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SUPERSEDING
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FEDERAL SPECIFICATION

NITRIC ACID, TECHNICAL

This specification is approved by the Assistant Administrator, Office of Federal Supply and Services, General Services Administration, for the use of all Federal agencies.

1. SCOPE

1.1 Scope. This specification covers technical grade nitric acid.

2. APPLICABLE DOCUMENTS

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

Federal Specifications:

NN-P-T1	- Pallets, Material Handling, Wood, Stringer Construction, 2-Way and 4-Way (Partial)
PPP-B-585	- Boxes, Wood, Wirebound
PPP-C-186	- Containers, Packaging and Packing for Drugs, Chemicals, and Pharmaceuticals
PPP-C-2020	- Chemicals, Liquid, Dry, and Paste: Packaging Of
PPP-F-320	- Fiberboard: Corrugated and Solid, Sheet Stock (Container Grade), and Cut Shapes

Federal Standards:

Fed. Std. No. 123	- Marking for Shipment (Civil Agencies)
Fed. Std. No. 313	- Material Safety Data Sheets Preparation and the Submission Of

(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, US Government Printing Office, Washington, DC 20402.

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(Single copies of this specification, 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; Washington, DC; Philadelphia, PA; Atlanta, GA; Chicago, IL; Kansas City, MO; Fort Worth, TX; Denver, CO; San Francisco, CA; Los Angeles, CA; and Seattle, WA.

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

Military Specifications:

MIL-B-117 - Bags, Sleeves and Tubing - Interior Packaging
MIL-B-2427 - Box, Ammunition Packing: Wood, Nailed
MIL-P-45449 - Pallet, Units, Wood, For Shipment of Projectile Metal Parts, and Projectile Ammunition

Military Standards:

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

(Copies of military specifications and standards required by contractors in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting officer.)

Code of Federal Regulations (CFR):

49 CFR 171 to 179 - Hazardous Materials Regulations

(The Code of Federal Regulations and the Federal Register (FR) are for sale on a subscription basis by the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402. When indicated, reprints of certain regulations may be obtained from the Federal agency responsible for issuance thereof.)

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.

Uniform Classification Committee, Agent:

Uniform Freight Classification

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

National Motor Freight Traffic Association, Inc., Agent:

National Motor Freight Classification

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

ASTM Standards:

- C 516 - Vermiculite Loose Fill Insulation
- D 1193 - Reagent Water
- E 29 - Indicating Which Places of Figures are to be Considered Significant in Specified Limiting Values

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

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

2.3 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein (except for associated detail specifications, specification sheets or MS standards), the text of this specification shall take precedence. Nothing in this specification, however, shall supersede applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Appearance. Nitric acid shall be free from sediment, suspended matter, and separated material when tested as specified in 4.2.4.1.

3.2 Chemical characteristics. Nitric acid 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	:	
Total acid content (as HNO ₃)	: 61.0	: 68.2	:	4.2.4.2
Residual acid (as H ₂ SO ₄)	: ----	: 0.5	:	4.2.4.3
Chloride (Cl)	: ----	: 0.5	:	4.2.4.4

3.3 Material Safety Data Sheets. Material Safety Data Sheets for nitric acid shall be prepared and submitted by the contractor as specified in Fed. Std. No. 313 (see 6.5).

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.

4.1.1 Responsibility for compliance. All items must meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become 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 assuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling in quality conformance does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to acceptance of defective material.

4.2 Quality conformance inspection.

4.2.1 Lotting. A lot shall consist of the nitric acid 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).

4.2.2 Sampling.

4.2.2.1 For examination of packaging. Sampling shall be conducted in accordance with MIL-STD-105, inspection level S-2.

4.2.2.2 For nitric acid test. See 6.4 for sampling and testing precautions. Sampling shall be conducted in accordance with table II. A representative specimen of approximately 150 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.

4.2.2.3 For container leakage test. Sampling shall be conducted in accordance with MIL-STD-105, inspection level S-2.

TABLE II. Sampling for nitric acid test

Number of containers in batch or lot		:	Number of sample containers
2 to 25	:		2
26 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, intermediate, or shipping container, as applicable, ready for shipment. Sample unit, intermediate, and shipping containers shall be examined for the following defects using an AQL of 1.5 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) Fiberboard pads missing or not as specified (when required)
- (f) Marking incorrect, missing or illegible
- (g) Unitization not as specified

4.2.3.2 For nitric acid test. See 6.4 for sampling and testing precautions. 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 1.5 percent defective.

4.2.3.4 Significant places. For the purpose of determining conformance with this specification, an observed or calculated value shall 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 E 29.

4.2.4 Nitric acid tests. Water in accordance with ASTM D 1193 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 Appearance. Pour approximately 25 milliliters (mL) of the thoroughly mixed specimen into a clean, dry test tube, allow to stand for at least 10 minutes, and then examine visually for sediment, suspended matter, and separated material.

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4.2.4.2 Total acid content. Weigh a small glass-stoppered Erlenmeyer flask containing approximately 15 mL of water to the nearest milligram. Rapidly add 2 to 3 mL of the thoroughly mixed specimen and reweigh. Titrate with approximately 1N sodium hydroxide solution which has been freshly standardized, using methyl red as the indicator. Calculate the percent by weight total acid as nitric acid as follows:

$$\text{Percent nitric acid} = \frac{6.301 AB}{(C - D)}$$

where: A = Milliliters of sodium hydroxide solution used,
 B = Normality of sodium hydroxide solution,
 C = Weight of stoppered flask, water, and nitric acid in grams, and
 D = Weight of stoppered flask and water in grams.

4.2.4.3 Residual acid. Evaporate approximately 50 g of the specimen weighed to the nearest milligram in an evaporating dish on a steam bath. Repeat the evaporation twice, adding 10 mL of water each time. Cautiously dilute the residue with 100 mL of cold water and transfer quantitatively to a 250-mL beaker. Titrate with approximately 0.2N sodium hydroxide solution which has been standardized, using methyl red as the indicator. Calculate the percent by weight residual acid as sulfuric acid as follows:

$$\text{Percent residual acid} = \frac{4.904 AB}{W}$$

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

4.2.4.4 Chloride. Weigh to the nearest milligram approximately 20 g of the specimen and dilute with 300 mL of water. Heat to nearly boiling and add 10 mL of 0.5N silver nitrate solution. Stir thoroughly and allow to settle for at least 1 hour in a dark place. Filter through a tared filter crucible, wash thoroughly with water and alcohol and dry to constant weight at 105 deg. to 110 deg. C. Calculate the percent by weight chloride as follows:

$$\text{Percent chloride} = \frac{24.74 (A - B)}{W}$$

where: A = Weight of crucible and precipitate in grams,
 B = Weight of crucible in grams, and
 W = Weight of specimen in grams.

4.2.5 Container leakage test. Place the container in each of the following positions, and leave it in each for a period of 15 minutes.

- (a) Upright
- (b) Upside down

- (c) On one side (or one quadrant)
- (d) On one end (or second quadrant)
- (e) On other side (or fourth quadrant)

Examine the container after each period for any evidence of leakage.

5. PACKAGING

5.1 Preservation. Nitric acid shall be preserved level A, B or C as specified (see 6.2) and shall be in accordance with Department of Transportation (DOT) regulations, any other applicable regulatory requirements and also in accordance with the general requirements of PPP-C-2020.

5.1.1 Level A.

5.1.1.1 Unit packing. Nitric acid shall be unit packed level A in a quantity of 1 pint (pt), 5 pt, 6-1/2 gallon (gal), or 13 gal as specified (see 6.2).

(a) One-pt quantity. A quantity of 1 pt (+1/8 or -0 fluid ounces) of nitric acid shall be unit packed level A in a nominal 1-pt capacity glass bottle conforming to group A, glass type optional, style 1, grade 1, highly acid resistant closure A, with outer seal A or PPP-C-186. The closure and seal shall be secured to the neck of the bottle in accordance with bottle manufacturer's instructions. There shall be no leakage of contents when the container is tested as specified in 4.2.5. The filled bottle shall then be centered with closure-end uppermost, and sealed in enclosure "B" as specified in PPP-C-2020.

(b) Five-pt quantity. A quantity of 5 pt (+1 or -0 ounce) of nitric acid shall be unit packed level A in the same manner as specified for the 1-pt quantity in 5.1.1.1(a).

(c) Six and one-half-gal quantity. A quantity of 6-1/2 US gal (+1/2 or -0 pt) of nitric acid shall be unit packed level A in a metal drum conforming to DOT Specification 5C of a minimum size to contain the 6-1/2 gal of acid. The drum shall be closed as specified by the drum manufacturer. There shall be no evidence of leakage of contents when the drum is tested as specified in 4.2.5.

(d) Thirteen-gal quantity. A quantity of 13 US gal (+1 or -0 pt) of nitric acid shall be unit packed level A in the same manner as specified for the 6-1/2-gal quantity in 5.1.1.1(a).

5.1.1.2 Intermediate packing.

(a) One-pt quantity. Twelve unit packs of the 1-pt quantity of acid shall be intermediately packed level A, with closure-ends uppermost in a three by four unit pack configuration in a close-fitting box conforming to class 3, style optional of PPP-B-585 and DOT Specification 16A, fitted with an

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interior bag liner. The bag shall conform to type I, class B, style optional of MIL-B-117. All voids among the cans and among the box and cans shall be filled with vermiculite conforming to ASTM C 516, grade 1 or 2.

(b) Five-pt quantity. Six unit packs of the 5-pt quantity of acid shall be intermediately packed level A upright in a two by three unit pack configuration in the same manner as specified for the 1-pt quantity in 5.1.1.2(a).

5.1.2 Level B.

5.1.2.1 Unit packing. Nitric acid shall be unit packed level 3 in a quantity of 1 pt, 5 pt, 6-1/2 gal or 13 gal, as specified (see 6.2).

(a) One-pt quantity. A 1-pt quantity of nitric acid shall be unit packed level B in the same manner as specified for level A, except that instead of enclosing each bottle in the specified enclosure B of PPP-C-2020, the individual 1-pt bottle shall be encased in a close-fitting foamed polystyrene cushioning case as specified for DOT Specification 33A.

(b) Five-pt quantity. The 5-pt quantity of nitric acid shall be unit packed level B in the same manner as specified for the level B, 1-pt unit pack in 5.1.2.1(a).

(c) Six and one-half-gal quantity. A quantity of 6-1/2 US gal (+1/2 or -0 pt) of nitric acid shall be unit packed level B in a nominal 6-1/2-gal capacity glass carboy cushioned in expanded polystyrene in a wooden wirebound box combination conforming to DOT Specification 1K.

(d) Thirteen-gal quantity. A quantity of 13 US gal (+1 or -0 pt) of nitric acid shall be unit packed level B in the same manner as specified for the 6-1/2-gal quantity in 5.1.2.1(c).

5.1.2.2 Intermediate packaging.

(a) One-pt quantity. Twelve unit packs of nitric acid shall be intermediately packed level B in the same manner as specified for level A.

(b) Five-pt quantity. Six unit packs of the 5-pt quantity of nitric acid shall be intermediately packed level B with closure-end uppermost in the same manner as specified for level A intermediate packing of the 5-pt quantity, except that the box shall merely conform to DOT Specification 16A.

5.1.3 Level C.

5.1.3.1 Unit packing. Nitric acid shall be unit packed level C in a 1-pt, 5-pt, 6-1/2-gal or 13-gal quantity as specified (see 6.2).

(a) One-pt quantity. A quantity of 1 pt (+1/8 or -0 ounce) of nitric acid shall be unit packed level C in a nominal 1-pt capacity glass bottle conforming to group A, glass type optional, style 1, grade 1, highly acid resistant closure A with outer seal A of PPP-C-136. The closure shall be secured to the neck of the bottle in accordance with the bottle manufacturer's instructions. There shall be no leakage of contents when tested as specified in 4.2.5. Each bottle shall then be inserted with closure end uppermost in a close-fitting paper-faced expanded polystyrene board box conforming to DOT Specification 12R. The box shall be closed by tape centered along all seams, using pressure sensitive, adhesive-backed filament reinforced tape of minimum 2 inch width.

(b) Five-pt quantity. A quantity of 5 pt (+1 or -0 ounce) of nitric acid shall be unit packed level C in the same manner as is specified for the 1-pt quantity in

(c) Six and one-half-gal quantity. A quantity of 6-1/2 US gal (+1/2 or -0 pt) of nitric acid shall be unit packed level C as specified for the level B unit packing except that the container shall be a nonreusable glass carboy in a nonreusable expanded polystyrene box combination conforming to DOT Specification 1M.

(d) Thirteen-gal quantity. A quantity of 13 US gal (+1 or -0 pt) of nitric acid shall be unit packed level C in the same manner as specified for level B except that the container may also be a boxed glass carboy conforming to DOT Specification 1A.

5.1.3.2 Intermediate packing, 1- and 5-pt quantities. Twelve unit packs of the 1-pt quantity, or six unit packs or the 5-pt quantity shall be intermediately packed level C in the same manner as specified for level F, except that the box shall merely conform to DOT Specification 16A.

5.2 Packing. Nitric acid shall be packed level A, B or C as specified (see 6.2), and in accordance with DOT requirements and all other applicable regulatory requirements and rules, and also in accordance with the general requirements of PPP-C-2020.

5.2.1 Level A.

5.2.1.1 One-pt quantity. Two intermediate packs of the 1-pt quantity of nitric acid shall be packed level A, assuring that bottle closure ends are uppermost in a close-fitting wirebound wood box conforming to class 3, style optional of PPP-B-585 and DOT Specification 16A. The box shall be preserved in accordance with the requirements of MIL-B-2427, grade A. Any motion of contents shall be prevented by inserting, where needed, fiberboard pads formed from material conforming to grade V3c of PPP-F-320. The box shall be closed as specified in PPP-B-585.

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5.2.1.2 Five-pt quantity. Two intermediate packs of the 5-pt quantity of nitric acid shall be packed level A in the same manner as specified for the 1-pt quantity above.

5.2.1.3 Six and one-half-gal and 13-gal quantities. The 6-1/2- and 13-gal quantities of nitric acid, unit packed as specified herein, shall require no further protection for shipment except for unitization.

5.2.2 Level B.

5.2.2.1 One- and 5-pt quantities. The 1- and 5-pt quantities of nitric acid shall be packed level B in the same manner as level A, except that the preservative for the box shall not be required.

5.2.2.2 Six and one-half-gal and 13-gal quantities. The 6-1/2- and 13-gal quantities of nitric acid, unit packed level B as specified herein, shall require no further protection for shipment except for unitization.

5.2.3 Level C.

5.2.3.1 One-pt and 5-pt quantities. The 1- and 5-pt quantities of nitric acid, intermediately packed as specified herein, shall be packed level C in the same manner as specified for level B.

5.2.3.2 Six and one-half-gal and 13-gal quantities. The 6-1/2- and 13-gal quantities of nitric acid, unit packed level C as specified herein, shall require no further protection for shipment except for unitization.

5.3 Unitization.

5.3.1 One-pt and 5-pt quantities. Uniform quantities of either the 1-pt or 5-pt quantity packs shall be palletized in accordance with the requirements for load type I of MIL-STD-147. The pallet shall conform to the preserved, type IV requirements of NN-P-71.

5.3.2 Six and one-half-gal and 13-gal quantities. Uniform quantities of either the 6-1/2- or 13-gal quantity packs shall be palletized in accordance with the requirements or MIL-STD-147 applicable to the particular proprietary configuration or the pack. The pallet shall conform to type IV of NN-P-71 except that pallets conforming to grade A of NN-P-71 shall be preserved as specified in MIL-P-45449.

5.4 Marking. Containers and palletized loads shall be marked in accordance with DOT requirements and any other regulations applicable to the intended mode of transportation, the civil agency or military activity marking requirements, as applicable, and as shown under precautionary marking herein. In addition, containers shall be marked to show the date of manufacture and the lot or batch number.

5.4.1 Civil agencies. Containers for civil agencies shall be marked in accordance with Fed. Std. No. 123.

5.4.2 Military activities. Containers for military activities shall be marked in accordance with MIL-STD-129, including the requirements for application of the "3 of 9" bar coding.

5.4.3 Precautionary marking. Each unit, intermediate, and shipping container shall be marked with the following precautionary marking:

HAZARD

CORROSIVE TO EYE, SKIN, AND MUCOUS MEMBRANES

STRONG OXIDIZER

DANGER! CAUSES SEVERE BURNS

CONTACT WITH OTHER MATERIALS

MAY CAUSE FIRE

Do not get in eyes, on skin, or on clothing. Avoid breathing vapor or mist. Keep container closed. Use with adequate ventilation. Keep from contact with combustible materials. Do not store near combustible materials or in direct sunlight. Wash thoroughly after handling.

FIRST AID: In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash exposed skin with plenty of water. Get medical attention. If inhaled, remove person to fresh air at once. If not breathing, give artificial respiration and get medical attention. If swallowed and person is conscious, give large quantities of water immediately to dilute the nitric acid. Do NOT induce vomiting. Get medical attention.

6. NOTES

6.1 Intended use. Nitric acid is intended for use in the manufacture of metals, chemicals, and fertilizers, in the cleaning of a variety of materials, and in the nitrating of agents.

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6.2 Ordering data. Acquisition documents should specify the following:

- (a) Title, number, and date of this specification,
- (b) Level or preservation and packing required (see 5.1 and 5.2), and
- (c) Quantity to be unit packed level A, B, or C (see 5.1.1.1, 5.1.2.1, and 5.1.3.1).

6.3 Batch. A batch is defined as that quantity or 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 Sampling and testing precautions. This specification requires inspection or chemical material which is potentially hazardous to personnel (see 5.4.3). All applicable safety rules, regulations, and procedures must be followed in the handling and processing of this material.

6.5 Material Safety Data Sheets. Contracting officers will identify those activities requiring copies of completed Material Safety Data Sheets prepared in accordance with Fed. Std. No. 313. The pertinent mailing addresses for submission or data are listed in appendix B of Fed. Std. No. 313.

MILITARY INTERESTS:

CIVIL AGENCY COORDINATING ACTIVITIES:

Custodians:

AGR-AMS
COM-NBS
GSA-7FCE
VA-OSS

Army EA
Navy - SH
Air Force - 68

Preparing activity:

Review activities:

Army - EA

Army - AR, MD, MI
Navy - OS
DLA - GS

Project No. 6810-B500

Orders for this publication are to be placed with the General Services Administration, acting as an agent for the Superintendent of Documents. See section 2 or this specification to obtain copies and other documents referenced herein.