MIL-S-8516E
30 July 1971
SUPERSEDING
See 6.6

MILITARY SPECIFICATION

SEALING COMPOUND, POLYSULFIDE RUBBER, ELECTRIC CONNECTORS AND ELECTRIC SYSTEMS, CHEMICALLY CURED

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

1. SCOPE

1.1 Scope. This specification establishes requirements for a two-part, chemically cured organic polysulfide liquid polymer for insulating, sealing, reinforcement and corrosion protection of electric connectors, wiring and other electric apparatus.

* 1.2 Classification. The sealing compound shall be furnished in the following types and classes:

1.2.1 Types (see 3.3.1.3).

Type I - Low viscosity (100 - 400 poises, initial mixed viscosity)
Type II - High viscosity (401 - 1200 poises, initial mixed viscosity)

1.2.2 Classes (see 4.5.4 and 6.4).

Class 1 - 24 hour cure at 77° F
Class 2 - 48 hour cure at 77° F
Class 3 - 72 hour cure at 77° F

* 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

J-C-30 Cable and Wire, Electrical (Power, Fixed Installation)

FSC 8030

SPECIFICATIONS

Federal (Continued)

L-P-403	Plastics Molding Material, Polytetrafluoroethylene (TFE Fluorocarbon)
NN-P-530	Plywood, Flat Panel
QQ-A-250	Aluminum Alloy, Plate and Sheet, General Specification for
QQ-P-416	Plating, Cadmium (Electrodeposited)
SS-S-550	Sodium Chloride, Technical, For Water Softening Units
TT-S-735	Standard Test Fluids, Hydrocarbon
TT-W-572	Wood-Preservative, Water-Repellant
CCC-C-419	Cloth, Duck, Cotton, Unbleached, Plied-Yarns, Army and Numbered
PPP-B-566	Boxes, Folding, Paperboard
PPP-B-585	Box, Wood, Wirebound
PPP-B-601	Box, Wood, Cleated-Plywood
PPP-B-621	Box, Wood, Nailed and Lock-Corner
PPP-B-636	Box, Fiberboard
PPP-B-676	Box, Set-Up
PPP-C-96	Cans, Metal, 28-Gage and Lighter
PPP-C-186	Containers, Packaging and Packing, For Drugs, Chemicals, and Pharmaceuticals
PPP-T-495	Tubes, Mailing and Filing

SPECIFICATIONS

Military

MIL-M-14	Molding Plastics and Molded Plastic Parts, Thermosetting
MIL-P-5315	Packing, Preformed, Hydrocarbon, Fuel Resistant
MIL-H-5606	Hydraulic Fluid, Petroleum Base, Aircraft, Missile, and Ordnance
MIL-T-5624	Turbine Fuel, Aviation, Grades JP-4 and JP-5
MIL-L-7808	Lubricating Oil, Aircraft Turbine Engines, Synthetic Base
MIL-S-8660	Silicone Compound
MIL-P-20693	Molding Plastic, Polyamide (Nylon) Rigid
MIL-W-22759/9	Wire, Electric, Fluorocarbon-Insulated, Extruded TFE, Silver-Coated Copper Conductor, 1000-Volt
MIL-L-23699	Lubricating Oil, Aircraft Turbine Engines, Synthetic Base
MIL-P-38714	Packaging and Packing of Two-Component Materials in Semkits
MIL-C-38736	Cleaning Compound, Solvent, for Use in Integral Fuel Tanks

STANDARDS

Federal

Fed. Test Method Std. 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

STANDARDS

Military (Continued)

MS3100	Connector, Receptacle, Electric, Wall Mounting
MS3103	Connector, Receptacle, Electric, for Potting
MS3106	Connector, Plug, Electric, Straight
MS25183	Connector, Plug, Electric, for Potting

(Copies of specifications, standards, drawings, and publications required by suppliers in connection with specific procurement functions should be obtained from the procuring activities 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.

Code of Federal Regulations

49 CFR 171-178	Department of Transportation (DOT) Regulations for the Transportation of Explosives and Other Dangerous Articles by Land and Water

(Application for copies should be addressed to the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402. Orders for the publication should cite "The latest issue and supplements thereto.")

* 3. REQUIREMENTS

3.1 Qualification. The sealing compound and curing agent furnished under this specification shall be a product (s) 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).

3.2 Material. The sealing compound shall be a two-component system consisting of an organic polysulfide liquid polymer base compound and a curing agent. Each component shall be homogeneous and free of lumps and foreign matter. The manufacturer shall certify that elemental sulfur is not present initially or as a by-product of the curing reaction (see 4.3.2).

* 3.2.1 Primer. The use of a primer to promote adhesion is permitted. The primer (s) shall be recommended by the manufacturer and shall be included in

the tests of this specification. The primer(s) shall be identified on the applicable qualified products list. The use and application of the acceptable primer(s) shall be in strict accordance with the manufacturers instructions.

3.2.2 Suitability. The sealing compound shall protect the electric connectors, wiring and other electric apparati by sealing and insulating against moisture, solvents, dirt and other foreign materials, and shall not corrode nor otherwise affect the operating capabilities of the electric system.

3.3 Characteristics and performance.

3.3.1 Properties before curing.

3.3.1.1 Color. Unless otherwise specified in the contract or order (see 6.2), the base compound shall be supplied in the manufactured color and shall contrast with the curing agent to facilitate mixing.

* 3.3.1.2 Consistency. The mixed polysulfide shall pour easily at normal temperatures, but shall not flow through connectors during the potting operation (see 4.5.3.4).

* 3.3.1.3 Application life. The mixed polysulfide shall be tested for application life as specified in 4.6.2.1. Requirements shall be initial viscosity and application time, of the mixed (catalyzed) compound.

3.3.1.3.1 Initial viscosity. The initial viscosity shall be as follows:

Type I - 100 to 400 poises
Type II - 401 to 1200 poises

3.3.1.3.2 Application time. The application time (minimum specified time to reach 500 poises for Type I and 1800 poises for Type II) of the mixed compound shall be as follows:

Class 1 - 30 minutes
Class 2 - 60 minutes
Class 3 - 120 minutes

* 3.3.1.4 Non-volatile content. The minimum non-volatile content of the polysulfide when determined in accordance with 4.6.2.2 shall be 94 percent.

* 3.3.1.5 Accelerated storage. Upon completion of the accelerated storage test of 4.6.2.9, the curing agent shall be stirred and shall return to a smooth workable consistency. The mixed compound shall not deviate from the initial viscosity (3.3.1.3.1) by more than plus 35, minus 5 percent and shall conform to application time (3.3.1.3.2), set time (Table I), and cure "A" hardness (initial, Table I).

TABLE I

NON-ELECTRIC PROPERTIES OF CURED COMPOUND

Property	Requirement 1/		Test Paragraph
Set Time	No sag or flow		4.6.2.3
Shrinkage, percent, max	10		4.6.2.4
	Cure A (See 4.5.4.1)	Cure B (See 4.5.4.2)	
Hardness, Shore A-2, initial, points	Type I - 25, min; Type II - 30, min	33 to 60	4.6.2.5
Adhesion, (piw), min.			4.6.2.6
Aluminum Alloy	2	15	
Chromated Cadmium Plate	2	15	
Diallyl Phthalate Plastic	-	15	
Nylon Plastic	2	15	
Polytetrafluoroethylene (TFE), treated	2	15	
Fluid resistance (Type I)			4.6.2.7
Adhesion after immersion, pounds, min.		10	
Change in Hardness, points, max.		±10	
Low temperature flexibility	-	No checking, cracking or separation from test panel	4.6.2.8
Corrosion	No greater corrosion than control wire		4.6.2.10
Hydrolytic stability, physical Change in Hardness, after exposure, points	-	+15 - 5	4.6.2.11

1/ Unless otherwise specified, the given value is for all types and classes. The "-" indicates a requirement not tested.

3.3.2 Properties after cure.

* 3.3.2.1 Non-electric properties. The non-electric properties of the cured polysulfide compound shall be in accordance with Table I.

* 3.3.2.2 Electric properties. The electric properties of the cured polysulfide shall be in accordance with Table II.

TABLE II

ELECTRIC PROPERTIES OF CURED COMPOUNDS

Property	Requirement 3/		Test Paragraph
	Cure A (See 4.5.4.1)	Cure B (See 4.5.4.2)	
Resistance to arc, seconds, min. 1/	25	60	4.6.3.1
Dielectric strength, volts/mil, min.	200	200	4.6.3.2
Dielectric Constant, max.			4.6.3.3
1 KC at 77° F (25° C)	9.5	9.5	
1 MC at 77° F (25° C)	9.5	9.5	
1 KC at 185° F (85° C)	-	9.0	
1 MC at 185° F (85° C)	-	9.0	
Dissipation factor, max.			4.6.3.3
1 KC at 77° F (25° C)	0.03	0.01	
1 MC at 77° F (25° C)	0.03	0.03	
1 KC at 185° F (85° C)	-	Type I - 0.090	
	-	Type II - 0.030	
1 MC at 185° F (85° C)	-	Type I - 0.095	
	-	Type II - 0.030	
Resistivity, min.			4.6.3.4
Volume at 77° F (25° C), OHM-CM	1×10^{11}	2×10^{11}	
Surface at 77° F (25° C), OHM	1×10^{12}	2×10^{12}	

TABLE II (Continued)

Property	Requirement 3/		Test Paragraph
	Cure A (See 4.5.4.1)	Cure B (See 4.5.4.2)	
Resistivity, min. (Continued)			
Volume at 185° F (85°C), OHM-CM	-	Type I - 5×10^9 Type II - 2×10^{11}	
Surface at 185° F (85° C), OHM	-	2×10^{10}	
Insulation resistance, megohm, min. 2/			4.6.3.5
As received			
Plastic inserts	4,000	10,000	
Resilient inserts	4,000	8,000	
After Thermal Shock			4.6.3.6
Plastic inserts	-	10,000	
Resilient inserts	-	8,000	
After hydrolytic stability, electrical			4.6.3.7
Plastic inserts	-	5,000	
Resilient inserts	-	5,000	
High potential resistance	-	No breakdown	4.6.3.8
Air leakage, max./hour	-	1 cubic inch	4.6.3.9
Overload	-	Shall not ignite	4.6.3.10

1/ The arc resistance shall be the number of seconds required to cause continuous burning or the formation of a conducting path in the specimen, whichever occurs first.

2/ When unpotted connectors which have an insulation resistance of 5,000 to 10,000 megohms (as determined in 4.6.3.5) are used, the value 4,000 megohms, min., shall be substituted for all insulation resistance values listed.

3/ Unless otherwise specified the given value is for all classes and types. The "-" indicates a requirement not tested for.

*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 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 service conform to prescribed requirements.

4.2 Classification of tests. The inspection and testing of the sealing compound shall be classified as follows:

(a) Qualification tests (see 4.3).
(b) Quality conformance tests (see 4.4).

4.3 Qualification tests. The qualification tests shall consist of all the tests and visual inspections of this specification.

4.3.1 Sampling instructions. Qualification test samples shall consist of six quarts of the base compound, together with the necessary curing agent, of the class on which qualification is desired. The compound and curing agent shall be furnished in containers of the type specified in Section 5. Samples shall be forwarded to the Commander, Naval Air Development Center, Warminster, Pennsylvania 18974. The samples shall be plainly and durably marked with the following information:

Sample for Qualification Test
SEALING COMPOUND, POLYSULFIDE RUBBER, ELECTRIC CONNECTORS AND ELECTRIC SYSTEMS, CHEMICALLY CURED
Specification MIL-S-8516E
Type and Class
Date of manufacture
Name and address of manufacturer
Plant address which produced the compound
Manufacturer's product identification
Submitted by (name and date) for qualification in accordance with the requirements of MIL-S-8516E under authorization (reference authorizing letter).

4.3.2 Manufacturer's data. Two copies of the manufacturer's test report, containing complete test data showing that the material submitted for qualification conforms to the requirements of this specification, shall be submitted with qualification samples. In addition two copies of the manufacturer's instructions for use of the compound and primer, if applicable, shall be submitted at this time.

4.3.3 Periodic qualification re-evaluation. Qualification re-evaluation shall be made at two year intervals after the date of the letter of notification of the product's acceptability for qualification. Materials from current production shall be examined for compliance to all the requirements of this specification. Complete instructions for this re-evaluation appear in 6.7.

4.4 Quality conformance tests.

4.4.1 Lot formation. Unless otherwise specified, a lot shall consist of all sealing compound of the same class, manufactured at one time from one batch, forming part of one contract or order, and submitted for acceptance at the same time and place.

4.4.2 Sampling.

* 4.4.2.1 Quality conformance. Two containers, each with enough material to prepare two test specimens for all tests, shall be randomly selected from each lot (see 4.4.1) and shall be tested as specified in 4.4.3.1.

4.4.2.2 Preparation for delivery. A quantity of shipping containers prepared for delivery, just prior to closure, shall be selected in accordance with Inspection Level I of MIL-STD-105 and examined in accordance with 4.4.3.2. The lot size for purposes of inspection shall be the number of shipping containers.

4.4.3 Inspections.

4.4.3.1 Quality conformance. Two specimens for each test shall be prepared from two of the containers selected in accordance with 4.4.2.1. The test specimens shall be examined and tested to the requirements of Table III. In addition, the samples may be subjected to any other test specified herein, when considered necessary by the procuring activity, to ensure conformance to the requirements of this specification. Nonconformance of a test specimen to a single requirement (Table III) shall be cause for rejection of the lot represented by the sample.

TABLE III

* QUALITY CONFORMANCE INSPECTION

Requirement	Test Paragraph
Examination of product	4.6.1
Application life	4.6.2.1
Non-volatile content	4.6.2.2
Set time	4.6.2.3
Shrinkage	4.6.2.4
Hardness (Cure A & B)	4.6.2.5

TABLE III (Continued)

Requirement	Test Paragraph
Adhesion (To PTFE, Treated and Aluminum)	4.6.2.6
Insulation resistance, as received values only (Cure A & B)	4.6.3.5

4.4.3.2 Preparation for delivery. The samples selected in accordance with 4.4.2.2 shall be visually examined to the requirements in Table IV and all other applicable requirements to determine conformance to Section 5 of this specification. The acceptable quality level (AQL) for this examination shall be 2.5 percent defective. In addition to Table IV, shipping containers fully prepared for delivery shall also be examined after closure for closure defects.

TABLE IV

EXAMINATION OF PREPARATION FOR DELIVERY

Examination	Defect
Fill	Not volume specified in contract or order
Packaging	Wrong size cans or kits Material or construction not as specified Components damaged or missing Unit package closure incomplete or damaged Not level required by contract or purchase order Base compound and accelerator not properly separated
Packing	Not level required by contract or purchase order Any nonconforming component, incomplete closures Bulged or damaged shipping containers
Count	Less than specified or indicated quantity per shipping container
Markings	Unit package and packing - Omitted, illegible, incorrect, incomplete or not in accordance with contract requirements

4.5 Tests.

4.5.1 Standard conditions. Unless otherwise specified herein, all mixing curing, and tests shall be performed at 77 ±2° F (25 ±1° C) and a relative humidity of 50 ±5 percent.

* 4.5.2 Mixing. The base compound and its curing agent, both in the original unopened containers, together with the required spatulas, beakers, and other mixing equipment shall be held at standard conditions (4.5.1) for a minimum of 16 hours. The base compound and curing agent shall then be thoroughly mixed in the proportions recommended by the manufacturer. Proper care should be taken to avoid incorporation of air by excessive stirring or folding action. Deaeration by centrifuge (1800 rpm for a maximum of 3 minutes) shall be used. The mixing operation shall be conducted at standard conditions (4.5.1).

4.5.3 Test specimens.

4.5.3.1 Preparation of parts. All molds, test panels and electric connectors shall be thoroughly cleaned with solvent cleaning compound conforming to MIL-C-38736, and wiped dry prior to any operation. Mold interiors and test panels shall, if necessary, be brush coated with the mixed compound to insure subsequent contact of the test compound with all surfaces.

* 4.5.3.2 Disc molds. Disc and other special shaped molds shall be constructed of polyethylene, a suitable metal coated with a silicone type varnish, or any composition that has a surface which will not transfer to the specimen. The mold shall be constructed in a manner that will permit easy release of the specimen. The mold shall be filled by slowly pouring or extruding the mixed compound into the cavity until a slight excess is obtained. The mold shall then be covered with a flat smooth surfaced metal plate and a pressure of approximately 2 pounds per square inch applied. Curing time shall be as specified in 4.5.4 and the applicable test method.

4.5.3.3 Panels. Sealing compound test panels shall be prepared and cured in accordance with 4.5.4 and the applicable test method.

* 4.5.3.4 Electric connector assemblies. Four connector assemblies equipped with diallyl phthalate or nylon inserts and four assemblies equipped with resilient inserts, conforming to the following shall be used:

Assembly #1 MS3103 Connector, receptacle
MS25183 Connector, plug

Assembly #2 Type MS3100 A22-18P Connector, receptacle
Type MS3106 A22-18S Connector, plug

12 inch lengths of polytetrafluoroethylene (PTFE) insulated wire conforming to MIL-W-22759/9 shall be chemically treated to provide a bondable surface, then soldered to each pin of the connector. Insulation resistance determinations are required before potting the wired assemblies (see 4.6.3.5). The mixed polysulfide shall be poured or extruded slowly into the connector until a slight excess is obtained. During all potting operations conformance to 3.3.1.2 shall be noted. Two of the four assemblies of each insert type shall be subjected to Cure A of 4.5.4.1. The remainder shall be subjected to Cure B. The cured potted connector assemblies shall be tested as specified in 4.6.3.5.

4.5.4 Curing of specimens.

4.5.4.1 Cure "A". All specimens shall be cured at 77 ±2° F (25 ±1°C) for the times indicated below.

Class 1 - 24 ±1/2 hours
Class 2 - 48 ±1/2 hours
Class 3 - 72 ±1/2 hours

Class I molded specimens shall be removed from the mold after 6 hours of cure has elapsed; Classes 2 and 3 after 24 hours. The polyethylene molds used in potting connectors shall also be removed at these times. The prescribed tests shall be initiated not later than 1 hour after completion of the applicable cure time.

4.5.4.2 Cure "B". Follow procedure of 4.5.4.1. Immediately following completion of cure "A", the specimens shall be transferred to an air circulating oven maintained at 158 ±2° F (70 ±1° C) for a period of 48 ±1/2 hours. Specimens from molds shall be placed on a flat plate. Mated connector assemblies and panels shall be placed on a metal screen. After the completion of cure "B", the specimens shall be removed from the oven and maintained at standard conditions (4.5.1) at least 2 hours but not more than 7 days before starting tests.

4.5.5 Finished specimens. The surfaces of molded and potted polysulfide specimens shall be clean, smooth, free from holes and bubbles, and all corners and edges shall be well defined.

4.6 Test methods.

4.6.1 Examination of product. The base compound and curing agent shall be examined for conformance to 3.3.1.1 and to requirements for which no test methods are specified herein.

4.6.2 Non-electric tests.

4.6.2.1 Application life. Initial viscosity and application time of Type I compounds shall be determined using a Model RVF Brookfield Viscometer equipped

with a No. 6 spindle and operated at 10 rpm. For Type II, the viscometer shall be equipped with a No. 7 spindle operated at 4 rpm.

* 4.6.2.1.1 Procedure. A quantity of the base compound and an appropriate amount of curing agent shall be mixed 5 minutes in a standard 1/2-pint can, approximately 2-3/4 inch diameter, or equivalent. The retaining flange of the can shall be removed. The mixed compound shall be of sufficient volumne to allow immersion of the spindle to its depth mark. Initial viscosity shall be determined immediately following the mix period. Application time determinations for Class 1 shall commence 20 minutes after the initial viscosity reading; for Classes 2 and 3, viscosity shall be determined after 50 and 110 minutes respectively (time counted from start of mix). Subsequent readings shall be made at 10 minute intervals until a value of 500 poises is obtained for Type I and 1800 poises for Type II compounds. The spindle shall remain immersed in the test compound for the duration of the test. Readings shall be taken after a minimum of 3 revolutions of the spindle.

4.6.2.2 Nonvolatile content. Five to ten grams of the mixed compound shall be transferred to a dish approximately 8 centimeters in diameter. The weight shall be determined to the nearest milligram. The compound shall be heated for twenty-four (24 +2, -0) hours at 158 ±2° F (70 ±1° C), transferred to a desiccator, cooled to standard conditions, and weighed to the nearest milligram. The percent nonvolatile content shall be calculated as follows:

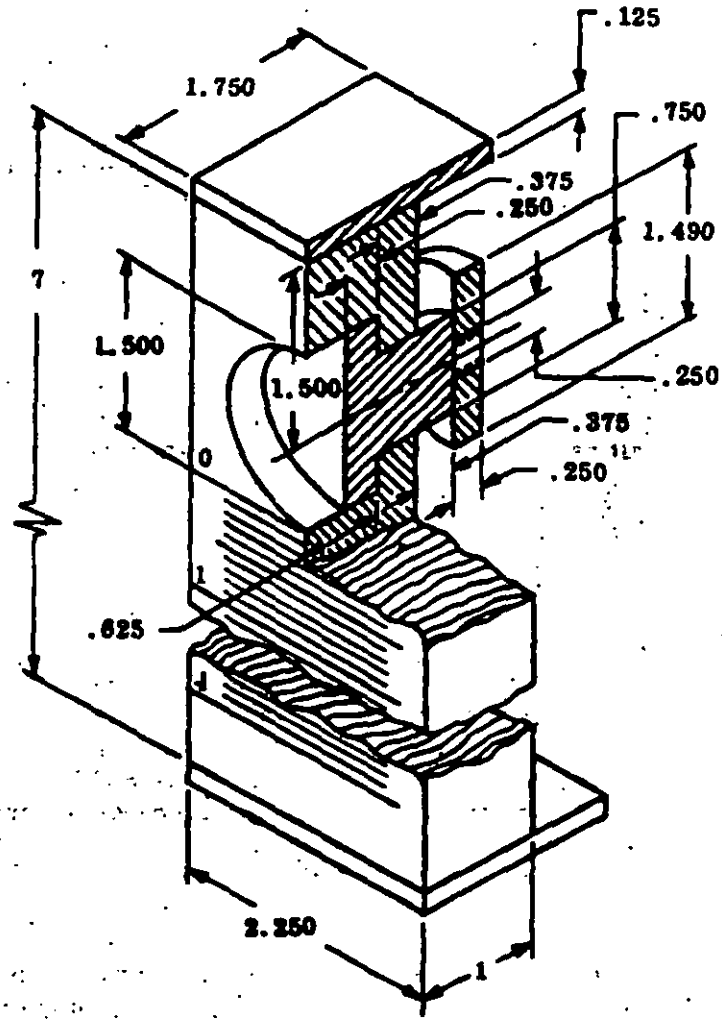
$$\text{Percent nonvolatile content} \quad \frac{\text{Final weight of base compound}}{\text{Initial weight of base compound}} \times 100$$

* 4.6.2.3 Set time. A flow test jig, conforming to Figure 1, shall be placed on a horizontal surface with the front face upward and the plunger depressed to the limit of its travel. A silicone mold release agent should be applied to the cavity side wall. 50 grams of base compound and appropriate curing agent shall be mixed thoroughly for 5 minutes. The mixed compound shall immediately be transferred to the cavity, leveled off to the face of the test jig and covered with polyethylene film (Thickness - 0.002 to 0.008 inch). Curing time shall be as follows:

Class 1 - 8 hours ±10 minutes
Class 2 - 8 hours ±10 minutes
Class 3 - 16 hours ± 10 minutes

After curing, the polyethylene film shall be removed, the test jig placed on its end, and the plunger advanced to the limit of its forward travel. Flow observations shall be made 5 minutes after the advancement of the plunger.

4.6.2.4 Shrinkage. A cubical mold, approximately 1.0 inch on each side and a suitable cover shall be constructed (4.5.3.2). The volume of the mold shall be determined at 77 ±2° F (25 ±1° C). The mixed compound shall be poured into the



MATERIAL: 4130 STEEL, CHROMIUM PLATED
DIMENSIONS IN INCHES.
TOLERANCES: DECIMALS ±.016

FIGURE 1. FLOW-TEST JIG

cavity as specified in 4.5.3.2, the cover set in place and then subjected to Cure A (4.5.4.1). Extreme care should be exercised when mixing to assure air free specimens. Immediately following the cure period, the specimen shall be placed in an air circulating oven for 48 hours at 185 ±2° F (85 ±1° C). The specimen shall then be removed from the oven, cooled, examined and its volume determined by water displacement, using an analytical balance or a jolly balance. The percent shrinkage shall be calculated as follows:

$$\text{Percent Shrinkage} = \frac{V_1 - V_2}{V_1} \times 100$$

where: V_1 = volume of mold
V_2 = final volume of cured specimen

4.6.2.5 Hardness. Two disc specimens, 3 inch diameter face dimension and 1/4 inch approximate thickness, shall be prepared in accordance with 4.5.3. One specimen shall be subjected to Cure A, the other to Cure B of 4.5.4. The specimens, after cure, shall be tested for 3-second hardness in accordance with Method 1082 of Fed. Test Method Std. No. 406, except that a Shore A-2 durometer shall be used.

4.6.2.6 Adhesion.

* 4.6.2.6.1 Preparation of test panels. The number and composition of panels to be coated shall be as specified in Table V. 1 by 6 inch sections of two strips of 1 by 12 inch cotton cloth conforming to CCC-C-419 shall be coated with the mixed compound and placed coated side down on the freshly prepared panel. The strips shall be placed so they are 0.25 inch from each lengthwise edge of the panel, and allowing a 6-inch uncoated cloth tail. When testing PTFE (Table V), the cotton cloth shall be replaced by the PTFE. An aluminum panel conforming to QQ-A-250/13 shall be used as the backing. The panels with the cloth or PTFE strips in place, shall then be subjected to the applicable cure in Table V.

4.6.2.6.2 Test of panels. The panels shall be individually tested in an autographic testing machine whose capacity shall be such that the tension at failure is not more than 85 percent nor less than 15 percent of the full scale load. If the machine is of the pendulum type, the weight shall swing as a free pendulum without engagement of the pawls. The rate of separation of the jaws shall be 2 inches per minute. Specimens shall be mounted in the machine so that the loose end of the cotton cloth strip will be folded 180 degrees as it is pulled from the panel. Each strip shall be pulled as follows: A cut through the sealant to the panel at the junction of separation shall be made at an angle of 45 degrees in the direction of separation. If the sealant separates from the cotton cloth, similar 45-degree cuts shall be made to promote separation of the sealant from the panel. A minimum of 5 cuts shall be made. The adhesion in pounds shall be automatically recorded on a chart as a continuous curve. The adhesion value shall be calculated by averaging maximum forces required to separate the sealant from the panel. If cohesive failure occurs, the adhesion value shall be reported as greater than the observed value.

TABLE V

TEST PANELS REQUIRED

Property	Test Para.	Panel Composition	Panel Specification	Panel Size, inch	Coating Thickness, inch 1/	Number of panels and cure procedure (4.5.4)
Adhesion	4.6.2.6	Aluminum Alloy Alclad	QQ-A-250/13	3 X 6 X 0.0625	0.125 ±0.030	1 panel - Cure A 1 panel - Cure B
		Chromated, Cadmium Plated Steel, Type II, Class 3	QQ-P-416	3 X 6 X 0.0625	0.125 ±0.030	1 panel - Cure A 1 panel - Cure B
		Diallyl Phthalate, Type MDG	MIL-M-	3 X 6 X 0.125	0.125 ±0.030	1 panel - Cure B
		Nylon	MIL-P-20693	1 X 6 X 0.125	0.125 ±0.030	1 panel - Cure B
		Polytetrafluoroethylene (PTFE) 3/	L-P-403	1 X 12 X 0.010	0.125 ± 0.030	1 panel - Cure A 1 panel - Cure B
Fluid Resistance	4.6.2.7	Aluminum Alloy Alclad	QQ-A-250/13	3 X 6 X 0.0625	0.25 ± 0.050	6 panels - Cure B
Low Temperature Flexibility 2/	4.6.2.8	Aluminum Alloy Alclad	QQ-A-250/13	1 X 6 X 0.032	0.058 ± 0.008	3 panels - Cure B

1/ Coating thickness after applicable cure.
2/ One inch at each lengthwise end of the panel shall not be coated.
3/ Prior to coating, the surface of the 0.010 skived polytetrafluoroethylene tape shall be chemically treated to provide a bondable surface.

4.6.2.7 Fluid resistance. Eight panels prepared and cured as specified in Table V and 4.6.2.6.1 shall be immersed, one in each of the fluids listed below. The duration of immersion in the fluids shall be 48 ±1 hours. The test temperature for fluid No. 8 shall be standard conditions (see 4.5.1). All other fluids shall be maintained at 140 ±2° F (60 ±1° C). Upon expiration of the test period each fluid shall be cooled to standard conditions (4.5.1). Each panel shall be tested for hardness (4.6.2.5) and adhesion (4.6.2.6.2) shall be determined on each panel within 10 minutes after removal from the fluid.

Fluid No.	Immersion fluids
1	Hydrocarbon test fluid, TT-S-735, Type III
2	Hydraulic fluid, MIL-H-5606
3	Lubricating oil, MIL-L-7808
4	Lubricating oil, MIL-L-23699
5	3 percent aqueous sodium chloride, SS-S-550
6	Distilled water
7	Isopropyl alchol
8	JP-4 fuel, MIL-T-5624

4.6.2.8 Low temperature flexibility. Three test panels shall be prepared in accordance with the applicable section of Table V and footnote 2/ to that table. The panels shall be inserted into a flexibility jig (Figures 2 and 3), so that the uncoated side of the panel will contact the contour block and the weight will contact only the uncoated end of the panel. The entire assembly shall be conditioned at -60 ±2° F (-51 ± 1° C) for 4 hours. After this period, and while still at the low temperature, the fastening hook on the jig shall be released causing the panels to bend around the curved portion of the assembly. The panels shall immediately be removed from the assembly and examined for conformance to the requirement in Table I.

4.6.2.9 Accelerated storage. A 1-quart sample of the base compound and an appropriate amount of curing agent, packaged in accordance with Section 5 of this specification, shall be conditioned 14 days at 120 ±2° F (49 ±1° C). The components shall conform to 3.3.1.5.

* 4.6.2.10 Corrosion. Prepare three 1.5 inch lengths of copper wire AWG Size 10 conforming to J-C-30, by removing all insulation and cleaning with a degreasing agent. Encapsulate two wire specimens centrally into a suitable mold 1 by 2 by 0.5 inch thick. A previously cured section of the same polysulfide compound undergoing test shall be placed in the mold as a support for the wires (see Figure 4). The mixed compound, prepared in accordance with 4.5.2 shall be subjected to Cure A (4.5.4.2). The third wire (control) shall also be subjected to the Cure A condition. The test specimens shall be placed on end, in a humidity chamber, so that the encapsulated wires are in a vertical position. The control wire

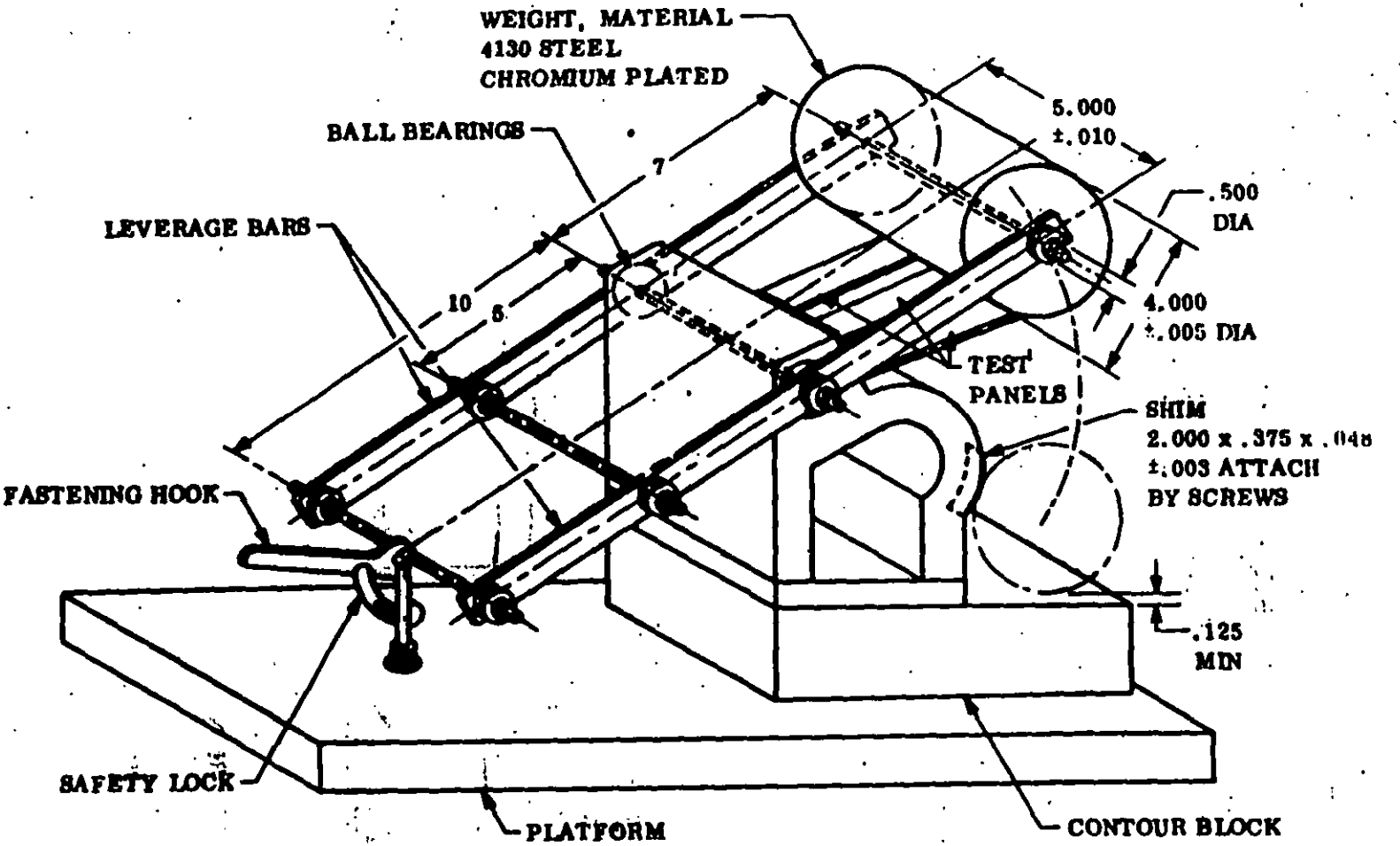


FIGURE 2. LOW TEMPERATURE FLEXIBILITY APPARATUS

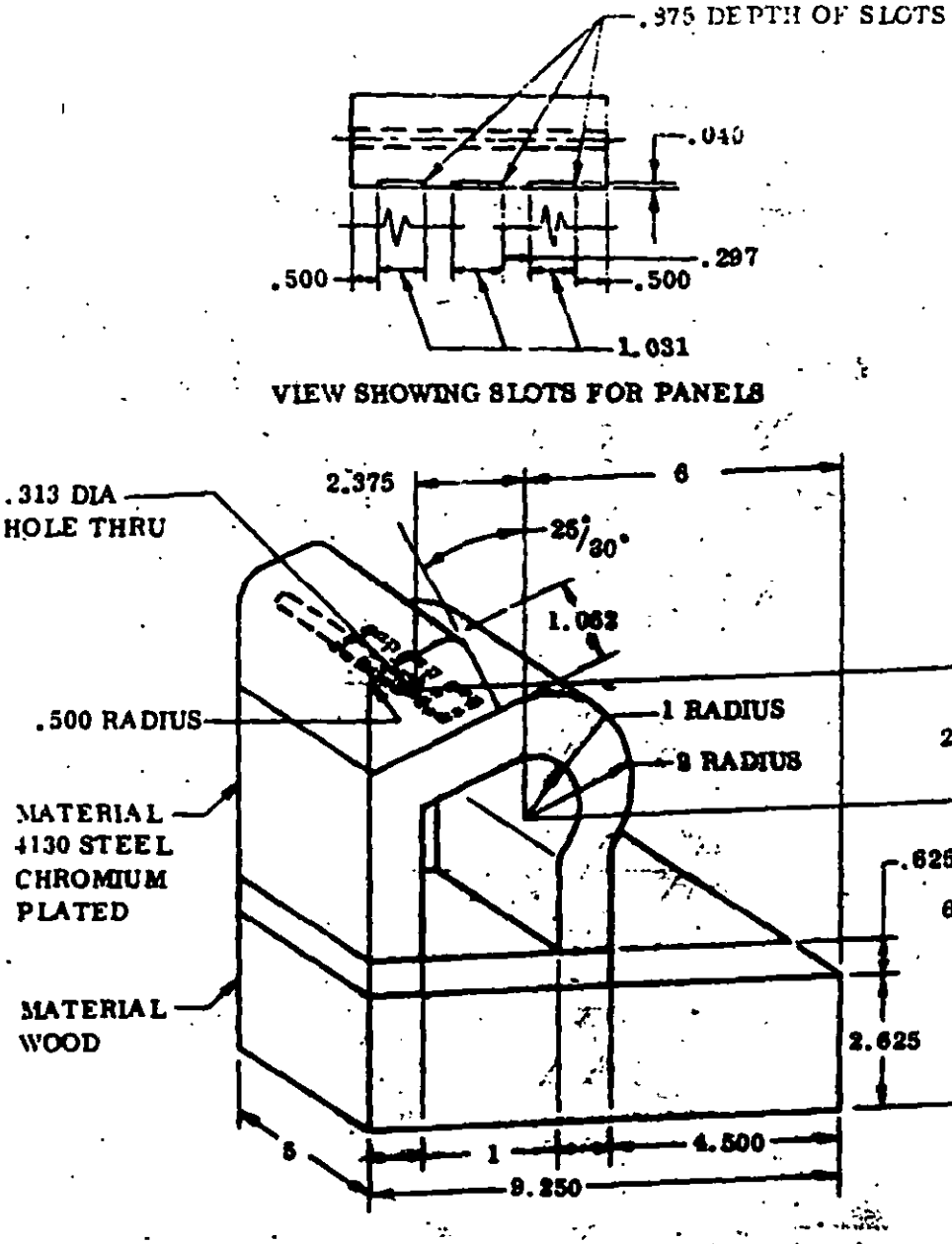
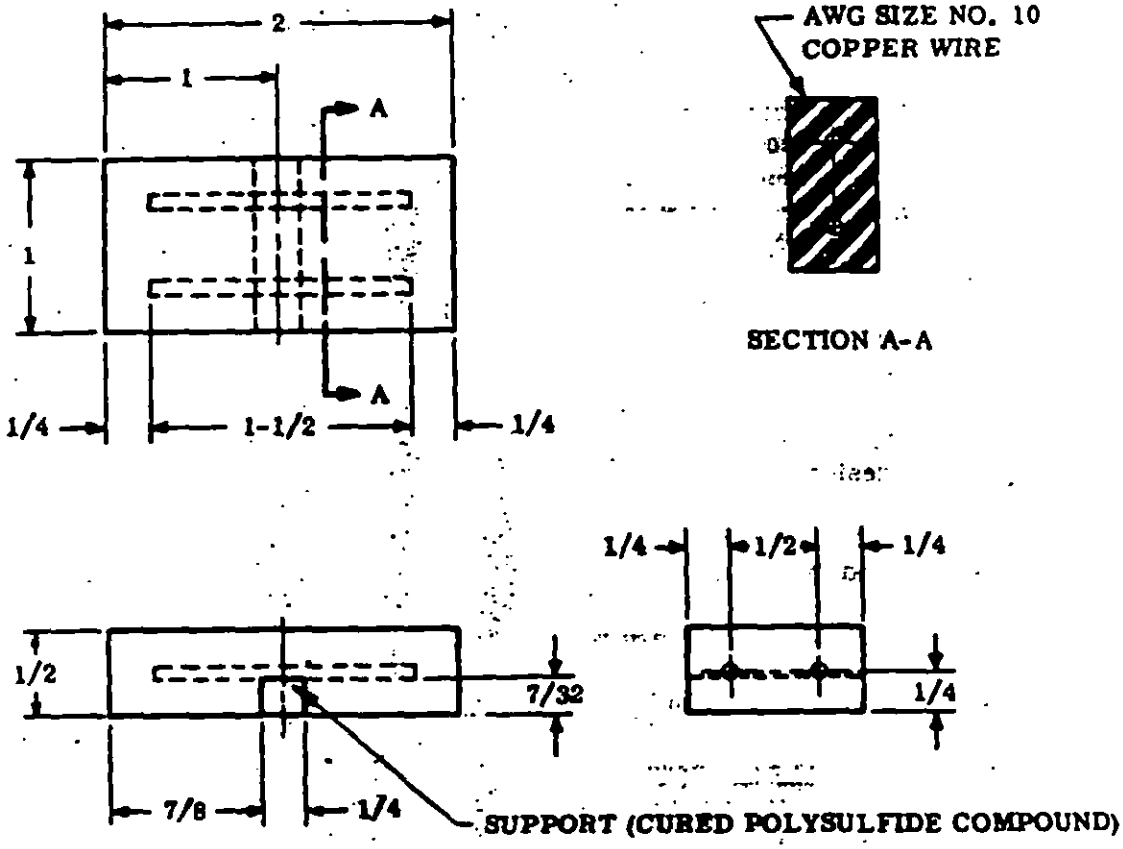


FIGURE 3. CONTOUR BLOCK



UNLESS OTHERWISE SPECIFIED, DIMENSIONS IN INCHES.

FIGURE 1. LOCATION OF THE WIRE SPECIMENS IN THE POLYSULFIDE CASTING

also shall be held in a vertical position by inserting one end into a pre-drilled polytetrafluoroethylene or polyethylene slab. The wires shall then be subjected to a 95 to 98 percent relative humidity at 120 ±2° F (49 ±1° C) for 28 days. At the end of this period the mold shall be slit open and the encapsulated wire compared with the control for compliance with the requirement in Table I.

4.6.2.11 Hydrolytic stability, physical.

4.6.2.11.1 Specimen preparation. Sufficient base compound and curing agent shall be mixed (4.5.2) to prepare 3 test specimens, 2-1/2 inch in diameter by 1/2 inch thick. Each specimen shall be subjected to Cure B of 4.5.4. Hardness shall be determined using a Type A Shore Durometer in accordance with Test Method 1082 of Fed. Test Method Std. No. 406 after 3-second application time. Hardness shall be determined at the same locations, before and after exposure.

4.6.2.11.2 Procedure. After determining hardness before exposure, the specimens shall be placed vertically on a tray in a suitable glass desiccator. The desiccator shall contain a glycerine (22 percent by weight) in water solution, in the bottom, which shall produce a relative humidity (RH) of 95 percent at the test temperature. The desiccator, containing the specimens, shall then be closed and inserted into an air circulating oven maintained at 160 ±2° F (71 ±1° C) for a period of 30 days ± 4 hours. At the end of the exposure period, the desiccator shall be removed from the oven and cooled to standard conditions (4.5.1) for 16 to 24 hours. Hardness shall be determined as specified in 4.6.2.11.1 and the obtained values for each specimen shall be in accordance with the requirement in Table I.

4.6.3 Electrical tests.

4.6.3.1 Arc resistance. Arc resistance shall be determined in accordance with Method 4011 of Fed. Test Method Std. No. 406. Test specimens shall be prepared as specified in Table VI and 4.5.3.2. The specimens shall be smooth and free from dust.

4.6.3.2 Dielectric strength. Test specimens shall be prepared as specified in Table VI and 4.5.3.2. Dielectric strength determinations shall be made in accordance with Method 4031 of Fed. Test Method Std. No. 406. Electrodes 1/4 inch in diameter shall be used and the tests shall be made under oil at a frequency not exceeding 100 cycles per second (CPS). The voltage shall be increased uniformly at the rate of 500 volts per second.

4.6.3.3 Dielectric constant and dissipation factor. Test specimens shall be prepared and cured as specified in Table VI and 4.5.3.2. Tests shall be conducted in accordance with Method 4021 of Fed. Test Method Std. No. 406. Lead or tin foil electrodes shall be used and applied to the specimen with a thin film of silicone conforming to MIL-S-8660 or equivalent. The electrodes shall consist of two lead or tin foil disks, one of the same diameter as the specimen and the other 2 inches in

diameter, centrally located on the opposite face of the specimen. The test current shall be introduced to the foil through two brass discs. The upper disc shall be 2 inches in diameter by 1 inch in thickness, and the lower disc shall be 4 inches in diameter. Cure A specimens shall be tested at frequencies of 1 Kilocycle and 1 Megacycle at a temperature of 77 ±2° F (25 ±1° C). Cure B specimens shall be tested at frequencies of 1 Kilocycle and 1 Megacycle at temperatures of 77 ±2° F (25 ±1°C) and 185 ±2°F (85 ±1° C). Calculation shall include corrections for edge and ground capacitance.

TABLE VI

DISC SPECIMENS

Property	Test Para. No.	Disc Size (inch)		Number of Discs	Cure Procedure (4.5.4)
		Diameter	Thickness		
Arc Resistance	4.6.3.1	4	0.125	1	Cure A
		4	0.125	1	Cure B
Dielectric Strength	4.6.3.2	4	0.125	1	Cure A
		4	0.125	1	Cure B
Dielectric Constant & Dissipation Factor	4.6.3.3	4	0.125	3	Cure A
		4	0.125	3	Cure B
Volume & Surface Resistivity	4.6.3.4	4	0.125	3	Cure A
		4	0.125	3	Cure B

4.6.3.4 Volume and surface resistivity. Disc specimens shall be prepared as specified in Table VI and 4.5.3.2. Resistivity tests shall be conducted in accordance with Method No. 4041 of Fed. Test Method Std. No. 406, using a General Radio Type 544B bridge or equivalent instrument with a test voltage of 500 volts. Readings shall be made 1 minute after application of current. Lead or tin foil electrodes shall be a disc, 2 inches in diameter, centrally located on one face of the specimen. The guard electrode shall be a concentric ring of 2.281 inches inside diameter and with an outside diameter equal to that of the specimen. The unguarded electrode shall be a foil disc 4 inches in diameter applied to the opposite side of the specimen. The test current shall be introduced to the guarded electrode, the guard electrode, and the unguarded electrode by means of a brass disc 2 inches in diameter by 1 inch in thickness, a brass ring 2.313 inches inside diameter by 4 inches outside diameter by 0.125 inch thick, and a brass disc 4 inches in diameter, respectively. Calculations

necessary for volume and surface resistivity shall be made using Method No. 4041 of Fed. Test Method Std. No. 406. Each specimen shall meet the minimum requirement of Table II.

4.6.3.5 Insulation resistance. Insulation resistance shall be determined on the wired, unpotted assemblies. Unpotted assemblies which exhibit less than 10,000 megohm resistance shall be discarded. If this is not practicable, footnote 2/ to Table II shall apply. All connector assemblies potted as specified in 4.5.3.4, regardless of cure procedure, shall undergo insulation resistance testing, "as received", after thermal shock (4.6.3.6), and after hydrolytic stability (4.6.3.7).

4.6.3.5.1 Procedure. Insulation resistance of each assembly shall be determined by a megohm bridge using a potential of approximately 500 volts. Electrification time shall not exceed 1 minute. Tests shall be conducted at 77 ±2° F (25 ±1° C). Two sets of readings shall be taken. The first set shall be between the shell and contacts A, E and G; the second set shall be made between contacts L to P and M to N. The average value of each set of readings shall be reported independently. No single value within each set shall be less than the minimum specified value of Table II. When a single value deviates from the average values by more than 50 percent, additional determinations shall be made for each set as follows:

First set readings between the shell and contacts B, C, D, H, J and K

Second set readings between contacts B to C, D to E, G to H, and J to K

The average of all values within each set shall then be reported.

4.6.3.6 Thermal shock. Connector assemblies used for insulation resistance with an "O" ring seal conforming to MIL-P-6315, or equivalent, placed over the barrel of the plug to seal the void between insert surfaces, shall be thermally cycled as follows:

start - 45 minutes in chamber at 185 ±5° F (85 ±1° C)
45 minutes in chamber at -67 ±2° F (-55 ±1° C)

One chamber for each temperature shall be used. The time required to effect transfer of the assemblies shall be no more than 3 minutes. This procedure shall be repeated a total of 5 cycles at each temperature. After the last cycle, insulation resistance shall be determined as specified in 4.6.3.5.1.

4.6.3.7 Hydrolytic stability, electrical. The mated connector assemblies tested as specified in 4.6.3.6 shall be tested for hydrolytic stability. The assemblies shall be placed in a humidity test chamber of the type described in 4.6.2.11.2.

The ends of the wire leads shall be sealed by wrapping with a glass filament-polyester insulation tape, or equivalent. The assemblies shall be exposed to a relative humidity (RH) of 95 percent at 160 ±2° F (71 ±1° C) for 30 days ± 4 hours. After exposure, the entire test chamber shall be removed from the heat source and cooled to room temperature for 16 to 24 hours before testing for insulation resistance as specified in 4.6.3.5.1. Aluminum foil shall be wrapped around the exposed compound when the assembly is not in the humidity chamber.

4.6.3.8 High potential resistance. Connector assemblies tested in 4.6.3.7 shall be tested for high potential resistance. A potential of 1500 volts root mean square (RMS), 60 cycles, shall be applied between all contacts and the shell for a period of one minute. The test voltage shall be applied at the rate of approximately 500 volts per second until the specified voltage is reached.

* 4.6.3.9 Air leakage. Diallyl phthalate or nylon, insert potted plugs tested in 4.6.3.8 shall be subjected to a pressure differential of 30 pounds per square inch (psi) while totally submerged in water for the time and temperature specified below:

Temperature	Time
Room Temperature	1 hour
185 ±2° F (85 ±1° C)	1 hour

Air leakage shall be measured after each hour by fluid displacement method.

4.6.3.10 Overload of wire. A cylindrical test specimen 1-1/2 inches long by 1/2 inch diameter shall be prepared. Centered within and along the lengthwise axis of the specimen shall be a 12 inch length of insulated wire (size 16) conforming to MIL-W-22759/9. The lengthwise axis of the specimen shall be centered on the wire. The test specimen shall then be held taut in a horizontal position and 55 amperes of direct current applied for a period of 2-1/2 minutes. The specimen shall meet the requirement of Table II.

5. PREPARATION FOR DELIVERY

5.1 Packaging. Packaging shall be Level A or C as specified (see 6.2).

5.1.1 Level A.

5.1.1.1 Kits. The sealing compound and curing agent shall be supplied in kit form as follows:

Kit No.	Size of Container	Paragraph
1	1-gallon	5.1.1.2.1
2	1/2-gallon	5.1.1.2.1

Kit No.	Size of Container	Paragraph
3	1-quart	5.1.1.2.1
4	1/2-pint	5.1.1.2.2
5	6-fluid ounce	5.1.1.2.3
6	2-1/2-fluid ounce	5.1.1.2.3

Unless otherwise specified, the base compound and the curing agent shall be packaged in individual containers. Each curing agent container shall be packaged with one base compound container with a suitable separator between the two containers, in a manner which will prevent accidental separation but which will permit easy separation for mixing purposes. The ratio of the quantity contained in the base compound container to the quantity contained in the attached curing agent container shall be the same as the manufacturer's recommended mixing ratio of the base compound and curing agent.

5.1.1.2 Kit description.

5.1.1.2.1 Kit Nos. 1, 2 and 3. The base compound shall be furnished in 1 quart, 1/2 or 1-gallon cans conforming to Type V, Class 2 or PPP-C-96. Terneplate cans shall not be used. The amount of base compound contained in each can shall fill the container to three-fourths of its capacity. The appropriate amount of curing agent shall be furnished in light resistant glass or plastic jars having vertical smooth inside walls, with projections or lips not exceeding 1/16 inch. The inside bottom shall be approximately horizontal. The glass jars shall have one rolled thread such that the cup will turn a minimum of 1/4 revolution to fully secure. The jars shall be provided with enameled metal or plastic screw type caps which will not adversely affect the curing agent. Jars shall be cushioned as necessary to protect against breakage.

5.1.1.2.2 Kit No. 4. The base compound shall be furnished in 1/2-pint cans containing 6 ±0.5 fluid ounces. The curing agent shall be furnished in 1 ounce light resistant glass jars or plastic containers with inside bottom concave and without corners. The caps of the glass jars shall be externally sealed at the lip with a cellulosic type band or cellulose acetate pressure sensitive adhesive tape with the tape overlapping 1/2 inch (see 6.2). Each kit shall contain one Group B, Class 1, aluminum applicator tube conforming to PPP-C-186, opened at one end and having a nozzle at the other end, and closed with a screw-type cap. The nozzle shall be 31/32 to 1-1/32 inches in length and shall have an orifice with a diameter of 0.300 to 0.325 inch. The overall length, including cap, shall be not less than 6-7/8 inches. The tube diameter shall be 2 inches. Each tube shall be supplied with one winding key for use in extruding the mixed compound from the tube. In each kit shall be included one wooden mixing spatula, having one corner rounded to a curvature equal to or slightly greater than that of the bottom of the curing agent container. Contents shall be placed in a folding carton conforming to PPP-B-566, a set up box conforming to PPP-B-676, or a mailing tube conforming to PPP-T-495.

5.1.1.2.3 Kits No. 5 and 6 - sectional-type cartridge. The base compound and curing agent shall be furnished in high density polyethylene sectional-type cartridges, Type I or II, Size A or B of MIL-P-38714 as specified by the procuring activity. The total volume content of base compound and curing agent in each sectional-type container shall be as follows:

Container Size	Total Content Base & Curing Agent	Volume Tolerance
A	3-1/2-fluid ounces	±1/8 fluid ounce
B	2-fluid ounces	±1/8 fluid ounce

5.1.1.3 Level C. The base compound and curing agent shall be packaged in accordance with the manufacturer's commercial practice.

5.2 Packing. Packing shall be Level A, B, or C as specified (see 6.2).

5.2.1 Level A. Base compound and curing agent packaged in accordance with 5.1.1 shall be packed in overseas exterior type containers conforming to PPP-B-585, PPP-B-601, PPP-B-621, or PPP-B-636, as specified (see 6.2). Weight of contents shall conform to the weight limitations of the applicable box specification and shall not exceed 200 pounds. Plywood shall conform to NN-P-530, Standard Grade with exterior glue of U.S. Product Standard PSI-66 showing the grade stamp of an approved testing agency and surface treated in accordance with TT-W-572. Containers shall be of uniform size and designed in such a manner to enclose the contents in a tight fitting manner. Each shipping container shall contain the same number of the type of unit packages procured (see 6.2). All shipping containers shall be closed and sealed in accordance with the appendix of the applicable specification.

5.2.2 Level B. The base compound and curing agent packaged as specified in 5.1.1 shall be packed as specified in 5.2.1, except that shipping containers shall be domestic type or class, as applicable.

5.2.3 Level C. Base compound and curing agent packaged as specified in 5.1 shall be packed to afford protection against damage during direct shipments from source of supply to the first receiving activity for immediate use. Containers shall comply with the carrier rules and regulations applicable to the mode of transportation.

5.3 Marking.

5.3.1 Packaging.

5.3.1.1 Component packages. All component packages shall be marked as required in the Code of Federal Regulations, 49 CFR 171-178.

5.3.1.2 Base compound container. Each base compound container shall be durably and legibly marked in accordance with MIL-STD-129 and include the following information:

SEALING COMPOUND, POLYSULFIDE RUBBER, ELECTRIC CONNECTORS AND ELECTRIC SYSTEMS, CHEMICALLY CURED
MIL-S-8516E
Type
Class
Date of Manufacture
Date of Packaging
Manufacturer's name, address, and product designation
Batch Number
Contract No.
Federal stock number

5.3.1.3 Curing agent container. Each curing agent container marking shall include the following:

Curing Agent for (insert product designation and batch number of base compound.)
Date of manufacture
Date of packaging

5.3.1.4 Sectional cartridge kit. The marking of Kit No's 5 and 6 shall include the information required in 5.3.1.

5.3.2 Exterior markings. Each exterior shipping container shall be marked as required in 5.3.1.1, 5.3.1.3 and in accordance with MIL-STD-129.

5.3.3 Mixing instructions. The manufacturer shall include in each unit package complete mixing instructions for the sealing compound and curing agent.

6. NOTES

6.1 Intended use. The cured polysulfide sealing compound is intended for use as a reinforcing and protecting medium for electric connectors and other related applications within the electric systems. Used within its operating temperature range (-60 to 200° F), the cured compound acts as a deterrent to fatigue, corrosion, contamination, and aids in reducing arc-over between pins of an electric connector.

6.1.1 Type I material is intended for use with electrical connectors, relays and switches. Type I material should not be used in coaxial cable potting operations.

6.2 Ordering data. Procurement documents should specify the following:

(a) Title, number and date of this specification

(b) Type and class required (see 1.2)

(c) Quantity required and kit size

(d) Level of packaging and packing required (see Section 5)

(e) Special markings required

(f) Additional requirements, if applicable (e.g. color)

6.3 Qualification. With respect to products requiring qualification, awards will be made only for products which are at the time set for openings of bids, qualified for inclusion in the applicable Qualified Products List whether or not such products have been so listed by that date. The attention of 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. The activity responsible for the Qualified Products List is the Naval Air Systems Command, Washington, D. C. 20360; however, information pertaining to qualification of products may be obtained from the Naval Air Development Center, Warminster, Pa. 18974, Attention: Director, Aero Materials Department.

6.4 Curing Time. The time and temperature specified as the cure time in 1.2.2 and 4.5.4 are for laboratory preparations. These conditions may be considered as the optimum for curing each class of compound. In actual field use, the curing cycle will be affected by changes in temperature and/or humidity.

6.5 Toxicity. The insulating and sealing compound shall have no adverse effect on the health of personnel when used for its intended purpose. Questions pertinent to this effect shall be referred by the procuring activity to the appropriate department medical service who will act as an adviser to the preparing activity.

6.6 Supersedure data. Mil-S-8516E supersedes MIL-S-008516D(AS), dated 7 November 1969, and MIL-S-8516C, dated 26 October 1960.

6.6.1 Cross-reference. Cross reference information is as follows:

(a) Type I and II, Class 0 of MIL-S-008516D(AS) are not included in MIL-S-8516E

(b) Type I, Classes 1, 2, and 3 were included as new compounds in MIL-S-008516D(AS) and are equivalent in MIL-S-8516E

(c) Type II, Classes 1, 2 and 3 of MIL-S-8516E are equivalent to those in MIL-S-008516D(AS) and are also equivalent to the slow, medium and fast cure compounds of MIL-S-8516C.

6.7 Instructions for qualification re-evaluation. It shall be the responsibility of the supplier to furnish the Qualifying Activity (see 6.3), at two (2) year intervals, test data certified by a government inspector, for all qualified products. The data should be complete test results from a current production sample which has been tested against all the requirements of this specification (see 4.3.3). The qualifying activity at its option, may accept test records of current production to the extent those tests agree with the test procedures of MIL-S-8516. In the event the re-evaluation date has passed and the supplier is not in production of the polysulfide compound, the supplier shall still be eligible for contracts. However, final acceptance of material shall be contingent upon the supplier furnishing data which show the material meets all the requirements of this specification.

6.8 Changes from previous issue. The outside margins of this document have been marked "a" to indicate where changes (deletions, additions, etc.) from the previous issue have been made. This has been 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 as written irrespective of the marginal notations and relationship to the last previous issue.

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