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SUPERSEDING
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FEDERAL SPECIFICATION

SULFURIC ACID, TECHNICAL

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

1. SCOPE AND CLASSIFICATION

1.1 Scope. This specification covers technical grade sulfuric acid.

1.2 Classification. Sulfuric acid shall be of the following types and classes as specified (see 6.2).

Type I - 66 deg. Baume
Type II - 60 deg. Baume

Class 1 - For galvanizing and plating
Class 2 - For general use

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-186 - Containers, Packaging and Packing for Drugs, Chemicals, and Pharmaceuticals

PPP-C-2020 - Chemicals, Liquid, Dry, and Paste: Packaging Of
PPP-D-729 - Drums, Shipping and Storage, Steel, 55-Gallon (208 Liters)
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 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.

(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; Houston, 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 Specification:

MIL-D-43703 - Drums, Shipping and Storage, Molded Polyethylene

Military Standards:

MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-129 - Marking and Shipment for 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 procuring 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, US 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.)

American Society for Testing and Materials (ASTM) Standards:

D 1193 - Reagent Water
E 223 - Analysis of Sulfuric Acid

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

3. REQUIREMENTS

3.1 Appearance. Sulfuric acid shall be an oily, clear to slightly cloudy liquid when tested as specified in 4.2.4.1.

3.2 Chemical and physical characteristics. Sulfuric acid shall conform to the requirements of table I when tested as specified therein.

TABLE I. Chemical and physical characteristics

Characteristic	Requirement				Test
	Type I		Type II		
	Class 1	Class 2	Class 1	Class 2	paragraph
Sulfuric acid, percent by weight, minimum	93.0	93.0	77.5	77.5	4.2.4.2
Specific gravity at 60 deg./60 deg. F, minimum	1.8347	1.8347	1.7040	1.7040	4.2.4.3
Nonvolatile matter, percent by weight, maximum	0.025	0.025	0.05	0.05	4.2.4.4
Arsenic, parts per million (ppm), maximum	0.02	---	0.02	---	4.2.4.4

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 sulfuric acid of one type and class, 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.

4.2.2.2 For sulfuric acid test. See 6.5 for sampling and testing precautions. Sampling shall be conducted in accordance with table II. A representative specimen of approximately 450 milliliters 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.

TABLE II. Sampling for sulfuric 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 1.0 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) 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 sulfuric acid 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.

4.2.3.3 For container leakage test. See 6.5 for sampling and testing precautions. 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.

4.2.4 Sulfuric acid tests. See 6.5 for sampling and testing precautions. 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. Visually examine the specimen for form and clarity.

4.2.4.2 Sulfuric acid. Determine sulfuric acid in accordance with the total acidity method of ASTM E 223.

4.2.4.3 Specific gravity. Determine the specific gravity of the specimen in accordance with the Baume gravity method of ASTM E 223.

4.2.4.4 Nonvolatile matter and arsenic. Determine the nonvolatile matter and arsenic content of the specimen in accordance with ASTM E223.

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

5.1.1 Level A.

5.1.1.1 Unit packing. Sulfuric acid shall be unit packed level A in a 1- or 5-pint (pt), or 5-, 6-1/2-, 13- or 55-gallon (gal) quantity as specified (see 6.2).

5.1.1.1.1 One-pt quantity. A quantity of 16 (+1/8 or -0) fluid ounces (oz) of sulfuric acid shall be unit packed in a nominal 1-pt capacity screwcap glass bottle. The bottle shall conform to group A, class 1, type of glass d, grade optional with closure A or R and outer seal A of PPP-C-186. The closure shall be closed to a torque within the range specified by the bottle manufacturer. There shall be no evidence of leakage prior to application of the outer seal when tested as specified in 4.2.5. The bottle shall then be cushioned and closed in enclosure A, B or C as specified in PPP-C-2020.

5.1.1.1.2 Five-pt quantity. A quantity of 5 (+1/4 or -0) pt of sulfuric acid shall be unit packed in a nominal 5-pt capacity glass bottle in the same manner as specified for the 1-pt quantity in 5.1.1.1.1.

5.1.1.1.3 Five-gal quantity. A quantity of 5 US gal of sulfuric acid shall be unit packed in a steel drum conforming to DOT Specification 5A or 5C, fitted with screw-thread plug closures. The exterior of the drum shall be finished as specified for the type V drum of PPP-D-729. The plugs on the drum shall be tightened to a torque within the range specified by the drum manufacturer. There shall be no evidence of leakage when tested as specified in 4.2.5.

5.1.1.1.4 Six and one-half-gal quantity. A quantity of 6-1/2 US gal of sulfuric acid shall be unit packed in a nominal 6-1/2-gal capacity glass carboy conforming to DOT Specification lA, lD or lK, or molded polyethylene carboy conforming to DOT Specification 2T in a steel crate conforming to DOT Specification lH or plywood box conforming to DOT specification 15P. The carboy and box or crate, as applicable, shall be closed tightly in accordance with the carboy and crate, or box manufacturer's instructions. There shall be no evidence of leakage when the unit pack is tested as specified in 4.2.5.

5.1.1.1.5 Thirteen-gal quantity. A quantity of 13 US gal of sulfuric acid shall be unit packed in a nominal 13-gal capacity container in the same manner as is specified for the 6-1/2-gal quantity above.

5.1.1.1.6 Fifty-five-gal capacity. A quantity of 55 US gal of sulfuric acid shall be unit packed in a nominal 55-gal capacity drum conforming to type V or VI of PPP-D-729. The threaded plugs shall be closed to a torque within the range specified by the drum manufacturer. There shall be no evidence of leakage of contents from the drum when tested as specified in 4.2.5.

5.1.1.2 Intermediate packing, l-pt quantity. Twelve l-pt bottles, unit packed as specified in 5.1.1.1.1, shall be intermediately packed in a close-fitting fiberboard box. The box shall conform to class weather-resistant, grade V3c of PPP-B-636. Motion of contents shall be prevented by inserting fiberboard pads as needed. Pads shall be formed from material conforming to class weather-resistant, grade V3c of PPP-F-320. The box shall be closed as specified in PPP-B-636 for the closure of interior containers.

5.1.2 Level B.

5.1.2.1 Unit packing. Sulfuric acid shall be unit packed level B in a 5-, 6-1/2-, 13- or 55-gal quantity, as specified (see 6.2).

5.1.2.1.1 Five-gal quantity. A quantity of 5 US gal of sulfuric acid shall be unit packed level B in a nominal 5-gal capacity polyethylene drum conforming to size 1 of MIL-D-43703. The drum shall be furnished with a molded-in, internally threaded closure for filling and pouring, and a similar but smaller venting closure. The closures shall be tightened to a torque within the range specified by the drum manufacturer. There shall be no evidence of leakage when the drum is tested as specified in 4.2.5.

5.1.2.1.2 Six and one-half-gal quantity. A quantity of 6-1/2 US gal of sulfuric acid shall be unit packed level B in a nominal 6-1/2-gal capacity drum conforming to DOT specification 34. The drum closure shall be tightened to a torque within the range specified by the drum manufacturer. There shall be no evidence of leakage when tested as specified in 4.2.5.

5.1.2.1.3 Thirteen-gal quantity. A quantity of 13 US gal of sulfuric acid shall be unit packed level B in a nominal 13-gal capacity polyethylene drum in the same manner as is specified for the 6-1/2-gal quantity of sulfuric acid.

5.1.2.1.4 Fifty-five-gal quantity. A quantity of 55 US gal of sulfuric acid shall be unit packed level B in a drum conforming to DOT Specification 5A or 5C in the same manner specified for the level A protection in 5.1.1.1.6.

5.1.2.2 Intermediate packing, l-pt quantity. Twelve l-pt bottles of sulfuric acid shall be intermediately packed level B in the same manner as for level A except that the box shall conform to class domestic, variety SW, minimum grade 200 of PPP-B-636 and the pads shall be type CF, class domestic, minimum grade 200 of PPP-F-320.

5.1.3 Industrial. Sulfuric acid shall be unit packed industrially in the quantity specified (see 6.2) in a manner to assure maintenance of the specified purity and quantity. Containers shall comply with DOT regulations and any other applicable regulatory requirements.

5.2 Packing. Sulfuric acid shall be packed level A, B or industrial as specified (see 6.2).

5.2.1 Level A. The 1- or 5-pt, or 5-, 6-1/2-, 13- or 55-gal quantity of sulfuric acid, as specified (see 6.2), shall be packed level A.

5.2.1.1 One-pt quantity. Two intermediate packs as specified in 5.1, each containing 12 l-pt bottles of sulfuric acid, shall be packed in a close-fitting wood box. The box shall conform to class 3, style optional of PPP-B-585. The wooden parts of the box shall be preserved in the same manner as those of the grade A box of PPP-B-621. Motion of contents shall be prevented by inserting fiberboard pads where needed. Pads shall be formed from material conforming to class weather-resistant, grade V3c fiberboard of PPP-F-320. The box shall be closed as specified in PPP-B-585.

5.2.1.2 Five-pt quantity. Four 5-pt bottles of sulfuric acid, unit packed as specified in 5.1, shall be packed in a wooden box in the same manner as that specified for the l-pt quantity in 5.2.1.1.

5.2.1.3 Five-, 6-1/2-, 13- and 55-gallon quantity. The 5-, 6-1/2-, 13- and 55-gal quantity of sulfuric acid, unit packed as specified in 5.1, shall require nothing further for shipment for level A protection other than unitization.

5.2.2 Level B. The 1- or 5-pt, or 5-, 6-1/2-, 13- or 55-gal quantity of sulfuric acid, as specified (see 6.2), shall be packed level B.

5.2.2.1 One-pt quantity. The l-pt quantity intermediate packs of sulfuric acid of 5.1 shall be packed in the same manner as specified for level A except that the box shall conform to class weather-resistant, grade V3c of PPP-B-636. The box shall be closed and reinforced as specified in PPP-B-636.

5.2.2.2 Five-pt quantity. The 5-pt quantity of sulfuric acid, unit packed as specified in 5.1, shall be packed level B in the same manner as specified for level A except that the box shall be class weather-resistant, grade V3c of PPP-B-636.

5.2.2.3 Five-, 6-1/2-, 13- and 55-gal quantity. The 5-, 6-1/2-, 13- and 55 gal quantity of sulfuric acid, unit packed as specified in 5.1, shall require nothing further for shipment for level B other than unitization.

5.2.3 Industrial. Sulfuric acid in the quantity as specified (see 6.2), shall be packed industrially in a manner to assure carrier acceptance and safe delivery from supply source to the initial destination, compliance with DOT and any other applicable regulations, and compliance with Uniform Freight Classification rules, National Motor Freight Classification rules and rules applicable to any other intended mode of transportation.

5.2.4 Unitization. Uniform quantities of the same size pack of sulfuric acid shall be palletized in accordance with the applicable requirements of MIL-STD-147 using the type IV, grade B, softwood pallet of NN-P-71 for level A packs, and the type IV, grade A, softwood pallet of NN-P-71 for the level B packs. Industrial packs shall be unitized in a manner to assure protection of the packs, carrier acceptance, and stable stackability during storage for a duration of up to six months.

5.3 Marking. Each container shall be marked to show the lot or batch number and the date of manufacture of the sulfuric acid. Each plastic container shall be marked to show a type II shelf life of 12 months. Each steel drum shall be marked: "Carefully release any hydrogen gas pressure at least once a month by loosening then re-tightening vent plug."

5.3.1 Civil agencies. In addition to DOT and any other applicable regulatory and precautionary marking, packs, intermediate packs, and unit packs shall be marked in accordance with Fed. Std. No. 123.

5.3.2 Military activities. In addition to DOT and any other applicable regulatory and precautionary marking, packs, intermediate packs, and unit packs shall be marked in accordance with MIL-STD-129.

5.3.3 Precautionary marking. Each container shall be marked as follows:

HAZARDS:

Corrosive, Eye and Skin
Irritating to Eyes, Nose, and Throat

DANGER! CAUSES SEVERE BURNS
HARMFUL IF INHALED
REACTS VIOLENTLY WITH WATER

Do not get in eyes, on skin, or on clothing.
Avoid breathing mist.
Keep container closed.
Use with adequate ventilation.
Wash thoroughly after handling.
May cause ignition on contact with combustible materials.
Flammable gas may be produced on contact with metals.
Poisonous gas may be produced in fire.
Extinguish fire with dry chemical or carbon dioxide.
Never pour water into acid, always pour acid into water.

FIRST AID: In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Call a physician. Wash clothing before reuse.

If inhaled, remove to fresh air. If not breathing, give artificial respiration, preferably mouth-to-mouth. If breathing is difficult, give oxygen. Call a physician.

If swallowed and victim is conscious, have victim drink water or milk. Do not induce vomiting. Call a physician.

SUPPLY/USE: Safety shower, eyewash fountain, safety goggles, face shield, approved respirator, rubber safety shoes, rubber apron, rubber gloves.

6. NOTES

6.1 Intended use. Sulfuric acid is intended for use in galvanizing and plating ferrous metals and for general purposes. Class 2 of type I is generally used in soda-acid fire extinguishers.

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 and class of sulfuric acid required (see 1.2),
(c) Level of preservation and packing required (see 5.1 and 5.2),
(d) Quantity to be unit packed level A, B, or industrially (see 5.1.1.1, 5.1.2.1, and 5.1.3), and
(e) Quantity to be packed level A, B, or industrially (see 5.2.1, 5.2.2, and 5.2.3).

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 Ln expressing the limiting value, in accordance with the rounding-off method of ASTM E 29.

6.5 Sampling and testing precautions. This specification covers inspection of chemical material which is potentially hazardous to personnel. Sulfuric acid is very corrosive and dangerous when improperly handled. Contact with body results in rapid destruction of tissues and severe burns. Adequate protection against any contact should be provided for all parts of the body. Although the acid itself is not flammable, it may cause ignition by contact with combustible materials; a highly flammable gas (hydrogen) is generated by the action of the acid on most metals. Concentrated sulfuric acid (type I) should not be stored in lead containers. Air pressure should never be used to empty carboys. All applicable safety rules, regulations and procedures must be followed in the handling and processing of sulfuric acid.

MILITARY INTERESTS:

Custodians

Army - EA
Air Force - 68

Review activities

Army - MD
DLA - GS

User activity

Army - MI

CIVIL AGENCY COORDINATING ACTIVITIES:

DOL-OSHA
GSA-FSS
LAB-TEC
VA-OSS

Preparing activity:

Army - EA

Project No. 6810-B029

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 of this specification to obtain extra copies and other documents referenced herein.