

INCH-POUND

MIL-DTL-2439G

03 July 2014

SUPERSEDING

MIL-DTL-2439F

05 February 2010

## DETAIL SPECIFICATION

## CONTAINER, AMMUNITION, FIBER, SPIRALLY WOUND

This specification is approved for use by U.S. Army Armament Research, Development and Engineering Center (ARDEC), and is available for use by all Departments and Agencies of the Department of Defense.

## 1. SCOPE

1.1 Scope. This specification covers the requirements for spirally wound fiber ammunition containers.

1.2 Classification. Six types of fiber containers and three classes of metal ends defined, as specified (see 6.2):

1.2.1 Types. The types of fiber containers are as follows:

- Type I - With two layers of aluminum foil
- Type II - With one layer of aluminum foil
- Type III - Without aluminum foil
- Type IV - With two layers of aluminum foil and resin impregnated
- Type V - With poly laminated layers without aluminum foil
- Type VI - With poly laminated layers and two layers of aluminum foil

Comments, suggestions, or questions on this document should be addressed to the Commander, U.S. Army ARDEC, ATTN: RDAR -QES-E, Picatinny, NJ 07806-5000 or emailed to [usarmy.picatinny.ardec.list.ardec-stdzn-branch@mail.mil](mailto:usarmy.picatinny.ardec.list.ardec-stdzn-branch@mail.mil). Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at <https://assist.dla.mil>.

ASMC N/A

FSC 8140

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

## MIL-DTL-2439G

1.2.2. Classes. Fiber containers have the following classes of metal ends:

- Class 1 - Single crimp
- Class 2 - Double crimp
- Class 3 - Cap (uncrimped)

## 2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 or 4 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of documents cited in sections 3 or 4 of this specification, whether or not they are listed.

### 2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the solicitation or contract.

#### FEDERAL SPECIFICATIONS

- QQ-A-1876 - Aluminum Foil
- PPP-B-1055 - Barrier Material, Waterproof, Flexible

#### FEDERAL STANDARDS

- FED-STD-595/27038 - Miscellaneous, Semi gloss

#### COMMERCIAL ITEM DESCRIPTIONS

- A-A-1507 - Chipboard
- A-A-59209 - Paperboard, Ammunition Container
- A-A-59255 - Fully Refined Paraffin Wax

#### DEPARTMENT OF DEFENSE SPECIFICATIONS

- MIL-A-13374 - Adhesive, Dextrin, for use in Ammunition Containers
- MIL-E-19603 - Enamel, Baking, for Roller Coat Application
- MIL-P-19602 - Primer, Size Coating, Baking, for Roller Coat Application
- MIL-P-20293 - Paper, Kraft, Asphalt-Impregnated
- MIL-V-21064 - Varnish, Finishing, Baking, for Roller Coat Application

#### DEPARTMENT OF DEFENSE STANDARDS

- MIL-STD-171 - Finishing of Metal and Wood Surfaces
- MIL-STD-1168 - Ammunition Lot Numbering and Ammunition Data Card
- MIL-STD-1916 - DOD Preferred Methods for Acceptance of Product

## MIL-DTL-2439G

(Copies of these documents are available online at: <http://quicksearch.dla.mil/> or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.2.2 Other Government documents, drawings and publications. The following other Government documents, drawings, and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract. See Table VIII for a complete listing of part numbers for applicable container drawings.

U.S. ARMY ARMAMENT RESEARCH, DEVELOPMENT AND ENGINEERING  
CENTER (ARDEC) DRAWINGS

12987995 - Adhesive

(Copies of these drawings are available from U.S. Army ARDEC, ATTN: RDAR-EIS-PE, Picatinny, NJ 07806-5000, or e-mail [army.picatinny.ardec.list.drawing-request-help-desk@mail.mil](mailto:army.picatinny.ardec.list.drawing-request-help-desk@mail.mil).)

2.3 Non-Government Publications. The following documents form part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are cited in the solicitation or contract.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM INTERNATIONAL)

ASTM-A599/A599M	- Standard Specification for Tin Mill Products, Electrolytic Tin-Coated Cold-Rolled Sheet
ASTM-A623M	- Standard Specification for Tin Mill Products, General Requirements
ASTM-A624/A624M	- Standard Specification for Tin Mill Products, Electrolytic Tin Plate, Single Reduced
ASTM-A626/A626M	- Standard Specification for Tin Mill Products, Electrolytic Tin Plate, Double Reduced
ASTM-A653/A653M	- Standard Specification for Steel Sheets, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by Hot-Dip Process
ASTM-A1008M/A1008M	- Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable
ASTM-B117	- Standard Practice for Operating Salt Spray (Fog) Apparatus
ASTM-D312	- Standard Specification for Asphalt Used in Roofing
ASTM-D4317	- Standard Specification for Polyvinyl Acetate-Based Emulsion Adhesives

## MIL-DTL-2439G

- |                |  |
|----------------|--|
| ASTM-D449      | - Standard Specification for Asphalt used in Damp-proofing and Water proofing  |
| ASTM-D523      | - Standard Test Method for Specular Gloss  |
| ASTM-D646      | - Standard Test Method for Grammage of Paper and Paperboard (Mass per Unit Area)   |
| ASTM-D879      | - Standard Specification for Steel Sheet, Zinc Coated by Electrolytic Process for Applications Requiring Designation of the Coating Mass on Each Surface |
| ASTM-D1894     | - Standard Test Method for Static and Kinetic Coefficients of Friction of Plastic Film and Sheet   |
| ASTM-D3950     | - Standard Specification for Strapping, Nonmetallic (and Joining Methods)  |
| ASTM-D4317     | - Standard Specification for Polyvinyl Acetate Based Emulsion Adhesives  |
| ASTM-E96/ E96M | - Standard Test Methods for Water Vapor Transmission of Materials  |
| ASTM-E376      | - Standard Practice for Measuring Coating Thickness by Magnetic-Field or Eddy Current (Electromagnetic) Examination Methods                              |

(Copies of these documents are available from <http://www.astm.org>, or ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.)

## TECHNICAL ASSOCIATION FOR PULP AND PAPER INDUSTRY

- |            |   |
|------------|---|
| TAPPI T403 | - Bursting Strength of Paper  |
| TAPPI T414 | - Internal Tearing Resistance of Paper (Elmendorf-Type Method)                                      |
| TAPPI T448 | - Water Vapor Transmission Rate of Paper and Paperboard at 23 degrees C and 50% RH                  |
| TAPPI T494 | - Tensile Breaking Properties of Paper and Paperboard (Using Constant Rate of Elongation Apparatus) |

(Copies of these documents are available from <http://www.tappi.org/> or TAPPI, 15 Technology Parkway South, Norcross, GA 30092.)

## INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

- |               |   |
|---------------|---|
| ISO 2758:2001 | - Paper: Determination of Breaking Strength |
|---------------|---|

(Copies of these documents are available from <http://www.iso.org> or International Organization for Standardization (ISO), 1, ch. de la Voie-Creuse, Case postale 56, CH-1211 Geneva 20, Switzerland.)

## MIL-DTL-2439G

2.4 Order of Precedence. Unless otherwise noted herein or in the contract, in the event of a conflict between the text of this document and the references cited herein, this document takes precedence. However, nothing in this document supersedes applicable laws and regulations, unless a specific exemption has been obtained.

### 3. REQUIREMENTS

#### 3.1 Required inspections.

3.1.1 First article inspection. When specified (see 6.2) a sample shall be subjected to first article inspection in accordance with (IAW) 4.3.

3.1.2 Conformance. A sample shall be subjected to conformance inspection IAW 4.4.

3.2 Outer and cover tube construction. The outer and cover tubes shall be spirally wound. For materials, winding sequence and other details for outer and cover tubes for Type I, II, and III containers, see Figure 1, for Type IV containers see Figure 2, for Type V containers see Figure 3, and Type VI containers see Figure 4. Windings shall be lapped as shown in Figure 8. Tube windings shall be securely adhered to each other. No waterproof layer shall be cut in subsequent crimping operations. A hairline of adhesive, not more than 1/32 inch in width or 1/64 inch in height, shall be permitted beyond the edge of the outer layer for the asphalt impregnated paper (Types I, II and III containers), the seven point Kraft paper (Type IV container) or the poly lam layer of the polyethylene laminated kraft paper (Type V and VI containers) to which the adhesive is applied on outer and cover tubes, only.

#### 3.3 Neck tubes.

3.3.1 Neck tube construction. The neck tubes shall be spirally wound. For materials, winding sequence and details for neck tubes of Type I, II and III containers see Figure 5, for Type IV containers see Figure 6, and for Type V and Type VI containers see Figure 7. Windings shall be lapped as shown in Figure 8. Tube windings shall be securely adhered to each other. No waterproof layer shall be cut in subsequent crimping operations.

3.3.2 Neck tube vent holes. Neck tubes may be perforated with vent holes as required (see Figure 9) to provide pressure relief in closing and opening the container. When the exposed length of the neck tube (portion holding the cap) is less than 2.5 inches, vent holes are not required.

3.3.3 Neck tube security. Any adhesive remaining on the exposed exterior surface of the neck tube, after assembly, shall be removed. Neck tubes, when glued to the outer tube, shall withstand the torque requirements specified in Table I without movement between the tubes.

## MIL-DTL-2439G

TABLE I. Torque requirements.

Outside Diameter of Outer Container	Torque to be Applied (Inch-Pounds, Minimum)
3 inches or less	50
Greater than 3 inches	100

3.4 Neck ring. Neck rings shall also be applied to fiber container neck tubes that open at both ends, as required. Construction details shall be IAW Figure 9.

3.4.1 Neck ring material. All neck rings, including alternate designs, shall be made from 33 gage, minimum, commercial black-plate.

3.4.2 Neck ring plating. The ring shall be blanked and plated IAW either finish number 1.9.1.3 or 1.9.2.3 of MIL-STD-171.

3.4.3 Neck ring corrosion resistance. The completed neck rings shall show no corrosion or rust products of base metal when subjected to 36 hours of 5% salt fog test.

3.4.4 Polyester tape. For Type I, II and III containers, Polyester tape may be applied to the neck tube, instead of a neck ring. The polyester tape shall be “Scotch”™ brand Film Tape, Black Y 8459 (0.0025 inch thick) “Scotchpar”™ Heat Shrinkable Film (a product of 3M Company, 3M Center, St. Paul, MN 55101), or equivalent (see 6.3). The application of the polyester tape to the open end of the neck tube shall be accomplished by a heat shrink process. See Figure 10 for details.

3.4.5 Neck ring workmanship. The neck ring shall be flush with the outside surface of the tube but may project above the inside surface of the tube by the thickness of the metal. The ring shall be crimped in place so that no sharp corners or burrs project. The waterproof layers of paper shall not be cut by the neck ring when it is crimped in place.

3.5 Inner tubes. Tubes, other than those specified in 3.2, shall be either convolute or spiral wound. Unless an overlap of the windings is specified, they shall be butted at the edges. Any gap at the butt joint shall not be greater than 1/16 inch. Inner tubes with greater than 1/4 inch wall thickness may be made of two or more tubes placed one within the other and securely glued together. For Type I, II, III, and IV fiber containers, windings shall be glued with an adhesive complying with ASTM-D4317 or MIL-A-13374. For Type V and VI fiber containers, windings shall be glued with an adhesive complying with ASTM-D4317. Inner tubes shall be made from plain commercial chipboard, suitable for winding and shall have a clean, uniform surface. The chipboard shall meet the following minimum requirements:

- a. Basis weight - Three pounds per 0.001 inch of thickness per 1,000 square feet
- b. Bursting strength - Two points per 0.001 inch thickness
- c. Acidity - pH of  $6.5 \pm 1.5$

## MIL-DTL-2439G

3.6 Container cover. The fiber container cover shall be slide fit on the neck tube. The weighted cover shall slide free of the neck tube within 15 seconds without shaking or vibration.

3.7 Metal ends, crimped and covers. The thickness of metal and end profile shall be as specified on the container drawing.

3.7.1 Metal for ends. The metal used shall conform to one of the materials specified in 3.7.1.1 or 3.7.1.2. More than one type material shall not be mixed within a given lot. The thickness shall be the thickness of the base steel or iron before plating.

3.7.1.1 Tin-coated steel (Tinplate).

3.7.1.1.1 For Type I, II, III, and IV fiber containers. Tinplate shall be either electrolytic number 100 or hot-dipped Standard Cokes (or better), IAW ASTM-A624/A624M or ASTM-A626/A626M. Steel type, temper, finish, and base weight shall be selected by the fiber container manufacturer to the values that permit compliance with 3.7.

3.7.1.1.2 For Type V and VI fiber containers. For US 28 gauge (0.0149 inch thick nominal): Tinplate shall be electrolyte No. 100 or hot dipped Standard cokes (or better) IAW ASTM-A624/624M. Steel type shall be Type D, L, or MR of ASTM-A623/A623M with a minimum of T-1 Temper. Finish and Base Weight shall be selected by the fiber tube manufacturer; surface treatment shall be suitable for painting on both sides. For US 26 gauge (0.0179 inch thick nominal): Tin mill products, electrolytic tin-coated, cold-rolled sheet, coating designation No. 100, un-melted, No. 5D Finish IAW ASTM-A599/A599M. Base steel sheet designation DDS per ASTM-A1008/A1008M; Rockwell Superficial Hardness HR15T range 74-79 (40-55 Rockwell B-Scale equivalent). Five hardness readings shall be taken on the material roughly adjacent to the area where each tension test sample was drawn from. Surface treatment shall be suitable for coil painting on both sides.

3.7.1.2 Zinc coated steel. The zinc coated steel shall comply with Steel Sheet, zinc-coated, coating designation G-60, commercial steel Type A, conforming to ASTM-A653/ASTM A635M (Hot Dip Method), or ASTM-A879 (Electro Deposition Method).

3.7.2 Crimping (Class 1 and Class 2 ends). For construction requirements of Class 1 end crimps see Figure 11 or for construction requirements of Class 2 end crimps see Figure 12.

3.7.2.1 Crimp integrity. The crimped metal ends shall withstand the load specified in Table II.

## MIL-DTL-2439G

TABLE II. Load requirements on crimped metal ends.

Inside Diameter of Outer or Cover Tube (Class 1):	Minimum Removal Force (Pounds)
Less than 2.40 inches	200
2.40 to 3.39 inches	300
Greater than 3.39 inches	400
Greater than 3.39 inches with 26-gauge metal ends	800
Inside Diameter of Outer or Cover Tube (Class 2):	Minimum Removal Force (Pounds)
Less than 3.40 inches with 26-gauge metal ends	900
3.40 to 4.70 inches with 26-gauge metal ends	1200
3.40 to 4.70 inches with 28-gauge metal ends	600
Greater than 4.70 inches with 26-gauge metal ends	1500

3.7.3 Metal end marking. If required on specific container drawings, metal ends shall be legibly embossed with the manufacturer's symbol, the word "CONTAINER", type, and month and year of manufacture (layout as specified on drawing). The month shall be represented by one or two digits, as applicable, and the year shall be represented by the last two digits of the year; a hyphen shall separate the month and year. The letter "F" shall be embossed on containers when one layer of foil is included in the tube construction (Type II), "FF" shall be included when two layers of foil are included in the construction (Type I), "FFR" shall be embossed when two layers of foil are included in the resin impregnation tube construction (Type IV), "PPP" shall be included when poly laminate without foil is used for tube construction (Type V), and letters "FFP" shall be included when polylaminate with two layers of aluminum foil is used for tube construction (Type VI). If necessary, the word "CONTAINER" may be abbreviated to "CNTNR". "CNTNR" shall be used for all new tooling. However, if tooling is already in existence with the abbreviated "CONT", it may be used in lieu of "CNTNR". Also, the embossing design shown on the drawing may be shifted circumferentially to provide additional space in the embossing circle. Alternatively, the date and the manufacturer's symbol may be placed in the center of the embossed end following approval by the procuring agency.

3.7.4 Metal end coating. Metal ends shall be coated on the outside surface IAW MIL-P-19602 and Class 2 of MIL-E-19603. A finishing varnish complying with Class 2 of MIL-V-21064 may be applied if desired. Alternately, Class 1 instead of Class 2 of MIL-E-



## MIL-DTL-2439G

19603 may be used if finishing varnish, Class 2 of MIL-V-21064 is used. In addition, the outside surface may be coated with finish number 20.5 of MIL-STD-171. All coatings shall be continuous and uniform. The final color of the coating shall be IAW FED-STD-595/27038, Black.

3.7.5 Metal end corrosion resistance. The coated ends shall be free of rust, undercutting, blistering and other defects to the extent specified in MIL-E-19603 when subject to 5% salt fog for 96 hours.

3.7.6 Domed metal ends. Domed metal ends shall be as depicted in detail drawings. PA167/PA153 120mm tubes and PA175/189/other 60mm tubes shall have domed metal ends below flush as indicated in detail drawings, all other domed metal ends shall be within flush to 1/32 inch below the outer crimped edge.

3.7.7 Metal end workmanship. After crimping (if applicable), it shall be visually verified that the metal ends are smooth, without gathering of metal or paper at the edge of the crimp, and no waterproof layer shall be cut by the crimping operation. Completed metal ends shall be free of cracks, splits, scratches, or pinholes in the metal or the coating, including the embossed areas. Markings and embossing shall be neat and legible.

### 3.8 Chipboard spacers.

3.8.1 Chipboard spacer construction. Spacers shall be built up to the required thickness from chipboard complying with A-A-1507, using adhesives complying with MIL-A-13374/ASTM-D4317 for Type I, II, III, and IV fiber containers and ASTM-D4317 for Type V and VI fiber containers. Chipboard spacers shall be securely adhered to the inner surface of flush panel metal ends using an adhesive that complies with Drawing 12987995. (See 6.4)

3.8.2 Chipboard spacer drop test resistance. The spacer shall not dislodge when the container is subjected to drop testing.

3.9 Polylam material properties. Polylam material shall comply with physical properties of Table III when tested per 4.7.

3.9.1 Properties of Polylaminated Paper (Polylam) – Inner layers. (42.5 ± 2.5 lb. natural kraft paper / 21 ± 7 lb. lb. LDPE / 72.5 ± 2.5 lb. natural craft paper). The sandwiched inner layers of poly laminated paper shown as layer B in Figures 3, 4, and 7 and shall have the properties listed in Table III. Suggested manufacturers are listed in 6.5.

## MIL-DTL-2439G

TABLE III. Properties of polylam material.

Property	Value (units)
Vertical (MD) Tear Strength	$\geq 221$ grams
Horizontal (CD) Tear Strength	$\geq 234$ grams
Vertical (MD) Tensile Strength	$\geq 77$ lb/in
Horizontal (CD) Tensile Strength	$\geq 36$ lb/in
Mullen Burst Strength	$\geq 99$ psi

3.10 Polycoat material properties. Polycoat material shall comply with physical properties of Table IV when tested per 4.7.

3.10.1 Properties of poly coated paper (polycoat) - outer layer. ( $79 \pm 9$  lb natural kraft paper /  $25 \pm 5$  lb. black polyolefin). The poly coated paper shown as layer C of Figures 3 and 4 shall have the following values for the properties listed in Table IV. Suggested manufacturers are listed in 6.5.

TABLE IV. Properties of polycoat material.

Property	Value (units)
Vertical (MD) Tear Strength	$\geq 144$ grams
Horizontal (CD) Tear Strength	$\geq 161$ grams
Vertical (MD) Tensile Strength	$\geq 41$ lb/in
Horizontal (CD) Tensile Strength	$\geq 23$ lb/in
Mullen Burst Strength	$\geq 50$ psi
Coefficient of Friction (poly to poly)	$\geq 0.29$
Water Vapor Transmission Rate ( $73^{\circ}\text{F}$ , 50% RH)	$\leq 2.48$ g/m <sup>3</sup> /day

3.11 Peel strength of polyester tape. When polyester tape is used in lieu of neck rings, the outer kraft ply of the neck tube shall exhibit 75 percent minimum fiber failure when the polyester tape is peeled when tested. Fiber failure does not apply to the overlap position of the tape.

3.12 Peel strength of outer layer. For Type I, II, and IV containers, the outer and cover tube shall exhibit 75 percent minimum fiber failure. For Type V containers, the outer and cover tube shall exhibit nearly total fiber failure; a bare spot up to 1/8 inch in diameter is allowable. For Type VI containers, the outer and cover fiber tubes shall exhibit 75 percent minimum fiber failure when laminated outer layers is peeled from the aluminum foil layer.

3.13 Resin content. Type IV containers, unless otherwise indicated, shall be 12 percent by weight minimum resin content of the outer, cover and neck tubes (See 6.8).

3.14 Wax. As an aid in the manufacturing process, fully refined paraffin wax IAW A-A-59255, Type I, with melting point between 123 to 150 degrees F, may be used to facilitate release of tubes from the forming mandrel. If wax is used as a lubricant, transfer of the wax to

## MIL-DTL-2439G

the inner ply of the container shall be permitted but there shall be no evidence of loose wax particles, flaking or caking of the wax on the inner plies.

3.15 Gloss. Gloss measurement of the fiber container exterior, to include metal ends and associated hardware, shall not have a gloss value of more than 35 when evaluated by a gloss meter with 60 degree geometry and tested IAW ASTM-D523.

3.16 Blisters. Type I, Type II, Type III, Type V, and Type VI parts and assemblies shall be free from blisters (See 6.7) when subject to temperature conditioning.

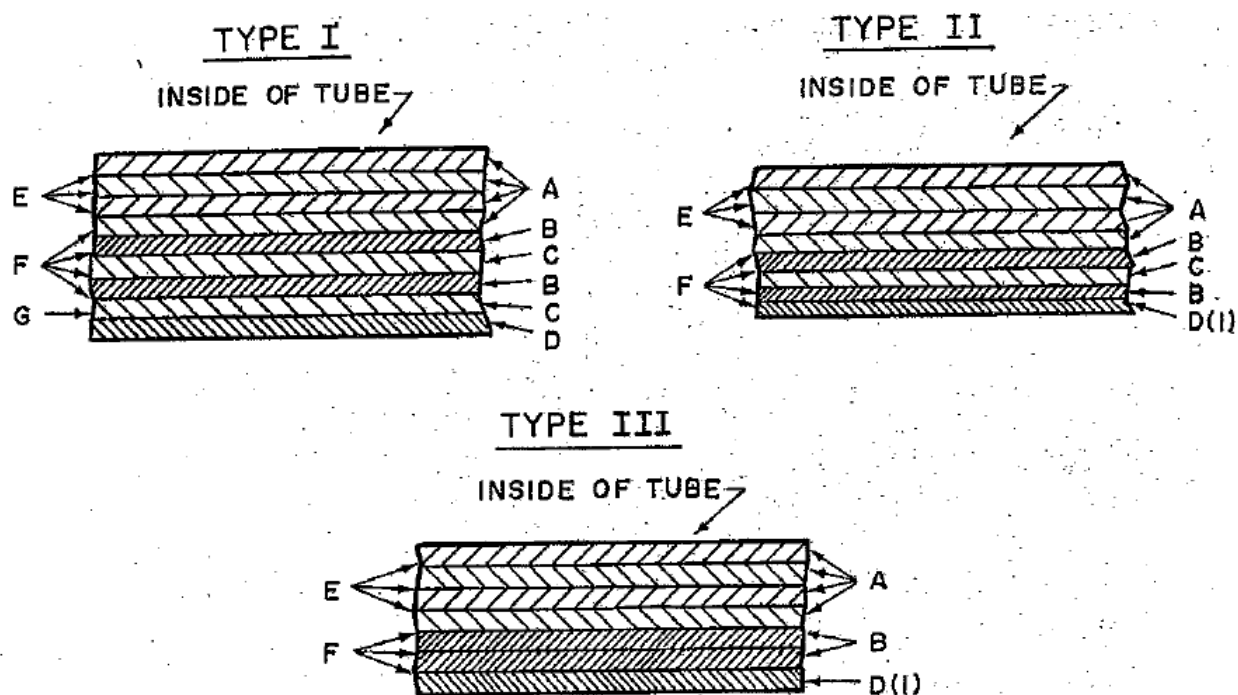
3.17 Assembly. All tubes in either the body or cover assemblies shall be securely glued together with glue complying with the following: ASTM-D4317, tackified polyvinyl alcohol, or tackified polyvinyl acetate adhesive (Type I, II, III, and IV) and MIL-A-13374 Class 1 adhesive (Type V and VI). Glue shall be applied in at least one continuous band completely around the tube being glued. Tubes, supports, and other related parts, when not specifically dimensioned, shall form a snug fit with mating pieces. Adhesive bonds will be of sufficient strength that tubes, supports, and parts other than spacers fastened into fiber containers, shall not be displaced when subject to drop testing.

3.17.1 Tubes (except outer and cover tubes). Any inner or neck tube resting against a metal end, a support for another tube, or some other part, shall make contact at least at one point on the periphery of the tube. When inner support or neck tubes are required they shall contact the metal end on at least one point of the periphery of the tube. Each end shall be square, when measured perpendicularly to the central axis, within one half the length tolerance for the tube.

3.17.2 Assembly workmanship. All parts and assemblies shall be clean and free from scuffs penetrating the outer layer, gouges, cuts, checks, imperfect adhesion between layers, asphalt (applicable to Type I, II and III containers), checking of paper on inside and outside surfaces, ragged slitter and re-cutter cuts, burrs on the inside edge of the open end of the cover, ragged edges on the open end of other tubes, excess glue or adhesive on mating surfaces that could interfere with opening or closing of container or come into contact with any surface of the packed end item, dirt, grease, rust, mold, mildew, and other foreign matter, except that traces of process lubricant will be permitted provided that noticeable staining or discoloration does not occur. Scuffs not penetrating the outer layers shall be permitted on a container if they are not larger than one inch and there are not more than two scuffs on the container.

3.18 Lot formation. Lot formation shall be IAW MIL-STD-1168. Container lots shall be identified on the packaging or palletization when delivered.

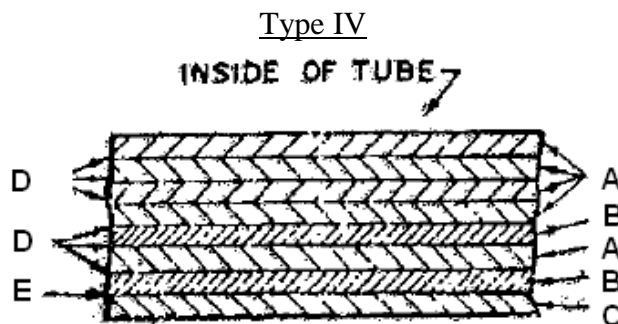
## MIL-DTL-2439G



- A - Ammunition container board, specification A-A-59209, as required to provide specific diameter.
- B - 0.007" waterproof asphalt duplex kraft wrapping paper, specification PPP-B- 1055, Class P-1, must LAP not less than 0.0625". Inner layer to be applied with asphalt on both sides, outer covering to be immersed in asphalt.
- C - Aluminum foil, specification QQ-A-1876, 0.001" thick. Foil may be partially annealed temper with maximum bursting strength of 45 psi. LAP foil to be not less than 0.25".
- D - 0.006" to 0.007" asphalt impregnated kraft paper, specification MIL-P-20293. LAP to be not less than 0.3125"
- (1) Entire surface to be completely coated with asphalt.
- E - Glue, specification ASTM-D4317 (see note H)
- F - Asphalt, specification ASTM-D449 or ASTM-D312, type III
- G - Neoprene latex base adhesive or polyvinyl acetate adhesive, meeting requirements of Drawing 12987995.
- H - Alternative adhesives – adhesive, dextrin, specification MIL-A-13374, or tackified polyvinyl alcohol adhesive or polyvinyl acetate adhesive meeting performance testing of ASTM-D4317

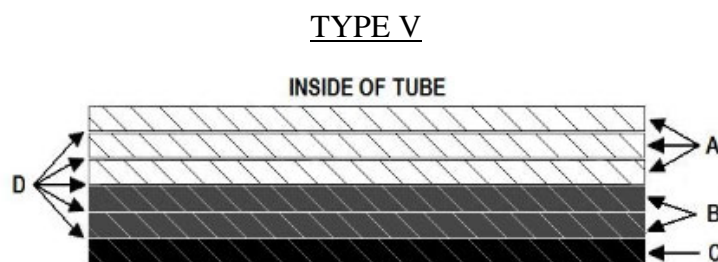
FIGURE 1. Type I, II, and III outer and cover tube construction requirements.

## MIL-DTL-2439G



- A - Ammunition container board, specification A-A-59209, as required to provide specific diameter. Use one or more layers of equal or better grade with minimum thickness 0.007" to obtain specific diameter.
- B - Aluminum foil, specification QQ-A-1876, 0.001" thick. Foil may be partially annealed temper with maximum bursting strength of 45 psi. LAP foil to be not less than 0.25".
- C - Seven (7) point lusterless black kraft. LAP shall not be less than 0.3125".
- D - Glue, specification ASTM-D4317 (see note F)
- E - Polyvinyl acetate adhesive, product no. 53-140, supplied by united resin products, Brooklyn, NY, or equivalent
- F - Alternative adhesives – neoprene latex base adhesive or polyvinyl acetate adhesive meeting requirements of Drawing 12987995.
- G - Resin is applied to all the outer surfaces of the tube H – Alternative adhesives – adhesive, dextrin, specification MIL-A-13374, or tackified polyvinyl alcohol adhesive or polyvinyl acetate adhesive meeting performance testing of ASTM-D4317

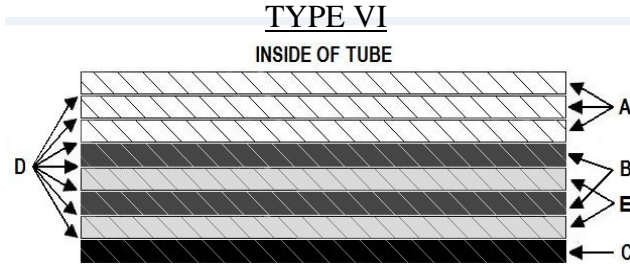
FIGURE 2. Type IV outer and cover tube construction requirements.



- A - Ammunition container board, specification A-A-59209, as required to provide specific diameter. Use one or more layers of equal or better grade with minimum thickness 0.007" to obtain specific diameter.
- B - Polylam (42.5 ± 2.5 lb natural kraft / 21 ± 7 lb LDPE / 72.5 ± 2.5 lb natural kraft)
- C - Polycoat (79 ± 9 lb natural kraft / 25 ± 5 lb black polyolefin)
- D - Glue, specification ASTM-D4317 (see note E)
- E - Alternative adhesives – adhesive, dextrin, specification MIL-A-13374, or tackified polyvinyl alcohol adhesive or polyvinyl acetate adhesive meeting performance testing of ASTM-D4317

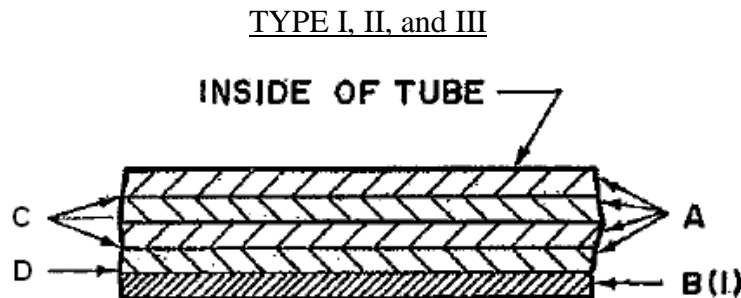
FIGURE 3. Type V outer and cover tube construction requirements.

## MIL-DTL-2439G



- A - Ammunition container board, specification A-A-59209, as required to provide specific diameter. Use one or more layers of equal or better grade with minimum thickness 0.007" to obtain specific diameter.
- B - Polylam (42.5 ± 2.5 lb natural kraft / 21 ± 7 lb LDPE / 72.5 ± 2.5 lb natural kraft)
- C - Polycoat (79 ± 9 lb natural kraft / 25 ± 5 lb black polyolefin)
- D - Glue, specification ASTM-D4317 (see note F)
- E - Aluminum foil, specification QQ-A-1876, 0.001" thick. Foil may be partially annealed temper with maximum bursting strength of 45 psi. LAP foil to be not less than 0.25"
- F - Alternative adhesives – adhesive, dextrin, specification MIL-A-13374, or tackified polyvinyl alcohol adhesive or polyvinyl acetate adhesive meeting performance testing of ASTM-D4317

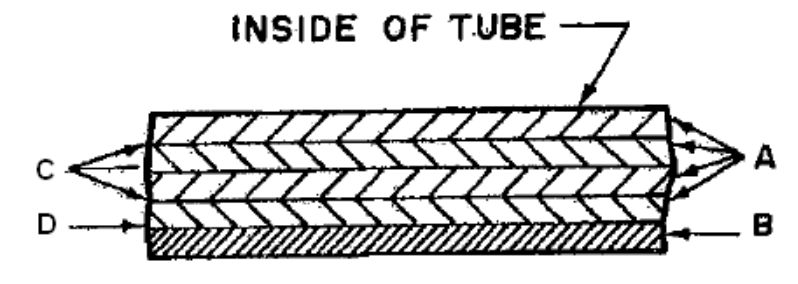
FIGURE 4. Type VI outer and cover tube construction requirements.



- A - Ammunition container board, specification A-A-59209, as required to provide specific diameter. Use one or more layers of equal or better grade with minimum thickness 0.007" to obtain specific diameter.
- B - 0.007" Waterproof asphalt duplex kraft wrapping paper, specification PPP-B- 1055, Class P-1, must lap not less than 0.0625".  
(1) Entire surface must be coated with asphalt
- C - Glue, specification ASTM-D4317 (see note E)
- D - Asphalt, specification ASTM-D449 or ASTM-D312, type III
- E - Alternative adhesives – adhesive, dextrin, specification MIL-A-13374, or tackified polyvinyl alcohol adhesive or polyvinyl acetate adhesive meeting performance testing of ASTM-D4317

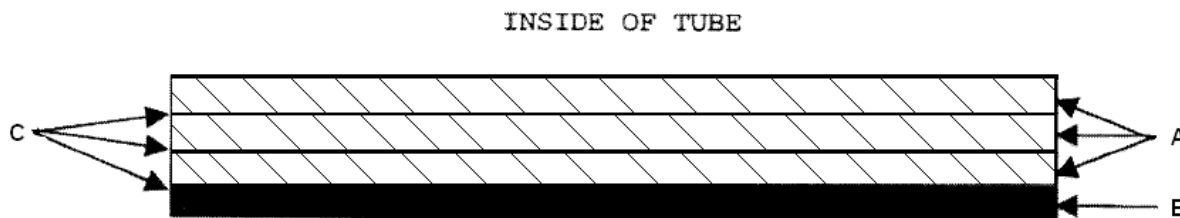
FIGURE 5. Type I, II, and III neck tube construction requirements.

## MIL-DTL-2439G

TYPE IV

- A - Ammunition container board, specification A-A-59209, as required to provide specific diameter. Use one or more layers of equal or better grade with minimum thickness 0.007" to obtain specific diameter.
- B - Seven (7) point lusterless black kraft. LAP shall not be less than 0.3125".
- C - Glue, specification ASTM-D4317 (see note E)
- D - Polyvinyl acetate adhesive, product no. 53-140, supplied by united resin products, Brooklyn, NY, or equivalent
- E - Alternative adhesives – neoprene latex base adhesive or polyvinyl acetate adhesive meeting requirements of Drawing 12987995
- F - Resin is applied to all the outer surfaces of the tube

FIGURE 6. Type IV neck tube construction requirements.

TYPE V and Type VI

- A - Ammunition container board, specification A-A-59209, as required to provide specific diameter. Use one or more layers of equal or better grade with minimum thickness 0.007" to obtain specific diameter.
- B - Polylam (42.5 ± 2.5 lb natural kraft / 21 ± 7 lb LDPE / 72.5 ± 2.5 lb natural kraft)
- C - Glue, specification ASTM-D4317 (see note D)
- D - Alternative adhesives – adhesive, dextrin, specification MIL-A-13374, or tackified polyvinyl alcohol adhesive or polyvinyl acetate adhesive meeting performance testing of ASTM-D4317

FIGURE 7. Type V and Type VI neck tube construction requirements.

MIL-DTL-2439G

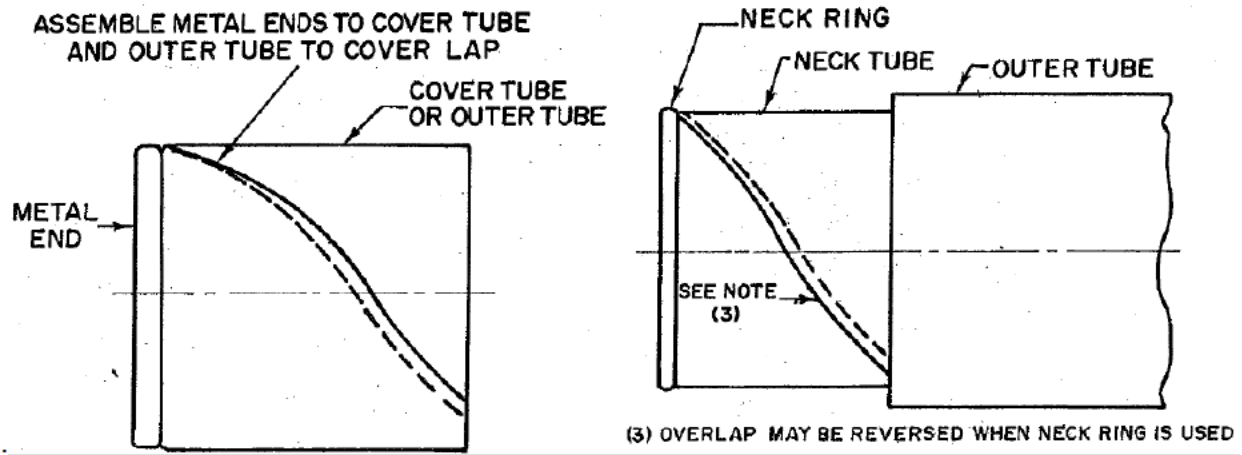


FIGURE 8. Winding lap for container construction.

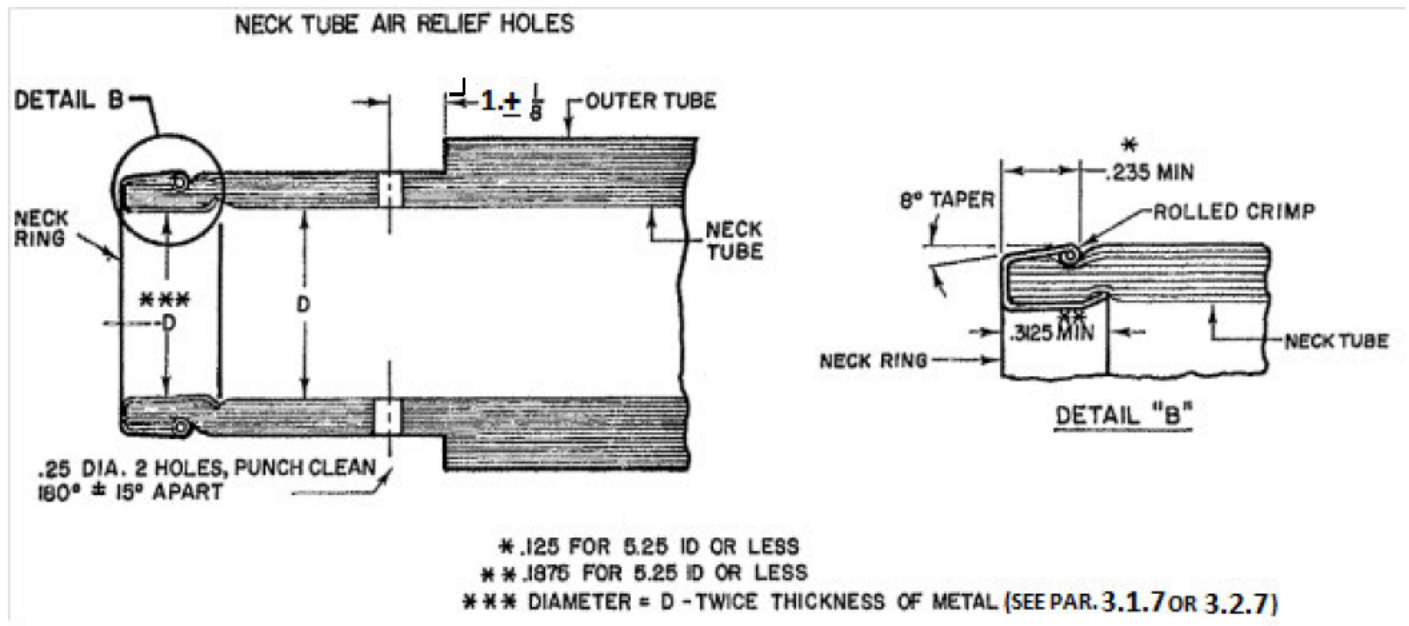
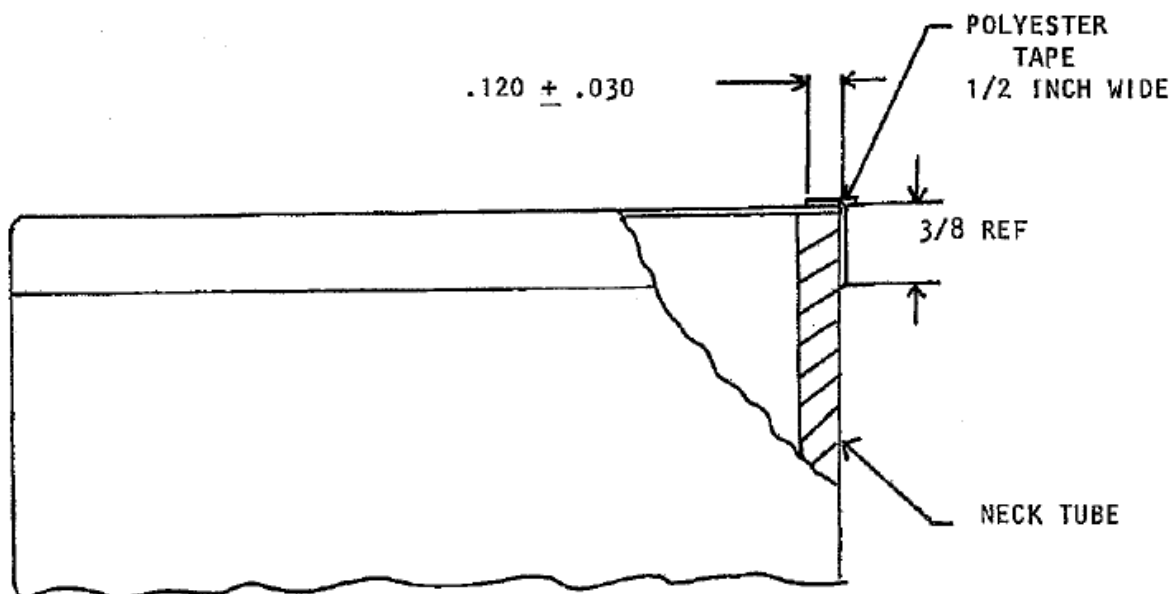


Figure 9. Neck tube requirements: neck rings and perforations.



## MIL-DTL-2439G

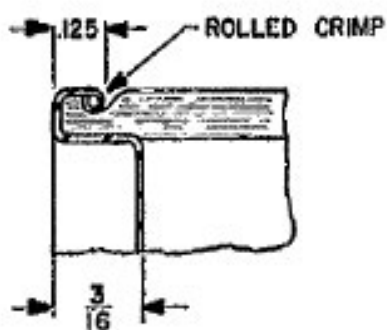
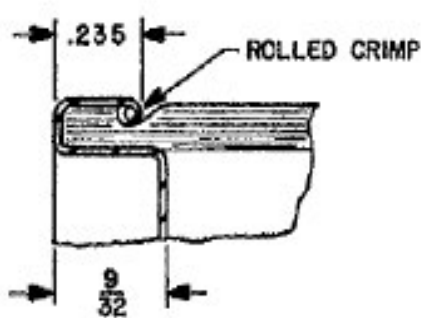
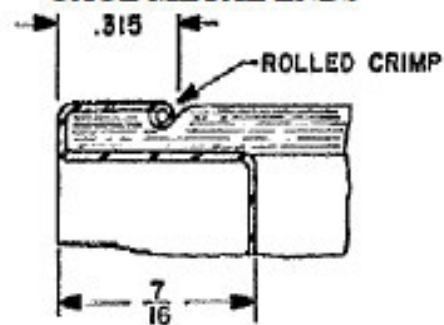
## POLYESTER TAPE APPLIED TO NECK TUBE



## NOTES:

1. MINIMUM OVERLAP OF POLYESTER TAPE SHALL BE 1/4 INCH.
2. PEEL STRENGTH TEST SHALL BE APPLICABLE TO THE PORTION OF THE POLYESTER TAPE WHICH IS ADHERED TO THE SIDEWALL OF THE NECK TUBE ONLY.

FIGURE 10. Requirements for polyester tape application.

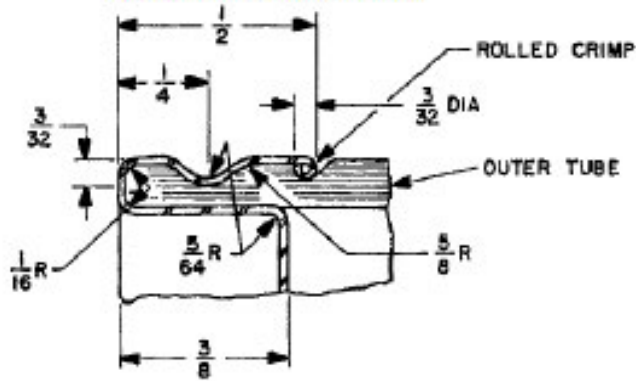
INSIDE DIAMETER OF  
3 INCHES OR LESSINSIDE DIAMETER  
MORE THAN 3 INCHESINSIDE DIAMETER OF 3.39  
INCHES AND MORE WITH 26  
GAGE METAL ENDS

**Note: All dimensions are minimum.**

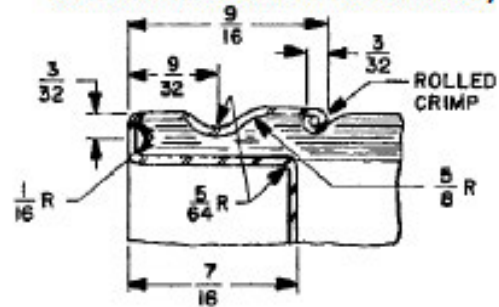
FIGURE 11. Requirements for Class 1 metal end crimps.

MIL-DTL-2439G

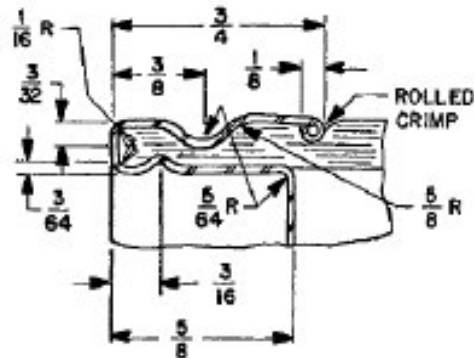
CONTAINER WITH INSIDE DIA OF  
3.39 INCHES OR LESS, WITH 26  
GAGE METAL ENDS



CONTAINER WITH OUTER TUBE INSIDE DIA OF  
3.40 TO 4.70 (WITH 28 GAGE METAL ENDS).  
(FOR 81MM FIBER CONTAINERS)  
(DIMENSIONS FOR INNER CRIMP DEPTH  
(7/16) IS FOR REFERENCE ONLY. REFER TO  
ACTUAL CONTAINER DRAWING TO  
DETERMINE CORRECT DIMENSION)



CONTAINER WITH OUTER TUBE INSIDE  
DIA OF 4.71 OR GREATER (WITH 26  
GAGE METAL ENDS.)(FOR 120MM  
FIBER CONTAINERS)



Note: Tolerance on radii  $\pm 0.25\%$ , tolerance on all fractional dimensions  $\pm 1/32$

FIGURE 12. Requirements for Class 2 metal end crimps.

## MIL-DTL-2439G

## 4. VERIFICATION

Table V. Requirement/Verification cross reference matrix.

<u>Method of Verification</u>		<u>Classes of Verification</u>						Section 4 Method
1 - Analysis		A - First article						
2 - Demonstration		B - Conformance						
3 - Examination								
4 - Test								
Section 3 Requirements	Descriptions	Verification Methods				Verification Class		
		1	2	3	4	A	B	
3.1.1	First article inspection	X		X	X	X		4.3
3.1.2	Conformance			X	X		X	4.4
3.2	Outer and cover tube construction			X	X	X	X	4.5.1
3.3.1	Neck tube construction			X	X	X	X	4.5.2.1
3.3.2	Neck tube vent holes			X	X	X	X	4.5.2.2
3.3.3	Neck tube security				X	X	X	4.5.2.3
3.4	Neck ring			X	X	X	X	4.5.3.1
3.4.1	Neck ring material	X		X		X	X	4.5.3.2
3.4.2	Neck ring plating	X		X		X	X	4.5.3.3
3.4.3	Neck ring corrosion resistance			X	X	X	X	4.5.3.4
3.4.4	Polyester tape	X	X	X		X	X	4.5.3.5
3.4.5	Neck ring workmanship			X		X	X	4.4.2.1, 4.5.15
3.5	Inner tubes	X			X	X	X	4.5.4
3.6	Container cover				X	X	X	4.5.5
3.7	Metal ends, crimped and covers	X		X		X	X	4.5.6
3.7.1	Metal for ends	X		X		X	X	4.5.6.1
3.7.1.1	Tin-coated steel (Tinplate)	X		X		X	X	4.5.6.1
3.7.1.1.1	Tin-coated steel for Type I, II, II, and IV fiber containers	X		X		X	X	4.5.6.1
3.7.1.1.2	Tin-coated steel for Type V and VI fiber containers	X		X		X	X	4.5.6.1
3.7.1.2	Zinc coated steel	X		X		X	X	4.5.6.1

## MIL-DTL-2439G

Table V. Requirement/Verification cross reference matrix - continued.

<u>Method of Verification</u>		<u>Classes of Verification</u>						
1 - Analysis		A - First article						
2 - Demonstration		B - Conformance						
3 - Examination								
4 - Test								
Section 3 Requirements	Descriptions	Verification Methods				Verification Class		Section 4 Method
		1	2	3	4	A	B	
3.7.2	Crimping (Class 1 and 2 ends)		X	X		X	X	4.5.6.2
3.7.2.1	Crimp integrity				X	X	X	4.5.6.3
3.7.3	Metal end marking			X		X	X	4.4.2.1
3.7.4	Metal end coating				X	X	X	4.5.6.4, 4.5.6.5
3.7.5	Metal end corrosion resistance				X	X	X	4.5.6.6
3.7.6	Domed metal ends			X		X	X	4.4.2.1
3.7.7	Metal end workmanship			X		X	X	4.5.15
3.8.1	Chipboard spacer construction	X		X		X	X	4.5.7
3.8.2	Chipboard spacer drop test resistance				X	X	X	4.5.14.1
3.9	Polylam material				X	X		4.7
3.9.1	Properties of poly laminated paper (Polylam)	X		X		X	X	4.7
3.10	Polycoat material				X	X		4.7
3.10.1	Properties of poly coated paper (Polycoat)	X			X	X	X	4.7
3.11	Peel strength of polyester tape				X	X	X	4.5.8
3.12	Peel strength of outer layer				X	X	X	4.5.9
3.13	Resin content		X		X	X		4.5.10
3.14	Wax			X		X	X	4.5.11
3.15	Gloss				X	X	X	4.5.6.5, 4.5.12
3.16	Blisters			X		X	X	4.5.13
3.17	Assembly				X	X	X	4.5.14.1
3.17.1	Tubes (except outer and cover tubes)			X		X	X	4.5.14.2
3.17.2	Assembly workmanship			X		X	X	4.5.15
3.18	Lot formation			X		X	X	4.6

## MIL-DTL-2439G

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

- a. First article inspection (See 4.3).
- b. Conformance inspection (See 4.4).

4.2 Inspection conditions. Unless otherwise specified all verifications shall be performed IAW the test conditions specified herein.

4.3 First article. When specified, a sample shall be subjected to first article verification.

4.3.1 First article quantity. The first article inspection shall be performed on the quantities listed in Table VI. The first article samples shall be manufactured using the same methods, materials, equipment, processes, inspections, in-process tests and facilities as will be used in full-rate production. All material shall be obtained from the same sources of supply as will be used in regular production.

4.3.2 Inspections to be performed. The first article inspection shall be performed IAW Table VI.

4.3.3 Rejection. If any assembly, component or test specimen fails to comply with any of the applicable requirements, the first article sample shall be rejected.

## MIL-DTL-2439G

TABLE VI. First article inspection.

Examination or Test	Verification Samples	Requirement Paragraph	Inspection Method
<u>Container assemblies</u>			
a. Examination for defects, <u>1/</u>	25	3.1.2	4.4.2.1
b. Drop test	5	3.17	4.5.14.1
c. Torque test	5	3.3.3	4.5.2.3
d. Metal end pull test	5	3.7.2.1	4.5.6.3
e. Fit of cover assembly	5	3.6	4.5.5
f. Peel strength of outer layer of asphalt impregnated kraft paper (Type I, Type II, and Type III containers) or polyethylene laminate (Type V and Type VI)	5	3.12	4.5.9, 4.5.9.1
g. Security of windings	5	3.16	4.5.13
h. Construction of outer tubing	3	3.2	4.5.1
<u>Coated metal ends (or coated sheet steel used for manufacture of metal ends)</u>			
a. Gloss	5	3.7.4	4.5.6.5
b. Salt spray test	5	3.7.5	4.5.6.6
<u>Neck rings (when applicable)</u>			
a. Construction	5	3.4, 3.4.1	4.5.3.1, 4.5.3.2
b. Coating thickness	5	3.4.2	4.5.3.3
c. Salt spray test	5	3.4.3	4.5.3.4
<u>Inner tube material</u>			
a. Basis weight	3	3.5	4.5.4
b. Bursting strength	3	3.5	4.5.4
c. Acidity (ph)	4	3.5	4.5.4
<u>Neck tubes</u>			
a. Peel strength of polyester tape (per applicable containers)	5	3.11	4.5.8
b. Resin content (applicable to Type IV containers.) <u>2/</u>	5	3.13	4.5.10
<u>Cover tubes</u>			
a. Resin content (applicable to Type IV containers.) <u>2/</u>	5	3.13	4.5.10
b. Construction (per applicable figure). <u>3/</u>	5	3.2	4.5.1
<u>Outer tubes</u>			
a. Resin content (applicable to Type IV containers.) <u>2/</u>	5	3.13	4.5.10
b. Construction (per applicable figure). <u>3/</u>	5	3.2	4.5.1
<u>Polylam &amp; Polycoat material</u>			
Vertical tear strength	<u>4/</u>	3.9/3.10	4.7
Horizontal tear strength	<u>4/</u>	3.9/3.10	4.7
Vertical tensile strength	<u>4/</u>	3.9/3.10	4.7
Horizontal tensile strength	<u>4/</u>	3.9/3.10	4.7
Mullen burst strength	<u>4/</u>	3.9/3.10	4.7
<u>Coefficient of friction</u>	<u>4/</u>	3.10	4.7
<u>Water vapor transmission</u>	<u>4/</u>	3.10	4.7
Notes:			
<u>1/</u> The sample which are used for the Examination for Defects shall then be used for the other tests.			
<u>2/</u> For the resin content test, five labeled samples (neck, cover, and outer tubes) that have not been resin impregnated shall be tested.			
<u>3/</u> Samples which are used for the metal end pull test shall be used for the construction test.			
<u>4/</u> Number of samples shall be per verification/test method			

## MIL-DTL-2439G

### 4.4 Conformance inspection.

4.4.1 Inspection lot formation. Lot formation shall be in accordance with Section 4 of MIL-STD-1916. More than one material interfix of laminated paper may be used in a contract or purchase order provided that two interfixes are not used in the same lot of container assemblies. During production, different interfixes of enamel coated metal sheets may be used in the same lot of container assemblies. Each lot of sheet material shall meet the salt spray test.

4.4.1.1 Sampling. Sampling shall be conducted IAW the classification of characteristics in 4.4.2.1. Samples shall be selected at random. Failure of any sample item to conform to any characteristic in the classification of characteristics, based on the acceptance criteria specified therein, shall be cause for rejection of the lot represented.

4.4.2 Classification of characteristics. Conformance examinations and tests shall be as specified in the following classification of characteristics, paragraph 4.4.2.1. When verification levels (VLs) are specified for selection of sample sizes and acceptance criteria, the Sampling Plans of MIL-STD-1916 shall apply, unless otherwise specified.

## MIL-DTL-2439G

4.4.2.1	<u>Container assembly.</u>			
Category	Characteristic	Conformance Criteria	Requirement Paragraph	Inspection Method
<u>Critical</u>	None defined			
<u>Major</u>				
101	Metal end diameter	VL - III	<u>1</u> /	Gage
102	Distance from outer tube to end of neck tube (when applicable)	VL - III	<u>1</u> /	Gage
103	Hole or break in end metal	VL - III	3.7.7	Visual
104	Crimp faulty or incomplete	VL - III	3.7.7	Visual
105	Cover and outer tube fail to meet	VL - III	3.2	Visual
106	Components missing or incorrectly positioned or loose	VL - III	3.17.2	Visual
107	Cuts, scuffs, gouges, checks, or crimping cuts that penetrate the outer layer	VL - III	3.17.2	Visual
108	Drop Test	5 acc 0/ rej 1	3.17	4.5.14.1
109	Torque Test	5 acc 0/ rej 1	3.3.3	4.5.2.3
110	Metal end pull test	5 acc 0/ rej 1	3.7.2.1	4.5.6.3
111	Fit of cover assembly test	5 acc 0/ rej 1	3.6	4.5.5
112	Gloss of container exterior and metal ends	5 acc 0/ rej 1	3.15	4.5.12
113	Length of outer tube	VL - III	<u>1</u> /	Gage
114	Length of outer cover	VL - III	<u>1</u> /	Gage
115	Depth to support or support assembly or washer from top of neck tube (or neck ring)	VL - III	<u>1</u> /	Gage
116	Depth to spacer tube from top of neck tube (or neck ring)	VL - III	<u>1</u> /	Gage
117	Outside diameter of outer tube or cover tube minimum	VL - III	<u>1</u> /	Gage
Notes: <u>1</u> / Dimensional requirements are listed on item drawings of individual technical data packages (see 6.2)				



## MIL-DTL-2439G

4.4.2.1 <u>Container assembly.</u> - continued				
Category	Characteristic	Conformance Criteria	Requirement Paragraph	Inspection Method
<u>Major</u>				
118	Inside diameter of neck tube (or neck ring)	VL - III	<u>1/</u>	Gage
119	Inside diameter of support tube (as applicable)	VL - III	<u>1/</u>	Gage
120	Inside diameter of spacer tube	VL - III	<u>1/</u>	Gage
121	Embossing on end missing, illegible, or misleading	VL - III	3.7.3	Visual
122	Excessive glue (dry or tacky) on outside of neck, inside diameter of cap, or anywhere that may come in contact with the intended contents of the container	VL - III	3.17.2	Visual
123	Looseness between layers	VL - III	3.17.2	Visual
124	Support or support assembly damaged or deformed	VL - III		Visual
125	Neck ring or support ring improperly crimped (when applicable)	VL - III	3.4.5	Visual
126	Metal end crimped to wrong end of tube or cap <u>2/</u>	VL - III	3.7.7	Visual
127	Mildew or mold present	VL - III	3.17.2	Visual
128	Bleeding of asphalt on outer surface (applicable to Type I, II, and III containers)	VL - III	3.17.2	Visual
129	Blisters	VL - III	3.16	4.5.13
130	Crimp on either end of spacer ring assembly faulty or incomplete (when applicable)	VL - III	3.7.7	Visual
131	Domed metal ends not within flush to 1/32" recess from outer crimped edge	VL - III	3.7.6	Gage
132	Neck tube vent holes	VL - III	3.3.2	4.5.2.2
133	Peel strength of outer layer	VL-I	3.12	4.5.9
<u>Minor</u>				
201	Evidence of poor workmanship	VL - II	3.17.2	Visual
Notes:				
<u>1/</u> Dimensional requirements are listed on item drawings of individual technical data packages (see 6.2)				
<u>2/</u> The metal end is crimped to the wrong end of the tube if, at the open end of the container, the end of the outermost layer is exposed instead of overlapped.				

## MIL-DTL-2439G

4.5 Tests.

4.5.1 Outer cover construction. Construction of the outer and cover tubes shall be verified visually and with standard measurement equipment to Figure 1, for Type I, II, and III tubes or Figure 2 for Type IV tubes or Figure 3 for Type V tubes, or Figure 4 for Type VI tubes. Verification shall be performed on a cross section by cutting the sample with a knife or other sharp instrument. The layers of the outer tubes and the cover tube shall then be separated for identification purposes. If the construction of the tubes does not match the required reference figure the sample shall be rejected.

4.5.2 Peel test of the outer layer of polyethylene. (see 3.12). For Type VI containers, five (5) containers shall be selected from each lot for this test. From each container selected, two (2) test specimens one (1) inch in width minimum by four inches in length minimum, shall be prepared and subjected to the test specified in 4.5.9.

4.5.2 Neck tubes.

4.5.2.1 Neck tube construction. Construction of neck tubes shall be verified to Figure 5, for Type I, II, and III tubes or Figure 6 for Type IV tubes or Figure 7 for Type V and Type VI tubes. Verification shall be performed on a cross section by cutting the sample with a knife or other sharp instrument. The layers of the outer tubes and the cover tube shall then be separated for identification purposes.

4.5.2.2 Neck tube vent holes. Pressure relief perforations in the neck tube shall be verified with the use of standard measurement equipment. Observations shall be made on a cross section of a completed item by cutting the sample with a knife or other sharp instrument. Perforations that do not comply with Figure 9 shall be cause for rejection of the sample.

4.5.2.3 Neck tube security torque test. The container shall be assembled into the fixture shown in Figure 13, or an approved equivalent. The product shall fail if the torque specified in Table II is applied and the neck tube is removed or loosened. Care shall be exercised to prevent damage to the crimp of the metal end of the container tube.

4.5.3 Neck rings.

4.5.3.1 Neck ring construction. A cross section of a completed item shall be created by cutting the sample with a knife or other sharp instrument and measured with standard measurement equipment.

4.5.3.2 Neck ring material. Analysis shall be done to verify conformance with commercial standard (See 6.2.h).

4.5.3.3 Plating thickness. The neck rings shall be tested IAW ASTM-E376 (69, Part 31). If plating thickness is found to be unacceptable for the requirement, it shall be cause for rejection.

## MIL-DTL-2439G

4.5.3.4 Salt spray test. The neck rings and coated metal ends shall be tested as specified in ASTM-B117. The evaluation shall be performed immediately after removal from the salt fog.

4.5.3.5 Polyester tape. When used, the polyester tape shall be applied IAW Figure 10. Dimensions shall be verified with standard measurement equipment.

4.5.4 Inner tube material (first article inspection only).

4.5.4.1 Basis weight. The inner tube material shall be tested IAW ASTM-D646. The basis weight results shall be recorded in pounds.

4.5.4.2 Bursting strength. The inner tube material shall be tested in accordance with ISO 2758:2001. (Note: TAPPI 403 is acceptable commercial standard alternative, if test procedures are already in place.)

4.5.4.3 Acidity, pH. The inner tube material shall be tested for acidity IAW TAPPI T448.

4.5.5 Container cover. The container shall be placed in a vertical position, cover end down, and supported at the base. The cover shall be positioned such that the open end of the cover is just below the neck perforations. The cover shall then be released. If the cover remains in place when released, it shall be removed; a 3 pound weight shall be placed therein and then be replaced on the neck tube as far as the perforations. Time to disengagement of the cover from the neck shall be observed. The sample shall be rejected if the cover does not disengage within the required time frame.

4.5.6 Metal ends.

4.5.6.1 Material for metal ends. Material used in the construction of the metal ends shall be in compliance with ASTM-A1008, ASTM-A599/A599M, ASTM-A623/A623M, ASTM-A624/ASTM-A624M or ASTM-A626/ASTM-A626M for tinplated steel, or ASTM-A653/ASTM-A653M for zinc-coated steel (See 6.2.h).

4.5.6.2 Crimping. A cross section of a finished item shall be created by cutting the sample with a knife or other sharp instrument. Crimps shall be verified to Figure 11 for Class 1 crimps and Figure 12 for Class 2 crimp, based on inside diameter of fiber container outer cover. Crimps found not to comply with Figures 11 and 12 shall be cause for rejection.

4.5.6.3 Metal end pull test. This test shall be performed on the metal ends of the cover and the body assembly. The assembly shall be prepared for the test by cutting the body tube 5 to 6 inches from the end and extracting all component parts, where necessary, from the cover or truncated body assembly without injury to the crimp of the metal end of the tube. The prepared cover and body assemblies shall then be assembled in an approved fixture similar to that shown in Figure 14. The test may be performed in a tensile testing machine or as static testing. Determine the load required to separate the metal end from the tube by applying the load parallel to the centerline of the specimen. When a tensile testing machine is used, the rate of travel of the head shall be  $0.25 \pm 0.05$  inches per minute.

## MIL-DTL-2439G

4.5.6.4 Coating thickness. The metal ends shall be tested IAW ASTM-E376 (69, Part 31). If coating thickness is found to be unacceptable for the requirement, it shall be cause for rejection of the lot.

4.5.6.5 Gloss of coated metal ends. The coated metal ends shall be tested for specular gloss at 60 degree geometry IAW ASTM-D523. Gloss reading exceeding the maximum stated in the requirement shall cause a rejection of the lot.

4.5.6.6 Salt spray of coated metal ends. The coated metal ends shall be tested as specified in the MIL-E-19603, except that the specimens are not required to be bent.

4.5.7 Chipboard spacers. Analysis shall be done to verify conformance with A-A-1507. (see 6.2.h).

4.5.8 Peel strength of polyester tape. Store container assemblies without cover tubes at ambient temperature and humidity for three hours, minimum. Upon completion of the conditioning, the tape shall be separated by a sharp object or other suitable means from the surface of the neck tube. The separation will be sufficient in length to permit fingertip grasping of the tape. Peel the tape perpendicular to the neck tube at an even rate of peel of approximately 1 inch, every five seconds. Examine for evidence of fiber failure of the surface of the outer kraft or polyethylene ply to the tape.

4.5.9 Peel strength of outer layer. Prior to being subjected to this test, the test coupons shall be stored at ambient room temperature and humidity for a period of three hours, minimum. Upon completion of conditioning, the outer layer of asphalt impregnated kraft paper (Type I, II, and III containers), poly laminated paper (Type IV), or aluminum foil (Type VI) shall be separated from the adjacent layer by a sharp object or other suitable means. The separation shall be sufficient in length to permit fingertip grasping of the layers. The separated layer will be peeled at a 180 degree angle and at an even rate of peel of one inch approximately every five seconds. Examine for evidence of fiber failure of the surface of asphalt impregnated kraft paper, poly laminated paper, or to the layer of aluminum foil. Insufficient fiber failure shall cause rejection of the lot.

4.5.9.1 Adhesion of exterior polylaminate coating to kraft paper. For Type V containers, the kraft paper shall exhibit 75 percent minimum fiber failure when a 5x5 inch minimum sample of polylaminated paper is tested as follows: Using a rough surface such as 40 grit sandpaper, grind a hole (approximately ½ inch diameter) through the coating in the center of the swatch, just sufficient to expose the kraft paper. Completely strip the LDPE back in all directions from the center outwards.

4.5.10 Resin content. Applicable to Type IV containers.

4.5.10.1 Batch process. After a cure time for the parts, outer tubes, cover tubes, or neck tubes, has been established, five samples each shall be inspected to qualify the resin impregnation procedure at the beginning of production. The non-impregnated samples shall be tared and labeled. Then, they shall be immersed in heated resin at 200 F to 225 F for three

## MIL-DTL-2439G

minutes, minimum. After the samples have been cured, they shall be weighed again and the resin content shall be calculated as follows:

$$\text{Resin content: \%} = \frac{(W2-W1)}{W2} \times 100$$

Where: W1 = Weight (in grams) before resin impregnation.

W2 = Weight (in grams) after resin impregnation.

4.5.10.2 Resin cure time. In establishing a cure time, check weigh ten parts, outer, cover, or neck tubes, after resin impregnation at periodic intervals, since resin impregnation and continue until weighing stability is achieved.

4.5.11 Wax. As an aid in the manufacturing process, fully refined paraffin wax, with melting point between 123 – 150 degrees F, may be used to facilitate release of tubes from the forming mandrel. Build-up of wax particles, flaking, or caking shall be inspected visually. Presence will be cause for rejection.

4.5.12 Gloss of coated container exterior. The exterior of finished containers shall be tested for specular gloss at 60 degree geometry IAW ASTM-D523. Gloss reading shall not exceed the maximum stated in 3.15.

4.5.13 Blister detection. The fiber container with cover removed, shall be dried in a circulating oven for a period of  $8 \pm 1/2$  hours, at a temperature of  $125 \pm 5$  F degrees. Following this procedure, visual determination shall be made for indications of blistering. Any presence of blistering shall be cause for rejection. This is applicable to Types I, II, III, V, and VI containers.

#### 4.5.14 Assembly.

4.5.14.1 Drop test. The container shall be held vertically with the low end four feet above a concrete or steel surface, released and allowed to fall freely. Repeat the operation having the opposite end contact the surface. Observation shall be made for loose or misplaced parts. Dislodgement of parts held in place by adhesive bonds is cause for rejection. Dislodgement of the spacer caused by separation of chipboard fibers rather than by separation of the adhesive bond between the spacer and the metal end shall not be cause for rejection. Dislodgement of parts held in place by press-fit rather than by an adhesive shall not be cause for rejection if the displacement is less than 3/4" and the dislodged part can be pushed back into position.

4.5.14.2 Construction details. Examination shall consist of cutting along the longitudinal axis and peeling back layers to verify conformance to all drawing requirements. For inner tubes, support tubes, or neck tubes also verify that those tubes are in contact with the outer or cover tube as applicable.

4.5.15 Workmanship. General workmanship of the item shall be verified by visual inspection on finished items. Evidence of poor workmanship shall be subject to rejection of the individual unit and withholding acceptance of lot for disposition.

## MIL-DTL-2439G

4.6 Ammunition lot numbers. Visually verify that a lot number has been assigned IAW MIL-STD-1168.

4.7 Polylam and Polycoat material test procedures. Polylam and Polycoat materials shall be tested IAW the specified test method of Table VII.

TABLE VII. Polylam/Polycoat material property test methods.

Property	Test Methods
Vertical (MD) Tear Strength	TAPPI T414
Horizontal (CD) Tear Strength	TAPPI T414
Vertical (MD) Tensile Strength	TAPPI T494
Horizontal (CD) Tensile Strength	TAPPI T494
Mullen Burst Strength	TAPPI T403
Coefficient of Friction	ASTM-D1894
Water Vapor Transmission Rate	ASTM-E96/ E96M

## 5. Packaging.

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order, (see 6.2). When actual packaging of material is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain the requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

## 6. Notes.

(This section contains information of a general or explanatory nature that may be helpful but is not mandatory).

6.1 Intended use. This specification is intended primarily for use in connection with assembly drawings of fiber containers which are intended for packaging of loaded ammunition items. Details, supports, specific tube dimensions and requirements for neck ring will be as shown on the applicable assembly drawings. Dimensions and specific details are to be determined by the appropriate design agency.

6.2 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number, and date of this specification.
- b. First article:
  - 1) Time required for contractor notification of Government to perform the first article test.

## MIL-DTL-2439G

- 2) Name and address of test facility and shipping instructions when testing is performed by the Government.
- 3) Time required for the Government to notify the contractor whether or not to proceed with production.
- 4) When a new or partial first article is required
- c. Dimensional requirements for verification of specific container, as depicted in 4.4.2.1.
- d. Requirements for contractor acceptance inspection equipment (AIE) design approval.
- e. Data Item Description, Army Electronic Product Support (AEPS) access information and Governmental Agency Responsible for Acceptance (GARA) information.
- f. Packaging requirements.
- g. Requirements for ammunition lot numbering.
- h. Requirement to provide Certification of Conformance/Certification of Analysis with each lot of material or shipment

6.3 Suggested source. A suggested source for obtaining tape applying and heat shrink equipment is 3M Company, 3M Center, Tape Customer Engineering, St. Paul, Minnesota 55101.

6.4 Spacer material. For Type I, II, III, IV, V, and VI containers alternate material for chipboard is Industrial Board, Homasote Company, Trenton, New Jersey.

6.5 Suggested Polylam/Polycoat Material Suppliers. Suggested sources for Polycoat material are Polyfiber LLC, Attleboro, MA, part # 900521 and Jen Coat, Inc., Westfield, MA, part # 2473. Suggested sources for Polylam are Polyfiber LLC, Attleboro, MA, part # 900501; Jen Coat, Inc., Westfield, MA, part # 3305; and Berry Plastics Tapes and Coatings, Homer, LA, part # 735671.

6.6 Submission of acceptance inspection equipment designs for approval. Submit inspection equipment designs for approval as specified in the contract. The contractor is responsible for all inspection equipment design and calibration.

6.7 Blisters. It is generally accepted that blistering results from faulty winding techniques and skips in the application of adhesive between the outer layers of the fiber container. Blistering is not always immediately or readily apparent upon completion of the winding operation. Blistering may appear after the containers have acclimated to ambient conditions. Exposure to large changes in temperature and humidity also tends to aggravate the potential for blistering. If there is a recent history of blistering or it is suspected that blistering may occur, it is recommended that the containers be held at ambient conditions for at least 24 hours, and preferably 48 hours, prior to final inspection for this defect.

6.8 Packing directly in to preservative treated boxes. When Type II or III containers are packed directly into preservative treated boxes, bleeding of the asphalt can be expected due to the action of solvent vapors from the preservative treatment, unless a water base preservative has been used.

## MIL-DTL-2439G

6.9 Resin material. Boler 1318 and Boler 1633 fully refined waxes, manufactured by Boler Petroleum Company, 85 Old Eagle School Road, Wayne, PA 19807, have been found satisfactory for use in resin immersion containers.

6.10 Dimensions. Container dimension should be IAW specific drawing referenced in Column A of Table VIII (below).

Table VIII. Container dimensions for specific cartridges.

A	B	C	D
Container Drawing Number (Reference)*	Container Nomenclature	Caliber	Cartridges
12995106	PA167	120mm	M929, M934A1, M930, M983, M931, M934, M933A1
12993642	PA163	81mm	M821A1, M821A2, M889, M821
12993641	PA162	81mm	M816, M819, M853A1
12994713	PA177	81mm	M880
13006240	PA179	81mm	M821A1E1, XM1058
13006169	PA176	60mm	M720, M722, M722A1, M769
13006170	PA175	60mm	M721, M767
13018948	PA189	60mm	M720A1, M768
13019323	PA181	60mm	M1061, XM1046
13019374	PA182	60mm	M888
8800493	M415A1	Hand Grenades	M67

\* Copies of these drawings are available from U.S. Army ARDEC, ATTN: RDAR-EIL-P, Picatinny, NJ 07806-5000 or e-mail [army.picatinny.ardec.list.drawing-request-help-desk@mail.mil](mailto:army.picatinny.ardec.list.drawing-request-help-desk@mail.mil).

6.11 Subject term (key word) listing

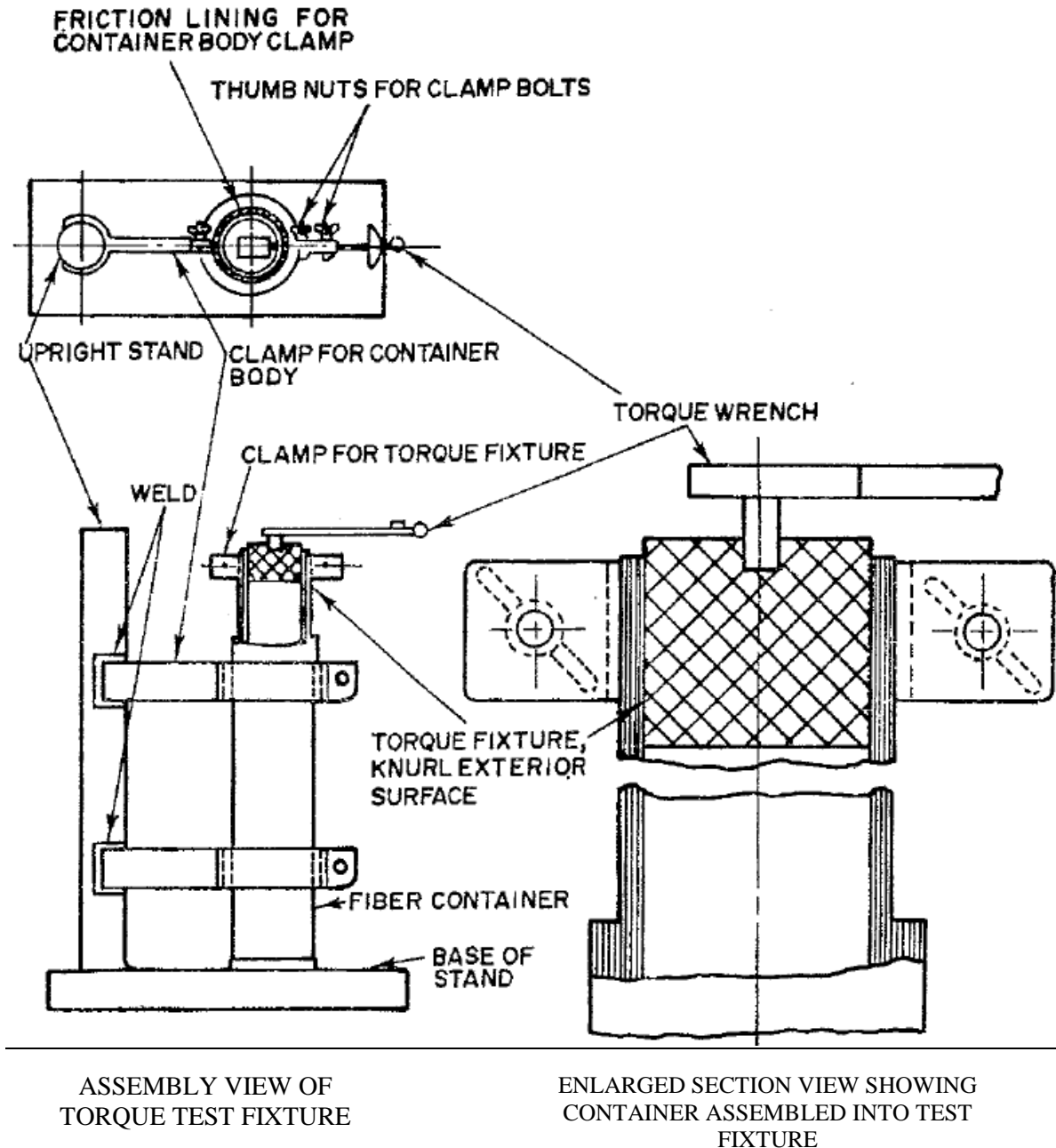
Asphalt  
Kraft Paper  
Metal Ends  
Packaging  
Poly Laminated  
Resin

6.12 Changes from previous revision. The margins of this specification are marked with vertical lines to indicate where changes from the previous issue were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this



## MIL-DTL-2439G

document based on the entire content irrespective of the marginal notations and relationship to the last previous issue.



ASSEMBLY VIEW OF  
TORQUE TEST FIXTURE

ENLARGED SECTION VIEW SHOWING  
CONTAINER ASSEMBLED INTO TEST  
FIXTURE

Note: When securing container to stand, do not tighten body clamps more than is necessary to hold container from moving under prescribed torque level.

FIGURE 13. Torque test fixture set-up.

MIL-DTL-2439G

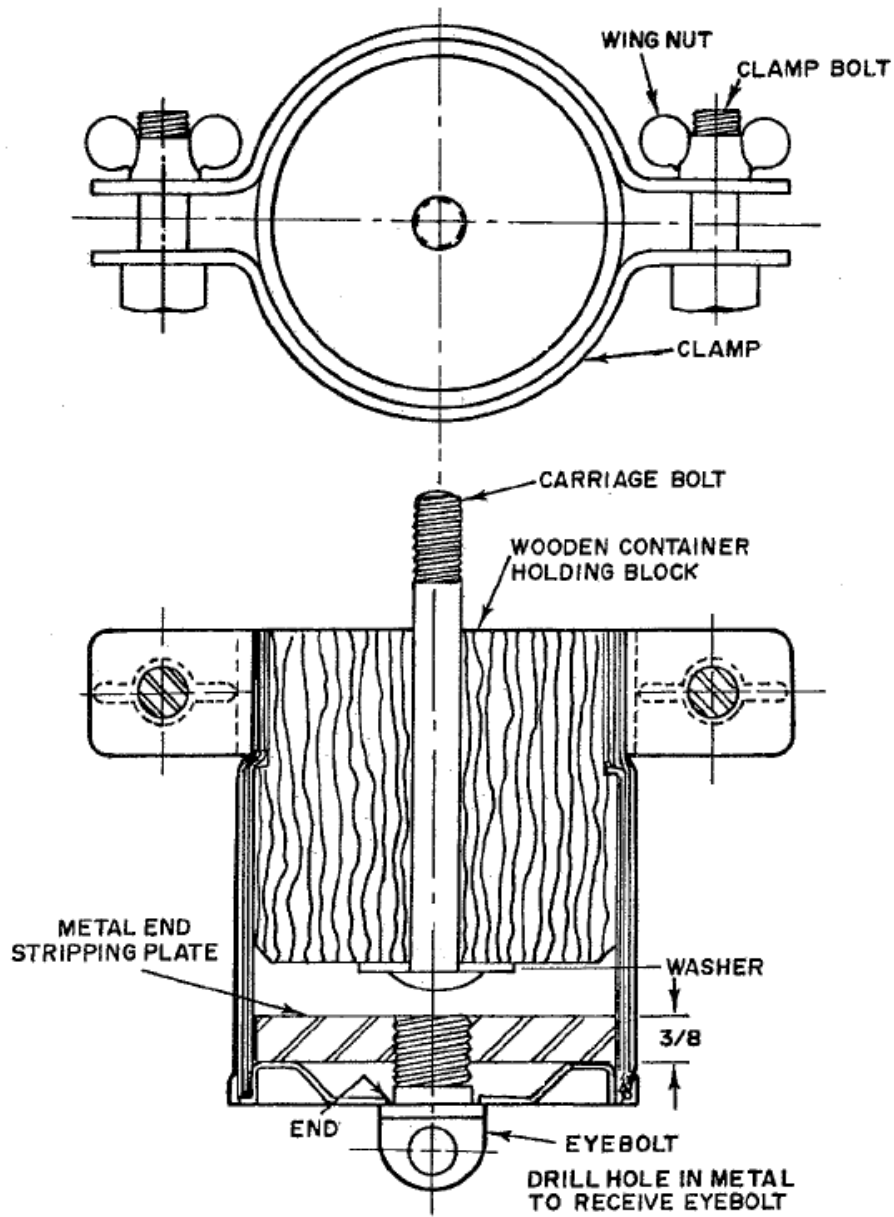


FIGURE 14. Metal end pull test fixture set-up.

MIL-DTL-2439G

Custodian:

Army - AR  
Navy - OS  
Air Force - 99

Preparing activity:

Army - AR  
(Project 8140-2014-025)

Review Activities:

Army - MI  
Navy - AS, MC  
Air Force - 11, 69, 70  
DLA - DH, GS, GS3, GS7  
Other - MP

Civil agency:

GSA - FAS

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at <https://assist.dla.mil>.