler tube. Dilute to the mark with 0.1N barium chloride solution.

(b) Standard solution. Weigh 0.780 g of barium chloride and dissolve in 1 liter (L) of water. Transfer a 10-mL aliquot of this solution to a 1-L volumetric flask and dilute to the volume mark with water.

(c) Procedure. Transfer 40 mL of the standard solution prepared in (b) to a 50-mL Nessler tube and dilute to the volume mark with 0.1N sulfuric acid. Compare the turbidity in this tube with the tube prepared in (a). The turbidity of the specimen solution shall be no greater than the turbidity of the standard solution.

4.2.4.9 Chloride. Transfer a 5.0 g portion of the specimen to a 100-mL low-form Nessler tube. Add 50 mL of water and shake until solution is complete. Add 10 mL of a 10-percent by volume solution of nitric acid and 2.0 mL of 10-percent silver nitrate solution and mix well. Simultaneously and in the same manner prepare a standard containing 1 mg of ammonium chloride and 5 g of chloride-free ammonium nitrate and the same amounts of reagents used in preparing the tube containing the specimen. As soon as the silver nitrate solution is added, compare the turbidities of the specimen solution and the standard solution. The turbidity of the specimen solution shall be no greater than the turbidity of the standard solution.

4.2.4.10 Particle size characteristics. Use a sieve conforming to ASTM E11. Place the required size sieve on a bottom pan. Weigh 100 g of specimen to the nearest 0.1 g and transfer to the sieve. Cover the sieve and sift for 2 minutes with a mechanical shaker geared to produce 300 $\pm$ 15 gyrations and 150 $\pm$ 10 taps of the striker per minute. Weigh and calculate the percent by weight specimen which passed through the sieve and the percent by weight retained on the sieve.

4.2.4.11 Zinc oxide. Weigh to the nearest milligram approximately 10 g of the specimen and transfer to a tared 100-mL evaporating dish. Heat on a hot plate until all the ammonium nitrate has been driven off, then heat over a gas flame to a dull heat, cool to room temperature in a desiccator, and weigh to the nearest 0.1 mg. Calculate the percent by weight zinc oxide as follows:

$$\text{Percent zinc oxide} = \frac{100A}{W}$$

where: A = Weight of residue, in grams, and
W = Weight of specimen in grams.

If the residue is red in color, dissolve it in hydrochloric acid, precipitate any iron present by the addition of ammonium hydroxide, and filter through filter paper conforming to type II, class 5 of NNN-P-1475. Ignite and weigh to the nearest 0.1 mg. Calculate the corrected percent by weight zinc oxide as follows:

$$\text{Percent zinc oxide (corrected for iron)} = \frac{100(A - B)}{W}$$

where: A = Weight of residue from original ignition of specimen, in grams,
B = Weight of ignited residue from ammonium hydroxide precipitation, in grams, and
W = Weight of specimen in grams.

4.2.5 Container leakage test. Determine container leakage in accordance with the test for container leakage in 49 CFR 178.241-4.

5. PACKAGING

5.1 Unit packing. Ammonium nitrate shall be unit packed level A or C as specified (see 6.2 and 6.5).

5.1.1 Level A. A quantity of 35.0 (+0.5 or -0) kilograms (kg) of ammonium nitrate shall be unit packed in accordance with Department of Transportation (DOT) regulations in a polyethylene bag. The bag shall be made of two plys of high-density polyethylene film laminated together, so that the orientation as to direction of extrusion of each ply of film is at right angles to the other. The bag shall be closed to comply with 49 CFR 178.241-3 and shall not rupture or show sifting of contents when tested as specified in 4.2.5.

5.1.2 Level C. A quantity of 35.0 (+0.5 or -0) kg of ammonium nitrate shall be unit packed level C in a bag in accordance with DOT regulations, and in a manner to assure protection of its specified purity and quantity from supply source to first destination.

5.2 Packing. Ammonium nitrate shall be packed level A or C as specified (see 6.2 and 6.5).

5.2.1 Level A. Unit packs of 5.1.1 shall require no further protection for shipment other than unitization.

5.2.2 Level C. Ammonium nitrate, unit packed level C as specified in 5.1.2, shall be packed level C in accordance with DOT regulations and in a manner to asure safe delivery from supply source to destination and for a minimum period in storage of six months. Containers shall be acceptable to the common carrier and shall be in accordance with Uniform Freight Classification Rules, National Motor Freight Classification Rules, and rules of other intended modes of transportation.

5.3 Unitization. Uniform quantities of level A bags of ammonium nitrate shall be palletized in accordance with load type IV of MIL-STD-147 using the soft wood pallet of NN-P-71, fiberboard cap storage aid 4, and either bonding means "O" shrink film, "P" stretch film, or combined bonding means K, L, and M strapping. Uniform quantities of level C containers shall be unitized in a manner to assure carrier acceptance and safe delivery at first destination, and in accordance with Uniform Freight Classification Rules and the rules and regulations applicable to any other intended mode of transportation.

5.4 Marking. Level A and C containers and unitized loads of ammonium nitrate shall be marked and labeled in accordance with MIL-STD-129, DOT regulations and all other applicable regulations (see 6.5). In addition, each container shall be durably and legibly marked with the following precautionary marking:

HAZARDS:

STRONG OXIDIZER
TOXIC BY INHALATION
TOXIC BY INGESTION
DANGER! STRONG OXIDIZER.
CONTACT WITH OTHER MATERIAL
MAY CAUSE FIRE.

WARNING! HARMFUL IF INHALED OR SWALLOWED.
IRRITATING TO EYES, NOSE, AND
THROAT.

Keep from contact with clothing and other
combustible materials.
May explode under confinement and high temperatures.
Can react vigorously with reducing materials.
Do not store near combustible materials.
Store in tightly closed container.
Remove and wash contaminated clothing
promptly.
Avoid breathing dust.
Keep container closed.
Use with adequate ventilation.

FIRST AID: If in eyes, flush with plenty of
water for at least 15 minutes. If inhaled,
remove to fresh air. If swallowed, dilute
with water or milk. If not breathing, give
artificial respiration. If breathing is
difficult, give oxygen. Call a physician.

6. NOTES

6.1 Intended use. Class 1 ammonium nitrate is intended for use in the manufacture of Amatol. Class 3 ammonium nitrate is intended for use as a nitrating agent in the manufacture of explosives.

6.2 Ordering data. Acquisition documents should specify the following:

(a) Title, number, and date of this specification,
(b) Class of ammonium nitrate required (see 1.2),
(c) Zinc oxide content, when required (see 3.4), and
(d) Level of unit packing and packing required (see 5.1 and 5.2).

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.

6.5 Regulatory coverage. The packaging requirements specified herein are based on regulations current at the time of specification preparation. Because regulations may change, it is recommended that the applicable regulations be reviewed at the time of ammonium nitrate packaging.

6.6 International standardization agreements. Certain provisions of this specification are the subject of international standardization agreements STANAG No. 4024 and QSTAG 117. When amendment, revision, or cancellation of this specification is prepared which will affect or violate the international agreement concerned, the preparing activity will make appropriate reconciliation action through international standardization channels including departmental standardization offices, if required.

6.7 Sampling and testing precautions. This specification covers inspection of chemical material which is potentially hazardous to personnel. Ammonium nitrate is a strong oxidizer, toxic by inhalation. All applicable safety rules, regulations, and procedures must be followed in the handling and processing of this material.

Custodians:

Army - EA
Navy - OS
Air Force - 68

Preparing activity:

Army - EA

Project No. 6810-B392

Review activities:

Army - MD
DLA - GS

User activity:

Navy - SH

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STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions – Reverse Side)

1. DOCUMENT NUMBER	2. DOCUMENT TITLE
MIL-A-175C	AMMONIUM NITRATE, TECHNICAL (METRIC)

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)*

DD FORM 82 MAR 1426 EDITION OF 1 OCT 76 IS OBSOLETE