

L-P-1036A
May 22, 1974
SUPERSEDING
Fed. Spec. L-P-1036
June 27, 1967

FEDERAL SPECIFICATION

PLASTIC ROD, SOLID: PLASTIC TUBES AND TUBING,
HEAVY WALLED: POLYVINYL CHLORIDE, RIGID

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

1. SCOPE AND CLASSIFICATION

1.1 Scope. This specification covers the requirements for solid rods and heavy walled tubes and tubing made from rigid polyvinyl chloride conforming to composition A of L-P-1035. The shapes are intended for use primarily as machine shop stock and do not cover pipe or electrical conduit (see 6.1).

1.2 Classification.

1.2.1 Types, classes, and grades. The rigid polyvinyl chloride rods and tubes conforming to this specification shall be of the following types, classes, and grades, as specified (see 6.2).

Composition A:

Type I - High mechanical properties, excluding impact strength which is moderate, and high chemical resistance.

Class 1 - Maximum mechanical properties, excluding impact strength, and maximum chemical resistance.

Class 2 - Maximum mechanical properties, excluding impact strength, and high chemical resistance.

Class 3 - High mechanical properties, excluding impact strength, and maximum chemical resistance.

Grade E - Electrical quality.

Grade NT - Nontoxic according to intended use.

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Type II - High impact strength, moderate chemical resistance.
Grade E - Electrical quality.
Grade GU - General use.
Grade NT- Nontoxic according to intended use.

Type III - Medium impact strength, low chemical resistance.
Grade E - Electrical quality.
Grade GU - General usage.
Grade NT - Nontoxic according to intended use.

2. APPLICABLE DOCUMENTS

2.1 The following documents, of the issues 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:

L-P-1035 - Plastic Molding Material, Vinyl Chloride Polymer and Vinyl Chloride - Vinyl Acetate Copolymer, Rigid.
PPP-B-585 - Boxes, Wood, Wirebound.
PPP-B-601 - Boxes, Wood, Cleated-Plywood.
PPP-B-636 - Boxes, Shipping, Fiberboard.

Federal Standard:

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

(Activities outside the Federal Government may obtain copies of Federal Specifications, Standards, and Handbooks as outlined under General Information in the Index of Federal Specifications and Standards and at the prices indicated in the Index. The Index, which includes cumulative monthly supplements as issued, is for sale on a subscription basis by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402.

(Single copies of this specification and other Federal specifications required by activities outside the Federal Government for bidding purposes are available without charge from Business Service Centers at the General Services Administration Regional Offices in Boston, New York, Washington, D. C., Atlanta, Chicago, Kansas City, Mo., Fort Worth, Denver, San Francisco, Los Angeles and Seattle, Washington.

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

Military Specifications:

- MIL-P-116 - Preservation, Methods of.
- MIL-P-10547 - Liners, Case, and Sheet, Overwrap, Water-Vaporproof or Waterproof Flexible.

Military Standards:

- MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.
- MIL-STD-129 - Marking for Shipment and Storage.

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

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless a specific issue is identified, the issue in effect on date of invitation for bids or request for proposal shall apply.

American Society for Testing and Materials (ASTM) Standards:

- D 618-61(1971) - Conditioning Plastics and Electrical Insulating Materials for Testing.
- D 883-72c - Nomenclature Relating to Plastics.
- D 1042-51(1971) - Measuring Changes in Linear Dimensions of Plastics.
- D 2152-67(1972) - Quality of Extruded Polyvinyl Chloride Pipe by Acetone Immersion.

(Copies may be obtained from the American Society for Testing and Materials, 1916 Race St., Philadelphia, Pennsylvania 19103.)

National Motor Freight Traffic Association, Inc., Agent:

National Motor Freight Classification.

(Application for copies should be addressed to the American Trucking Associations, Inc., Tariff Order Section, 1616 P Street, N. W. Washington, DC 20036).

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, Illinois 60606).

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

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3. REQUIREMENTS

3.1 Material. The rods and tubes shall be manufactured from rigid polyvinyl chloride conforming to composition A and the type, class, and grade of L-P-1035, as specified herein.

3.2 Property values. Specimens machined, or molded from rods and tubes cut into small pieces, shall conform to the property values specified in L-P-1035, as applicable.

3.3 Acetone resistance. Specimens cut from rods or tubes shall withstand immersion in anhydrous acetone in accordance with 4.3.2, without cracking, flaking, disintegration, or loss of weight in excess of 1.0 percent.

3.4 Heat shrinkage. Specimens cut from rods or tubes shall not shrink in length by more than 9.0 percent, when tested in accordance with 4.3.3.

3.5 Color. The color of rods and tubes shall be as specified by the procuring agency (see 6.2). When color is not specified, the color shall be that normally supplied by the fabricator for the applicable type, class, and grade. Color shall be uniform as determined by visual inspection.

3.6 Dimensions.

3.6.1 Length. Unless otherwise specified (see 6.2) rods and tubes shall be supplied in lengths of 10 feet $+1/4$ -0 inch, except that a maximum of 5 percent of the lot may be supplied in lengths of from 5 to 10 feet.

3.6.2 Diameter. The nominal diameters of rods and the nominal outside diameters of tubes shall be multiples of $1/8$ inch, as specified. Unless otherwise specified (see 6.2 and 6.3), actual diameters shall be within the tolerances shown in table I.

TABLE I. Diameter tolerances^{1/}

Nominal diameter of rod or nominal outside diameter of tube, inches	Diameter tolerance, percent of nominal	
	Rods	Tubes
Under $5/8$	+5, -0	+5, -0
$5/8$	+4, -0	+4, -0
$3/4$ through $7/8$	+3, -0	+3, -0
1 through $1-1/2$	+3, -0	+2, -0
$1-5/8$ through $2-1/2$	+3, -0	+1.5, -0
$2-5/8$ and over	+3, -0	+1, -0

^{1/}Includes out-of-roundness.

3.6.3 Wall thickness of tubes. The nominal wall thickness of tubes shall be multiples of 1/16 inch and the actual wall thickness shall be within the tolerances of +10 -0 percent of the nominal wall thickness. This requirement includes eccentricity.

3.7 Marking. The rods and tubes shall carry any markings specified. The method of marking shall be as specified (see 6.2)

3.8 Workmanship. The rods and tubes shall have a square-cut end, a smooth finish, and shall be as free of bow, kink, blisters, bubbles, wrinkles, cracks, gouges, foreign inclusions, and other defects that affect the appearance or which might affect serviceability. (These defects shall be defined in accordance with ASTM D 883-72c, as applicable.)

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified, the supplier may utilize his own facilities or any commercial laboratory acceptable to 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 that supplies and services conform to prescribed requirements.

4.2 Sampling for inspection and acceptance. Sampling for inspection and acceptance shall be performed in accordance with provisions set forth in MIL-STD-105, except where otherwise indicated. For purposes of sampling, an inspection lot for examination and tests shall consist of all material of the same type, class, grade, and nominal dimensions submitted for delivery at one time.

4.2.1 Inspection of materials and components. In accordance with 4.1, the supplier is responsible for insuring that materials and components used were manufactured, tested, and inspected in accordance with the requirements of referenced subsidiary specifications and standards to the extent specified, or if none, in accordance with this specification. In the event of conflict, this specification shall govern. A supplier's certificate of compliance with 3.1 and 3.2 shall be furnished.

4.2.2 Inspection of rods and tubes. Examination of rods and tubes shall be made in accordance with the classification of defects, inspection levels, and acceptable quality levels (AQLs) set forth below. The lot size, for purpose of determining the sample size in accordance with MIL-STD-105, shall be expressed in units of packages of plastic rods or tubes for examination in 4.2.2.1, 4.2.2.2, and in units of shipping containers for examination in 4.2.2.3.

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4.2.2.1 Examination of rods and tubes for defects in appearance and workmanship. The sample unit for the examination specified in table II shall be one rod or tube.

TABLE II. Examination of rods and tubes for defects in appearance and workmanship

Examine	Defect
Rods and tubes	Color not as specified. Not uniform in color, finish, or texture. Presence of foreign matter. Any blister, crack, wrinkle, hole, or gouge. End not square cut. Warped or kinked. Marking not as specified.

4.2.2.2 Examination of rods and tubes for defects in dimensions. The sample unit for the examination specified in table III shall be one rod or tube.

TABLE III. Examination of rods and tubes for dimensional defects

Examine	Defect
Rods and tubes	Not nominal size or shape specified. Diameter of rod or outside diameter of tube, including out-of-roundness, outside tolerance limits. Length of nominal full length outside tolerance limits. More than 5 percent of lengths between 5 and 10 feet. Length less than 5 feet.
Tubes	Wall thickness, including eccentricity, outside of tolerance limits.

4.2.2.3 Examination of preparation for delivery requirements. An examination in accordance with table IV shall be made to determine that packaging, packing, and marking comply with requirements of section 5. The sample unit for this examination shall be one shipping container fully packed, selected just prior to the closing operation. Shipping containers fully prepared for delivery shall be examined for closure defects.

TABLE IV. Examination for defects in preparation for delivery

Examine	Defect
Packaging	Not level specified. Not individually packaged, multiple packaged, or intermediate packaged, as specified. Packaging material not as specified: Closure not accomplished by specified or required methods or materials; component missing. Weight of intermediate packages exceeds specified requirements.
Packing	Not level specified. Containers not as specified, closures not accomplished by specified or required methods of materials. Any nonconforming component, component missing, damaged or otherwise defective, affecting serviceability.
Count	Less than specified or indicated quantity.
Weight	Gross weight exceeds specified requirements.
Markings	Interior or exterior markings, as applicable, omitted, illegible, incorrect, of improper size, location, sequence or method of application, or not in accordance with contract requirements.

4.2.2.4 Inspection levels and AQLs for examinations. The inspection levels for determining the sample size and the AQL, expressed in defects per 100 units, shall be as follows:

Examination paragraph	Inspection level	AQL
4.2.2.1	I	2.5
4.2.2.2	S-2	4.0
4.2.2.3	S-2	2.5

4.2.3 Testing. The rods and tubes shall be tested for the requirements listed in 3.3 and 3.4, in accordance with the test methods specified herein for each lot submitted for inspection. The lot size, for the purpose of determining sample size for testing, shall be expressed in units of 100 pounds of rods and tubes. The sample unit shall consist of sufficient material to prepare all specimens required for testing. The inspection level shall be S-1 with an acceptance number of 0. The results of each test shall be the averaged results of the specimens.

4.3 Test methods.

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4.3.1 Conditioning and testing. For acetone resistance and heat shrinkage, conditioning shall be in accordance with procedure A of ASTM D 618-61 (1971). Testing temperature shall be as specified in the applicable test method.

4.3.2 Acetone resistance. Three specimens shall be tested in accordance with ASTM D 2152-67(1972). Specimen dimensions shall be as specified in ASTM D 2152-67(1972).

4.3.3 Heat shrinkage. Three specimens shall be prepared for testing in accordance with ASTM D 1042-51 (1971). Specimen dimensions shall be as specified in ASTM D 1042-51 (1971). Each specimen shall be placed in an air oven maintained at $93^{\circ} \pm 3^{\circ}\text{C}$ ($200^{\circ} \pm 5.4^{\circ}\text{F}$), allowed to remain for 30 ± 5 minutes, removed, allowed to cool to starting temperature, and remeasured. The thermometer indicating oven temperature shall be located as close as possible to the specimen being tested.

5. PREPARATION FOR DELIVERY

Application: The requirements of section 5 apply only to purchase by or direct shipment to the Government.

5.1 Preservation and packaging. Preservation and packaging shall be level A or C, as specified (see 6.2).

5.1.1 Level A.

5.1.1.1 Unit packaging. Unless otherwise specified in the contract or purchase order (see 6.2) rods, tubes and tubing shall be packaged in quantities specified by the procuring activity in accordance with method III of MIL-P-116. Shapes of only one set of nominal dimensions shall be placed in one package.

5.1.1.2 Intermediate packaging. When required, specified quantities of unit packages shall be intermediately packaged as specified in the contract or purchase order (see 6.2).

5.1.2 Level C. Rods, tubes and tubing shall be preserved and packaged to afford adequate protection against deterioration and physical damage during shipment from the supply source to the first receiving activity. The supplier may use standard practice when it meets these requirements.

5.2 Packing.

5.2.1 Level A. Rods, tubes and tubing packaged as specified in 5.1.1 shall be packed in containers conforming to PPP-B-585(class 3), PPP-B-601 (overseas type) or PPP-B 636 (class-weather resistant, grade V3c. Unless otherwise specified PPP-B-585 (class 3) and PPP-601 (overseas type) containers shall be provided with a case liner conforming to MIL-L-10547. Closure and strapping shall be in accordance with the appendix to the applicable container specifications.

5.2.2 Level B. Rods, tubes and tubing packaged as specified in 5.1.1 shall be packed in containers conforming to PPP-B-585(class 1), PPP-B-601, or PPP-B-636 (**variety DW, grade 350**). Closure shall be in accordance with the appendix to the applicable container specification.

5.2.3 Level C. Rods, tubes and tubing shall be packed in a manner to insure carrier acceptance and safe delivery at destination at the lowest transportation rate for such supplies. Containers shall be in accordance with Uniform Freight Classification Rules or National Motor Freight Rules, as applicable.

5.3 Marking.

5.3.1 Civil agencies. In addition to any special marking required by the contract or order, unit packages and shipping containers shall be marked in accordance with Fed. Std. No. 123.

5.3.2 Military agencies. In addition to any special marking required by the contract or purchase order, unit packages and shipping containers shall be marked in accordance with MIL-STD-129.

6. NOTES

6.1 Intended use. The rods and tubes covered by this specification are intended to be used as supporting bars in chemical tanks or as machine shop stock for making pipe fittings, pump, and valve parts and other items requiring the unique combination of nonflammability, strength, stiffness, and resistance to acids and other chemicals characteristic of rigid-polyvinyl chloride. Grade NT, nontoxic material, is required in water purification equipment.

Type I, class 1 material is used in applications, such as those involving contact with rocket fuels, requiring the highest obtainable chemical resistance available in PVC compositions and in which impact strength and cost are of secondary importance. Type I, class 3 material is used where high but not maximum mechanical properties are required along with maximum chemical resistance.

Type I, class 2 material is used in applications similar to those of class 1 but in which slightly lower acid resistance can be tolerated. Many acid-resistant pipe fittings are machined from this class.

Type II material is used where the higher impact strength of this type is required.

Type III material is used where lower impact strength and chemical resistance than provided by type II is required.

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When the item is required to have superior electrical properties, grade E may be specified in the appropriate type and class. However, grade GU is suitable for many electrical uses. Some manufacturers furnish the same product against grade E that they do against grade GU but charge a higher price for it because of the cost of the electrical tests and the danger of an occasional rejection because of those tests.

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, class, and grade of polyvinyl chloride required (see 1.2, 3.1, and 6.1).
- (c) Color required (see 3.5).
- (d) Nominal diameter of rod or nominal outside diameter and nominal wall thickness of tube (see 3.6), as applicable.
- (e) Length, if different (see 3.6.1).
- (f) Marking of rods and tubes, if required (see 3.7).
- (g) Selection of the applicable levels of preservation, packaging, and packing required (see 5.1 and 5.2).
- (h) Quantities of rods and tubes required in the unit and intermediate packages (see 5.1.1.1 and 5.1.1.2).

6.3 Centerless grinding. Closer diameter tolerances can be obtained on some sizes of rods and tubes by centerless grinding.

MILITARY CUSTODIANS:

Army - MR
Air Force - 11

Review activities:

Army - ME, GL, EL,
Air Force - 11, 84

User activity:

Army - PA
Navy - SH

Preparing activity:

Army - MR

CIVIL AGENCY COORDINATING ACTIVITIES:

GSA-FSS
COM-NBS

Orders for this publication are to be placed with General Services Administration, acting as an agent for the Superintendent of Documents. See section 2 of this specification to obtain copies and other documents referenced herein. Price 15 cents each.

SPECIFICATION ANALYSIS SHEET		Form Approved Budget Bureau No. 119 R004
INSTRUCTIONS		
This sheet is to be filled out by personnel either Government or contractor, involved in the use of the specification in procurement of products for ultimate use by the Department of Defense. This sheet is provided for obtaining information on the use of this specification which will insure that suitable products can be procured with a minimum amount of delay and at the least cost. Comments and the return of this form will be appreciated. Fold on lines on reverse side, staple in corner, and send to preparing activity.		
SPECIFICATION L-P-1036A, Plastic Rod, Solid: Plastic Tubes and Tubing, Heavy Walled: Polyvinyl Chloride, Rigid		
ORGANIZATION	CITY AND STATE	
CONTRACT NO.	QUANTITY OF ITEMS PROCURED	DOLLAR AMOUNT \$
MATERIAL PROCURED UNDER A		
<input type="checkbox"/> DIRECT GOVERNMENT CONTRACT <input type="checkbox"/> SUBCONTRACT		
1 HAS ANY PART OF THE SPECIFICATION CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE?		
A GIVE PARAGRAPH NUMBER AND WORDING		
B RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES		
2 COMMENTS ON ANY SPECIFICATION REQUIREMENT CONSIDERED TOO RIGID		
3 IS THE SPECIFICATION RESTRICTIVE?		
<input type="checkbox"/> YES <input type="checkbox"/> NO IF "YES" IN WHAT WAY?		
4 REMARKS (Attach any pertinent data which may be of use in improving this specification. If there are additional papers, attach to form and place both in an envelope addressed to preparing activity)		
SUBMITTED BY (Printed or typed name and activity)		DATE

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REPLACES NAVSHIPS FORM 4863, WHICH IS OBSOLETE

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