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13 October 1972
SUPERSEDING
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(See 6.5 and 6.7)

MILITARY SPECIFICATION

MOLDING PLASTICS AND MOLDED PLASTIC PARTS,

THERMOSETTING

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

1. SCOPE

1.1 Scope. This specification covers the basic properties of molding compounds, as such, and the methods suited to their satisfactory determination. The appendix covers requirements for parts molded from such compounds, together with procedures for inspection of such parts.

1.2 Classification. Molding thermosetting plastic compounds shall be of the following types, as specified (see 6.2 and 40.3.3):

Phenolic resin:
- Type CFG - Cellulose filler, general-purpose.
- Type CFI-5 - Cellulose filler, impact-resistant; nominal impact strength, 0.5 foot-pounds per inch notch.
- Type CFI-10 - Cellulose filler, impact-resistant; nominal impact strength, 1.0 foot-pounds per inch notch.
- Type CFI-20 - Cellulose filler, impact-resistant; nominal impact strength, 2.0 foot-pounds per inch notch.
- Type CFI-30 - Cellulose filler, impact-resistant; nominal impact strength, 3.0 foot-pounds per inch notch.
- Type CFI-40 - Cellulose filler, impact-resistant; nominal impact strength, 4.0 foot-pounds per inch notch.
- Type MFA-30 - Asbestos filler, arc and flame-resistant; nominal impact strength, 3.0 foot-pounds per inch notch.
- Type MFE - Mineral filler, best electrical properties.
- Type MFG - Asbestos filler, general-purpose, heat-resistant.
- Type MFH - Mineral filler, heat-resistant.
- Type MFI-10 - Asbestos filler, impact-resistant; nominal impact strength, 1.0 foot-pounds per inch notch.
- Type MFI-20 - Asbestos filler, impact-resistant; nominal impact strength, 2.0 foot-pounds per inch notch.
- Type GPI-100 - Glass fiber filler, impact-resistant; nominal impact strength, 10.0 foot-pounds per inch notch.

Melamine resin:
- Type CMG - Cellulose filler, general-purpose.
- Type CMI-5 - Cellulose filler, impact-resistant; nominal impact strength, 0.5 foot-pounds per inch notch.
- Type CMI-10 - Cellulose filler, impact-resistant; nominal impact strength, 1.0 foot-pounds per inch notch.
- Type MME - Mineral filler, arc- and flame-resistant.
- Type MMI-5 - Glass fiber filler, impact-resistant; nominal impact strength, 0.5 foot-pounds per inch notch.
- Type MMI-30 - Glass fiber filler, impact-resistant; nominal impact strength, 3.0 foot-pounds per inch notch.

Polyester resin:
- Type MAG - Mineral filler, general-purpose.
- Type MAI-60 - Glass fiber filler, impact-resistant; nominal impact strength, 6 foot-pounds per inch notch.
- Type MAT-30 - Glass fiber reinforced, mineral filler, impact-resistant, track and flame-resistant; nominal impact strength, 3.0 foot-pounds per inch notch.

Polyester resin (diallyl phthalate cross-linked):
- Type MAI-30 - Mineral filled, glass-fiber reinforced; nominal impact strength, 3.0 foot-pounds per inch notch.

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Diallyl phthalate resin:
Type GDI-30 - Long glass fiber filler, general-purpose, nominal impact strength, 3.0 foot-pounds per inch notch.
Type GDI-30F - Long glass fiber filler, flame-resistant, nominal impact strength, 3.0 foot-pounds per inch notch.
Type MDG - Mineral filler, general-purpose.
Type SDG - Short glass fiber filler, general-purpose.
Type SDG-F - Short glass fiber filler, flame-resistant.
Type SDI-5 - Acrylic polymer fiber filler, impact-resistant; nominal impact strength, 0.5 foot-pounds per inch notch.
Type SDI-30 - Polyethylene terephthalate fiber filler, impact-resistant; nominal impact strength, 3.0 foot-pounds per inch notch.

Silicone resin:
Type MSG - Mineral filler, general-purpose.
Type MSI-30 - Glass fiber filler, impact-resistant; nominal impact strength, 3.0 foot-pounds per inch notch.

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 the specification to the extent specified herein.

STANDARDS

FEDERAL
FED-STD-406 - Plastics: Methods of Testing.
FED-STD-595 - Colors.

(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 documents form a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

DEFENSE DOCUMENTATION CENTER
Defense Documentation Center Report Number AD297457

(Application for copies should be addressed to the Defense Documentation Center, Cameron Station, Alexandria, Virginia 22314.)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)
D 229-69 - Testing Rigid Sheet and Plate Materials Used for Electrical Insulation.
D 2303-68 - Liquid-Contaminant, Inclined-Plane Tracking and Erosion of Insulating Materials, Test for.

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

(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.)

3. REQUIREMENTS

3.1 Qualification.

3.1.1 Molding thermosetting plastic compounds shall be products (manufacturer's proprietary designation for a specific molding compound) which are qualified for listing on the applicable qualified products list at the time set for opening of bids (see 4.3 and 6.3).

3.1.2 Manufacturers shall obtain qualification approval for each product or compound. Materials qualified for one color will be qualified for all colors requested by manufacturers

3.2 Compound. The compound shall consist of a suitable filler impregnated or intimately combined with a thermosetting condensation or polymerization product binder, processed to conform to this specification. No scrap compound previously cured and reground shall be utilized.

3.2.1 Uniformity. All molding compound of the same brand from one manufacturer shall be uniform in texture, in color (see 3.2.2), and in the specified properties as determined by the batch-acceptance inspection specified in 4.4.

3.2.2 Color. Unless otherwise specified in the contract or order, mineral filled phenolic-resin materials shall be furnished in natural color. Other types of compounds shall be supplied in the color specified by the procuring activity (see 6.2). In such cases, if the color is not specified, the compound shall be furnished in the normal color in which manufactured.[1/] Natural-colored compounds are those in which no coloring matter of any sort has been added. In evaluating uniformity of color, consideration shall be given to the fact that variation in color of raw materials, particularly in the filler, may be reflected in the color of the "natural" molding compound. Coloring matters reducing the electrical properties below the specified limits shall not be used.

3.2.3 Property values. Standard specimens of the compounds shall conform to the property values shown in tables I, II, III (qualification); IV, V, and VI (lot acceptance).

3.3 Workmanship. The compound manufactured and processed (parts molded and processed) in accordance with this specification shall be such as to meet all the requirements of this specification and any referenced subsidiary specification, drawing, or other document when inspected in accordance with section 4 (section 40).

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 in the contract or order, the supplier may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.2 Classification of tests. The tests shall be classified as follows:

Qualification tests (see 4.3).
Batch-acceptance inspection (at the manufacturer's plant (see 4.4)).

4.3 Qualification tests. Qualification tests shall be conducted at a laboratory satisfactory to the Naval Ship Engineering Center. Qualification tests shall consist of the tests specified in tables I, II, and III. Application for Qualification tests shall be made in accordance with "Provisions Governing Qualification SD-6" (see 6.3 and 6.3.1).

4.3.1 Specimens. Tests shall be conducted on standard test specimens molded by the manufacturer of each compound for which qualification is required.

4.3.2 Preparation. Specimens shall be prepared for tests as specified in 4.5.1.

4.3.3 Instruction for submission of qualification sample. Each set of test specimens shall be marked with the manufacturer's name or trade-mark, grade (brand designation of the molding compound), date of manufacture, and the claimed type under this specification. The date and file number of the authorizing letter shall also be furnished.

4.4 Batch-acceptance inspection. Batch-acceptance inspection shall be as shown in tables IV, V, and VI. They shall be conducted at the manufacturer's plant on standard specimens molded by the manufacturer from each batch of compound to be supplied to molders for production of molded parts under this specification. The molding of specimens and the conduct of tests shall be under the supervision of the inspector.

4.4.1 Definition. A batch is a homogeneous unit of finished molding compound manufactured at one time.

1/ The normal color of types of MAI-30 and MAI-60 compounds is such that when molded the color is an approximate match to light-gray color #26307 of FED-STD-595.

Table I - Property values for qualification tests of phenolic resin molding compounds.

Property to be tested	Test method: FED-STD-406	Test method: Modified by	Specimens: Form and dimensions	Specimens: Number tested	Conditioning procedure (see 4.5.1.5)	Unit of value
Arc resistance	4011	-----	4-inch disk, 1/8 inch thick	3	A	Seconds (minimum average)
Compressive strength endwise	1021	-----	1 by 1/2 by 1/2 inch	5	E-48/50+C-96/23/50	P.s.i. (minimum average)
Dielectric constant:						
At 1 kilocycle	4021	-----	4-inch disk, 1/8 inch thick	3	E-48/50+des	Maximum average
				3	E-48/50+D-24/23	
At 1 megacycle	4021	-----	2-inch disk, 1/8 inch thick	3	E-48/50+des	
				3	E-48/50+D-24/23	
Dissipation factor:						
At 1 kilocycle	4021	-----	4-inch disk, 1/8 inch thick	3	E-48/50+des	Maximum average
				3	E-48/50+D-24/23	
At 1 megacycle	4021	-----	2-inch disk, 1/8 inch thick	3	E-48/50+des	
				3	E-48/50+D-24/23	
Dielectric strength:						
Short-time test	4031	4.5.2.1	4-inch disk, 1/8 inch thick	3	E-48/50+C-96/23/50	Volts per mil (minimum average)
Step-by-step test	4031	4.5.2.1		5		
Short-time test	4031	4.5.2.1	4-inch disk, 1/8 inch thick	3	E-48/50+D-48/50	
Step-by-step test	4031	4.5.2.1		5		
Dielectric breakdown:						
Short-time test	4031	4.5.2.1.3	See figure 1 herein	1	E-48/50+C-96/23/50	Kilovolts (minimum average)
Step-by-step test	4031	4.5.2.1.3		3		
Short-time test	4031	4.5.2.1.3		1	E-48/50+D-48/50	
Step-by-step test	4031	4.5.2.1.3		3		
Flame resistance: Ignition time; Burning time		4.6	5-inch bar, 1/2 by 1/2 inch	5	A	Seconds (minimum average); Seconds (maximum average)
Flexural strength, face[1]	1031	4.5.2.2	5-inch bar, 1/4 by 1/2 inch	5	E-48/50+C96/23/50	P.s.i. (minimum average)
Heat distortion temperature side[2]	2011	4.5.2.3	5-inch bar, 1/2 by 1/2 inch	3	A	Degrees C (minimum average)
Impact strength: Face[1]; Side[2]	1071	-----	See figure 1071 of FED-STD-406	5; 5	E-48/50+C-96/23/50	Foot-pound per inch of notch (minimum average)
Tensile strength	1012	-----	See figure 1012A of FED-STD-406, 1/4 inch specimen	5	E-48/50+C-96/23/50	P.s.i. (minimum average)
Water absorption	7031	4.5.2.4	2-inch disk, 1/8 inch thick	3	E-24/100+des+D-48/50	Percent (maximum average)
Volume resistance	-----	4.5.2.7	4-inch disk, 1/8 inch thick	5	(See 4.5.2.7)	Megohms (minimum individual)
Surface resistance	-----	4.5.2.7	4-inch disk, 1/8 inch thick	5	(See 4.5.2.7)	Megohms (minimum individual)
Toxicity when heated: Carbon dioxide; Carbon monoxide; Ammonia; Aldehydes as H.CHO; Cyanide as HCN; Oxides of nitrogen as No_2; Hydrogen chloride	----	4.5.2.8	5-inch bar, 1/2 by 1/2 inch	4	A	Parts per million (maximum average)

See footnotes at end of table.

Table I - Property values for qualification tests of phenolic resin molding compounds (continued).

Property to be tested	Value required for each type of compound												
	Type CFG	Type CFI-5	Type CFI-10	Type CFI-20	Type CFI-30	Type CFI-40	Type MFE	Type MFG	Type MFH	Type MFI-10	Type MFI-20	Type GPI-100	Type MFA-30
Arc resistance	----	----	----	----	----	----	----	----	----	----	----	----	180
Compressive strength endwise	25,000	23,000	20,000	20,000	19,000	18,000	15,000	15,000	15,000	18,000	18,000	20,000	20,000
Dielectric constant:													
At 1 kilocycle	----	----	----	----	----	----	6.0	----	----	----	----	6.0	------
	----	----	----	----	----	----	6.0	----	----	----	----	7.0	------
At 1 megacycle	----	----	----	----	----	----	6.0	----	----	----	----	5.7	------
	----	----	----	----	----	----	6.0	----	----	----	----	6.0	------
Dissipation factor:													
At 1 kilocycle	----	----	----	----	----	----	0.030	----	----	----	----	0.04	------
	----	----	----	----	----	----	.033	----	----	----	----	.05	------
At 1 megacycle	----	----	----	----	----	----	0.15	----	----	----	----	.03	------
	----	----	----	----	----	----	.017	----	----	----	----	.04	------
Dielectric strength:													
Short-time test	300	250	240	210	250	175	325	150	215	45	45	300	80
Step-by-step test	200	150	180	150	150	----	275	100	150	40	40	200	65
Short-time test	75	50	40	45	20	25	325	75	125	18	18	75	25
Step-by-step test	45	27.5	27.5	25	10	15	275	45	80	10	10	50	15
Dielectric breakdown:													
Short-time test	(To be recorded as basis for determining initial voltage step-by-step)												
Step-by-step test	30	18	18	18	18	18	45	10	35	4	6	40	10
Short-time test	(To be recorded as basis for determining initial voltage step-by-step)												
Step-by-step test	2.5	2.5	2.5	2.5	2.5	2.5	40	6	10	2	2	15	4
Flame resistance:													
Ignition time	60	60	60	60	60	60	60	150	120	120	120	120	180
Burning time	270	330	330	330	330	330	210	90	150	200	200	120	90
Flexural strength, face[1]	9,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	7,000	8,000	8,000	15,000	8,000
Heat distortion temperature, side[2]	115	115	115	115	115	115	115	120	130	175	175	200	200
Impact strength:													
Face[1]	----	0.60	1.10	2.30	4.0	5.20	----	0.84	0.26	1.30	2.56	10.0	3.0
Side[2]	0.24	.48	1.05	1.75	2.55	3.50	----	.64	.25	1.30	2.00	10.0	3.0
Tensile strength	6,000	5,700	5,600	5,700	5,700	6,000	4,200	4,500	4,200	5,400	6,000	4,500	6,000
Water absorption	3.0	4.0	4.0	4.0	4.0	4.0	0.10	0.50	0.35	2.0	2.0	1.5	2.0
Volume resistance	----	----	----	----	----	----	2.0	----	----	----	---	----	----
Surface resistance	----	----	----	----	----	----	5.0	----	----	----	---	----	----
Toxicity when heated:													
Carbon dioxide	----	----	----	----	----	----	----	----	----	----	----	----	15,000
Carbon monoxide													1,000
Ammonia													2,500
Aldehydes as H.CHO													50
Cyanide as HCN													60
Oxides of nitrogen as No_2													100
Hydrogen chloride													100

[1] The face of a test specimen is that area formed by the top or bottom force plug.
[2] The side of a test specimen is that area formed by the chase of the mold.

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Table II - Property values for qualification tests of melamine and polyester resin molding compounds.

Property to be tested	Test method: FED-STD-406	Test method: Modified by	Specimens: Form and dimensions	Specimens: Number tested	Conditioning procedure (see 4.5.1.5)	Unit of value
Arc resistance	4011	----	4-inch disk, 1/8 inch thick	3/ 3	A	Seconds (minimum average)
Compressive strength endwise	1021	----	1 by 1/2 by 1/2 inch	5	E-48/50+C-96/23/50	P.s.i. (minimum average)
Dielectric constant:						
At 1 kilocycle	4031	----	4-inch disk, 1/8 inch thick	3	E-48/50+des	Maximum average
				3	E-48/50+D-24/23	
At 1 megacycle	4021	----	2-inch disk, 1/8 inch thick	3	E-48/50+des	
				3	E-48/50+D-24/23	
Dissipation factor:						
At 1 kilocycle	4021	----	4-inch disk, 1/8 inch thick	3	E-48/50+des	Maximum average
				3	E-48/50+D-24/23	
At 1 megacycle	4021	----	2-inch disk, 1/8 inch thick	3	E-48/50+des	
				3	E-48/50+D-24/23	
Dielectric strength:						
Short-time test	4031	4.5.2.1	4-inch disk, 1/8 inch thick	3	E-48/50+C-96/23/50	Volts per mil (minimum average)
Step-by-step test				5		
Short-time test	4031	4.5.2.1	4-inch disk, 1/8 inch thick	3	E-48/50+D-48/50	
Step-by-step test				5		
Dielectric breakdown:						
Short-time test	4031	4.5.2.1.3	See figure 1 herein	1	E-48/50+C-96/23/50	Kilovolts (minimum average)
Step-by-step test				3		
Short-time test	4031	4.5.2.1.3		1	E-48/50+D-48/50	
Step-by-step test				3		
Flame resistance:						
Ignition time		4.6	5-inch bar, 1/2 by 1/2 inch	5	A	Seconds (minimum average)
Burning time						Seconds (maximum average)
Flexural strength, face 1/	1031	4.5.2.2	5-inch bar, 1/4 by 1/2 inch	5	E-48/50+C-96/23/50	P.s.i. (minimum average)
Heat-distortion temperature, side 1/	2011	4.5.2.3	5-inch bar, 1/2 by 1/2 inch	3	A	Degrees C. (minimum average)
Track resistance	----	4.5.2.9	2-inch by 5-inch by thickness	5	A	Minutes (minimum average)

See footnotes at end of table.

Table II - Property values for qualification tests of melamine and polyester resin molding compounds (continued).

Property to be tested	Test method		Specimens		Conditioning procedure (see 4.5.1.5)	Unit of value
	FED-STD-406	Modified by	Form and dimensions	Number tested		
Impact strength: Face[1/] Side[2/]	1071	----	See figure 1071 of FED-STD-406	5 5	E-48/50+C-96/23/50	Foot-pounds per inch notch (minimum average)
Tensile strength	1012	----	See figure 1012A of FED-STD-406 (1/4 inch specimen)	5	E-48/50+C-96/23/50	P.s.i. (minimum average)
Water absorption	7031	4.5.2.4	2-inch disk, 1/8 inch thick	3	E24/100+des+D-48/50	Percent (maximum average)
Heat resistance	1031	4.5.2.5	5-inch bar, 1/4 by 1/2 inch	5	E-48/50+C-96/23/50 +E-1/100	Percent flexural strength retained (minimum)
Dimensional stability (high temperature)	----	4.5.2.6	5-inch bar, 1/2 by 1/2 inch	5	(See 4.5.2.6)	Percent (maximum average)
Toxicity when heated: Carbon dioxide Carbon monoxide Ammonia Aldehydes as H.CHO Cyanide as HCN Oxides of nitrogen as No_2 Hydrogen chloride	----	4.5.2.8	5-inch bar, 1/2 by 1/2 inch	4	A	Parts per million (maximum average)

See footnotes at end of table.

Table II - Property values for qualification tests of melamine and polyester resin molding compounds (continued).

Property to be tested	Value required for each type of compound									
	Type CMG	Type CMI-5	Type CMI-10	Type MME	Type MMI-5	Type MMI-30	Type MAG	Type MAI-60	Type MAI-30	Type MAT-30
Arc resistance	100	125	----	125	180	180	175	130	160	180
Compressive strength, endwise	20,000	25,000	----	25,000	28,000	20,000	15,000	18,000	20,000	18,000
Dielectric constant:										
At 1 kilocycle	----	----	----	7.0	9.6	8.0	6.2	6.0	6.3	6.0
	----	----	----	7.0	10.0	9.0	6.5	7.0	6.4	6.0
At 1 megacycle	----	----	----	6.5	7.5	7.5	5.7	5.7	6.2	5.5
	----	----	----	6.5	8.0	8.0	6.0	6.0	6.4	5.5
Dissipation factor:										
At 1 kilocycle	----	----	----	0.06	0.08	0.06	0.4	0.03	0.015	.03
	----	----	----	.065	.10	.08	.06	.08	.017	.05
At 1 megacycle	----	----	----	.04	.03	.03	.02	.03	.012	.03
	----	----	----	.045	.04	.04	.03	.05	.015	.05
Dielectric strength:										
Short-time test	275	250	----	325	215	150	375	150	300	325
Step-by-step test	200	150	----	275	150	125	325	125	250	275
Short-time test	125	50	----	275	100	100	300	100	275	275
Step-by-step test	100	27.5	----	225	50	50	250	50	250	225
Dielectric breakdown:										
Short-time test	(To be recorded as basis for determining initial voltage in step-by-step test)									
Step-by-step test	30	18	----	40	40	40	40	40	45	40
Short-time test	(To be recorded as basis for determining initial voltage in step-by-step test)									
Step-by-step test	5	2.5	----	35	5	5	35	35	45	40
Flame resistance:										
Ignition time	60	120	----	90	600	600	60	90	100	100
Burning time	180	60	----	180	0	0	200	90	75	50
Flexural strength, face[1/]	8,000	7,500	11,000	6,000	8,500	8,500	7,500	12,000	14,000	15,000
Heat-distortion temperature, side[2/]	120	160	----	120	200	200	175	200	200	275
Track resistance	----	----	----	----	----	----	----	----	----	300

See footnotes at end of table.

Table II - Property values for qualification tests of melamine and polyester resin molding compounds (continued).

Property to be tested	Value required for each type of compound									
	Type CMG	Type CMI-5	Type CMI-10	Type MME	Type MMI-5	Type MMI-30	Type MAG	Type MAI-60	Type MAI-30	Type MAT-30
Impact strength:										
Face[1/]	----	0.60	1.00	----	0.60	3.20	----	10.0	3.0	3.0
Side[2/]	----	.48	1.00	----	.48	3.20	----	6.0	3.0	3.0
Tensile strength	5,000	5,700	----	4,200	5,000	5,500	3,500	3,500	6,000	4,000
Water absorption	4.0	4.0	4.0	0.50	1.5	4.0	0.50	1.5	0.5	0.5
Heat resistance	----	----	----	----	50	50	----	----	----	----
Dimensional stability (high temperature)	----	----	-----	0.7	----	----	0.2	----	----	----
Toxicity when heated:										
Carbon dioxide	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000
Carbon monoxide	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Ammonia	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500
Aldehydes as H.CHO	50	50	50	50	50	50	50	50	50	50
Cyanide as HCN	60	60	60	60	60	60	60	60	60	60
Oxides of nitrogen as No_2	100	100	100	100	100	100	100	100	100	100
Hydrogen chloride	100	100	100	100	100	100	100	100	100	100

[1/] The face of a test specimen is that area formed by the top or bottom force plug.

[2/] The side of a test specimen is that area formed by the chase of the mold.

[3/] Five readings shall be made on each of the three specimens.

Table III - Property values for qualification tests of diallyl phthalate and silicone molding compounds.

Property to be tested	Test method		Specimens		Conditioning procedure (see 4.5.1.5)	Unit of value
	FED-STD-406	Modified by	Form and dimensions	Number tested		
Arc resistance	4011	-----	4-inch disk, 1/8 inch thick	3/ 3	A	Seconds (minimum average)
Compressive strength, endwise.	1021	-----	1 by 1/2 by 1/2 inch	5	E-48/50+C-96/23/50	P.s.i. (minimum average)
Dielectric constant:						
At 1 kilocycle	4021		4-inch disk, 1/8 inch thick	3	E-48/50+des	Maximum average
				3	E-48/50+D-24/23	
At 1 megacycle	4021		2-inch disk, 1/8 inch thick	3	E-48/50+des	
				3	E-48/50+D-24/23	
Dissipation factor:						
At 1 kilocycle	4021		4-inch disk, 1/8 inch thick	3	E-48/50+des	Maximum average
				3	E-48/50+D-24/23	
At 1 megacycle	4021		2-inch disk, 1/8 inch thick	3	E-48/50+des	
				3	E-48/50+D-24/23	
Dielectric strength:						
Short-time test	4031	4.5.2.1	4-inch disk, 1/8 inch thick	3	E-48/50+C-96/23/50	Volts per mil (minimum average)
Step-by-step test				5		
Short-time test	4031	4.5.2.1	4-inch disk, 1/8 inch thick	3	E-48/50+D-48/50	
Step-by-step test				5		
Dielectric breakdown:						
Short-time test	4031	4.5.2.1.3	See figure 1 herein	1	E-48/50+C-96/23/50	Kilovolts (minimum average)
Step-by-step test				3		
Short-time test	4031	4.5.2.1.3		1	E-48/50+D-48/50	
Step-by-step test				3		
Flame resistance:						
Ignition time		4.6	5-inch bar, 1/2 by 1/2 inch	5	A	Seconds (minimum average)
Burning time						Seconds (maximum average)
Flexural strength face 1/	1031	4.5.2.2	5-inch bar, 1/4 by 1/2 inch	5	E-48/50+C-96/23/50	P.s.i. (minimum average)

See footnotes at end of table.

Table III - Property values for qualification tests of diallyl phthalate and silicone molding compounds (continued).

Property to be tested	Test method		Specimens		Conditioning procedure (see 4.5.1.5)	Unit of value
	FED-STD-406	Modified by	Form and dimensions	Number tested		
Heat-distortion temperature, side[2/]	2011	4.5.2.3	5-inch bar, 1/2 by 1/2 inch	3		Degrees C (minimum average)
Impact strength: Face[1/] / Side[2/]	1071		See figure 1071 of FED-STD-406	5 / 5	E-48/50+C-96/23/50	Foot-pounds per inch notch (minimum average)
Tensile strength	1012	----	See figure 1012A of FED-STD-406 (1/4 inch specimen)	5	E-48/50+C-96/23/50	P.s.i. (minimum average)
Water absorption	7031	4.5.2.4	2-inch disk, 1/8 inch thick	3	E-24/100+des+D-48/50	Percent (maximum average)
Heat resistance	1031	4.5.2.5	5-inch bar, 1/4 by 1/2 inch	5	E-48/50+C-96/23/50 +E-1/200	Percent flexural strength retained (minimum)
Dimensional stability (high temperature)	----	4.5.2.6	5-inch bar, 1/2 by 1/2 inch	5	(See 4.5.2.6)	Percent (maximum average)
Volume resistance	----	4.5.2.7	4-inch disk, 1/8 inch thick	5	(See 4.5.2.7)	Megohms (minimum individual)
Surface resistance	----	4.5.2.7	4-inch disk, 1/8 inch thick	5	(See 4.5.2.7)	Megohms (minimum individual)
Water extract conductance	7071	----	----	---	----	Mhos per centimeter
Toxicity when heated: Carbon dioxide; Carbon monoxide; Ammonia; Aldehydes as H.CHO; Cyanide as HCN; Oxides of nitrogen as No_2; Hydrogen chloride	----	4.5.2.8	5-inch bar, 1/2 by 1/2 inch	4	A	Parts per million (maximum average)

See footnotes at end of table.

Table III - Property values for qualification tests of diallyl phthalate and silicone molding compounds (continued).

Property to be tested	Value required for each type of compound								
	Type GDI-30	Type GDI-30F	Type MDG	Type SDG	Type SDG-F	Type SDI-5	Type SDI-30	Type MSG	Type MSI-30
Arc resistance	----	----	115	115	115	100	115	210	175
Compressive strength, endwise	20,000	20,000	18,000	16,000	16,000	18,000	16,000	15,000	10,000
Dielectric constant:									
At 1 kilocycle	4.6	4.6	8.2	4.6	4.6	4.1	4.1	5.0	5.0
	4.7	4.7	9.5	4.7	4.7	4.2	4.2	5.2	5.5
At 1 megacycle	4.6	4.6	6.0	4.4	4.4	3.8	3.8	4.7	4.7
	4.7	4.7	6.0	4.5	4.5	3.9	3.9	5.0	5.1
Dissipation factor:									
At 1 kilocycle	.010	.010	0.14	0.009	0.009	0.025	0.016	0.015	0.015
	.012	.012	.20	.013	0.013	.028	.018	.020	.050
At 1 megacycle	.018	.018	.12	.015	.015	.020	.020	.010	.010
	.019	.019	.14	.017	.017	.023	.023	.015	.060
Dielectric strength:									
Short-time test	325	325	325	325	325	325	325	325	160
Step-by-step test	300	300	275	300	300	300	300	300	125
Short-time test	325	325	140	325	325	325	325	300	75
Step-by-step test	300	300	140	300	300	300	300	275	50
Dielectric breakdown:									
Short-time test			(To be recorded as basis for initial voltage in step-by-step test)						
Step-by-step test	45	45	40	45	45	45	45	35	30
Short-time test			(To be recorded as basis for initial voltage in step-by-step test)						
Step-by-step test	40	40	35	40	40	40	40	35	30
Flame resistance:									
Ignition time	----	90	----	----	90	----	----	90	90
Burning time	----	90	----	----	90	----	----	120	120
Flexural strength face[1/]	10,000	10,000	6,800	9,000	9,000	8,000	10,000	6,000	7,000

See footnotes at end of table.

Table III - Property values for qualification tests of diallyl phthalate and silicone molding compounds (continued).

Property to be tested	Value required for each type of compound								
	Type GDI-30	Type GDI-30F	Type MDG	Type SDG	Type SDG-F	Type SDI-5	Type SDI-30	Type MSG	Type MSI-30
Heat-distortion temperature, side[2/]	180	180	148	160	160	100	115	200	200
Impact strength:									
Face[1/]	3.0	3.0	0.28	0.30	0.30	0.60	3.00	0.25	3.2
Side[2/]	2.75	2.75	.28	.30	.30	.60	2.75	.25	3.2
Tensile strength	4,500	4,500	4,000	4,500	4,500	3,500	3,600	2,500	2,000
Water absorption	.5	.5	0.70	0.50	0.50	0.50	0.50	0.50	0.50
Heat resistance	----	----	----	----	----	----	----	25	25
Dimensional stability (high temperature)	.1	.1	0.2	0.2	0.2	0.2	0.2	----	----
Volume resistance	5,000	5,000	2.0	10	5,000	100	10	1,000	----
Surface resistance	5,000	5,000	5.0	10	5,000	100	10	1,000	----
Water extract conductance	50×10^{-6}	50×10^{-6}	----	----	----	----	----	----	----
Toxicity when heated:									
Carbon dioxide		15,000			15,000			15,000	15,000
Carbon monoxide		1,000			1,000			1,000	1,000
Ammonia		2,500			2,500			2,500	2,500
Aldehydes as H.CHO	----	50	----	----	50	----	----	50	50
Cyanide as HCN		60			60			60	60
Oxides of nitrogen as No_2		100			100			100	100
Hydrogen chloride		100			100			100	100

1/ The face of a test specimen is that area formed by the top or bottom force plug.

2/ The side of a test specimen is that area formed by the chase of the mold.

3/ Five readings shall be made on each of the three specimens.

Table IV - Property values for lot-acceptance of phenolic resin molding compounds.

Property to be tested	Test method		Specimens		Conditioning procedure (see 4.5.1.5)	Unit of value
	FED-STD 406	Modified by	Form and dimensions	Number tested		
Arc resistance	4011	----	4-inch disk, 1/8 inch thick	3	A	Seconds (minimum average)
Dielectric constant at 1 megacycle	4021	----	2-inch disk, 1/8 inch thick	3	E-48/50+D-24/23	Maximum average
Dissipation factor at 1 megacycle	4021	----	2-inch disk, 1/8 inch thick	3	E-48/50+D-24/23	Maximum average
Dielectric strength step-by-step	4031	4.5.2.1	4-inch disk, 1/8 inch thick	5	E-48/50+D-48/50	Volts per mil (minimum average)
Flexural strength face[1/]	1031	4.5.2.2	5-inch bar, 1/4 by 1/2 inch	5	E-48/50+C-96/23/50	P.s.i. (minimum average)
Impact strength side[2/]	1071	----	See figure 1071 of FED-STD-406	5	E-48/50+C-96/23/50	Foot-pounds per inch notch (minimum average)
Water absorption	7031	4.5.2.4	2-inch disk, 1/8 inch thick	3	E-24/100+des+D-48/50	Percent (maximum average)

Property to be tested	Value required for each type of compound												
	Type CFG	Type CFI-5	Type CFI-10	Type CFI-20	Type CFI-30	Type CFI-40	Type MFE	Type MFG	Type MFH	Type MFI-10	Type MFI-20	Type GPI-100	Type MFA-30
Arc resistance													180
Dielectric constant at 1 megacycle							6.0					6.0	---
Dissipation factor at 1 megacycle							0.017					0.04	---
Dielectric strength step-by-step	45	27.5	27.5	25	25	----	----	45	80	10	10	50	15
Flexural strength face[1/]	9,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	7,000	8,000	8,000	15,000	8,000
Impact strength side[2/]	----	0.48	1.05	1.75	2.55	3.50	----	0.64	----	1.30	2.00	10.0	3.0
Water absorption	3.0	4.0	4.0	4.0	4.0	4.0	0.10	0.50	0.35	2.0	2.0	1.5	2.0

1/ The face of a test specimen is that area formed by the top or bottom force plug.

2/ The side of a test specimen is that area formed by the chase of the mold.

Table V - Property values for lot-acceptance inspection of melamine and polyester resin molding compounds.

Property to be tested	Test method		Specimens		Conditioning procedure (see 4.5.1.5)	Unit of value
	FED-STD-406	Modified by	Form and dimensions	Number tested		
Arc resistance	4011	----	4-inch disk, 1/8 inch thick	3/ 3	A	Seconds (minimum average)
Dielectric constant at 1 megacycle	4021	----	2-inch disk, 1/8 inch thick	3	E-48/50+D-24/23	Maximum average
Dissipation factor at 1 megacycle	4021	----	2-inch disk, 1/8 inch thick	3	E-48/50+D-24/23	Maximum average
Dielectric strength step-by-step	4031	4.5.2.1	4-inch disk, 1/8 inch thick	5	E-48/50+D-48/50	Volts per mil (minimum average)
Flexural strength face 1/	1031	4.5.2.2	5-inch bar, 1/4 by 1/2 inch	5	E-48/50+C-96/23/50	P.s.i. (minimum average)
Impact strength, side 2/	1071	----	See figure 1071 of FED-STD-406	5	E-48/50+C-96/23/50	Foot-pounds per inch notch (minimum average)
Water absorption	7031	4.5.2.4	2-inch disk, 1/8 inch thick	3	E-24/100+des+D-48/50	Percent (maximum average)
Track resistance	----	4.5.2.9	2-inch by 5-inch by thickness	5	A	Minutes (minimum average)

Property to be tested	Value required for each type of compound									
	Type CMG	Type CMI-5	Type CMI-10	Type MME	Type MMI-5	Type MMI-30	Type MAG	Type MAI-60	Type MAI-30	Type MAT-30
Arc resistance	100	125	----	125	180	180	175	130	175	180
Dielectric constant at 1 megacycle	----	----	----	6.5	8.0	8.0	6.0	6.0	6.4	5.5
Dissipation factor at 1 megacycle	----	----	----	0.045	0.04	0.04	0.03	0.05	0.015	.05
Dielectric strength step-by-step	----	----	----	----	50	50	----	50	----	---
Flexural strength face 1/	8,000	7,500	11,000	6,000	8,500	8,500	7,500	12,000	14,000	15,000
Impact strength side 2/	----	0.48	1.00	----	0.48	3.20	----	6.0	3.0	3.0
Water absorption	4.0	4.0	4.0	0.50	1.5	4.0	0.50	1.5	0.5	0.5
Track resistance	----	----	----	----	----	----	----	----	----	300

1/ The face of a test specimen is that area formed by the top or bottom force plug.
2/ The side of a test specimen is that area formed by the chase of the mold.
3/ Five readings shall be made on each of the three specimens.

Table VI - Property values for lot-acceptance inspection of diallyl phthalate and silicone resin molding compounds.

Property to be tested	Test method		Specimens		Conditioning procedure (see 4.5.1.5)	Unit of value
	FED-STD-406	Modified by	Form and dimensions	Number tested		
Arc resistance	4011	----	4-inch disk, 1/8 inch thick	3/ 3	A	Seconds (minimum average)
Dielectric constant at 1 megacycle	4021	----	2-inch disk, 1/8 inch thick	3	E-48/50+D-24/23	Maximum average
Dissipation factor at 1 megacycle	4021	----	2-inch disk, 1/8 inch thick	3	E-48/50+D-24/23	Maximum average
Dielectric strength step-by-step	4031	4.5.2.1	4-inch disk, 1/8 inch thick	5	E-48/50+D-48/50	Volts per mil (minimum average)
Flexural strength face 1/	1031	4.5.2.2	5-inch bar, 1/4 by 1/2 inch	5	E-48/50+C-96/23/50	P.s.i. (minimum average)
Impact strength, side 2/	1071	----	See figure 1071 of FED-STD-406	5	E-48/50+C-96/23/50	Foot-pounds per inch notch (minimum average)
Water absorption	7031	4.5.2.4	2-inch disk, 1/8 inch thick	3	E-24/100+des+D-48/50	Percent (maximum average)

Property to be tested	Value required for each type of compound								
	Type GDI-30	Type GDI-30F	Type MDG	Type SDG	Type SDG-F	Type SDI-5	Type SDI-30	Type MSG	Type MSI-30
Arc resistance	----	----	115	115	115	100	115	210	175
Dielectric constant at 1 megacycle	4.7	4.7	6.0	4.7	4.7	3.9	3.9	5.0	5.0
Dissipation factor at 1 megacycle	.019	.019	0.14	0.017	0.017	0.023	0.023	0.015	0.050
Dielectric strength step-by-step	300	300	140	300	300	300	300	275	50
Flexural strength face 1/	10,000	10,000	6,800	9,000	9,000	8,000	10,000	6,000	7,000
Impact strength, side 2/	2.75	2.75	0.28	0.30	0.30	0.60	2.75	0.25	3.2
Water absorption	0.5	0.5	.70	.50	.50	.50	0.50	.50	0.50
Water extract conductance	50×10^{-6}	50×10^{-6}	----	----	----	----	----	----	----

1/ The face of a test specimen is that area formed by the top or bottom force plug.

2/ The side of a test specimen is that area formed by the chase of the mold.

3/ Five readings shall be made on each of the three specimens.

Table VII - Standard test specimens for qualification tests.

Specimen Designation	Specimen Description	Number of specimens														
		Types CFG, CFI-5, 10, 20, 30, 40, MFG, MFH, MFI-10 MFI-20	Type MFE	Type GPI-100	Types CMI-5, MFA-30	Type CMG	Type CMI-10	Types MME, MAG	Types MMI-5, MMI-30, MSI-30	Types MAI-30, MAI-60	Type MAT-30	Type GDI-30	Type GDI-30F	Types MDG, SDG, SDI-5, SDI-30	Type SDG-F	Type MSG
1	4 in. disk by 1/8 in.	16	38	28	19	19	-	31	31	31	31	38	38	41	41	41
2	1 in. by 1/2 in. by 1/2 in.	5	5	5	5	5	-	5	5	5	5	5	5	5	5	5
3	2 in. disk by 1/8 in.	3	15	15	3	3	3	15	15	15	15	15	15	15	15	15
4	4 in. disk by 1/2 in. (Fig. 1, MIL-M-14)	8	8	8	8	8	-	8	8	8	8	8	8	8	8	8
5	5 in. by 1/2 in. by 1/2 in.	8	8	8	12	12	4	17	12	12	12	8	17	8	17	12
6	5 in. by 1/2 in. by 1/4 in.	5	5	5	5	5	5	5	10	5	5	5	5	5	5	10
7	2-1/2 in. by 1/2 in. by 1/2 in. (Fig. 1071, FED-STD-406)	10	-	10	10	-	10	-	10	10	10	10	10	10	10	10
8	See Fig. 1012A of FED-STD-406	5	5	5	5	5	-	5	5	5	5	5	5	5	5	5
9	2 in. by 5 in. by thickness	-	-	-	-	-	-	-	-	-	5	-	-	-	-	-
10	See Method 7071 of FED-STD-406	-	-	-	-	-	-	-	-	-	-	X	X	-	-	-

4.4.2 Preparation of specimens. Specimens shall be prepared as specified in 4.5.1.

4.4.3 Test equipment and test facilities. The manufacturer shall furnish and maintain all necessary facilities and equipment for making all batch-acceptance inspection. The test equipment shall be adequate in quantity to enable the testing to keep up with the production, and shall be of sufficient accuracy and quality to permit performance of the required tests.

4.4.4 Results of tests. A copy of the results of the batch-acceptance inspection shall be furnished the Government.

4.4.5 Rejection. Failure to comply with tables IV, V, and VI shall result in rejection of the batch of compound.

4.5 Test procedures.

4.5.1 Standard test specimens.

4.5.1.1 Number. The minimum number of standard test specimens to be tested shall be as specified in tables I, II, III, IV, V, and VI, and summarized in table VII.

4.5.1.2 Form. The form of the standard test specimens shall be as specified in the applicable method of FED-STD-406 and as shown in tables I, II, III, IV, V, and VI, and summarized in table VII.

4.5.1.3 Molding of test specimens. Test specimens shall be molded by methods which are representative of sound practice. No special treatment shall be used to improve the properties of the specimens when compared with parts molded in commercial production.

4.5.1.4 Tolerance. Tolerance on dimensions shall be ± 5.0 percent unless otherwise stated.

4.5.1.5 Conditioning. Standard test specimens shall be conditioned before test, as specified in tables I, II, III, IV, V, and VI.

4.5.1.5.1 Nomenclature. The following letters shall be used to indicate the respective general conditioning procedures:

Condition A - As received; no special conditioning.
Condition C - Humidity conditioning.
Condition D - Immersion conditioning in distilled water.
Condition E - Temperature conditioning.
Condition desiccation - Desiccation condition, cooling over silica gel or calcium chloride in a desiccator at 23°C. for 16 to 20 hours after temperature conditioning.

4.5.1.5.2 Designation. Conditioning procedures shall be designated as follows:

(a) A capital letter indicating the general condition of the specimen; that is, as received, humidity, immersion, or temperature conditioning.
(b) A number indicating in hours the duration of the conditioning.
(c) A number indicating in degrees Centigrade the conditioning temperature.
(d) A number indicating relative humidity, whenever relative humidity is controlled.

The numbers shall be separate from each other by slant marks, and from the capital letter by a dash. A sequence of conditions shall be denoted by use of a plus (+) sign between successive conditions.

Examples:
Condition C-96/23/50 - Humidity condition, 96 hours at 23° ± 1.1°C. and 50 ± 2 percent relative humidity.
Condition D-48/50 - Immersion condition, 48 hours at 50° ± 1°C.
Condition E-48/50 - Temperature condition, 48 hours at 50° ± 3°C.
Condition E-48/50 + C-96/23/50 - Temperature condition, 48 hours at 50° ± 3°C.; followed by humidity condition, 96 hours at 23° ± 1.1°C. and 50 ± 2 percent relative humidity.

4.5.2 Methods of test. All test measurements with the exception of dielectric strength, dielectric breakdown, heat resistance, and volume and surface resistance (see 4.5.2.1, 4.5.2.1.3, 4.5.2.5, and 4.5.2.7) shall be taken at standard laboratory atmosphere of 23° ±

1.1°C. and 50 plus or minus 2 percent relative humidity. The test methods shall be in conformance with the applicable method of FED-STD-406 (see tables I, II, III, IV, V, and VI) modified as follows:

4.5.2.1 Dielectric strength. The apparatus and procedure specified in method 4031 of FED-STD-406 shall be used. Tests shall be made under oil at a frequency not exceeding 100 cycles per seconds (c.p.s.), at the temperature of the final conditioning.

4.5.2.1.1 Short-time test. The voltage shall be increased uniformly at the rate of 500 volts per second.

4.5.2.1.2 Step-by-step test. The voltage shall be increased in increments, as shown in table VIII up to failure, and shall be held at each step for 1 minute. The change from one step to the next higher shall be made within 10 seconds.

Table VIII - Voltage increase for step-by-step test.

Breakdown by short-time method	Increment of increase
Kilovolts	Kilovolts
12.5 or less	0.5
Over 12.5 to 25, inclusive	1.0
Over 25 to 50, inclusive	2.5
Over 50 to 100, inclusive	5.0
Over 100	10.0

4.5.2.1.3 Dielectric breakdown. The apparatus and procedure specified in method 4031 of FED-STD-406 shall be used, except that the electrodes shall be American Standard No. 3 tapered pins. The test potential shall be applied successively between the numbered pairs of electrodes (see figure 1) and the average of the three readings shall be taken as the reading for the specimen. Tests shall be made under oil at a frequency not exceeding 100 c.p.s. at the temperature of the final conditioning.

4.5.2.2 Flexural strength. Method 1031 of FED-STD-406 shall be used. The span-depth ratio shall be 16 to 1.

4.5.2.3 Heat-distortion temperature. Method 2011 of FED-STD-406 shall be used. The specimens shall be placed directly in the oil bath and not in an air bath surrounded by an oil bath.

4.5.2.4 Water absorption. Method 7031 of FED-STD-406 shall be used, modified as follows:

(a) The specimens shall be conditioned at 100° + 2°C. for 24 hours, followed by 16 to 20 hour period of cooling over silica gel or calcium chloride in a desiccator at 23° + 1.1°C.

(b) The specimens shall be immersed in distilled water maintained at a temperature of 50° + 1°C. for 48 hours. The report shall include only the following data: The percentage increase in weight during immersion calculated to the nearest 0.01 percent as follows:

$$\text{Increase in weight (percent)} = \frac{\text{wet weight-conditioned weight}}{\text{conditioned weight}} \times 100$$

4.5.2.5 Heat resistance. The method shall be the same as specified in 4.5.2.2 except that:

(a) Specimens of types MMI-5 and MMI-30 shall be given an additional conditioning of 1 hour at 150° + 2°C. and then be tested at 150° + 2°C.

(b) Specimens of types MSG and MSI-30 shall be given an additional conditioning of 1 hour at 200° ± 2°C. and then be tested at 200° ± 2°C.

The average of five such determinations divided by the average flexural strength determined as in 4.5.2.2 shall be multiplied by 100 and recorded as percent flexural strength retained.

4.5.2.6 Dimensional stability (high temperature). The specimens shall be machined so the 1/2 by 1/2 inch ends are smooth and parallel. The specimens shall be subjected to the condition C-96/23/50 (see 4.5.1.5.2). The initial length of the specimens shall then be measured to the nearest 0.001 inch. The specimens shall then be subjected to 10 cycles,

each cycle as follows: 48 hours in a circulating air oven at 125° ± 5°C. plus 24 hours at 23° ± 1.1°C. and 50 ± 2 percent relative humidity. At the completion of 10 cycles the final length of the specimens shall be measured to the nearest 0.001 inch. The percentage dimensional change is calculated to the nearest 0.1 percent as follows:

$$\text{Dimensional change (percent)} = \frac{\text{(initial length - final length)}}{\text{initial length}} \times 100$$

The average percent dimensional change of the five specimens shall be recorded.

4.5.2.7 Volume and surface resistance - condition C-720/70/100+dew.

4.5.2.7.1 Specimens. Five 4 inch diameter 1/8 inch thick specimens shall be used. Specimens shall be cleaned by noninjurious methods to assure freedom from contamination. Precautions shall be taken in handling the specimens to avoid additional contamination. Five specimens shall be employed for the measurements of this test.

4.5.2.7.2 Electrodes. Electrodes shall consist of a guarded electrode 2 inches in diameter, 1/4 inch guard ring spaced 1/4 inch from the guarded electrode on the same side and the third electrode 3 inches in diameter on the opposite side and concentric with the guarded electrode. Dimensions of electrodes shall be maintained to a tolerance of plus or minus 1/64 inch. Silver paint, permeable to moisture (equivalent to Dupont No. 4817) shall be used for painting electrodes on the specimens. The electrodes shall exhibit a resistance of not more than 5 ohms both before and after the C-720/70/100+dew conditioning when measured with potentials of not greater than 3 volts between points diametrically opposite on each electrode. The specimens shall be permitted to air dry after painting for at least one week in an atmosphere of less than 60 percent relative humidity at a temperature of 25° ± 5°C.

4.5.2.7.3 Humidity chamber. The humidity chamber shall consist of a glass container with a corrosion resistant cover. The cover shall be provided with thru-panel type insulators. The insulators may serve as supports for the electrode holders as shown on figure 2. The chamber shall be of such size that the ratio of specimens surface area to water surface area shall not exceed 2.5. The ratio of volume of air in the humidity chamber to surface area of the water shall not exceed 10. One hundred percent relative humidity with condensation shall be obtained by natural evaporation from a quantity of distilled water located at the bottom of the chamber. The cover shall be sealed to the chamber by an inert sealing compound applied to the exterior joints formed by the cover and the walls of the chamber. A small vent hole shall be provided in the cover to equalize pressure. The vent hole shall be sealed as soon as the air temperature in the humidity chamber has reached 70°C.

4.5.2.7.4 Specimen holders. The specimens shall be installed in a vertical plane in the conditioning chamber with the lower edge of the specimen not closer than 1 inch from the surface of the water. The specimens may be held in position by the electrode contactors in a manner similar to that shown on figure 2. Electrical connection to the specimen holders may be made by means of the through-panel insulators. The insulators shall be capable of withstanding the adverse conditions within the chamber without excessive loss of insulating properties. (Insulator resistance to cover plate shall at all times exceed 10 megohms). Polytetrafluoroethylene insulators on the humidity side of the conditioning chamber are recommended to meet this requirement. These should be cleaned with alcohol before the start of each test. Electrode contactors and all other metallic parts of the sample shall be silver plated. Contact pressure against the electrodes may be provided by backing the contactors with phosphor bronze springs or other corrosion-resistant spring material.

4.5.2.7.5 Heating chamber. The humidity chamber shall be installed in an oven or other heating chamber capable of maintaining a temperature of 70° ± 1°C. The rate of heating of the oven shall be such that the air temperature at a point near the volumetric center of the humidity chamber shall attain 70°C. in 4 hours ± 1 hour. The quantity of water in the chamber shall be such that the water temperature shall attain 65°C. in 4 hours ± 1 hour. Room temperature shall be maintained at 25° ± 5°C. The insulation of the conductors connecting the through-panel insulators to the measuring equipment shall not be significantly deteriorated by the elevated temperatures encountered in the oven. Polytetrafluoroethylene coated wire is recommended.

4.5.2.7.6 Measurements[2/]. Volume and surface resistances shall be measured by the three terminal method employing measuring equipment such as a megohm bridge capable of applying 500 volts direct current (d.c.) to the specimen. A single set of measurements shall be made of each specimen while in the conditioning chamber after 30 days of the specified conditioning. Conversion of the measurements to resistivities is not required since electrode dimensions are specified. The potentials shall be applied to the specimens as shown on figure 3 or with polarities opposite to those shown on the figure. Surface resistance measurements shall be made on the same specimens as those used for volume resistance except that the potentials of guard and low electrodes shall be interchanged. The volume and surface resistance shall be measured in each case, 1 minute after the potentials are applied. Low values of volume and surface resistance (below 5 megohms) may be measured by the circuits shown on figure 4.

4.5.2.8 Toxicity when heated. The method described in Defense Documentation Center Report Number AD297457 shall be used.

4.5.2.9 Track resistance. Time-to-track method of ASTM D2303-68 shall be used. The test voltage shall be 2,500 volts.

4.6 Flame resistance. Flame resistance shall be determined in accordance with method II of ASTM D229-69 with the following exceptions:

(a) Determination of weight and weight loss, such as in definitions, apparatus, procedures, calculations, and report sections, are not applicable.

(b) Flame cabinet. The 9/16-inch slot at bottom of the flame cabinet shall be on all four sides. The door shall be provided with a 1-1/4 inch diameter peep hole located directly opposite the heater coil when the door is closed. The hole shall be kept closed during testing by means of a cover.

(c) Pyrometer. The means of correction from black-body radiation to actual conditions of this test shall be delineated as follows:
(1) When a pyrometer calibrated for black-body emission is used, 6°C. shall be added to the pyrometer to obtain the true temperature of the Nichrome V coil.

(d) Specimens. Test specimens shall be as follows:
(1) Specimens shall be molded to 1/2 by 1/2 by 5 ± 1/16 inches.
(2) The test sample shall consist of five test specimens.

(e) Calibration. In the calibration of this equipment, adjust the heater current to obtain an equilibrium temperature of 860° ± 2°C.

(f) Calculation of burning time. Arrange the five values of burning time in increasing order of magnitude, as T_1, T_2, T_3, T_4, and T_5. Compute the following ratios:

$$\frac{T_2 - T_1}{T_5 - T_1} \text{ and } \frac{T_5 - T_4}{T_5 - T_1}$$

If either of these ratios exceeds 0.642, then T_1 or T_5 is judged to be abnormal and is eliminated. The burning time reported shall be the average of the remaining four values.

(g) Average ignition time. The ignition time is calculated as the arithmetic mean of the five specimens.

2/ Because of the variability of the resistance of a given specimen with test conditions and because of non-uniformity of the same material from specimen to specimen, determinations are usually not reproducible to closer than 10 percent and are often even more widely divergent. A range of values of 10 to 1 may be obtained under apparently identical conditions. Errors in resistance determinations may result from the fact that the current measuring device is shunted by the resistance between the guarded terminal and the guard system. In some bridge techniques a standard resistor in the bridge is shunted by the resistance between the unguarded terminal and the guard system. To assure validity of the volume and surface resistance measurements obtained by the bridge methods the resistance between the unguarded and the guard terminal should be at least five times greater than the standard resistance employed in the bridge. This may be ascertained by direct two terminal measurements between these two terminals.

5. PREPARATION FOR DELIVERY

5.1 Not applicable to this specification.

6. NOTES

6.1 Intended use.

6.1.1 Type CFG. This type is a general-purpose, wood-flour-filled phenolic compound intended for applications requiring good electrical properties with mechanical properties better than the acceptable minimum. Preheating the molding compound is advisable and improves the electrical properties. Moldability of this material is excellent.

6.1.2 Type CFI-5. This type is a moderate-impact, cotton- or paper-filled phenolic compound intended for use where good all around mechanical properties are required. Impact strength is approximately 0.5 foot-pounds per inch notch.

6.1.3 Type CFI-10. This type is a medium-impact, cotton rag-filled phenolic compound providing good finish. Impact strength is approximately 1.0 foot-pounds per inch notch.

6.1.4 Type CFI-20. This type is a high-impact, rag- or cotton-filled phenolic compound, providing good finish. Impact strength is approximately 2.0 foot-pounds per inch notch.

6.1.5 Type CFI-30. This type is a high impact, cotton-filled phenolic compound, providing good finish. Impact strength is approximately 3.0 foot-pounds per inch notch.

6.1.6 Type CFI-40. This type is the highest-impact grade of cotton-filled phenolic compound. Impact strength is approximately 4.0 foot-pounds per inch notch.

6.1.7 Type MFA-30. This type is a heat resistant, arc-resistant, flame resistant, high impact, asbestos-filled phenolic compound. Impact strength is approximately 3.0 foot-pounds per inch notch.

6.1.8 Type MFE. This type is a low-loss, high-dielectric-strength, low-water absorption, mineral-filled phenolic compound intended for applications requiring the best dielectric properties for a phenolic material. To secure optimum electrical properties, this compound should be preheated immediately before molding. Care should be taken, however, to prevent precuring.

6.1.9 Type MFG. This type is a general-purpose, asbestos-filled phenolic compound intended for applications requiring good mechanical and heat-resistant properties.

6.1.10 Type MFH. This type is a mineral-filled phenolic compound intended for applications requiring highest heat resistance. Its mechanical properties are relatively low.

6.1.11 Type MFI-10. This type is a heat-resistant, medium-impact, asbestos-filled phenolic compound. Impact strength is approximately 1.0 foot-pounds per inch notch.

6.1.12 Type MFI-20. This type is a heat-resistant, high-impact, asbestos-filled phenolic compound. Impact strength is approximately 2.0 foot-pounds per inch notch.

6.1.13 Type GPI-100. This type is a glass-fiber filled phenolic resin molding compound of high impact strength and good electrical properties. Impact strength is approximately 10.0 foot-pounds per inch notch.

6.1.14 Type CMG. This type is a cellulose-filled, general-purpose, melamine molding compound with good electrical and mechanical properties, for use where good arc resistance is required.

6.1.15 Type CMI-5. This type is a cellulose-filled, moderate-impact melamine compound with good all around mechanical properties for use where resistance to arcing and moderate impact is required.

6.1.16 Type CMI-10. This type is a cellulose-filled, moderate impact phenol modified melamine compound with good all around mechanical properties suitable for tableware and similar applications. It is not intended for electrical use.

6.1.17 Type MME. This type is a mineral-filled melamine compound for use where good dielectric properties and arc and flame resistance are required. Of the melamine compounds this one is the most dimensionally stable.

6.1.18 Type MMI-5. This type is a glass fiber-filled melamine resin molding compound of lower impact strength and higher dielectric constant and dissipation factor at 1 megacycle than type MMI-30. It has superior "moldability" when compared with type MMI-30. Impact strength is approximately 0.5 foot-pounds per inch notch.

6.1.19 Type MMI-30. This type is a glass fiber-filled melamine compound of high-impact strength for use where heat-resistance, arc resistance, and flame resistance are required.

6.1.20 Type MAG. This type is a mineral-filled polyester compound for use where good dielectric properties and arc resistance are required.

6.1.21 Type MAI-60. This type is a glass fiber-filled polyester compound for use where high-impact strength, good dielectric properties, and arc resistance are required.

6.1.22 Type MAT-30. This type is a heat resistant, track resistant, flame resistant, high impact mineral filled glass fiber reinforced alkyd compound. Impact strength is about 3.0 foot-pounds per inch notch.

6.1.23 Type MAI-30. Type MAI-30 is a mineral filled, glass-fiber reinforced alkyd resin molding compound having excellent handling and molding characteristics. It is an arc-resistant, flame-resistant, heat-resistant, high-impact compound having good mechanical and excellent electrical characteristics.

6.1.24 Type GDI-30. This type is a glass-fiber filled diallyl phthalate resin molding compound of low-loss, high dielectric strength, low shrinkage, excellent moisture resistance, and relatively high impact strength.

6.1.25 Type GDI-30F. This type is a molding material for applications where flame retardancy is at a maximum when plastic material is burned.

6.1.26 Type MDG. This type is a mineral-filled diallyl phthalate compound for use where good dielectric properties and low shrinkage are required.

6.1.27 Type SDG. This type is a glass-filled diallyl phthalate resin compound of low-loss, high dielectric strength, low shrinkage, and good moisture resistance, and relatively low impact strength.

6.1.28 Type SDG-F. This type is a glass-filled diallyl phthalate resin compound of low-loss, high dielectric strength, low shrinkage, flame resistant, and good moisture resistance, and relatively low impact strength.

6.1.29 Type SDI-5. This type is an acrylic polymer fiber filled diallyl phthalate resin compound of low-loss, high dielectric strength, low shrinkage, excellent moisture resistance, and moderate impact strength.

6.1.30 Type SDI-30. This type is a polyethylene terephthalate fiber filled diallyl phthalate resin compound of low-loss, high dielectric strength, low shrinkage, very good moisture resistance, and high impact strength.

6.1.31 Type MSG. This type is a mineral-filled silicone compound of low-loss, high dielectric strength, and excellent heat resistance.

6.1.32 Type MSI-30. This type is a glass-fiber-filled silicone compound of high impact strength and heat resistance, but somewhat poorer electrical properties than type MSG.

6.2 Ordering data. Procurement documents should specify the following:

(a) Title, number, and date of this specification.
(b) Type required (see 1.2).
(c) Color required (see 3.2.2 and 30.4).
(d) Dimensions and spacing required (see 30.5.1 and 30.5.2).
(e) Requirements and inspection for molded parts (see 30.5, 30.6, 30.7, and section 40.)
(f) Applicable levels of packaging and packing required (see 50.1 and 50.2).

6.3 With respect to products requiring qualification, awards will be made only for products which are at the time set for opening of bids, qualified for inclusion in applicable Qualified Products List QPL-14, whether or not such products have actually been so listed by that date. The attention of the suppliers is called to this requirement, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. The activity responsible for the Qualified Products List is the Naval Ship Engineering Center, Prince George's Center, Center Building, Hyattsville, Maryland 20782, and information pertaining to qualification of products may be obtained from that activity. Application for Qualification tests shall be made in accordance with "Provisions Governing Qualification SD-6" (see 6.3.1).

6.3.1 Copies of "Provisions Governing Qualification SD-6" may be obtained upon application to Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, Pennsylvania 19120.

6.4 Engineering information. Table IX gives engineering information on the electrical properties of silicone resin molded materials covered by this specification when measured at elevated temperatures after 1 hour exposure to the elevated temperature. This information will not be used for approval action under this specification, nor for acceptance or rejection of lots under this specification.

Table IX - Engineering information on electrical properties of silicone resin molding compounds at elevated temperatures.

Property	Condition	Unit of value	Range of values	
			Type MSG	Type MSI-30
Dielectric strength S/T	E-48/50+C-96/23/50 E-1/150 E-1/200 E-1/250	Volts per mil.	344-416 376-433 310-445 284-443	167-277 113-288 152-325 95-408
Dielectric constant (1 kc.)	E-48/50+des E-1/150 E-1/200 E-1/250	---	3.64-4.90 3.98-5.74 4.29-5.48 4.67-5.73	3.89-3.97 3.99-4.23 3.89-4.53 3.82-4.93
Dissipation factor (1 kc.)	E-48/50+des E-1/150 E-1/200 E-1/250	---	0.00405-0.00898 .0204-0.0478 .021-0.137 .024-0.411	0.00217-0.004 .0131-0.0174 .0169-0.0716 .0307-0.176
Dielectric constant (1 mc.)	E-48/50+des E-1/150 E-1/200 E-1/250	---	3.15-4.67 3.65-4.95 3.63-4.77 3.55-4.54	3.65-3.86 3.81-4.38 3.68-4.33 3.62-4.14
Dissipation factor (1 mc.)	E-48/50+des E-1/150 E-1/200 E-1/250	---	0.004-0.00620 .0064-0.012 .0070-0.011 .0094-0.0145	0.00274-0.004 .0019-0.0034 .0024-0.0031 .0025-0.0035

6.5 Supersession data. This specification supersedes MIL-M-14F, dated 15 January 1960; MIL-P-19833B, dated 6 August 1963; and MIL-M-21556(SHIPS), dated 30 September 1958.

6.5.1 The molding compounds covered by MIL-M-14F, MIL-M-18794A(NAVY), MIL-M-19061(SHIPS), MIL-M-19536A(NAVY), MIL-P-19833B, MIL-M-21556(SHIPS), and MIL-M-21699(SHIPS) have been included in MIL-M-14G as listed below:

MIL-M-14G	MIL-M-14F	MIL-M-18794A(NAVY)	MIL-M-19061(SHIPS)	MIL-M-19536A(NAVY)	MIL-P-19833B	MIL-M-21556(SHIPS)	MIL-M-21699(SHIPS)
Types							
CFG	X						
CFI-5	X						
CFI-10	X						
CFI-20	X						
CFI-30							
CFI-40	X					X	
MFA-30							
MFE	X						
MFG	X						
MFH	X						
MFI-10	X						
MFI-20	X			X			
GPI-100	X						
CMG	X						
CMI-5	X						
CMI-10	X						
MME	X		X				
MMI-5	X						
MMI-30	X						
MAG	X						
MAI-60	X						
MAT-30							X
MAI-30	X				X		
GDI-30					X		
GDI-30F							
MDG	X						
SDG	X	X					
SDG-F	X						
SDI-5	X	X					
SDI-30	X	X					
MSG	X						
MSI-30	X						

APPENDIX

10. SCOPE

10.1 This appendix covers general requirements for parts molded from compounds covered by this specification, together with procedures for the inspection of such parts.

20. APPLICABLE DOCUMENTS

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

SPECIFICATIONS

FEDERAL
PPP-B-585 - Boxes, Wood, Wirebound.
PPP-B-591 - Boxes, Fiberboard, Wood-Cleated.
PPP-B-601 - Boxes, Wood, Cleated-Plywood.
PPP-B-621 - Boxes, Wood, Nailed and Lock-Corner.
PPP-B-636 - Boxes, Shipping, Fiberboard.
PPP-T-76 - Tape, Pressure-Sensitive Adhesive Paper, (For Carton Sealing).

MILITARY
MIL-P-116 - Preservation, Methods of.
MIL-B-10377 - Box, Wood, Cleated, Veneer, Paper Overlaid.
MIL-L-10547 - Liners, Case, and Sheet, Overwrap; Water-Vaporproof or Waterproof, Flexible.

STANDARDS

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

(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.)

20.2 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.

UNIFORM CLASSIFICATION COMMITTEE
Uniform Freight Classification Rules

(Application for copies should be addressed to the Uniform Classification Committee, Room 1106, 222 South Riverside Plaza, Chicago, Illinois 60606.)

30. REQUIREMENTS

30.1 Sample for first article inspection. Prior to beginning production, molded parts shall be tested as specified in 40.3.

30.2 Material. Molded parts shall be molded from compounds which have received qualification (see 3.1 and 6.3) and batches of compounds which have been tested and accepted (see 4.4). No scrap compound previously cured and reground shall be used.

30.3 Uniformity. All molded parts from the same molder shall be uniform in color, in finish, and in specified properties determined by the first article and quality conformance inspection.

30.4 Color. Unless otherwise specified in the contract or order, mineral filled phenolic-resin materials shall be used in natural color. Other types of compounds shall be used in color specified by the procuring activity (see 6.2). In such case, if the color is not specified, the compound shall be used in the normal color in which manufactured. Natural colored compounds are those in which no coloring matter of any sort has been added. In evaluating uniformity of color, consideration shall be given to the fact that variation in color of raw materials, particularly the filler, may be reflected in the color of the "natural" molded parts. Coloring matters reducing the electrical properties of the molding compound below the specified limits shall not be used (see 3.2.2).

6.6 International interest. Certain provisions of this specification are the subject of international standardization agreement ABC-NAVY-STD-17. When amendment, revision, or cancellation of this specification is proposed which will affect or violate the international agreement concerned, the preparing activity will take appropriate reconciliation action through international standardization channels including departmental standardization offices, if required.

6.7 THE MARGINS OF THIS SPECIFICATION ARE MARKED "#" TO INDICATE WHERE CHANGES (ADDITIONS, MODIFICATIONS, CORRECTIONS, DELETIONS) FROM THE PREVIOUS ISSUE HAVE BEEN 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 DOCUMENT BASED ON THE ENTIRE CONTENT IRRESPECTIVE OF THE MARGINAL NOTATIONS AND RELATIONSHIP TO THE LAST PREVIOUS ISSUE.

Custodians:
Army - ME
Navy - SH
Air Force - ~~11~~ 70
Review activities:
Army - ~~MF~~, EL, MI, MB, ~~MO~~ AR, EA
Navy - ~~OM~~, AS 03
~~Air Force - 11, 17, 84~~ ~~GJT~~
~~NSA~~ DLA-GS
User activities:
Navy - YD, AS
EC
International standardization (see 6.7)

Preparing activity:
Navy - SH
(Project 9330-0515)

30.5 General (as applicable).

30.5.1 Dimensions. All molded parts shall conform to the dimensions specified (see 6.2), and shall be within the dimensional tolerances specified. This is necessary to assure a high degree of interchangeability of parts of the same kind.

30.5.2 Inserts. All inserts, holes, and lugs shall conform to the dimensions and spacings specified (see 6.2). The inserts, holes, and lugs shall not be damaged in any way, nor shall they be coated with molding compound or foreign substance in such a way as to result in imperfect electrical contact or poor mechanical fit. All inserts shall be so designed and assembled in the compound that they will easily withstand the tensile or torsional load that is to be applied.

30.5.3 Threads. All threaded sections, whether threaded metal inserts or threads molded or tapped into the part itself, shall be smooth, clean, and free from nicks, tears, or other damage.

30.5.4 Surface defects and porosity (except types MAI-60, MAI-30, MMI-30, and MSI-30). The molded finish on parts shall not be disturbed. All molded parts shall be free from warp, cracks, chipped edges or surfaces, blisters, uneven surfaces, scratches, dents, and heat marks. Unless otherwise specified in the contract or order or in the detailed specification, they shall be free from fins, burrs, or projecting ridges at the dividing line of the mold, and free from unsightly finish caused by chipping, filing, or grinding of the ridges without subsequent buffing or polishing. All molded parts shall be uniformly dense throughout the structure, and free from porosity. They shall contain no holes, air or gas pockets, resin pockets, solvent areas, delamination, soft spots, area lacking resin, or uncured areas.

30.5.5 Surface defects and porosity (types MAI-60, MAI-30, MMI-30, and MSI-30 only). Molded parts having slight blemishes caused by contamination in the air or mold, burn marks, noticeable surface flow lines, or surface porosity and crazing are considered acceptable, and shall not be cause for rejection. In general, the molded surface finish on parts should not be disturbed; however, where gates are removed and where flash is removed, the surface may be ground or filed (medium or fine cuts) without subsequent buffing or polishing. Minor chipping is considered acceptable provided no loose chips are present. Knit line cracks around the gate portion of the molded part and stress line cracks in most cases are considered acceptable. Tight, small blisters that cannot be broken or dented are considered acceptable except where uneven surface cannot be tolerated. Questionable defects such as cracks, blisters, or chipping that cannot be resolved between the vendor and the Government inspector shall be submitted to the Government procuring activity for final resolution.

30.5.6 Machinability. All molded parts shall be suitable for fabrication by standard machining operations, when performed in accordance with good practice, and shall not crack, split, craze, or distort as a result of such operations.

30.5.7 Marking. Each molded part shall clearly show the drawing or part number (if available) the cavity number, and the molder's trade-mark or symbol, unless such markings are impracticable because of the small size of the parts or because of special applications. If part but not all of markings listed can be shown, the order of preference shall be as listed above.

30.6 Contract inspection. Parts shall conform to the inspection specified (see 6.2).

30.7 Optional tests. Where additional tests consistent with the end use of the molded part are mutually agreed to by the purchaser of the molded part and the molder (see 6.2), the requirements for such parts shall be established as follows:

(a) For any property which is expressed in terms of a minimum requirement, the minimum acceptable value for quality conformance inspection shall be the lowest value obtained and acceptable on the first article inspection.
(b) For any property which is expressed in terms of a maximum requirement, the maximum acceptable value for quality conformance inspection shall be the highest value obtained and acceptable on the first article inspection.

Information in 60.1 shall serve as a guide in the formulation of such tests and requirements for molded parts.

30.8 Compatibility with explosives. When suitability for use with a particular explosive is required, a special test shall be conducted at a designated laboratory to determine the compliance of the material in this respect. This test shall be requested by the procuring activity.

30.9 Workmanship. The compound manufactured and processed (parts molded and processed) in accordance with this specification shall be such as to meet all the requirements of this specification and any referenced subsidiary specification, drawing, or other document when inspected in accordance with section 4 (see section 40).

40. QUALITY ASSURANCE PROVISIONS

40.1 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 in the contract or order, the supplier may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

40.2 Classification of inspection. The methods of sampling, examination, and test conducted upon molded thermosetting plastic parts shall be classified as follows:

First article inspection (see 40.3).
Quality conformance inspection (see 40.4).

40.3 First article inspection. After award of contract but prior to production, test shall be made on each kind of part furnished under the contract or order. Any production started before approval shall be at the contractor's risk. If additional contracts are awarded for the part, the Government may waive these tests when prior first article inspection will establish the limits on which quality conformance inspection can be based for subsequent deliveries.

40.3.1 Sampling for first article inspection. The samples for first article examination and tests shall consist of a sufficient number of parts to perform the examination and tests specified in 40.3.3 through 40.3.6.

40.3.2 Location of first article inspection. Where possible, all examination and tests specified in 40.3.3 through 40.3.6, shall be conducted at the molder's plant or at a commercial laboratory under contract to the molder under the supervision of a Government inspector.

40.3.3 First article verification of type. It shall be ascertained from the Qualified Products List that the compound used is of the particular type (see 1.2) specified for the part; that is a product that has been approved (see 3.1); and that it has passed the batch acceptance inspection (see 4.4).

40.3.4 First article visual examination. Molded parts shall be examined for uniformity in color (see 30.3); for dimensions, inserts, threads, surface defects, porosity, machinability, and marking, as applicable (see 30.5.1 to 30.5.7, inclusive); and for workmanship (see 30.9).

40.3.5 First article contract inspection. Contract inspection shall consist of such tests as are specified (see 30.6).

40.3.6 First article optional tests. Optional tests shall consist of those additional tests, consistent with the end use of the molded part (see 30.7) chosen from the guide to the formulation of tests and requirements for molded parts (see 60.1) and mutually agreeable to the purchaser of the molded part and the molder. Initiative for the establishment of optional tests and requirements normally rests with the purchaser of the molded part who shall provide the molder and Government inspector with copies of contracts, specifications, drawings, or other documents wherein the tests and requirements are specified.

40.4 Sampling for inspection. Sampling for inspection shall be performed in accordance with the provisions set forth in MIL-STD-105, except where otherwise indicated. For purposes of sampling, an inspection lot for examinations and tests shall consist of all material of the same resin, filler, and form submitted for inspection and delivery at one time.

40.4.1 Inspection of materials and components. In accordance with 40.1 of the specification, 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. In event of conflict, this specification shall govern.

40.4.1.1 The finished forms shall be fabricated from molding materials conforming to the property values for qualification tests for the applicable resin and filler as set forth in tables I, II, and III of this specification.

40.4.2 Inspection of end item.

40.4.2.1 Examination of the end item. Examination of the end item shall be made in accordance with the classification of defects, inspection levels, and acceptable quality levels (AQLs) 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 sheets, rods, tubing, or shapes of the same composition for examination in 40.4.2.1.1, 40.4.2.1.2, and in units of shipping containers in 40.4.2.1.3.

40.4.2.1.1 Examination of the end item for defects in appearance and workmanship. The sample unit for this examination shall be one sheet, one length or a minimum of six feet of rod or tubing or one shape as applicable.

Examine	Defect
Appearance and workmanship All forms	Not type resin, filler or form specified. Not uniform color, finish or texture. Presence of dirt, foreign material or imbedded particles. Any holes, cracks gouges, bubbles, blisters, chipped edges or surfaces, dents, or heat marks.
Sheets	Laminations not as specified (as applicable). Warped, twisted or distorted. (Unless otherwise specified, a 3 foot sheet shall not deviate from a straight edge by more than the following values: Thickness, inches — Percent to 1/8 — 5 over 1/8 to 1/4 — 2.5 over 1/4 to 1 — 1.0 over 1 — 0.5 Edges not straight, smooth or square.
Rods	Not straight. (Unless otherwise specified, a three foot length of 1/2 inch or larger diameter rod shall not deviate from a straight edge by more than 1/4 inch.) Ends not square cut.
Tubes	Not straight. (Unless otherwise specified, a three foot length of tube, 1 inch or larger diameter and 1/8 inch or thicker wall, shall not deviate from a straight edge more than 1/4 inch.) Hole not concentric. Ends not square.
Shapes	Not shape specified. Sharp edges or projections, as applicable.

40.4.2.1.2 Examination of the end item for dimensional defects. The sample unit for this examination shall be one sheet, one length or a minimum length of six feet of rod or tubing or one shape as applicable. Unless otherwise specified or required by contract or purchase order, the tolerances for the dimension indicated below shall apply for the applicable form.

Examine	Defect
Sheets Length and width (Commercial sizes) (cut sizes) Thickness	Minus 1/4, plus 1/2 inch Minus 1/16, plus 1/4 inch Range inches: ± tolerance percent up to 1/8: 10 over 1/8 to 1/4: 8 over 1/4 to 1/2: 6 over 1/2 to 1: 5 over 1: 3
Rods Length (Commercial lengths) (cut length) Diameter	Minus 1/2, plus 2 inches Minus 1/16, plus 1/4 inch Range inches: ± tolerance inches up to 1/4: 0.003 over 1/4 to 1/2: 0.004 over 1/2 to 1: 0.005 over 1: 0.0075
Tubes Length (Commercial lengths) (Cut lengths) Outside diameter Wall thickness	Minus 1/2, plus 2 inches Minus 1/16, plus 1/4 inch Range inches: ± tolerances inches up to 1/2: 0.005 over 1/2 to 1: 0.010 over 1 to 3: 0.025 over 3: 0.050 Range inches: ± tolerances inches up to 0.10: 0.005 over 0.10 to .25: 0.008 over 0.25 to 0.5: 0.010
Shapes Length (Cross section)	± 1 percent Range inches: ± tolerances inches to .5: 0.0045 over 0.5 to 1.0: 0.0055 over 1.0 to 2.0: 0.007 over 2.0: 0.010

40.4.2.1.3 Examination of preparation for delivery. An examination shall be made to determine that packaging, packing, and marking shall comply with the requirements set forth in section 50 of this specification. The sample unit for this examination shall be one shipping container, fully packed, selected just prior to the closing operation. Shipping containers, fully packed for shipment shall be examined for closure defects.

Examine	Defect
Packaging and packing	Not level specified. Container material or construction not as specified. Any non-conforming component, component missing, or otherwise damaged, affecting serviceability.
Count	Less than the indicated or required number of sheets, rods, tubes, or shapes, as applicable.
Marking	Interior or exterior markings (as applicable) omitted, illegible, incorrect, incomplete, or not in accordance with contract requirements.

40.4.2.1.4 Inspection levels and acceptable quality levels (AQLs) for examinations. The inspection level for determination of the sample size and acceptable quality levels (AQLs) expressed in defects per 100 units shall be as follows:

Examination paragraph	Inspection level	AQL
40.4.2.1.1	I	2.5
40.4.2.1.2	S-2	4.0
40.4.2.1.3	S-1	4.0

40.5 Quality conformance testing. Quality conformance testing of the end item shall be conducted in accordance with table X for the characteristics as indicated therein for each lot submitted for inspection. The lot size shall be expressed in units of sheets, rods, tubes, or shapes, as applicable. each form having the same resin and filler. The sample unit shall be two panels, one 12 by 12 by 1/8 inches and one 12 by 6 by 1/2 inches for preparation of test specimens. If the shape or size of the end item cannot be used for test specimens, or to avoid using portions of costly items, the contractor shall provide two panels of the size indicated for each sample unit prepared from the identical molding material and by methods used to fabricate the end item. The sample size shall be S-1 except that at least three sample units shall be randomly selected from the lot or prepared by the contractor, as applicable. The acceptable quality level shall be 4.0 expressed as defects per 100 units.

Table X - Instructions for testing (sample unit).

Characteristic	Specification reference		Rqmts. appl. to	Number determinations per sample unit	Results reported as
	Requirement	Test method FED-STD-406	Indiv. unit.		Numerically to nearest 1/
Property values, as applicable	as applicable				
Arc resistance	Tables V & VI	4011	X	Avg of 3	Seconds
Dielectric constant	Tables IV, V & VI	4021	X	Avg of 3	0.1 unit
Dissipation factor	Tables IV, V & VI	4021	X	Avg of 3	0.0001 unit
Dielectric step by step	Tables IV, V & VI	4031 and 4.5.2.1	X	Avg of 5	volts per mil
Flexural strength, face	Tables IV, V & VI	1031 and 4.5.2.2	X	Avg of 5	P.S.I.
Impact strength, side	Tables IV, V & VI	1071	X	Avg of 5	Foot-pounds per inch notch
Water absorption	Tables IV, V & VI	7031 and 4.5.2.4	X	Avg of 3	0.1 percent

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

50. PREPARATION FOR DELIVERY

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

50.1.1 Level A. Molded parts shall be packaged in accordance with method III of MIL-P-116. Contact preservative is not required.

50.1.2 Level C. Molded parts shall be preserved and packaged in accordance with the manufacturer's commercial practice.

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

50.2.1 Level A. Molded parts, packaged as specified (see 6.2), shall be packed in overseas type, wood cleated fiberboard, nailed wood, wirebound wood, fiber, wood cleated veneer paper overlaid, or wood cleated plywood boxes conforming to PPP-B-591, PPP-B-621, PPP-B-585, PPP-B-636, class 3, MIL-B-10377, or PPP-B-601, respectively, at the option of the contractor. Shipping containers shall have caseliners conforming to MIL-L-10547 and shall

be closed and sealed in accordance with the appendix thereto. Caseliners for boxes conforming to PPP-B-636 may be omitted provided all joints and corners of the boxes are sealed with minimum 1-1/2 inch wide tape conforming to PPP-T-76. Boxes shall be closed and strapped in accordance with the applicable box specification or appendix thereto. The gross weight of wood or wood cleated boxes shall not exceed 200 pounds; fiber boxes shall not exceed the weight limitations of the applicable box specification.

50.2.2 Level B. Molded parts, packaged as specified (see 6.2), shall be packed in domestic type wood cleated fiberboard, nailed wood, wirebound wood, cleated plywood or wood cleated veneer paper overlaid boxes or class 2 fiber boxes conforming to PPP-B-591, PPP-B-621, PPP-B-585, PPP-B-601, MIL-B-10377, or PPP-B-636, respectively, at the option of the contractor. Box closures shall be as specified in the applicable box specification or appendix thereto. The gross weight of wood or wood cleated boxes shall not exceed 200 pounds; fiber boxes shall not exceed the weight limitations of the applicable box specification.

50.2.3 Level C. Molded parts, packaged as specified (see 6.2), shall be packed in containers which will insure acceptance by common carrier and safe delivery at destination. Shipping containers shall comply with the Uniform Freight Classifications Rules or other regulations as applicable to the mode of transportation.

50.3 Marking. In addition to any special marking required by the contract or order or herein, interior and exterior shipping containers shall be marked in accordance with MIL-STD-129.

60. NOTES

60.1 Guide to the formulation of tests and requirements for molded parts.

60.1.1 General. The following tests and requirements, which have been specified for various kinds of molded parts used in Military applications, should serve as a guide in the formulation of tests and requirements for molded parts. These do not all apply to every kind of molded part but they are listed to indicate, in a general way, what tests and requirements should be considered. The suggested tests and requirements are purposely given in general terms, since the nature of the applications vary and the specific detailed description of the tests and requirements should depend on the specific circumstances of the application.

60.1.2 Performance properties and tests.

60.1.2.1 Shockproofness and impact strength.

(a) Molded parts may be mounted on the Navy class HI shock machine, and shock-tested. Various methods of loading the parts may be used.
(b) Molded parts may be dropped from fixed heights on specified surfaces.
(c) Molded parts may be subjected to impact from steel balls dropped from a fixed height.
(d) Sections cut from molded parts may be tested as above or subjected to Izod impact tests.

60.1.2.2 Static loading.

(a) Molded parts may be subjected to static loading under a combination of one or more of the following types of stresses: tensile, compression, shear, flexure, bending, torsion, or bearing.
(b) Molded parts may be subjected to fatigue tests resulting from repeated cycles of the above types.

60.1.2.3 Vibration. Molded parts may be subjected to harmonic vibration, in each of three mutually perpendicular planes, at the resonant frequency of the part.

60.1.2.4 Dielectric strength. Molded parts may be subjected to dielectric strength tests between current-carrying parts of the same and opposite polarity. Proof tests usually employ an alternating current, 60-cycle voltage of twice the rated voltage plus 1,000 volts applied for 1 minute. Endurance tests may be conducted when applied voltages are maintained for much longer periods. Short-circuit tests may be used as an indication of suitability for emergency operations.

60.1.2.5 Insulation-resistance. Molded parts may be subjected to insulation-resistance tests between current-carrying parts of the same and opposite polarity. In such cases, readings are usually taken 1 minute after the application of voltage.

60.1.2.6 Dielectric loss. Molded parts for electronic uses may be subjected to dielectric loss tests (dissipation factor, dielectric constant) at the frequency involved in the application.

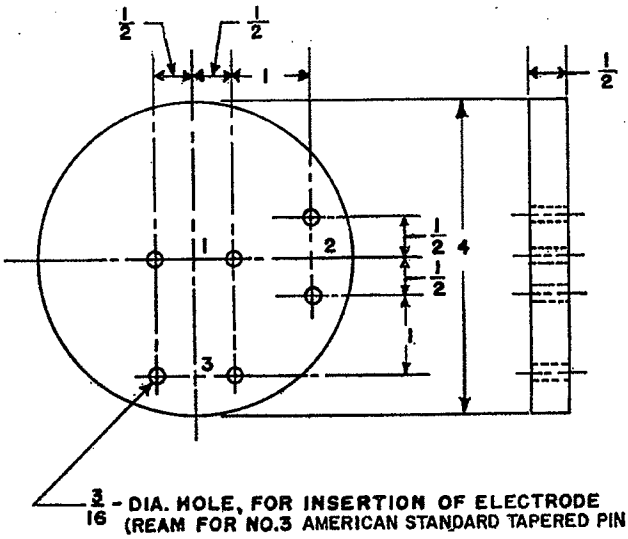
60.1.2.7 Arc resistance. Molded parts may be subjected to arc-resistance tests, particularly in applications involving high-arcing voltages or in switch-gear power applications which involve making and breaking circuits.

60.1.3 Conditions for performance properties and tests. Choice of conditions to which the molded parts are to be subjected before tests are performed should be based on the following service conditions:

Normal operation - Continuous or interrupted service.
Abnormal operation - Continuous or interrupted service.
Emergency operation.

The following factors should be taken into consideration in choosing the conditions:

Temperature - High, normal, and low.
Moisture - High humidity and water immersion.
Contaminants - Salt, oil, dust, fungus, and combinations thereof.



NOTES:

1. ALL DIMENSIONS IN INCHES.
2. TOLERANCES ON DIMENSIONS, PLUS OR MINUS 5 PERCENT.
3. DISKS SHALL BE FURNISHED UNDRILLED AND SHALL BE DRILLED BY LABORATORY.

TEST: DIELECTRIC BREAKDOWN

Figure 1 - Standard test specimen drilled for three pairs of electrodes.

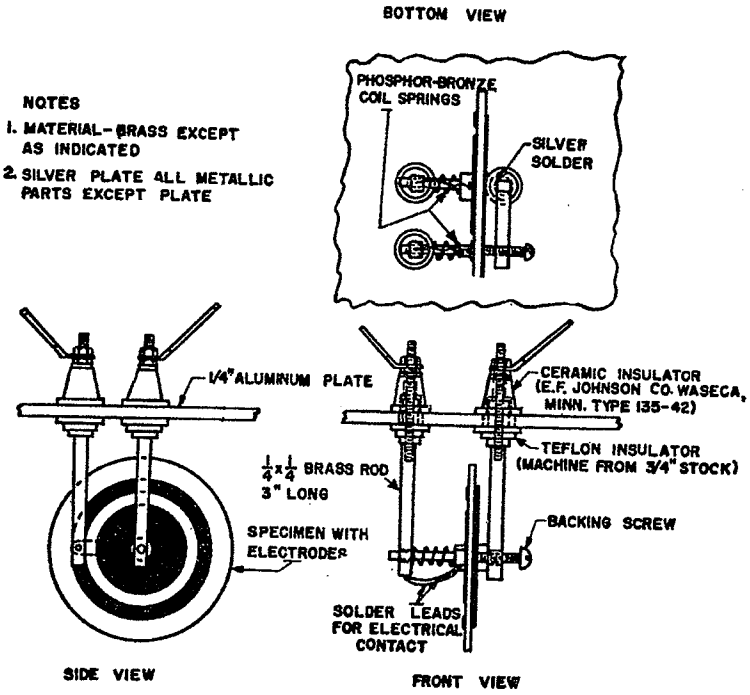


Figure 2 - Specimen holders, electrodes, test samples, and humidity chamber cover - volume and surface resistance test.

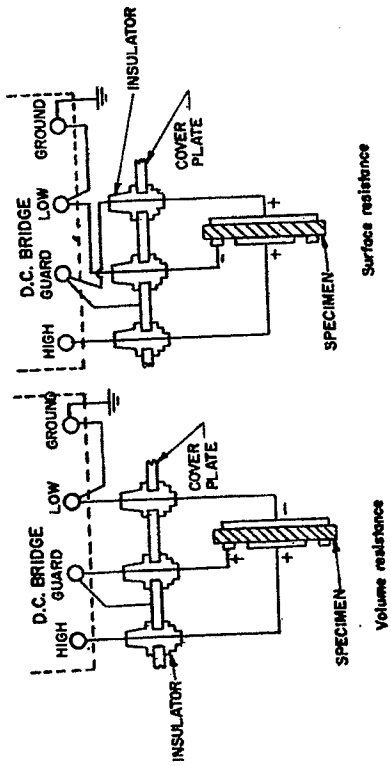


Figure 3 - Arrangements for volume resistance and surface resistance test.

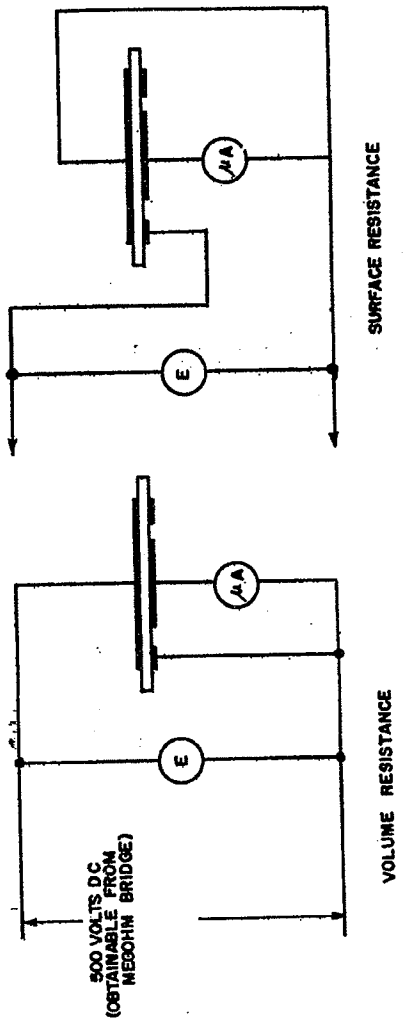


Figure 4 - Circuits for measuring low values of volume and surface resistance.

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