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SUPERSEDING
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FEDERAL SPECIFICATION

AMMONIUM HYDROXIDE, TECHNICAL

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

1. SCOPE AND CLASSIFICATION

1.1 Scope. This specification covers four types of technical grade ammonium hydroxide, also known as aqua ammonia.

1.2 Classification.

1.2.1 Types. Ammonium hydroxide shall be of the following types as specified (see 6.2):

Type I - 26° Baumé (27 to 30 percent as NH_3).
Type II - 21° Baumé (19 to 21 percent as NH_3).
Type III - 16° Baumé (9 to 10 percent as NH_3).
Type IV - 14° Baumé (6 to 7 percent as NH_3).

2. APPLICABLE DOCUMENTS

2.1 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:

NN-P-71 - Pallets, Material Handling, Wood, Stringer Construction, 2-Way and 4-Way (Partial).
PPP-B-585 - Boxes, Wood, Wirebound.
PPP-B-621 - Boxes, Wood, Nailed and Lock-Corner.
PPP-B-636 - Boxes, Shipping, Fiberboard.
PPP-C-1337 - Containers, Metal, with Polyethylene Inserts.
PPP-F-320 - Fiberboard; Corrugated and Solid, Sheet Stock (Container Grade), and Cut Shapes.

Federal Standard:

Fed. Std. No. 123 - Marking for Shipment (Civil Agencies).

(Activities outside the Federal Government may obtain copies of Federal Specifications, Standards, and Handbooks as outlined under General Information in the Index of Federal Specifications and Standards and at the prices indicated in the Index. The Index, which includes cumulative monthly 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 required by activities outside the Federal Government for bidding purposes are available without charge from Business Service Centers at the General Services Administration Regional Offices in Boston, New York, Washington, DC, Atlanta, Chicago, Kansas City, MO, Fort Worth, Denver, San Francisco, Los Angeles, and Seattle, WA.

(Federal Government activities may obtain copies of Federal Specifications, Standards, and Handbooks and the Index of Federal Specifications and Standards from established distribution points in their agencies.)

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 for 40" x 48" Pallets.

(Copies of Military Specifications and Standards required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

Code of Federal Regulations:

49 CFR 171-179 - Department of Transportation Rules and Regulations for the Transportation of Explosives and Other Dangerous Articles.

(The Department of Transportation regulations are a part of the Code of Federal Regulations available from the Superintendent of Documents, U. S. Government Printing Office, Washington, DC 20402. Orders for the above publication should cite "49 CFR 171-179.")

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) Standards:

D1122-58 - Specific Gravity of Engine Antifreezes by the Hydrometer.
D1193-72 - Reagent Water.

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

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

3. REQUIREMENTS

3.1 Appearance. Ammonium hydroxide shall be a colorless, transparent, aqueous solution of ammonia (NH_3) and water, visually free from foreign matter when tested as specified in 4.2.4.1.

3.2 Physical and chemical characteristics. Ammonium hydroxide shall conform to the applicable physical and chemical characteristics of table I when tested as specified therein.

Table I. Physical and chemical characteristics

Characteristic	Type I	Type II	Type III	Type IV	Test paragraph
Residue after ignition, percent by weight, maximum	0.03	0.03	0.03	0.03	4.2.4.2
Specific gravity at 60°/60° F, maximum	0.904	0.929	0.963	0.974	4.2.4.3
Assay (as NH_3), percent by weight	27 to 30	19 to 21	9 to 10	6 to 7	4.2.4.4
Nonvolatile matter, percent by weight, maximum	0.05	0.05	0.05	0.05	4.2.4.5

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or order, the supplier 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 specified requirements.

4.2 Quality conformance inspection.

4.2.1 Lotting. A lot shall consist of the ammonium hydroxide 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 preparation for delivery. Sampling shall be conducted in accordance with MIL-STD-105, inspection level S-2 using an AQL of 4.0 percent defective.

4.2.2.2 For ammonium hydroxide tests. Sampling shall be conducted in accordance with table II. A representative specimen of approximately 250 grams (g) shall be removed from each sample unit 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 unit containers in batch or lot	Number of sample unit 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

4.2.2.3 For container leakage test. Sampling shall be conducted in accordance with MIL-STD-105, inspection level S-4 using an AQL of 2.5 percent defective.

4.2.3 Inspection procedure.

4.2.3.1 For examination of preparation for delivery. 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 inspection level S-2 and an AQL of 4.0 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) Container closure loose, damaged, or deformed
(f) Outer seal on screw cap not as specified, loose, or missing
(g) Neck finish of bottle not as specified
(h) Marking incorrect, missing, or illegible
(i) Palletization not as specified

4.2.3.2 For ammonium hydroxide tests. Each 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 containers selected in 4.2.2.3 shall be tested as specified in 4.2.5.

4.2.4 Ammonium hydroxide tests. Water in accordance with ASTM D1193-72 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. Visually examine the specimen for color, transparency, and presence of foreign matter.

4.2.4.2 Residue after ignition. Shake thoroughly and then weigh to the nearest gram approximately 100 g of the specimen into a tared platinum crucible or other suitable dish weighed to the nearest milligram (mg). Evaporate the specimen to dryness, ignite at 800° ± 25° C for 15 minutes, cool, and weigh to the nearest milligram. Calculate the percent residue after ignition as follows:

$$\text{Percent residue after ignition} = \frac{100\ (A - B)}{W}$$

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

4.2.4.3 Specific gravity. Determine specific gravity at 60°/60° F in accordance with ASTM D1122-58.

4.2.4.4 Assay (as NH_3). Introduce a glass-stoppered weighing bottle containing approximately 10 g of the specimen, weighed to the nearest 0.01 g, into an 800-milliliter (ml) Erlenmeyer flask containing approximately 200 ml of water and sufficient 0.5N sulfuric acid to combine with the ammonia plus 10 ml excess. Stopper the flask and warm gently until the stopper in the weighing bottle is forced out and the ammonia combines with the acid. Mix thoroughly, allow the solution to cool, and titrate the excess sulfuric acid with 0.5N sodium hydroxide solution using methyl red indicator. Calculate the percent by weight NH_3 as follows:

$$\text{Percent } NH_3 = \frac{1.7\ (AB - CD)}{W}$$

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

4.2.4.5 Nonvolatile matter. Shake thoroughly and then weigh to the nearest 0.1 g approximately 25 ml of the specimen into a tared evaporating dish weighed to the nearest milligram. Evaporate to dryness on a steam bath. Dry the residue to constant weight at 105° C. Cool to room temperature in a desiccator and weigh to the nearest milligram. Calculate the percent by weight nonvolatile matter as follows:

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

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

4.2.5 Container leakage test.

4.2.5.1 Bottles. Remove the outer seal (if present) from the filled bottle and hold the bottle in an inverted position at a temperature of 75° ± 5° F for 2 hours and then at 120° ± 5° F for an additional 4 hours. Observe for evidence of leakage during and at the end of this test.

4.2.5.2 Drums. Store the filled drum for at least 24 hours at a temperature of 75° ± 5° F. Then invert the drum and maintain at 75° ± 5° F for 4 additional hours. Observe for evidence of leakage during and at the end of the 4-hour period.

5. PREPARATION FOR DELIVERY

5.1 Packaging. Ammonium hydroxide shall be packaged level A, B, or C as specified (see 6.2). Special dispensing closures and other devices, if required shall be as specified (see 6.2).

5.1.1 Level A. Ammonium hydroxide shall be packaged in unit quantities of 1 pint, 1 quart, 4 pounds (lb), or 1 gallon as specified (see 6.2).

5.1.1.1 One-pint quantity. A quantity of 16 (+0.2 or -0) fluid ounces (oz) of ammonium hydroxide shall be packaged in a new, clean, polyethylene screw-cap bottle. The volume of contents shall be 75 to 95 percent of the overflow capacity of the bottle. The bottle shall be formed from a polyethylene copolymer having a melt index of 0.200 to 0.400 g per 10 minutes and a density of 0.950 to 0.955 g per cubic centimeter. The configuration of the bottle shall be commercial designation "Boston Round" type having a minimum wall thickness of 0.020 inch. The neck finish shall be 28 millimeters (mm) and shall have at least one turn of modified buttress type thread. The closure for the bottle shall be designed to fit the neck finish. The combined neck finish and closure shall be capable of being tightened to minimum torque of 30 inch-lb without stripping or slipping threads, or deforming or cracking the bottle neck finish or screw cap. The screw cap for the bottle shall be furnished with either integral or insert type seals which are impervious to ammonium hydroxide. The bottle shall be closed by tightening the screw cap to the neck of bottle to a torque of 15 to 19 inch-lb. The filled and closed bottle shall show no evidence of leakage when tested as specified in 4.2.5. Each screw cap shall be secured to the neck of the bottle by an outer seal of shrinkable cellulose hydrate or equivalent band which covers the head of the bottle and extends at least half way up the sides of the screw cap. When shrunk, the outer seal shall conform tightly to the contour of the cap and head of the neck preventing loosening of the screw cap.

5.1.1.2 One-quart quantity. A quantity of 32 (+0.32 or -0) fluid oz of ammonium hydroxide shall be packaged as specified for the 1-pint quantity in 5.1.1.1 except that the bottle shall have a minimum wall thickness of 0.025 inch and a neck finish of 38 mm.

5.1.1.3 Four-lb quantity. A quantity of 4 lb (+2/3 or -0 oz avoirdupois) of ammonium hydroxide shall be packaged as specified for the 1-pint quantity in 5.1.1.1 with the following exceptions: The bottle shall have a minimum wall thickness of 0.032 inch. The bottle shall have a neck finish of nominal 38 mm. The closure shall be capable of being tightened to a minimum torque of 40 inch-lb without stripping or slipping threads or deforming or cracking the neck finish or screw cap. The bottle shall be closed by tightening the screw cap to the neck of the bottle to a torque of 20 to 25 inch-lb.

5.1.1.4 One-gallon quantity. A quantity of 1 U.S. gallon (+ 1.25 or -0 fluid oz) of ammonium hydroxide shall be packaged as specified for the 1-pint quantity in 5.1.1.1 with the following exceptions: The style of the bottle shall be either "jug" with integral handle or "Boston Round." The bottle or jug shall have a minimum wall thickness of 0.050 inch and a neck finish of nominal 38 mm. The closure shall be capable of being tightened to a minimum torque of 40 inch-lb without stripping or slipping threads or deforming or cracking the neck finish or screw cap. The container shall be closed by tightening the screw cap to the neck of the bottle to a torque of 20 to 25 inch-lb.

5.1.1.5 Intermediate packaging. Ammonium hydroxide packaged as specified in 5.1.1.1 through 5.1.1.4 shall be intermediately packaged as specified in table III in a snug-fitting fiberboard box conforming to grade W5c for a type 2 load of PPP-B-636. Each bottle shall be inserted into a full bottle height cell formed by fiberboard separators. Fiberboard pads shall be inserted where needed to assure a tight pack. Separators and pads shall be formed from material conforming to grade W5c of PPP-F-320. The box shall be closed as specified in the appendix to PPP-B-636.

Table III. Intermediate packages

Unit quantity	Arrangement in fiberboard box			Total number of unit containers
	No. of layers	No. of rows	No. in row	
1 pint	1	3	4	12
1 quart	1	3	4	12
4 pounds	1	2	3	6
1 gallon	1	2	2	4

5.1.2 Level B, for civil agency use. One quart of ammonium hydroxide shall be packaged in a high density polyethylene bottle and closed with a screw cap. The closed bottle shall show no evidence of leakage when tested as specified in 4.2.5.

5.1.3 Level C. Ammonium hydroxide in the unit quantity specified (see 6.2) shall be packaged in accordance with Department of Transportation (DOT) regulations and in a manner to assure integrity of the container without alteration of the contents. The container shall provide protection against seepage, spillage, and hazards during shipment, handling, and for a limited time in storage.

5.2 Packing. Ammonium hydroxide shall be packed level A, B, or C as specified (see 6.2).

5.2.1 Level A

5.2.1.1 One-pint, 1-quart, 4-lb, and 1-gallon quantities. Ammonium hydroxide intermediately packaged as specified in 5.1.1.5 shall be packed for shipment in a wirebound wood box conforming to class 3, style 3, for a type 2 load of PPP-B-585 or in a nailed wood box conforming to class 2, style 4, for a type 2 load of PPP-B-621. Pads formed from fiberboard conforming to grade W5c or V3c of PPP-F-320 shall be inserted where needed to prevent movement of the contents. The gross weight of the box and contents shall be no more than 200 pounds. The box shall be closed and reinforced as specified in the applicable box specification.

5.2.1.2 Thirty-five-lb quantity. A quantity of 35 (+0.4 or -0) lb of ammonium hydroxide shall be packed in a drum conforming to type II, class 1 of PPP-C-1337. The drum shall have a pour spout which is depressible for shipment and extensible for easy pouring. The filled and closed drum shall show no evidence of leakage when tested as specified in 4.2.5.

5.2.1.3 One hundred-lb quantity. A quantity of 100 (+1 or -0) lb of ammonium hydroxide shall be packed as specified for the 35-lb quantity in 5.2.1.2 except that the drum shall conform to type II, class 2 of PPP-C-1337.

5.2.2 Level B.

5.2.2.1 For military activities. Ammonium hydroxide shall be packed as specified in 5.2.1.1 except that the shipping container shall conform to grade V3c of PPP-B-636.

5.2.2.2 For civil agencies. Eighteen 1-quart bottles of ammonium hydroxide packaged as specified in 5.1.2 shall be packed in a box conforming to class domestic of PPP-B-636. The box shall be fitted with partitions, dividers, and cells fabricated of fiberboard of the same material description as the box. The box shall be closed in accordance with the appendix to PPP-B-636.

5.2.3 Level C. Ammonium hydroxide shall be packed to meet carrier acceptance and assure safe delivery to destination in compliance with requirements of carrier rules and regulations applicable to the mode of transportation.

5.3 Marking. In addition to the special marking in 5.3.1, marking shall be in accordance with DOT regulations. Marking for shipments protected levels A and B shall include the lot or batch number and shall be in accordance with MIL-STD-129 for military activities or Fed. Std. No. 123 for civil agencies. Marking for shipments protected level C shall be applied by any means which provides legibility and shall contain, as a minimum, the following information:

(a) Noun nomenclature as cited in the contract or purchase order
(b) National Stock Number (NSN) or part number when NSN is not given
(c) Government contract or purchase order number
(d) Quantity
(e) Lot or batch number
(f) Date of manufacture and date of pack
(g) Contractor's name
(h) Additional markings as may be required by the contract and the contractor's policy and procedures
(i) Exterior containers and palletized loads shall also be marked with the appropriate address markings

5.3.1 Special marking. Each unit container shall be durably and legibly marked to show the following special information:

POISON!

WARNING!
LIQUID CAUSES BURNS
VAPOR EXTREMELY IRRITATING

Avoid breathing vapor.
Avoid contact with eyes, skin and clothing.
In case of contact, immediately flush skin or eyes with plenty of water for at least 15 minutes; for eyes, get medical attention.

HANDLING AND STORAGE

Use care in opening this container as a portion of the contents may blow out violently due to the pressure of the ammonia gas; safety goggles or a face shield must be worn.
Place a cloth over the cap or stopper before removal.
It is also advisable to cool container before opening, especially during warm seasons.
Keep well closed and in a cool place.

5.4 Palletization. When specified in the contract or order, shipping containers shall be palletized (see 6.2). Shipments specified as being required to meet levels A or B protection shall be palletized in accordance with the applicable requirements of MIL-STD-147 utilizing softwood pallets conforming to type IV of NN-P-71. Shipments required to meet level C protection shall be palletized to meet carrier acceptance and safe delivery to destination.

6. NOTES

6.1 Intended use. Ammonium hydroxide is intended for miscellaneous uses, such as a cleansing agent, an accelerator in vulcanization, and as a dry diazo print developer for white print machines.

6.2 Ordering data. Purchasers should select the preferred options permitted herein and include the following information in procurement documents:

(a) Title, number, and date of this specification.
(b) Type of ammonium hydroxide required (see 1.2.1).
(c) Level of packaging required (see 5.1).
(d) If special closure or dispensing device is required (see 5.1).
(e) Unit quantity required (see 5.1.1 and 5.1.3).
(f) Level of packing required (see 5.2).
(g) If palletization is required (see 5.4).

6.2.1 When ordering ammonium hydroxide for use as a dry diazo print developer, purchasers should specify the make, model, and name of the white print machine. Polyethylene carboys provided with a cap closure and dispensing system are required only on the initial order since the cap closure and dispensing system remain on the white print machine when the ammonium hydroxide containers are changed.

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 the Recommended Practice for Indicating Which Places of Figures Are To Be Considered Significant in Specified Limiting Values (ASTM E29).

MILITARY INTEREST:

Custodians:

Army - EA
Air Force - 68

Review activities:

Army - MD, ME, PA
Air Force - 68
DSA - GS

User activities:

Army - MI, SM

Civil Agency Coordinating Activities:

GSA - FSS

Preparing activity:

Army - EA

Orders for this publication are to be placed with General Services Administration, acting as an agent for the Superintendent of Documents. See section 2 of this specification to obtain extra copies of documents referenced herein. Price 35 cents each.