NOT MEASUREMENT SENSITIVE

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SUPERSEDING
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PERFORMANCE SPECIFICATION

SEALING COMPOUND (WITH ACCELERATOR), SILICONE RUBBER, ELECTRICAL

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 requirements for electrical silicone rubber sealing compounds that are not resistant to fuel. These compounds are intended for use in the temperature range of -62 to +204°C (-80 to +400°F).

1.2 Classification. The sealing compound is furnished in the following types, classes and grades, as specified (see 6.2):

1.2.1 Type. The sealing compound is classified by viscosity of the base compound as follows:
Type I - Low viscosity
Type II - Intermediate viscosity
Type III - High viscosity

1.2.2 Class. The sealing compound is classified as follows:
Class 1 - Fast cure (room temperature 25° ±1°C [77° ±2°F])
Class 2 - Medium cure (room temperature 25° ±1°C [77° ±2°F])
Class 3 - Slow cure (room temperature 25° ±1°C [77° ±2°F])
Class 4 - Elevated temperature cure 80° ±1°C (175° ±2°F)

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Naval Air Warfare Center Aircraft Division, Code 414100B120-3, Highway 547, Lakehurst, NJ 08733-5100, by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A FSC 8030

1.2.3 Grade. The sealing compound is furnished in the following grades:

Grade A - Condensation cure
Grade B1 - ersion resistant, condensation cure
Grade B2 - ersion resistant, addition cure

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 of this specification. This section does not include documents cited in the other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements documents cited in sections 3 and 4 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DoDISS) and supplement thereto, cited in the solicitation (see 6.2).

SPECIFICATIONS

FEDERAL

QQ-A-250/13	-	Aluminum Alloy Alclad 7075, Plate and Sheet
TT-E-751	-	Ethyl Acetate, Technical
TT-I-735	-	Isopropyl Alcohol
TT-N-97	-	Naphtha, Aromatic

DEPARTMENT OF DEFENSE

MIL-P-38714	-	Packaging and Packing of Two-component Materials in Semkits
MIL-C-38736	-	Cleaning Compound, Solvent Mixtures, for use in Integral Fuel Tanks

(Unless otherwise indicated, copies of specifications, standards and handbooks are available from the DoDSSP - Customer Service, Standardization Documents Order Desk, 700 Robbins Avenue, Bldg. 4D, Philadelphia, PA 19111-5094.)

2.3 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DoD adopted are those listed in the issue of the DoDISS cited in the solicitation. Unless otherwise

specified, the issues of documents not listed in the DoDISS are the issues of the documents cited in the solicitation (see 6.2).

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM-D149	-	Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies, Standard Test Method for (DoD Adopted)
ASTM-D150	-	AC Loss Characteristics and Permittivity (Dielectric Constant) of Solid Electrical Insulation, Standard Test Method for (DoD Adopted)
ASTM-D257	-	DC Resistance or Conductance of Insulating Materials, Standard Test Method for (DoD Adopted)
ASTM-D412	-	Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers - Tension, Standard Test Method for (DoD Adopted)
ASTM-D471	-	Rubber Property - Effect of Liquids, Standard Test Method for
ASTM-D495	-	High-Voltage, Low-Current, Dry Arc Resistance of Solid Electrical Insulation, Standard Test Method for (DoD Adopted)
ASTM-D740	-	Methyl Ethyl Ketone, Standard Specification for (DoD Adopted)
ASTM-D746	-	Brittleness Temperature of Plastics and Elastomers by Impact, Standard Test Method for (DoD Adopted)
ASTM-D2240	-	Rubber Property - Durometer Hardness, Standard Test Method for (DoD Adopted)

(Application for copies should be addressed to the American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohoken, PA 19428-2959.)

2.4 Order of precedence. In the event of a conflict between the text of this document and the references cited herein the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Qualification. The sealing compound, along with the curing agent and primer, when required, furnished under this specification shall be products that are authorized by the qualifying activity for listing on the applicable qualified products list before contract award (see 4.2 and 6.4).

3.2 Materials. The sealing compound shall be based on polysiloxane polymer and shall require a separate curing agent. Classes 1, 2, and 3 shall cure at room temperature. Class 4 shall be cured at elevated temperatures only.

3.2.1 Primer (Classes 1, 2, and 3). When required, the manufacturer shall recommend a primer to be used in all adhesion and repairability tests. Class 4 materials do not require a primer.

3.3 Physical properties.

3.3.1 Properties before cure.

3.3.1.1 Appearance. The base compound and curing agent shall be uniform and free of skin, jelled or coarse particles. There shall be no separation of components that cannot be dispersed by mechanical agitation or hand mixing. The sealing compound shall be furnished in the as-manufactured color.

3.3.1.2 Nonvolatile content. The nonvolatile content of each type mixed sealing compound shall be not less than 98 percent when tested as specified in 4.7.2.

3.3.1.3 Viscosity, based compound. Viscosity of the base compound, in poises, when tested as specified in 4.7.3, shall be as follows:

Type I - 200, maximum
Type II - 200 to 2,000
Type III - 5,000 to 20,000

3.3.1.4 Pot life. When tested as specified in 4.7.4.1, pot life shall be as follows.

Class 1 - 15 to 45 minutes
Class 2 - 1 to 3 hours
Class 3 - 3 to 7 hours
Class 4 - 8 hours, minimum (Grade B-2)

3.3.1.5 Application time Grade B-2 (classes 1, 2, and 3) only. Application time shall be determined by a viscometer in accordance with 4.7.4.2. The viscosity at the end of the rated application time shall be as follows:

Type I - 400 poises, maximum, after 45 minutes.
Type II - 2,000 poises, maximum, after 1.5 hours.

3.3.2 Properties after cure.

3.3.2.1 Physical properties. Physical properties of the cured sealing compound shall be as specified in table I.

3.3.2.2 Corrosion. The encapsulated wire shall not exhibit more corrosion than the corrosion on the control wire, when tested as specified in 4.7.16.

3.3.2.3 Reversion (deep section cured) resistance (Grades B1 and B2). Reversion resistance shall consist of a deep section cure, followed by heat aging. The as-cured hardness, when determined in accordance with 4.7.17, shall be not more than 5 points less than the as-received

value from 4.7.5. After heat aging, the hardness shall not decrease by more than 7 points from the deep section cure hardness.

3.3.2.4 Storage life. After being stored as specified in 4.7.18, the viscosity of the base compound shall not exceed by more than 30 percent the as-received viscosity, and cured specimens made from the stored compound shall exhibit a hardness within ±5 points of the as-received hardness.

TABLE I. Physical properties after cure.

Characteristics	Requirements by type			Test paragraph
	I	II	III	
Hardness, points, minimum:				
Class 1	40	45	45	
Class 2	35	30	45	4.7.5
Class 3	40	45	45	
Class 4	35	50	--	
Tensile strength, psi, minimum				
Classes 1,2, and 3	250	325	400	4.7.6
Class 4	150	600	---	
Elongation, percent (%), minimum				
Classes 1,2, and 3	100	100	100	4.7.6
Class 4	70	150	---	
Linear shrinkage, %, maximum				4.7.7
Classes 1,2, and 3	1.0	1.0	1.0	
Class 4	2.5	2.0	---	
Specific gravity, maximum	1.50			4.7.8
Brittle point, °F, maximum	-90°			4.7.9
Adhesion, pounds, minimum	4			4.7.10
Hydrolytic stability: Hardness after exposure, points, minimum	30			4.7.12
Water immersion 72 hours at 60°C, change in:				
Weight, %, maximum	±2			4.7.13
Volume, %, maximum	±3			
Hardness, points, maximum	–10			

TABLE I. Physical properties after cure. - Continued.

Characteristics	Requirements by type			Test paragraph
	I	II	III	
Oil immersion 72 hours at 100°C, change in:				
Weight, %, maximum		+5		
Volume, %, maximum		+10		
Hardness, points, maximum		-10		4.7.14
Tensile strength, %, maximum		-25		
Elongation, % from original, % maximum		-25		
Heat aging 72 hours at 204°C:				
Adhesion, pounds, minimum		4		
Change in:				
Hardness, points, maximum		±10		4.7.15
Tensile strength, %, maximum		-25		
Elongation, % from original, %, maximum		-25		

3.3.2.4.1 Shelf life extension (for field use). The field storage life of these compounds may be extended an additional 3 months providing the requirements specified in 3.3.2.4 are met. The method of examination shall be as specified in 4.7.18.1. Material may be tested again after 3 more months storage. If acceptable, extend the storage period an additional 3 months.

3.3.2.5 Electrical properties. The electrical properties of the cured sealing compound shall conform to the requirements in table II.

3.4 Unit of issue. In order to interface with existing equipment and meet the required storage characteristics, the sealing compound unit of issue shall be in kits as follows:

a. 1 pint and 1 gallon kits - Base compound filled to 75 percent by volume in multiple friction top 1 pint or 1 gallon metal containers with the appropriate amount of curing agent in smooth, vertical, glass lined or plastic lined jars with screw cap (to facilitate removal of the curing agent).

b. 2½ ounce and 6 ounce sectional type (see 6.7) kits - The total content (base compound and curing agent) shall be 2 fluid ounces in the 2½ and 3½ fluid ounces in the 6 ounce sectional type container. The volume tolerance shall be ±1/8 fluid ounce.

c. 5 gallon kit - The base compound shall be supplied in 5 gallon metal containers with sealed crimped lids. Appropriate amounts of curing agent shall be in multiple friction top metal containers. Appropriate amounts of the supplier recommended primer shall be furnished in containers compatible with the primer. 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 recommended mixing ratio of the base compound and curing agent.

TABLE II. Electrical properties of cured silicone rubber compounds.

Test	Type I		Type II		Type III		Test Para.
	Grade		Grade		Grade		
	A	B1 & B2	A	B1 & B2	A	B1 & B2	
Dielectric strength Volts/mil, minimum	400	400	400	400	400	400	4.7.19
Volume resistivity: 1/							4.7.20
OHM-CM, minimum at 23° ±1.1°C (73.4° ±2°F)	2×10^{14}	5×10^{13}	1×10^{14}	3×10^{13}	1×10^{14}	2×10^{14}	
OHM-CM, minimum at 149° ±1.1°C (300° ±2°F)	2×10^{12}	5×10^{11}	1×10^{13}	5×10^{11}	2×10^{12}	2×10^{12}	
Surface resistivity: 1/							4.7.20
OHM-CM, minimum at 23° ±1.1°C (73.4° ±2°F)	2×10^{14}	2×10^{14}	2×10^{14}	2×10^{14}	2×10^{14}	2×10^{14}	
OHM-CM, minimum at 149° ±1.1°C (300° ±2°F)	2×10^{14}	2×10^{14}	2×10^{14}	2×10^{14}	2×10^{14}	2×10^{14}	
Dielectric constant:							4.7.21
1 kilohertz, maximum	4.5	4.5	4.5	4.5	4.5	4.5	
1 megahertz, maximum	4.5	4.5	4.5	4.5	4.5	4.5	
Dissipation factor							4.7.21
1 kilohertz, maximum	0.020	0.020	0.020	0.020	0.020	0.020	
1 megahertz, maximum	0.010	0.010	0.010	0.010	0.010	0.010	
Arc resistance, seconds, minimum	100	100	100	100	100	100	4.7.22

1/ Median values shall be recorded.

3.5 Instructions for use. The supplier of the sealing compound shall furnish with each shipment, two copies of complete instructions for use which shall contain:

a. Storage procedures indicating optimum storage temperature and conditions of storage.
b. Types of catalyst, accelerators or other cure promoting agents including the proportions and times required to give maximum cure. The proper mixing ratios of base compound to curing agent shall be clearly stated.
c. Directions for application and drying of the primer.
d. Any safety precautions.

3.6 Workmanship. The compound shall be homogeneous and shall be free of grit, foreign matter and lumps, and shall be so formulated as to meet all the requirements of this specification.

4. VERIFICATION

4.1 Classification of inspections. The inspection requirements specified herein are classified as follows:

a. Qualification inspection (see 4.2).
b. Conformance inspection (see 4.3).

4.2 Qualification inspection. The qualification inspection shall consists of all the tests specified in table III.

TABLE III. Qualification inspections.

Property	Requirement	Test Method
Appearance	3.3.1.1	4.7.1
Nonvolatile content	3.3.1.2	4.7.2
Viscosity base compound	3.3.1.3	4.7.3
Application properties	3.3.1.4	4.7.4
Hardness	Table I	4.7.5
Tensile strength	Table I	4.7.6
Elongation	Table I	4.7.6
Linear shrinkage	Table I	4.7.7
Specific gravity	Table I	4.7.8
Brittle point	Table I	4.7.9
Adhesion	Table I	4.7.10
Repairability	Table I	4.7.11
Hydrolytic stability	Table I	4.7.12
Water immersion	Table I	4.7.13
Oil immersion	Table I	4.7.14
High-temperature aging	Table I	4.7.15
Corrosion	3.3.2.2	4.7.16
Reversion resistance	3.3.2.3	4.7.17
Storage life	3.3.2.4	4.7.18
Unit of issue	3.4	Visual
Instructions for use	3.5	Visual
Dielectric strength	Table II	4.7.19
Volume and surface resistivity	Table II	4.7.20
Dielectric constant	Table II	4.7.21
Dissipation factor	Table II	4.7.21
Arc resistance	Table II	4.7.22

4.2.1 Qualification test samples. Qualification test samples shall consist of 12 one pound units of the base compound, together with the necessary curing agent and primer (when required), of the type, class and grade for which qualification is desired. The compound, curing agent and primer shall be furnished in containers of the type to be used in filling contract orders. Samples shall be

forwarded to the qualifying laboratory, specified in the qualification authorization letter. The samples shall be plainly and durably marked with the following information:

Sample for Qualification Test
SEALING COMPOUND, ELECTRICAL, SILICONE RUBBER, ACCELERATOR REQUIRED
MIL-PRF-23586F
Type
Class
Grade
Date of shipment
Name and address of manufacturer
Manufacturer's identification of item (base, curing agent and primer, as required)
Submitted by (name) (date) for qualification test in accordance with the requirements of MIL-PRF-23586F under authorization (reference authorizing letter).

4.2.2 Manufacturer's data.

4.2.2.1 Test reports. Two copies of the manufacturer's test report, containing complete test data showing that material submitted for qualification conforms to the requirements of this specification, shall be submitted with qualification samples. Location and identity of the plant that produced the samples tested shall also be supplied.

4.2.2.2 Instructions for use. Duplicate copies of the manufacturer's instructions for use of the compound and the appropriate primer shall be furnished with the qualification samples for approval.

4.3 Conformance inspection.

4.3.1 Source inspection. Materials acquired by the Government under this specification shall be source inspected to ensure conformance prior to shipment. Sealing compound shall be packaged in approved units of issue (see 3.4).

4.3.2 Lot formation. Unless otherwise specified herein or in the contract, a lot shall consist of all the sealing compound formulated from the same components, under essentially the same conditions, forming a part of one contract or order, and submitted for acceptance at one time.

4.3.3 Sampling. Containers shall be selected at random to allow preparation of specimens for the tests specified in table IV. The samples shall be examined and tested as specified in 4.3.4.

TABLE IV. Conformance inspections. 1/

Property	Requirement paragraph	Test paragraph
Viscosity	3.3.1.3	4.7.3
Pot life (Grade A, B1 and Class 4, Grade B2)	3.3.1.4	4.7.4.1
Application time (Grade B2 except Class 4)	3.3.1.5	4.7.4.2
Hardness	Table I	4.7.5
Tensile Strength 2/	Table I	4.7.6
Elongation 2/	Table I	4.7.6

1/ Class 4 conformance specimens shall be cured for 1 hour at 150° ±1°C (302° ±2°F).
2/ Specimens for these requirements may be heat cured for conformance inspections.

4.3.4 Testing. The sample selected in 4.3.3 shall be tested to the requirements specified in table IV. Nonconformance of a test specimen to a single requirement (see table IV) shall be cause for rejection of the lot represented by the sample.

4.4 Test conditions.

4.4.1 Standard conditions. Standard laboratory conditions shall be 25° ±1°C (77° ±2°F) and a relative humidity (RH) of 50 ±5 percent. Unless otherwise specified herein, all mixing and testing of the sealing compound shall be at standard conditions.

4.4.2 Mixing. The base compound and the curing agent, both in their original unopened containers, together with the required spatulas, beakers and other mixing equipment shall be held at a temperature of 25° ±1°C (77° ±2°F) for a minimum of 24 hours. The individual components shall be thoroughly mixed in their respective containers prior to combining in the proportions recommended by the manufacturer. Proper care shall be exercised to avoid incorporation of air by too rapid stirring or folding action. Deaeration by vacuum shall be employed to remove excess air.

4.5 Cleaning of metal test panels. Unless otherwise specified in the applicable test method, metal panels shall be cleaned with lint-free cheesecloth towels, using test panel cleaner formulated in accordance with table V or a solvent conforming to MIL-C-38736. Immediately after rinsing, the panels shall be wiped dry with a clean, lint-free cloth.

TABLE V. Formulation of test panel cleaner.

Ingredient	Specification	Percent By Volume
Aromatic petroleum naphtha	TT-N-97, type I, grade B	50.0 ±2.5
Ethyl acetate	TT-E-751	20.0 ±1.0
Methyl ethyl ketone	ASTM-D740	20.0 ±1.0
Isopropyl alcohol	TT-I-735	10.0 ±0.5

4.6 Curing conditions.

4.6.1 Classes 1, 2, and 3. All test specimens shall be cured at standard conditions (see 4.4.1) for a maximum of 72 ±2 hours. All molded specimens shall be removed from the molds in 24 ±2 hours, and total cure time shall include the time the specimen is in the mold. Unless otherwise specified, cured specimens shall be tested within 2 hours from the end of the cure period.

4.6.2 Class 4. Class 4 sealing compound shall be cured at 80° ±1°C (175° ±2°F) for 3 hours. Cured specimens shall cool to standard conditions and be permitted to stand for 4 hours or more after reaching standard conditions before testing.

4.7 Test methods.

4.7.1 Appearance. The sealing compound shall be visually examined for conformance to 3.3.1.1.

4.7.2 Nonvolatile content. Five to ten grams of the mixed sealing 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 24 to 26 hours at 70° ±1°C (158° ±2°F), transferred to a desiccator, cooled to standard conditions (see 4.4.1), and weighed to the nearest milligram. The percent nonvolatile content shall be calculated as follows:

$$\text{Percent nonvolatile content} = \frac{\text{Final weight of mixed compound}}{\text{Initial weight of mixed compound}} \text{ X } 100$$

4.7.3 Viscosity. The viscosity of the base compound shall be determined by a Brookfield viscometer, or equivalent. In using the viscometer, the spindle and speed shall be consistent with the viscosity of the material tested. All readings shall be taken after a minimum of 3 spindle revolutions.

4.7.4 Application life properties.

4.7.4.1 Pot life. Fifty grams ±5 grams of catalyzed compound shall be placed in a suitable container so that a 0.5 ±0.5 inch thickness layer of compound is obtained. A micro-spatula shall periodically be dipped well below the compound surface, slowly withdrawn and the stringy compound observed. The length of time required for the strings to first break without stretching more than approximately one inch shall be considered pot life.

4.7.4.2 Application time. Sufficient base compound and accelerator to fill a half pint container (2-7/8 inches in diameter by 2-7/8 inches high) within ½ inch of the top shall be mixed at standard conditions (see 4.4.1). The can shall be tightly covered except when determining viscosity. At the end of the rated application time (see 3.3.1.5), measured from the start of mix, stir the mixed compound for 1 minute with a glass rod, then determine the viscosity as specified in 4.7.3 using the following spindles and speeds:

Type I - #2 spindle at 5 rpm
Type II - #6 spindle at 10 rpm
Type III - #2 spindle at 2 rpm

4.7.5 Hardness. Two specimens, 0.25 by 1 by 2 inches, shall be prepared in an open mold and cured as specified in 4.6. After a 3-second application, hardness shall be determined in accordance with ASTM-D2240, using the type A Durometer.

4.7.6 Tensile properties. Tensile strength and elongation shall be determined in accordance with ASTM-D412 using specimens cut from die C. Specimens shall be cut from molded sheets approximately 0.075 inch thick, prepared and cured as specified in 4.6.

4.7.7 Linear shrinkage. Linear shrinkage shall be determined by curing mixed compound in a 6 by 6 by 0.075 inch mold filled to capacity and cured as specified in 4.6. The molded sheet shall be measured using a ruler with 0.01-inch divisions. Shrinkage shall be calculated as follows:

$$\text{Percent Shrinkage} = \frac{\text{6 inch - molded slab measurement (inch)}}{\text{6 inches}} \times 100$$

4.7.8 Specific gravity. Three specimens, 0.075 by 1 by 2 inches, shall be cured as specified in 4.6. The specimens shall be weighed in air and then in water by means of an analytical or Jolly balance. The specific gravity shall be computed as follows:

$$\text{Specific Gravity} = \frac{\text{Weight in air}}{\text{Weight in air - Weight in water}}$$

4.7.9 Brittle point. Molded sheets, approximately 0.075 inch in thickness, shall be cured as specified in 4.6. The brittle point of the compound shall be determined in accordance with ASTM-D746.

4.7.10 Adhesion.

4.7.10.1 Preparation of panels. A coating of compound, 0.125 ±0.030 inch thick, shall be applied to the primed side (as recommended by the manufacturer) of a 3 by 6 by 0.0625 inch aluminum alloy panel conforming to QQ-A-250/13 (see figure 1). Two strips, measuring 1 inch by 12 inches by 0.006 inch, of a thin flexible material (such as 30 mesh aluminum screen primed when required, as specified by the manufacturer) shall be placed primed side down on the surface of the freshly applied compound. The strips shall be placed so that they are 0.25 inch from each edge and 0.5 inch apart, leaving a 6 inch long tail. Four panels shall be prepared and cured as specified in 4.6. Two panels shall be tested upon completion of the curing period. Prior to testing, the remaining two shall be exposed as specified in 4.7.15.

4.7.10.2 Testing 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 aluminum mesh strip will be folded 180° 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 in the direction of separation. If the sealant separates from the aluminum mesh, 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 the maximum forces required to separate the sealant from the panel.

4.7.11 Repairability. A coating of compound, 0.125 inch thick, shall be applied to the primed (if required) side of each of two 3 by 6 by 0.0625 inch thick aluminum alloy panels conforming to QQ-A-250/13. Both panels shall be cured as specified in 4.6. One panel shall be oven aged at 240° ±3°C (400° ±5°F) for 72 ±2 hours. The surface of specimens cured in accordance with 4.6.2 shall be lightly abraded before recoating. Each coated panel shall then be recoated with an additional 0.125-inch thickness of freshly mixed compound. Aluminum strips shall be placed as specified in 4.7.10, with testing as specified in 4.7.10.2.

4.7.12 Hydrolytic stability, physical.

4.7.12.1 Specimen preparation. Sufficient base compound and curing agent shall be mixed to prepare 3 molded test specimens, 2½ inches in diameter by ½-inch thick. After a 3-second application time, hardness shall be determined using a type A Durometer in accordance with ASTM-D2240. Hardness shall be determined at the same locations before and after exposure.

4.7.12.2 Procedure. After determining hardness before exposure, the specimens shall be placed vertically in a holder, on a tray in a 250 mm glass desiccator. The desiccator shall contain glycerin (22 percent by weight) in water solution in the bottom which will produce an 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 71° ±1°C (160° ±2°) for a period of 120 days. At the end of the exposure period the desiccator shall be removed from the oven and cooled to standard conditions (see 4.4.1) for 16 to 24 hours. Hardness shall be determined as specified in 4.7.12.1 and the obtained values for each specimen shall meet the requirements in table I.

4.7.13 Distilled water immersion. Specimens, 1.0 by 2.0 by 0.25 inch, cured as specified in 4.6, shall be immersed in distilled water for 72 ±2 hours at 60° ±1°C (140° ±2°F). Volume and weight change shall be determined in accordance with ASTM-D471 and hardness as specified in 4.7.5.

4.7.14 Oil immersion. Specimens for hardness, volume and weight changes, and tensile properties shall be prepared and cured as specified in 4.6 and the applicable test method of this specification. The specimens shall be immersed in oil conforming to ASTM-D471, ASTM No. 1 at 100° ±2°C (212° ±4°F) for 72 ±2 hours. Hardness, tensile and elongation properties, and volume and weight changes shall be determined as specified in 4.7.5, 4.7.6, and 4.7.13, respectively and shall meet the requirements specified in table I.

4.7.15 High temperature aging. Specimens for hardness, tensile properties and adhesion shall be prepared as specified in the applicable test method, then cured as specified in 4.6. All specimens shall be exposed for 72 ±2 hours in an air circulating oven maintained at 204° ±3°C (400° ±5°F). Hardness, tensile properties and adhesion shall be determined in accordance with 4.7.5, 4.7.6, and 4.7.10, respectively.

4.7.16 Corrosion. Prepare three 1.5 inch lengths of copper wire (American Wire Gauge [AWG] size no. 10) by removing the insulation, cleaning with a degreasing agent and buffing to a bright finish. Two wires shall be placed in an open mold as shown in figure 2. The wires shall be encapsulated by adding freshly mixed sealing compound to the mold and curing as specified in 4.6. The third wire shall be the control. 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 also shall be held in a vertical position by inserting one end into a pre-drilled polytetrafluoroethylene or polyethylene slab or in any equivalent manner. The wires shall then be stored for 28 days at 49° ±1°C (120° ±2°F) and RH of 95 to 98 percent. At the end of this period, the mold shall be slit open and the encapsulated wires compared with the control for compliance with 3.3.2.2.

4.7.17 Reversion resistance (deep section cure) for Classes 1, 2 and 3; Grades B1 and B2.

4.7.17.1 Preparation of test specimens. The container for the confinement of the catalyzed silicone elastomer shall be a metal tube, 4.250 ±0.005 inches in length, threaded at both ends, having an inner diameter of 2.5 inches and a wall thickness capable of supporting threading. Metal screw caps and aluminum foil gaskets that provide an air-tight seal shall be used for end closures

and shall be designed so that the total inside height of the capped tube does not exceed 4.250 ±0.005 inches. Seal one end of the tube and pour the mixed and aerated catalyzed sealing compound to a depth of 4.125 ±0.032 inch. The compound shall be vacuum deaerated for 5 minutes at less than 5 mm mercury (Hg) pressure at 25° ±1°C (77° ±2°F). Allow the material to cure as specified in 4.6 with the container top uncapped. The sealing compound shall remain in the mold for the entire test cycle. Remove the bottom cap and determine the hardness in the center area of the bottom surface using a Type A Durometer (as-cured hardness). Seal both ends of the tube and condition the test fixture at 71° ±1°C (160° ±3°F) for 28 days for grade B1 and at 200° ±1°C (392° ±2°F) for 7 days for grade B2.

4.7.17.2 Testing. At the expiration of the heat aging period, allow the test fixture to cool at standard conditions (see 4.4.1) for 24 ±1 hours. Obtain a hardness reading in the same area where the as cured hardness was determined. Tests shall be made in duplicate and compliance with 3.3.2.3 shall be noted.

4.7.18 Storage life (shelf life). One pint of the base compound together with its curing agent shall be stored separately in the as-received container for 6 months (time shall be counted from date of shipment). The storage temperature shall not exceed 25°C (77°F). The compound shall be tested for viscosity (4.7.3), and cured specimens molded shall be tested for hardness (4.7.5) at the beginning and end of the storage period. Conformance to 3.3.2.4 shall be noted.

4.7.18.1 Extension of field storage procedure. Two containers of material from the same lot that have reached the shelf life (field service) limitation shall be selected and tested as specified in 4.7.18 to determine whether extension of shelf life is possible.

4.7.19 Dielectric strength. Disk specimens, 4 inches in diameter and approximately 0.075 inch thick, shall be cured as specified in 4.7. Dielectric strength determinations shall be made in accordance with ASTM-D149. Electrodes with a diameter of 0.25 inch shall be used and the tests shall be made under oil at a frequency not exceeding 100 Hertz (Hz). The voltage shall be increased uniformly at the rate of 500 volts per second.

4.7.20 Volume and surface resistivity. Three disk specimens, 4 inches in diameter and approximately 0.075 inch thick, shall be prepared and cured as specified in 4.6. Resistivity tests shall be conducted in accordance with ASTM-D257, 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 foil electrodes shall be a disk, 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 disk, 4 inches diameter, applied to the guarded electrode, the guard electrode and the unguarded electrode by means of a brass disk, 2 inches diameter by 1 inch thickness, a brass ring, 2.313 inches inside diameter by 4 inches outside diameter by 0.125 inch thick, and a brass disk, 4 inches in diameter, respectively. Calculations shall be in accordance with ASTM-D257.

4.7.21 Dielectric constant and dissipation factor. Three disk specimens, 4 inches in diameter and approximately 0.075 inch thick, shall be prepared and cured as specified in 4.6. The test shall be conducted in accordance with ASTM-D150. Lead foil electrodes shall be used and applied to the specimen with silicone grease. The electrodes shall consist of two lead 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 disks. The upper disk shall be 2 inches in diameter by 1 inch in thickness, and the lower disk shall be 4 inches in diameter. The specimens shall be tested at frequencies of 1 kilohertz and 1 megahertz. Calculations shall include corrections for edge and ground capacitance effects.

4.7.22 Arc resistance. Three disk specimens, 4 inches in diameter and approximately 0.075 inch thick, shall be cured as specified in 4.6. The surface of the test specimens shall be smooth, and free from dust or other contamination. Arc resistance shall be determined in accordance with ASTM-D495.

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When actual packaging of materiel is to be performed by DoD personnel, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activity within the Military Department or Defense Agency, or within the Military Department's System Command. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

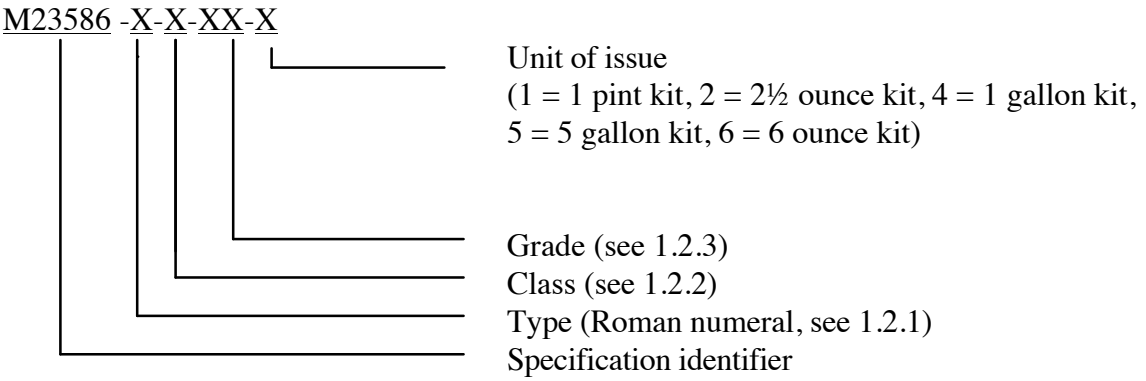
6.1 Intended use. The sealing compound covered by this specification in its cured condition is intended for use on various electrical applications of military weapons systems at temperatures ranging from -62 to +204°C (-80 to +400°F) when potting or encasing electrical and electronic components with an elastomeric medium. This material is used when tear resistance is not critical. The grade A material should not be used for thick sections or in confined areas (see 6.5). The grade B2 addition cure material is used only to repair itself and must not be used to repair grade A or B1 material.

CAUTION - Grade B2 catalyzed material must be vacuum de-aired to eliminate voids and porosity due to gas evolution and to achieve maximum electrical and physical properties. Care should also be taken to avoid mixing air into the material during the addition of catalyst.

6.2 Acquisition requirements. Acquisition documents must specify the following:

a. Title, number and date of this specification.
b. Type, class, and grade required (see 1.2).
c. Issue of DoDISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.2).
d. Quantity and unit of issue required (see 3.4).

6.3 Specification part number. The specification part number, to be used for cataloging purposes, shall be derived from the requirement options available herein, as follows:



6.4 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time of award of contract, qualified for inclusion in Qualified Products List (QPL-23586) whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, 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 purchase orders for the products covered by this specification. Information pertaining to qualification of products may be obtained from the Naval Air Systems Command, AIR-4.3.4, 1421 Jefferson Davis Highway, Arlington, VA 22243-5120; however, information pertaining to qualification of products may be obtained from Commander, Naval Air Warfare Center Aircraft Division, Code 4.3.4, 48066 Shaw Road, Bldg. 2188, M/S 5, Patuxent River, MD 20670-5304.

6.4.1 Retention of qualification. In order to retain qualification of products approved for listing on the Qualified Products List (QPL), the Government may require the manufacturer to verify by certification to the qualifying activity that his product complies with the requirements of this specification. The time of periodic verification by certification is in two-year intervals and will be initiated by the Government. The Government reserves the right to re-examine the qualified product whenever deemed necessary to determine that the product continues to meet any or all of the specification requirements.

6.5 Processing information.

6.5.1 Thick section. The use of condensation cure, room-temperature vulcanizing (RTV) silicones (Grade A) in thick sections, particularly when partially or totally confined, require special process techniques for complete cure. Theses techniques may involve the pouring of successive layers for thick section build-up followed by room temperature as well as elevated temperature post-curing.

6.5.2 Volatile by-products. Volatile by-products formed during cure must be removed. The presence of volatiles in a confined system may affect encapsulated components, retard cure, or cause the solidified elastomer to revert (depolymerize) to a much lower Durometer hardness upon heating at moderate temperatures 50 to 70°C(122 to 158°F).

6.5.3 Cure rate. Factors affecting the rate and degree of cure are numerous, such as: catalyst concentration, humidity, diluents (if used to lower the viscosity), thickness of section, area exposed for the release of volatiles and the post-cure employed prior to total confinement of the RTV silicone. The high volume expansion of RTV silicones precludes their use for the total filling of confined units. Pressures developed upon heating are of a high order. The high volume expansion suggests the use of built in void areas and the use of silicone cellular rubber or sponge in the unit.

6.5.4 Inhibition of cure. Localized inhibition of polymerization will be encountered at the interface when curing grade B2 addition cure material to condensation curing systems (grades A and B1). Sulfur-containing and organo-metallic salt containing compounds, such as organic rubbers and many room-temperature cured silicone rubbers are the greatest offenders. Literature pertaining to the manufacturer's product should be thoroughly understood prior to consideration of RTV silicones. All applications involving the use of RTV silicones should be thoroughly evaluated prior to release.

6.6 International standardization agreement. Certain provisions of this specification are the subject of international standardization agreements. When amendment, revision, or cancellation of this specification is proposed which will modify the international agreement concerned, the preparing activity will take appropriate reconciliation action through international standardization channels, including departmental standardization offices, to change the agreement or make other appropriate accommodations.

6.7 Sectional type containers. Sectional type containers as specified in 3.4 are covered by MIL-P-38714, "Packaging and Packing of Two Component Materials in Semkits."

6.8 Subject term (key word) listing.

Electrical connectors
Heat cure
Repairability
Room temperature cure

6.9 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extent of the changes.

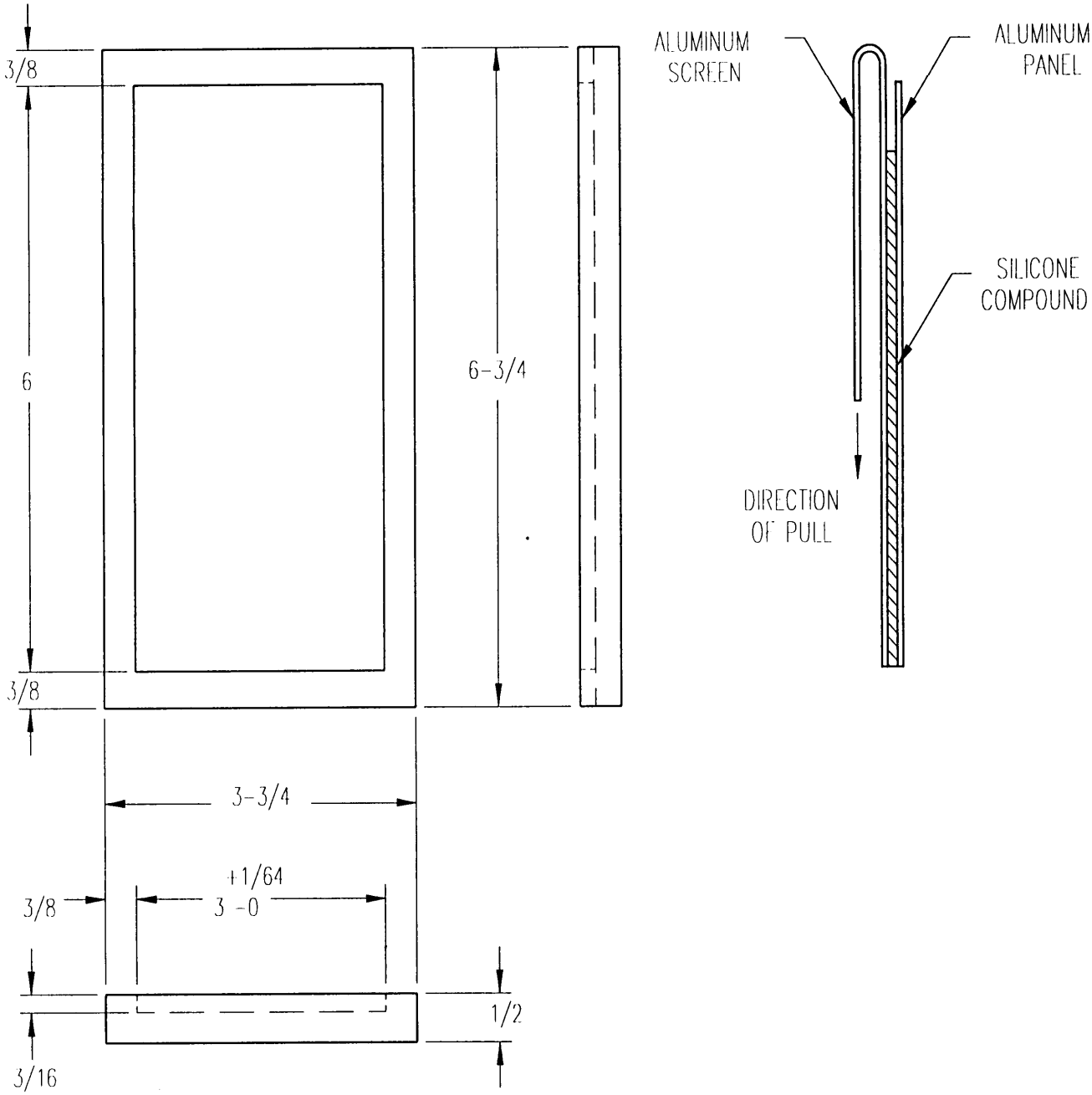


FIGURE 1. Adhesion assembly fixture and test specimen.

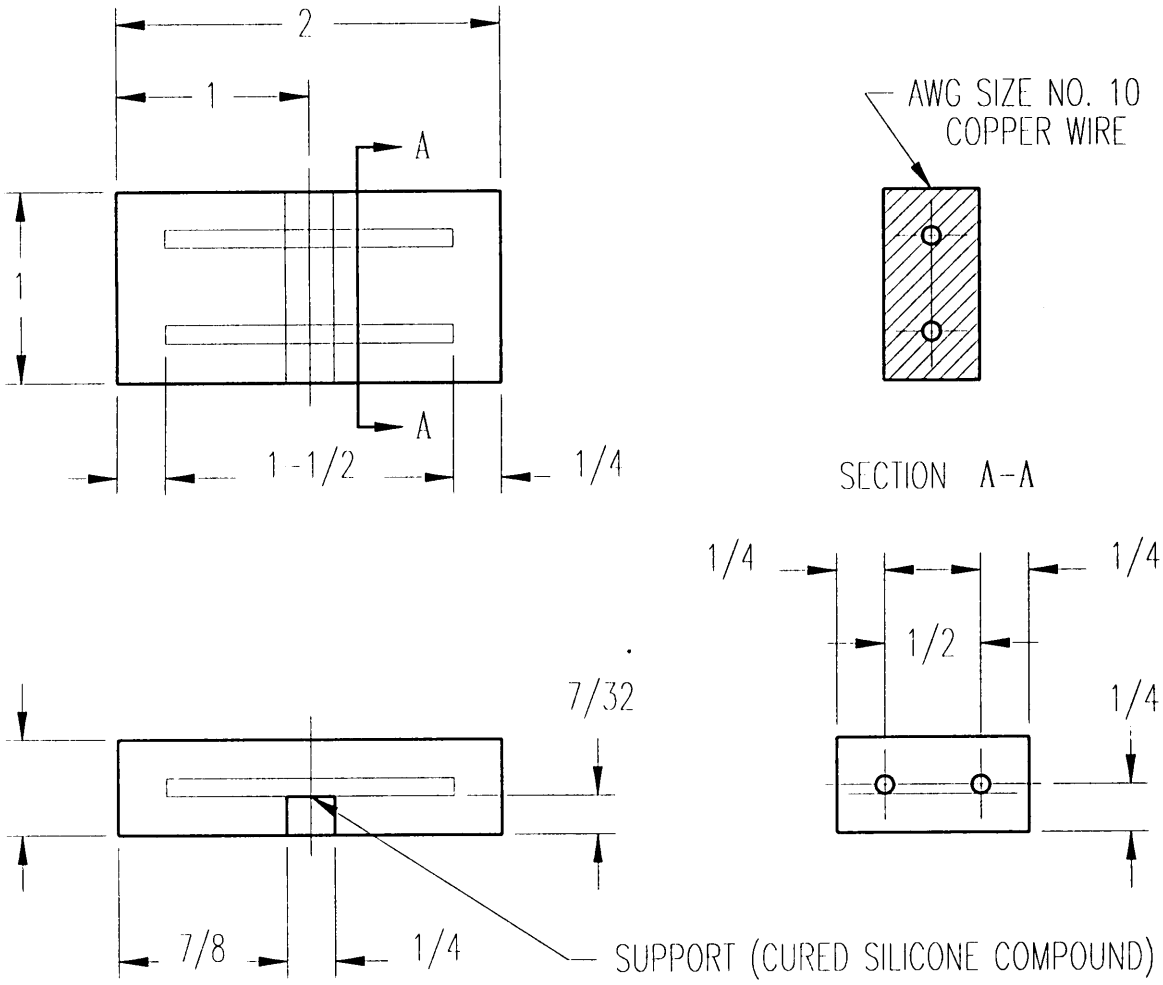


FIGURE 2. Location of the wire specimen in the silicone casting.

CONCLUDING MATERIAL

Custodians:
Army - MR
Navy - AS
Air Force -99

Preparing Activity:
Navy - AS

Review Activities:
Army -AR, CR, MI, AV
Navy - EC, OS, YD1
Air Force -84

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.

2. The submitter of this form must complete blocks 4, 5, 6, and 7.

3. The preparing activity must provide a reply within 30 days from receipt of the form.
NOTE: This form may not be used to request copies of documents, nor to request waivers, or clarification of requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the eferenced
document(s) or to amend contractual requirements.

I RECOMMEND A CHANGE:	1. DOCUMENT NUMBER MIL-PRF-23586F	2. DOCUMENT DATE (*YYMMDD*) 961230

3. DOCUMENT TITLE
SEALING COMPOUND (WITH ACCELERATOR), SILICONE RUBBER, ELECTRICAL

4. NATURE OF CHANGE (*Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.*)

5. REASON FOR RECOMMENDATION

6. SUBMITTER

a. NAME (*Last, First, Middle Initial*)	b. ORGANIZATION	
c. ADDRESS (*Include Zip Code*)	d. TELEPHONE (*Include Area Code*) (1) Commercial: (2) DSN: (*If Applicable*)	7. DATE SUBMITTED (*YYMMDD*)

8. PREPARING ACTIVITY

a. NAME COMMANDER NAVAL AIR WARFARE CENTER AIRCRAFT DIVISION	b. TELEPHONE NUMBER (*Include Area Code*) (1) Commercial (908) 323-7488 (2) DSN 624-7488
c. ADDRESS (*Include Zip Code*) CODE 414100B120-3 HIGHWAY 547 LAKEHURST, NJ 08733-5100	IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT: Defense Quality and Standardization Office, 5203 Leesburg Pike, Suite 1403, Falls Church, VA 22041-3466 Telephone (703) 756-2340 DSN 289-2340