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MILITARY SPECIFICATION

BOTTLES, SCREW CAP AND CARBOYS POLYETHYLENE PLASTIC

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

1. SCOPE

1.1 Scope. This specification covers polyethylene plastic containers for mildly corrosive liquids (see 6.1).

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications and standards. Unless otherwise specified (see 6.2), the following specifications and standards 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

PPP-B-636	Boxes, Shipping, Fiberboard
PPP-T-66	Tape: Pressure-Sensitive Adhesive, Vinyl Plastic Film

Military

MIL-P-116	Preservation-Packaging, Methods Of

STANDARDS

Military

MIL-STD-105	Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-129	Marking for Shipment and Storage
MIL-STD-1188	Commercial Packaging of Supplies and Equipment

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Air Force Packaging Evaluation Agency, AFALD/PTP, Wright-Patterson AFB OH 45433, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

(Copies of specifications, standards, drawings, and publications required by contractors in connection with specific procurement functions should be obtained from the procuring 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. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

LAWS AND REGULATIONS

Code of Federal Regulations, Title 49, Part 1 to Part 199.

(The code of Federal Regulations, Title 49, Part 1 to Part 199 is available from The Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402).

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) STANDARDS

D 1238 - Measuring Flow Rates of Thermoplastics by Extrusion Plastometer

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

3. REQUIREMENTS.

3.1 Material. Plastic bottles and carboys shall be made from natural color, blowmolding grade, high density polyethylene resin, either homopolymer or copolymer. The use of clean internally generated regrind or reclaimed material conforming to the preceeding is permissable. The bottles shall have a maximum melt index of 1.0 when tested as specified in 4.4.4.

3.2 Shape. Bottles and carboys may be round or modified square about their vertical axis and shall be one piece, seamless construction. Unless otherwise specified, handles formed as an integral part of the bottle shall be provided for 1-quart (0.95L), and 1-gallon (3.8L) bottles (see 6.2).

3.3 Capacities. Unless otherwise specified, the plastic bottles furnished under this specification shall have the following nominal capacities:

1/2-PINT (0.25 LITERS)	2-GALLONS (7.6 LITERS)
1-PINT (0.5 LITERS)	6-1/2-GALLONS (25 LITERS)
1-QUART (0.95 LITERS)	13-GALLONS (49.2 LITERS)
1-GALLON (3.8 LITERS)	

3.4 Dimensions and tolerances. Unless otherwise specified, the plastic bottles and carboys furnished under this specification shall have dimensions and tolerances as specified in table I. Neck finish of bottles and carboys shall be specified by the procuring activity (see 6.2).

TABLE I - Dimensions and Tolerance for Plastic Bottles and Carboys.

Size of Bottle or Carboy (LITER)	Outside Diameter Inches (mm)	Height Without Cap-Inches (mm)
1/2-Pint (0.25 LITERS)	----------	----------
1-Pint (0.5 LITERS)	3.00±0.25 (76±6)	7.00±0.50 (178±13)
1-Quart (0.95 LITERS)	3.75±0.25 (95±6)	8.50±0.50 (216±13)
1-Gallon (3.8 LITERS)	6.00±0.50 (152±13)	11.50±0.50 (292±13)
2-Gallons (7.6 LITERS)	7.50±0.50 (191±13)	16.00±0.50 (406±13)
6-1/2-Gallons (25 LITERS)	11.50±0.50 (292±13)	24.00±0.50 (610±13)
13-Gallons (49.2 LITERS)	13.50±0.50 (343±13)	29.75±0.50 (756±13)

3.5 Closure. Unless otherwise specified, caps for bottles and carboys furnished under this specification shall be made of polyethylene of the same type as the bottles. Caps made from material other than polyethylene shall have separate liners. When separate liners are required for either polyethylene or non-polyethylene caps, they shall be made of a 50-50 mixture of polyethylene and polyisobutylene and shall have a thickness of 0.050 inch ± 0.005 inch (1.3mm±0.013mm). Liners shall be molded within the cap or attached to the cap with a suitable adhesive.

3.5.1 Attachment of caps. When specified, each bottle or carboy shall have a cap affixed to the neck. If not specified to be affixed to neck, caps equal in number to the bottles or carboys shall be placed in the unit container (half-pint and pint) or shipping container (see 6.2).

3.6 Threads. Threads on the neck of the bottle and carboy with the cap shall be of the buttress type allowing at least one revolution before seating of the cap against the bottle. When the cap is completely screwed onto the bottle, the rim of the bottle shall seat firmly against the inner bearing surface of the cap or against the liner to ensure sealing.

3.7 Jackets for carboys. Plastic carboys of 6-1/2 (25L), and 13-gallons (49.2L) capacities shall be cased within plywood, wood, metal, or other suitable jackets. Jackets shall contain no protrusions which could abrade or puncture the bottle.

3.7.1 Compression. The jacketed carboys shall withstand a compressive load of 5,000 pounds without showing signs of leakage when tested as specified in 4.4.3.

3.8 Outage. The outage or air space of the bottles and carboys shall be a minimum 5 percent and a maximum of 10 percent when tested as specified in 4.4.1.

3.9 Durability. The bottles, carboys, or closures shall show no cracks, breaks, or signs of leakage after being dropped from the specified height when tested as specified in 4.4.2.

3.10 Chemical resistance. The plastic bottles and carboys shall exhibit no cracking, crazing, darkening, or other signs of attack when tested as specified in 4.4.5.

3.11 Identification. All plastic bottles and carboys which conform to the requirements of Department of Transportation (DOT) specification 2T, 2TL, or 2U shall be marked as prescribed in the applicable specification. Bottles and carboys which do not meet the requirement for DOT specification containers shall be marked to indicate capacity, manufacturer, and month and year of manufacture. The marking shall be molded into the bottle or carboy.

3.12 Workmanship.

3.12.1 Finish. The finish of the bottles and carboys shall be smooth and the surface shall be free from ridges and pinch off flash, flow marks, or depressions on mold partition line crevices.

3.12.2 Freedom from defects. The bottles and carboys shall be free from bubbles, cracks, pinholes, dirt, foreign matter, warpage, chipped edges, blisters, scratches, and other defects affecting their serviceability or appearance.

3.12.3 Uniformity. The bottles and carboys shall be uniform in color, texture, finish and physical properties.

3.13 Compatibility. When specified in the contract or order (see 6.2), the container supplier shall furnish evidence based on shelflife studies of the degree of compatibility between his container and the intended contents. The supplier shall offer his container only for those contents known to be compatible with it. Evidence of compatibility shall be lack of chemical or physical degradation of the container or contents under conditions of protected storage at an average temperature of 70°F (21°C) for a period of at least one year.

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 Sampling for inspection. Sampling for inspection shall be performed in accordance with the provisions set forth in MIL-STD-105, except where otherwise indicated. For purposes of sampling, an inspection lot for examination and test shall consist of all containers of the same capacity produced under the same process and formulation and submitted for delivery at one time.

4.2 Classification of inspections. The inspection requirements specified herein are classified as follows:

Quality conformance inspection (see 4.3).

4.3 Inspection of the end item.

4.3.1 Examination of the end item. Examination of the end item shall be made in accordance with the classification of defects, inspection levels and acceptable quality levels (AQLs) following. The lot size, for the purpose of determining the sample size in accordance with MIL-STD-105, shall be expressed in units of bottles or carboys, complete with cap and jacket, as applicable, of the specified capacity for examinations under 4.3.1.1 and 4.3.1.2, and units of shipping containers for examination under 4.3.1.3.

4.3.1.1 Examination of the end item for defects in appearance, construction, and general workmanship. The sample unit for this examination shall be one complete bottle, or carboy, with cap and jacket as applicable.

EXAMINE	DEFECTS (Major)
Appearance and Construction	Not formed in one piece and not symmetrical in shape. Bottom of bottle or carboy, as applicable, does not rest evenly upon a flat, smooth level surface. Surface not smooth finish; evidence of flow marks or ridges. Not clean, dry, or ready for use. Presence of bubbles, blisters, cracks, chipped edges, dirt, foreign matter, deep scratches, or abrasions. Neck opening not as specified. Neck finish not as specified. Thread on neck and within cap not buttress type. Threads not clean; distorted or contain sharp edges. Cap not material specified. Cap does not provide tight fitting closure. Cap liners not molded or securely attached within the cap; not tight fitting. Carboys of 6-1/2 (25L), and 13-gallon (49.2L) capacity not enclosed within jacket (see 3.7). Jackets, not smoothly finished, contain sharp edges or protrusions on any surface.
Markings	Identification markings not molded into bottle or carboy; omitted, illegible, incorrect, incomplete or not in accordance with contract requirements (see 3.11).

4.3.1.2 Examination of the end item for defects in dimensions. The sample unit for this examination shall be one bottle or carboy, as applicable, of the specified capacity.

EXAMINE	DEFECTS (Major)
Outside Diameter	Not within tolerance specified in Table I for the applicable size bottle or carboy.
Height (excluding cap)	Not within tolerance specified in Table I for the applicable size bottle or carboy.

4.3.1.3 Inspection levels and acceptable quality levels (AQLs) for examination. The inspection levels for determining the sample size and the Acceptable Quality Levels (AQLs) expressed in defects per 100 units shall be as follows:

EXAMINATION PARAGRAPH	INSPECTION LEVEL	AQLs
4.3.1.1	I	2.5
4.3.1.2	S-2	1.5

4.3.2 Testing of the end item. The end item shall be tested for the applicable characteristics as indicated in Table II for each lot of material presented for examination. The sample unit for performance of all tests shall consist of three bottles of the specified capacity, jacketed or unjacketed as applicable. Three sample units randomly selected shall be tested with no evidence of failure to meet the specified requirements.

4.4 Test methods.

4.4.1 Outage. Bottles and carboys shall be tested in the following manner to determine compliance with 3.8.

4.4.1.1 Procedure. The bottle or carboy and cap shall be weighed empty. The bottle or carboy shall be filled with water equal in volume to the nominal capacity of the bottle or carboy and the bottle or carboy shall be reweighed. The bottle or carboy shall then be completely filled to the top with water and the cap screwed on tight. Care shall be taken to ensure that no air bubbles are entrapped in the bottle. The bottle or carboy shall be wiped dry and reweighed again. The outage shall be caculated as follows:

$$\text{Percentage Outage} = \frac{W_3 - W_2}{W_3 - W_1} \times 100$$

NOTE: Weights are to the nearest gram for half-pint, pint and 1-quart bottles; to the nearest ounce for larger bottles.

W_1 = Weight of empty bottle (to the nearest ounce for larger bottles).

W_2 = Weight of bottle filled to rated capacity with water

W_3 = Weight of bottle completely filled with water (no air content).

TABLE II - Instruction for testing

Characteristic	Requirement	Test Method	Requirements Applicable to Sample Unit	Requirements Applicable to Lot Average	Description or Numerical Point of Failure as Applicable 1/	Results Reported to Nearest Per cent or Grams/ 10 min 2/
Outage	3.8	4.4.1	X	1		Percent
Drop Test						
(Bottles)	3.9	4.4.2.1	X	1	X	-------
(Carboys)		4.4.2.2	X	2 (1 bottom, 1 top)	X	-------
Compression test (jacketed carboys)	3.7.1	4.4.3	X	1	X	-------
Melt Index	3.1	4.4.4	X	1	X	-------
Chemical resistance	3.10	4.4.5	X	1		Grams/10 minutes
Bottle					X	-------
Contents					X	-------

NOTE:

1/ If failure is indicated, report either description or numerical point of failure, as applicable.

2/ Test reports shall include all values on which results are based.

4.4.2 Drop test.

4.4.2.1 Bottles. The bottles shall be filled to rated capacity with a 30 percent calcium chloride solution and conditioned for 24 hours at -40°C ± 1°C (-40°F ± 2°F). After conditioning each bottle shall be immediately dropped twice from a height of 4 feet (1.2M) in a free fall, onto a flat solid concrete surface, one to fall flat upon the side opposite the handle, if any, and one to fall bottom first. The bottles shall then be examined for defects to determine complaince with 3.9.

4.4.2.2 Jacketed carboys. The carboys shall be filled and conditioned as specified in 4.4.2.1. They shall then be dropped once from a height of 4 feet (while encased in their jackets) so as to strike first on the bottom and then on that portion of the top diagonally opposite the portion of the bottom on which they were first dropped. The carboys shall then be examined for defects to determine compliance with 3.9.

4.4.3 Compression test. Each sample carboy shall be filled to rated capacity with water. The cap shall be screwed on; and the carboy, encased in its jacket, shall be placed on its side in the testing machine. The bearing plates shall be long enough to make contact with the entire length of the jacket. A load of 5,000 pounds (2268kg) shall be applied in compression using a constant rate of load increase of 2,500 pounds (1134kg) per minute; and the total deflection shall not exceed 1 inch. The carboys shall then be examined for leakage to determine compliance with 3.7.1.

4.4.4 Melt index. Bottles and carboys shall be tested for melt in accordance with ASTM D1238, procedure A, condition E specified therein.

4.4.5 Chemical resistance. The bottles and carboys shall be filled to stated capacity with a solution of sulfuric acid having a specific gravity of 1.28 then stored at a temperature of 50°C ± 2° (122°F ± 4°F) in a constant temperature cabinet for a period of 21 days. The bottles, carboys and acid shall be examined before the test and upon removal from storage for compliance with paragraph 3.10. Before and after the test the acid color shall be compared by means of any laboratory type colorimeter with a standard kept in a glass bottle. The acid contained shall not have darkened more than one unit (see 3.10).

4.4.6 Packaging inspection. The inspection of the packaging and interior package marking shall be in accordance with the group A and B quality conformance inspection requirements of MIL-P-116. The inspection of the packing and marking for shipment and storage shall be in accordance with the quality assurance provisions of the applicable container specification and the marking requirements of MIL-STD-129.

5. PACKAGING

5.1 Preservation. Preservation shall be level A or industrial as specified.

5.1.1 Level A.

5.1.1.1 Cleaning and drying. Items shall be cleaned and dried using any suitable process specified in MIL-P-116.

5.1.1.2 Preservative application. Preservatives shall not be used.

5.1.1.3 Unit packaging. Twenty-four 1/2-pint (0.25L) or twelve 1-pint (0.5L) capacity bottles shall be placed in a snug fitting fiberboard box conforming to style RSC, type CF (variety SW) class domestic, grade 125 of PPP-B-636 and closed in accordance to the appendix thereto. Unit packaging is not required on larger capacity bottles.

5.1.2 Industrial. The industrial preservation shall be in accordance with the requirements of MIL-STD-1188.

5.1.3 Caps. When specified, caps shall be securely attached to the bottle or carboy neck; otherwise, caps shall be placed in the unit or shipping container (see 3.5.1).

5.2 Packing. Packing shall be level A, B, or industrial as specified.

5.2.1 Level A. (Note: This level is not generally specified for this type item. Procuring activity should determine requirements on individual logistics basis).

5.2.2 Level B.

5.2.2.1 Half-pint (0.25L), pint (0.5L), quart (0.95L), 1-gallon (3.8L), 2-gallon (7.6L) capacity bottles. Ninety-six half-pint (0.25L), forty-eight 1-pint (0.5L) capacity bottles, packaged as specified in 5.1; twenty-four 1-quart (0.95L); four 1-gallon (3.8L); or four 2-gallon (7.6L) capacity bottles shall be packed in snug fitting containers conforming to style RSC, class weather resistant, type, variety and grade of PPP-B-636 optional. When 1-quart (0.95L) capacity bottles are packed in tiers, a weather resistant grade fiberboard pad shall be placed between the tiers. Each shipping container shall be closed in accordance with method II as specified in the appendix of the container specification.

5.2.2.2 Six and one-half gallon (25L) and 13-gallon (49.2L) capacity carboy bottles. Six and one-half gallon (25L) and 13-gallon (49.2L) capacity carboy bottles, jacketed as specified in 3.7, shall not require additional packing.

5.2.3 Industrial. Items shall be packed in accordance with MIL-STD-1188.

5.3 Marking.

5.3.1 Level A and B. In addition to any special marking required by the contract or order, interior packages (when applicable) and shipping containers (including carboys) shall be marked in accordance with MIL-STD-129.

5.3.2 Industrial. Marking shall be in accordance with MIL-STD-1188.

6. NOTES

6.1 Intended use. The plastic bottles and carboys covered by this specification are intended for use as containers for mildly corrosive liquids within the limitations prescribed by DOT and Civil Aeronautics Board (CAB) regulations and military directives relating to shipment. Containers, which are not marked to indicate conformity to applicable DOT container specifications, shall be used only for items not regulated by DOT tariffs and for regulated items for which non-specification polyethylene containers are permitted.

6.1.1 Certain chemicals have been tested for storage in polyethylene containers. The containers were commercial sizes--1-quart (0.95L), 1-gallon (3.8L), 6.5-gallons (25L), and 13-gallons (49.2L). The test temperature ranged from plus 32°F to plus 165°F (0°C - 73.9°C).

6.1.1.1 A grouping of chemicals by family is listed below. In all cases the boiling point and flash point of the chemical should be considered before packaging the chemical in a polyethylene container. If the temperature will exceed or approximate the boiling point and flash point of the chemical, then that chemical should not be stored in a polyethylene container.

Chemicals	Degrees Fahrenheit*/Celsius
Inorganic Acids	165 (73.9°C)
Nitric 20 Percent	130 (54°C)
67 Percent	70 (21°C)
Alkalies	165 (73.9°C)
Organic Acids	130 (54°C)
Alcohols	130 (54°C)
Dihydric Alcohols	165 (73.9°C)
Ketones	70 (21°C)
Aldehydes	70 (21°C)
Nitro Compounds	70 (21°C)
OTHER	
Water	165 (73.9°C)
Aqua Ammonia	100 (37.8°C)
Acetic Anhydride	100 (37.8°C)
Mono-Chloroacetic Acid	100 (37.8°C)
Hydrogen Peroxide Solutions not Exceeding 37 percent H_2 O_2 by weight	70 (21°C)
Ammonimum Chloride	165 (73.9°C)
Sodium Carbonate	165 (73.9°C)
Sodium Benzoate	165 (73.9°C)
Sodium Hypochlorite 16 Percent Solutions and Under	130 (54°C)

*Temperature above which chemical should not be stored or transported.

NONPACKAGEABLE

Esters

Ethers

Terpenes

Aliphatic Hydrocarbons

Cyclic Compounds

Concentrated Nitric Acid

Hydrogen Peroxide Solutions Exceeding 37 percent H_2O_2 by weight

Sodium Hypochlorite Solutions over 16 percent in Strength

6.2 Ordering data. Procurement documents should specify the following:

a. Title, number, and date of this specification.

b. Size of container required (see 3.3).

c. Neck finish required (see 3.4).

d. When liners are required for polyethylene caps (see 3.5).

e. Levels of packaging and packing (see 5.1 through 5.2.3).

f. Marking requirements (see 5.3).

g. When the cap should be attached to bottle and/or carboy neck (see 3.5.1).

h. If handles are not required on 1-quart (0.95L) and 1-gallon (3.8L) bottles (see 3.2).

i. When evidence of compatibility of intended contents with the container is desired (see 3.13).

6.3 Changes from previous issue. Asterisks are not used in this revision to identify changes with respect to the previous issue, due to the extensiveness of the changes.

6.4 Stock numbers. The following stock numbers were valid as of the date of this specification. Their validity should be confirmed before ordering.

Half-pint (0.25L)	8125-00-680-0141
Pint (0.5L)	8125-00-902-6514
Quart (0.95L)	8125-00-819-6085
Gallon (3.8L)	8125-00-174-0852
2-Gallon (7.6L)	8125-00-558-1641
6-1/2-Gallon (25L)	8125-00-993-8039
13 Gallon (49.2L)	8125-00-993-8040

CUSTODIANS:

Army - GL
Navy - SA
Air Force - 69

Review Activities:

Army - MD, SM, AR
Navy -
Air Force - 99
DLA - GS

User:

Army -
Navy - AS, MC
Air Force -

Preparing activity:

Air Force - 69

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