MIL-P-81390
15 August 1966

Supersession Data
See Section 6

MILITARY SPECIFICATION

PLASTIC, MOLDING MATERIAL, POLYCARBONATE, GLASS FIBER REINFORCED

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

1. SCOPE

1.1 Scope - This specification covers three types of glass-fiber filled polycarbonate materials suitable for injection molding and extrusion.

1.2 Classification - Glass-fiber filled polycarbonate material covered by this specification shall be of the following types, as specified:

Type I - General purpose, 40% glass-fibers
Type II - General purpose, 20% glass-fibers
Type III - High dispersion, 20% glass-fibers

2. APPLICABLE DOCUMENTS

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

SPECIFICATIONS

Federal

L-P-393	Plastic Molding Material, Polycarbonate Molding and Extrusion
PPP-B-601	Box, Wood, Cleated-Plywood
PPP-B-621	Box, Wood, Nailed and Lock Corner
PPP-C-96	Can, Metal, 28 Gage and Lighter
PPP-P-704	Pails, Shipping, Steel (1 through 12 Gallon)

STANDARDS

Federal

Fed. Test Method Standard No. 406	Plastics: Methods of Testing

Military

MIL-STD-105	Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-129	Marking for Shipment and Storage
MIL-STD-831	Test Reports Preparation of

(Copies of specifications, standards, drawings, and publications 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 document forms a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

CONSOLIDATED CLASSIFICATION COMMITTEE
Uniform Freight Classification Rules.

(Application for copies should be addressed to the Consolidated Classification Committee, 202 Chicago Union Station, Chicago 6, Ill.)

3. REQUIREMENTS

3.1 Preproduction - This specification provides for preproduction inspection (see 4.4.1).

3.2 Material - The material shall consist of glass fibers dispersed in a polycarbonate resin with or without additives or stabilizers, as required, to meet the requirements of this specification. The base resin shall meet the requirements of Federal Specification L-P-393.

3.2.1 Color - The color of the material shall be natural, unless otherwise specified (see 6.2).

3.2.2 Form - The form of the material shall be as specified by the procuring activity (see 6.2).

3.3 Properties - The material shall meet the requirements specified in table I, when tested in accordance with the applicable method specified in section 4.

3.4 Workmanship - The plastic material shall be uniform in form and composition. It shall be free of foreign matter, and shall be prepared by such processes as to conform to this specification.

TABLE I

PROPERTY VALUES

Property	REQUIREMENT		
	Type I	Type II	Type III
Specific Gravity	1.50 - 1.56	1.33 - 1.40	1.33 - 1.40
Tensile strength, psi, minimum	21,000	19,000	18,000
Izod Impact Strength, ft. -lbs./in. of notch, minimum	3.8	2.9	2.0
Deflection temperature under load, 264 psi, °F, minimum	285	285	283
Deformation under load of 4000 psi at 122° F, percent, maximum	0.09	0.13	0.12
Flexural strength, psi, minimum	27,000	24,000	24,000
Moisture content, percent, maximum	0.15	0.20	0.20
Volume Resistivity Ohm-Cm minimum	$1x10^{15}$	$1x10^{15}$	$1x10^{15}$
Surface Resistivity Ohm, minimum	$7x10^{15}$	$7x10^{15}$	$7x10^{15}$

TABLE I - (Cont'd)

PROPERTY VALUES

Property	REQUIREMENT		
	Type I	Type II	Type III
Dielectric strength, step-by-step, V/mil, minimum	400	415	415
Arc resistance, stainless steel electrodes, sec., minimum	5	5	5
Dielectric constant, 10^3 cps, maximum	3.9	3.5	3.5
Fungus resistance rating, maximum	None	None	None
Corrosivity Index, specific conductance (ohms-cm)-1, maximum	103×10^{-6}	103×10^{-6}	111×10^{-6}
Flammability	self-ext.	self-ext.	self-ext.

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 supplies and services conform to prescribed requirements.

4.2 Lot or batch - For the purposes of sampling, the term lot shall be the inspection lot or manufacturer's batch. This shall consist of all material produced under like conditions in a continuous unchanged process by one manufacturer and inspected at one time.

4.3 Sampling -

4.3.1 Inspection of filled containers - A random sample of filled containers shall be selected from each lot or batch in accordance with MIL-STD-105, at inspection level I, and the acceptable quality level (AQL) specified in table II to verify compliance with stipulations of this specification regarding closure, marking, and other requirements not involving actual testing.

4.3.2 Sampling for tests - Three representative samples of equal size shall be selected from each batch prior to packaging. If sampling is done after packaging, three containers (packages or drums) shall be selected at random from each batch. Containers shall be opened carefully, making sure that there is no contamination from scale, paint, shattered heads, torn liners, or from any other cause. The three representative samples shall be composited, placed in a clean dry metal or glass container, and tightly closed.

TABLE II - Inspection of Filled Containers

Material	AQL	Classification of defect	Defect	Method of inspection
Material (see 3.2.1, 3.2.2 and 3.4)	2.50	Minor 201	Non-uniform material of form	Visual
		Minor 202	Contaminated material	Visual
In open container (see 5.1)	1.00	Major 101	Improper liner or no liner (in fiber or plywood drum)	Visual
Closed container (see 4.3.2, 5.1 and 5.2)	1.00	Major 102	Exceeds Max. or Min. gross weight	Approved scale
		Major 103	Marking misleading, missing, or unidentifiable.	Visual

4.4 Classification of tests - The examining and testing of the resin shall be classified as follows:

(a) Preproduction inspection

(b) Quality conformance inspection

4.4.1 Preproduction inspection - Preproduction inspection shall consist of testing for all the property values listed in Table I. The responsibility for the performance of the preproduction inspection shall be as specified in the contract or order (see 6.2).

4.4.1.1 Preproduction test sample - The production test sample shall consist of a sufficient quantity of resin selected at random from a production batch (see 4.3). Preproduction samples shall be identified as required and forwarded to the designated laboratory. Each sample shall be accompanied by the contractor's test report, prepared according to MIL-STD-831, and the manufacturer's instructions.

4.4.2 Quality Conformance Inspection - Quality conformance tests shall consist of the following tests unless otherwise specified:

(a) Specific Gravity
(b) Tensile Strength
(c) Flexural Strength
(d) Izod Impact Strength
(e) Deflection Temperature
(f) Dielectric Strength
(g) Dielectric Constant

4.5 Methods of test - Tests shall be conducted in accordance with table III and the following paragraphs.

4.5.1 Preparation of Test Specimens - Specimens of the form specified shall be molded from dry polycarbonate resin. Drying of the resin (if required) and molding conditions shall be in accordance with the manufacturer's instructions.

4.5.2 Tensile strength - Five specimens shall be tested in accordance with Method 1011 of Federal Test Method Standard 406. The speed of the cross head shall be 0.2 inch per minute throughout the test, and the elongation and modulus shall be recorded automatically.

Table III - Test Methods and Numbers of Specimens

Test	Method No. of Fed. Test Method Std 406	Modified by Paragraph	Number and size of Specimens to be tested [1]
Specific Gravity	5011		1 (2 in. dia) (1/8 in. thk)
Tensile strength	1011	4.5.2	5 (1/8 in. thk)
Izod Impact strength	1071		5 (1/4 in. wide)
Deflection temperature	2011		3 (1/2 in. thk)
Deformation under load	1101	4.5.3	3
Flexural strength	1031		5
Dielectric strength	4031		4 (1/8 in. thk)
Dielectric constant	4021		4
Arc resistance, Stainless Steel Electrodes	4011		5
Volume resistivity	4041		4 (1/8 in. thk)
Surface resistivity	4041		4 (1/8 in. thk)
Corrosivity Index	7071	4.5.4	1
Flammability	2021		10
Fungus resistance	6091		1
Moisture		4.5.5	1

[1] Size is given if other than specified in the procedure.

4.5.3 Deformation under load - The specimens shall be tested in accordance with Method 1101 of Federal Test Method Std. No. 406, except that the specimens shall be pre-conditioned 24 hours at 50 ± 1°C prior to testing. All 1/2 inch surfaces shall be flat and parallel to each other. All horizontal surfaces shall be plane-parallel and ground if necessary to remove sink marks.

4.5.4 Corrosivity Index - A specimen shall be tested in accordance with Method 7071 of Federal Test Method Std. No. 406 except that an equivalent to a Wiley mill may be used.

4.6.5 Moisture content - A 200-gram, or larger, sample of pellets shall be placed in a 300°F. heating chamber for 60 minutes, or longer. The weight loss divided by the original weight, multiplied by 100 determines the percent moisture.

4.6 Rejection - Failure to comply with any of the requirements of this specification shall be cause for rejection of the lot represented.

5. PREPARATION FOR DELIVERY

5.1 Packaging -

5.1.1 Level A - A specified quantity (see 6.2) of glass filled polycarbonate resin shall be packaged in a container conforming to Specification PPP-C-96 or PPP-P-704. Selected container shall be provided on interior coating as prescribed in the applicable container specification.

5.1.2 Level C - The resin shall be packaged in a manner which shall afford adequate protection during shipment from the supply source to the first receiving activity.

5.2 Packing -

5.2.1 Levels A and B - The packaged resin shall be packed in snug fitting boxes conforming to Specification PPP-B-601 or Specification PPP-B-621. The gross weight of the filled box shall not exceed 200 pounds.

5.2.2 Level C - The polycarbonate resin molding material shall be packed to insure acceptance by common carrier and safe delivery to destination at the lowest applicable rate. Containers shall comply with the Uniform Freight Classification Rules or other carrier regulations applicable to the mode of transportation.

5.3 Marking - In addition to any special marking specified in the contract or order, the shipping containers shall be marked in accordance with Standard MIL-STD-129.

6. NOTES

6.1 Intended use - Glass reinforced polycarbonate may be utilized in applications where dimensional stability, high-impact resistance, and good dielectric properties are needed. It is self-extinguishing and fungus resistant. In specifying this material, design engineers are cautioned that polycarbonates are not recommended for applications requiring good fatigue strength when subjected to ultra-violet light exposure. The three types are suitable for the following applications.

6.1.1 Type I: -

Terminal blocks
Connectors
Tool housings
Stuffing boxes
Rocket launcher components
Pump impellers
Switch bodies

6.1.2 Type II: - Electrical components in which non-flammability is most important i.e. coil forms terminal strips etc.

6.1.3 Type III: - Same as Type II applications but with the added requirements of molded-in cores or small core pins. The improved dispersability of the fiber facilities molding around these cores.

6.2 Ordering data - Procurement documents should specify the following:

(a) Title number and date of this specification
(b) Type of material required (see 1.2)
(c) Color (see 3.2.1)
(d) Form if required (see 3.2.2)
(e) Size and kind of container and quantity desired
(f) Applicable levels of packaging and packing (see 5.1 and 5.2)
(g) Responsibility for the performance of the preproduction inspection.

6.3 Supersession data - This specification includes the requirements of Navy Purchase Description WS 2466 dated 27 June 1963.

Custodians:
Army - MR
Navy - AS

Preparing Activity:
Navy - AS
Project No. 9330-0223

Review Activities:
Army - MR, MO, MI, EL
Navy - AS, SH

Review/user information is current as of the date of this document. For future coordination of changes to this document, draft circulation should be based on the information in the current Federal Supply Classification Listing of DOD Standardization Documents.