

L-P-396B

June 10, 1975

SUPERSEDING

Fed. Spec. L-P-396A

August 1, 1969

## FEDERAL SPECIFICATION

### PLASTIC MOLDING AND EXTRUSION MATERIAL, POLYSTYRENE

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 polystyrene materials suitable for molding and extrusion.

#### 1.2 Classification.

1.2.1 Types and classes. The polystyrene plastic material shall be of the following types and classes, as specified (see 6.2):

Type I - Lowest Vicat softening point range (80° to 84.9°C.), maximum flow rate.

Type II - Second lowest Vicat softening point range (85° to 89.9°C.) maximum flow rate.

Type III - Mid-range Vicat softening point (90° to 94.9°C.), second highest flow rate.

Type IV - Second highest Vicat softening point range (95° to 102.9°C.), second lowest flow rate.

Type V - Highest Vicat softening point range (103°C. and above), lowest flow rate.

Class 1 - Non-electrical quality.

Class 2 - Electrical quality.

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## 2. APPLICABLE DOCUMENTS

2.1 The following documents of the issue in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein.

### Federal Specifications:

PPP-D-723 - Drums, Fiber.

PPP-D-729 - Drums, Shipping and Storage, Steel, 55-Gallon.

### 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, DC, 20402.

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

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

### Military Standards:

MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.

MIL-STD-129 - Marking for Shipment and Storage.

(Copies of Military Specifications and Standards required by suppliers 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 150 - A-C- Loss characteristics and Dielectric Constant (Permittivity) of Solid Electrical Insulating Materials
- D 542 - Index of Refraction of Transparent Organic Plastics.
- D 618 - Conditioning Plastics and Electrical Insulating Materials for Testing.
- D 638 - Tensile Properties of Plastics.
- D 792 - Specific Gravity and Density of Plastics by Displacement.
- D 1238 - Flow Rates of Thermoplastics by Extrusion Plastometer.
- D 1525 - Vicat Softening Point of Plastics.
- D 1897 - Injection Molding of Specimens of Thermoplastic Molding and Extrusion Materials.
- D 2292 - Compression Molding of Specimens of Styrene-Butadiene Molding and Extrusion Materials.

( Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pa. 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, D.C. 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, IL 60606.)

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### 3. REQUIREMENTS

3.1 Material. The material shall consist of amorphous homopolymers of styrene with or without the addition of colorants or lubricants. Special purpose materials such as light stabilized and anti static grades, styrene copolymers, homopolymers of substituted styrenes, or styrene plastics modified with other polymers, such as rubbers, are excluded.

3.2 Property values. When tested as specified in the applicable procedure of 4.3, the material shall conform to the property values shown in table I. When class 1 colored material is specified (see 3.4), property values for specific gravity, and refractive index (see table I), shall apply to uncolored specimens made from polystyrene used to prepare the colored molding and extrusion material (see 4.2.1.)

TABLE I. Property values

Property	Value <sup>1/</sup>				
	Type I	Type II	Type III	Type IV	Type V
Vicat softening point <sup>2/</sup> , range °C.	80 to 84.9	85.0 to 89.9	90.0 to 94.9	95.0 to 102.9	103.0 and above
	176 to 184.9	185 to 193.9	194 to 202.9	203 to 217.3	217.4 and above
Flow rate, grams per 10 minutes, min.	11.0	11.0	6.0	3.0	1.0
Specific gravity <sup>3/</sup> , 23°/23°C. (73.4°/73.4°F.)	Max. 1.07	1.07	1.07	1.07	1.07
	Min. 1.04	1.04	1.04	1.04	1.04
Tensile strength, p.s.i., min. Injection molded specimens	5000	5000	5500	6000	7000
	3500	3500	4000	4500	5500
Compression molded specimens	1.600	1.600	1.600	1.600	1.600
	1.585	1.585	1.585	1.585	1.585
Refractive index <sup>3/</sup> , n <sub>D</sub> 20:	Max. 2.60	2.60	2.60	2.60	2.60
	Min. 2.60	2.60	2.60	2.60	2.60
Dielectric constant <sup>4/</sup> max.	at 1 KHz 2.60	2.60	2.60	2.60	2.60
	at 1 MHz 2.60	2.60	2.60	2.60	2.60
Dissipation factor <sup>4/</sup> max.	at 1 KHz 0.0005	0.0005	0.0005	0.0005	0.0005
	at 1 MHz 0.0005	0.0005	0.0005	0.0005	0.0005

<sup>1/</sup>Unless otherwise specified, applicable to classes 1 and 2.

<sup>2/</sup>The minimum Vicat value will determine, although the maximum may fall within the next higher type ranges.

<sup>3/</sup>Applicable only to uncolored material (see 3.2).

<sup>4/</sup>Applicable to class 2 material only.

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3.3 Form. The material shall be furnished in the form of pellets or granules, as specified (see 6.2). When a particular particle size is specified, the limits and method of testing shall be as specified by the procuring agency (see 6.3).

3.4 Color. The color and transparency or opacity of the material shall be as specified by the procuring agency (see 6.2).

3.5 Suitability for use with explosives and chemicals. When suitability for use with a particular explosive or chemical is specified, the material shall be approved by the procuring agency. The suitability shall be verified in a Government laboratory and the method of inspection shall be as specified by the procuring agency (see 6.2 and 6.4).

3.6 Workmanship. The granules or pellets shall be uniform in color within each container and from container to container. The material shall be uniform in form, from container to container, and shall be free from contamination as determined by visual examination.

#### 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 use 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 the 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 and class 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 this specification and, to the extent specified, of all referenced subsidiary specifications and standards. In the event of conflict, this specification shall govern. A supplier's certificate of compliance with 3.1 shall be furnished. When class 1 colored material is supplied, the certificate of compliance shall be based on tests run on either the colored material itself or the uncolored polystyrene from which the colored material was produced.

#### 4.2.2 Inspection of materials.

4.2.2.1 Examination of the material. Examination of the material shall be made in accordance with the list 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 200 pounds for examination in 4.2.2.1.1, and in units of shipping containers for examination in 4.2.2.1.2.

4.2.2.1.1 Examination of the material for defects in appearance and workmanship. The sample unit for this examination, specified in table II, shall be approximately one pound.

TABLE II. Examination for defects in appearance and workmanship

Examine	Defect
Appearance and workmanship	Form or color not uniform Form not as specified Color not specified Not clean, presence of foreign material or other contamination

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

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TABLE III. Examination for preparation for delivery

Examine	Defect
Packing	Not level specified; not in accordance with contract requirements  Any nonconforming component, component missing, damaged or otherwise defective affecting serviceability  Inadequate application of components such as: incomplete closures of case liners; container flaps, loose or inadequate strappings, bulged or distorted containers
Quantity of material	Less than specified or indicated quantity
Weight	Gross weight exceeds specified requirements
Markings	Interior or exterior markings omitted, illegible, incorrect, incomplete, of improper size, location, sequence or method of application, or not in accordance with contract requirements

4.2.2.1.3 Inspection levels and acceptable quality levels (AQLs) for examinations. The inspection levels for determining the sample size and the acceptable quality level (AQL) expressed as defects per 100 units shall be as follows:

<u>Examination paragraph</u>	<u>Inspection level</u>	<u>AQL</u>
4.2.2.1.1	I	1.0
4.2.2.1.2	S-2	2.5

4.2.2.2 Classification of tests. All tests under this specification shall be classified as lot acceptance tests. Lot acceptance tests shall be made on each lot of material and, in conjunction with the above examination, shall be the basis of acceptance or rejection of the lot.



4.2.3 Testing. The material shall be tested for the characteristics listed in table I in accordance with the test methods specified herein. The lot size, for the purpose of determining the sample size for testing shall be expressed in units of 300 pounds. The sample unit shall consist of sufficient material to prepare all required specimens plus the sample for flow rate determination. The inspection level shall be S-1 with an acceptance number of 0. The results for each test shall be the averaged results of the specimens, unless only one specimen or determination is specified for testing.

#### 4.3 Test methods.

4.3.1 Specimen preparation. Unless otherwise specified, all specimens shall be prepared by injection molding, except for tensile strength testing. For tensile strength testing, specimens shall be prepared either by injection molding or compression molding. Injection molding shall be in accordance with ASTM D 1897, and compression molding shall be in accordance with ASTM D 2292.

4.3.2 Specimen conditioning and testing. Samples for flow rate determination shall require no conditioning. All other specimens except those for Vicat softening point, shall be conditioned in accordance with procedure A of ASTM D 618 except that the minimum conditioning time shall be 16 hours. Specimens for Vicat softening point shall be conditioned for a minimum of 1 hour at  $23^{\circ}\pm 2^{\circ}\text{C}$ . ( $73.4^{\circ}\pm 3.6^{\circ}\text{F}$ ). Testing shall be at  $23^{\circ}\pm 2^{\circ}\text{C}$ . ( $73.4^{\circ}\pm 3.6^{\circ}\text{F}$ .) and  $50\pm 5$  percent relative humidity, except where otherwise specified in the test method.

4.3.3 Vicat softening point. Two specimens shall be tested in accordance with ASTM D 1525, using rate B. Measurement shall be rounded off to the nearest  $0.1^{\circ}\text{C}$ . or  $0.1^{\circ}\text{F}$ ., as applicable, using an appropriate thermometer or thermocouple.

4.3.4 Flow rate. One determination shall be made in accordance with ASTM D 1238, with the measurements to be made under condition G.

4.3.5 Specific gravity. One specimen shall be tested in accordance with ASTM D 792, using method A.

4.3.6 Tensile strength. Three specimens shall be tested. Unless otherwise specified by the procuring agency, the three specimens shall be either compression molded or injection molded. Molded specimens shall be 1/8 inch thick and other dimensions shall conform to type I of figure 1 of ASTM D 638. Testing shall be in accordance with ASTM D 638, using speed B.

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4.3.7 Refractive index. Two specimens shall be tested in accordance with ASTM D 542 using the refractometric method. The test specimens shall be as specified in ASTM D 542.

4.3.8 Dielectric constant and dissipation factor (applicable to class 2 material only). Three specimens shall be tested in accordance with ASTM D 150, using any electrode system specified in this test method.

## 5. PREPARATION FOR DELIVERY

5.1 Packing. Packing shall be level A, B, or C, as specified (see 6.2).

5.1.1 Level A. Unless otherwise specified (see 6.2), the material in the quantity specified (see 6.2), shall be packed in metal drums conforming to PPP-D-729, type III or type IV, in quantities of 400 pounds maximum.

Insofar as practical, containers shall be of uniform shape and size, with minimum cube and tare consistent with the protection required. Containers shall contain identical quantities and shall be closed in accordance with the applicable container specification. Fiber drums shall be furnished with an 0.004 inch thick polyethylene liner properly heat sealed.

5.1.2 Level B. Unless otherwise specified (see 6.2), the material, in the quantity specified (see 6.2), shall be in one of the following types of containers:

- (a) Fiber drums conforming to PPP-D-723, type I, grade A in quantities of 200 pounds maximum.
- (b) Metal drums conforming to PPP-D-729, type III or type IV, in quantities of 400 pounds maximum.

Insofar as practical, containers shall be of uniform shape and size with minimum cube and tare consistent with the protection required. Containers shall contain identical quantities and shall be closed in accordance with the applicable container specification. Fiber drums shall be furnished with an 0.004 inch thick polyethylene liner properly heat sealed.

5.1.3 Level C. Packing shall be in accordance with commercial practice adequate to ensure acceptance and delivery by the carrier for the mode of transportation employed. Containers shall comply with the requirements of the Uniform Freight Classification Rules or National Motor Freight Classification Rules, as applicable.

## 5.2 Marking.

5.2.1 Civil agencies. In addition to any special marking specified in the contract or order (see 6.2) shipping containers shall be marked in accordance with Fed. Std. No. 123.

5.2.2 Military agencies. In addition to any special marking specified in the contract or order (see 6.2) shipping containers shall be marked in accordance with MIL-STD-129.

## 6. NOTES

### 6.1 Intended use.

6.1.1 Types I and II. Type I and type II styrene plastics are intended for use in making shapes that are difficult to mold.

6.1.2 Type III. Type III styrene plastics are intended for use in drafting equipment; covers for dials, gages, and control panels; handicraft work; and study models. Type III may also be used as window material for cabinets, containers, and other enclosures that do not require optimum properties.

6.1.3 Types IV and V. Type IV and type V styrene plastics are intended for use in light diffusing shields, edge-lighted signs, and surgical instrument handles. Type V material may be used for parts subjected to boiling water.

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

- (a) Title, number, and date of this specification.
- (b) Type and class of material required (see 1.2).
- (c) Form, if required (see 3.3).
- (d) Color, and opacity, if required (see 3.4).
- (e) Suitability for use with explosives and chemicals, if required (see 3.5).
- (f) Level of packing required (see 5.1).
- (g) Quantity in shipping container (see 5.1.1 and 5.1.2).
- (h) Special markings required (see 5.2.1 and 5.2.2).

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6.3 Fabricator choice of form. The fabricator of molded parts or extruded shapes is expected to specify the material form best suited to his equipment (see 3.3).

6.4 Suitability for use with explosives. Information concerning suitability of many plastics for use with various explosives and chemicals under various conditions is on file at Picatinny Arsenal, Dover, New Jersey 07801. Procuring agencies desiring information on this subject should first contact Picatinny Arsenal to determine whether information is already available.

6.5 Cross index. Table IV shows the classification of material covered by L-P-396A and L-P-396B, and the corresponding classification of material specified in L-P-396. Because of technological changes, properties may not be exactly equivalent. The classification is based on thermal properties.

TABLE IV. Classification in this document and corresponding classification in L-P-396

Classification in documents L-P-396A and L-P-396B	Classification in L-P-396
Type I	Type IV
Type II	Type I or II
Type III	Type III
Type IV	-
Type V	-
Class 1	Class 1
Class 2	Class 2

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MILITARY INTEREST:

Civil Agency Coordinating Activities:

Custodians:

Army - MR  
Navy - SH  
Air Force - 84

GSA - FSS  
HEW - FEC  
COMMERCE - NBS  
ERDA

Review activities:

Army - EL, PA, SM, ME  
Navy - SH  
Air Force - 84  
DSA - IS

Preparing activity:

Army - MR

User activities:

Army - GL  
Navy - AS, MC, YD, OS

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Orders for this publication are to be placed with General Services Administration, acting as an agent for the Superintendent of Documents. See Section 2 of this specification to obtain extra copies and other documents referenced herein. Prices 40 cents each.

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## 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-396B, Plastic Molding and Extrusion Material, Polystyrene**

ORGANIZATION

CITY AND STATE

CONTRACT NO.

QUANTITY OF ITEMS PROCURED

DOLLAR AMOUNT

\$

MATERIAL PROCURED UNDER A

 DIRECT GOVERNMENT CONTRACT 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?

 YES 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

DD FORM 1426  
APR 63

REPLACES NAVSHIPS FORM 4863, WHICH IS OBSOLETE