

MIL-A-46106A  
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## MILITARY SPECIFICATION

### ADHESIVE-SEALANTS, SILICONE, RTV, GENERAL-PURPOSE

#### (FOR ELECTRICAL AND MECHANICAL SEALING)

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

#### 1. SCOPE

1.1 Scope. This specification covers two types of one-part, room-temperature - vulcanizing, non-fuel resistant, silicone compounds which cure to durable, rubber sealants and adhesives upon contact with moisture in the air. This specification also covers primers (see 6.1.2) for use with the silicone compounds.

#### 1.2 Classification.

1.2.1 Types of silicone compounds. The silicone compounds shall be furnished in one of the following types as specified (see 6.2).

Type I - Soft spreadable thixotropic paste  
Type II - Self-leveling liquid

1.2.2 Primer. The primer (if required) shall be either type I or type II (see 3.3.3) as recommended by the manufacturer of the silicone compound (see 6.1.2).

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## 2. APPLICABLE DOCUMENTS

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

## SPECIFICATIONS

## FEDERAL

- QQ-A-250/4 - Aluminum Alloy 2024, Plate and Sheet.
- QQ-S-698 - Steel, Sheet and Strip, Low Carbon.
- PPP-B-566 - Boxes, Folding, Paperboard.
- PPP-B-601 - Box, Wood, Cleated-Flywood.
- PPP-B-636 - Box, Fiberboard.
- PPP-B-676 - Box, Set-up.
- PPP-C-96 - Can, Metal, 28 Gage and Lighter.
- PPP-C-300 - Chemicals Liquid; Packaging and Packing of
- PPP-D-705 - Drum, Metal Shipping, Steel (Over 12 and under 55 Gallon)
- PPP-D-729 - Drum, Metal, 55-Gallon (For Shipment of Noncorrosive Material)
- PPP-D-732 - Drum, Metal, Reconditioned, 55 Gallon (For Shipment of Noncorrosive Materials).
- PPP-P-704 - Pails: Shipping, Steel (1 through 12 Gallon)

## MILITARY

- MIL-T-3689 - Tubes, Collapsible

## STANDARDS

## MILITARY

- MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.
- MIL-STD-129 - Marking for Shipment and Storage.
- MIL-STD-147 - Palletized and Containerized Unit Load 40" X 48" Pallets Skids, Runners or Pallet-Type Base

(Copies of specifications, standards, drawings, and publications required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer).

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

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American Society for Testing and Materials (ASTM) Standards:

- D 149 - Dielectric Breakdown Voltage and Dielectric Strength of Electrical Insulating Materials at Commercial Power Frequencies.
- D 150 - A-C Loss Characteristics and Dielectric Constant (Permittivity) of Solid Electrical Insulating Materials (Tentative).
- D 257 - D-C Resistance or Conductance of Insulating Materials.
- D 412 - Tension Testing of Vulcanized Rubber.
- D 573 - Accelerated Aging of Vulcanized Rubber by the Oven Method.
- D 746 - Brittleness Temperature of Plastics and Elastomers by Impact.
- D 903 - Peel or Stripping Strength of Adhesive Bonds.
- D 1084 - Consistency of Adhesives.
- D 1298 - Density, Specific Gravity, or API Gravity of Crude Petroleum and Liquid Petroleum Products by Hydrometer Method.
- D 2240 - Indentation Hardness of Rubber and Plastics by Means of a Duxometer.

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

Technical society and technical association specifications and standards are generally available for reference from libraries. They are distributed among technical groups and using Federal agencies.

OFFICIAL CLASSIFICATION COMMITTEE

Uniform Freight Classification Rules.

(Application for copies should be addressed to the Uniform Classification Committee, 202 Union Station, 516 West Jackson Boulevard, Chicago, Illinois 60606).

NATIONAL MOTOR FREIGHT TRAFFIC ASSOCIATION, INC.

National Motor Freight Classification.

(Application for copies should be addressed to the American Trucking Association, Inc., 1616 P Street, N. W., Washington, D. C. 20036).

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### 3. REQUIREMENTS

3.1 First article. The sealing compound and primer (when required) furnished under this specification shall be a product which has been inspected and has passed the first article examination as specified in 4.4.1 and 4.6.1.3 (as applicable) and all tests of this specification as specified in 4.5.3.1. Two representative containers of the silicone compound and 2 representative containers of the primer (if required) shall be selected for the tests. Approval of the first article samples by the procuring activity shall not relieve the contractor of his obligation to supply silicone compound and primer that shall conform to all the requirements of this specification. The responsibility for the performance of the first article inspection shall be as specified by the procuring activity (see 6.2).

### 3.2 Material.

3.2.1 Silicone compound. The silicone compound shall be supplied in the type and color as specified (see 6.2) and shall vulcanize at room temperature to produce a rubber compound to meet the physical and electrical properties of this specification.

3.2.2 Primer. The primer shall be an air drying liquid to meet the physical properties of this specification (see 3.3.3 and 6.1.2).

### 3.3 Product characteristics.

3.3.1 Uncured silicone compound. The uncured silicone compound shall be in accordance with the requirements of table I.

Table I. Physical properties of uncured silicone compound

Property	Requirements		Test paragraph
	Type I	Type II	
Total solids content, (percent)	92 min.	92 min.	4.5.3.2.1
Extrusion rate (grams per minute)	100 min.	-	4.5.3.2.3
Flow (inches)	0.5 max.	-	4.5.3.2.4
Viscosity (poises)	-	150 - 550	4.5.3.2.5
Tack free time (hours)	1.0 max.	1.0 max.	4.5.3.2.6
Storage life (minimum)	6 months (see 3.3.1.1)	6 months (see 3.3.1.1)	4.5.3.2.8

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3.3.1.1 Storage life. The uncured silicone compounds and primers (if required) shall meet all the requirements of this specification after 6 months of storage from date of delivery. Silicone compound that meets the requirements of extrusion rate or viscosity (as applicable) (3.3.1) Tensile strength (3.3.2.1) Elongation (3.3.2.1) and Peel strength (3.3.2.1) may be considered to meet the storage life requirements when tested after storage as specified in 4.5.3.2.8.

### 3.3.2 Cured silicone compound.

3.3.2.1 Physical properties. The physical properties of the cured silicone compounds shall be as specified in table II.

Table II. Physical properties of cured silicone compound

Property	Requirements		Test paragraph
	Type I	Type II	
Brittle point	-80°F (-62.2°C)	-80°F (-62.2°C)	4.5.3.1.1
Hardness, Shore A Durometer	20 min.	15 min.	4.5.3.2
Tensile strength, psi	175 min.	150 min.	4.5.3.2
Elongation, percent	300 min.	150 min.	4.5.3.2
Peel strength, lb/l" width Aluminum (primer optional) Steel (primer optional)	10 min. 10 min.	4 min. 4 min.	4.5.3.2.7

3.3.2.1.1 Resistance to heat. The cured silicone compound after exposure for  $168 \pm 4$  hours (7 days  $\pm 4$  hours) at  $392^\circ \pm 3.6^\circ\text{F}$  ( $200^\circ \pm 2^\circ\text{C}$ ) shall meet the requirements for hardness, tensile strength and elongation as specified in table II when tested as specified in 4.5.3.1.2.

3.3.2.1.2 Hydrolytic stability, physical. The cured silicone compound after exposure for 28 days  $\pm 4$  hours at  $200^\circ \pm 3.6^\circ$  ( $93 \pm 2^\circ\text{C}$ ) and 95  $\pm 2$  percent relative humidity shall meet the requirements for hardness, tensile strength, and elongation as specified in table II when tested as specified in 4.5.3.1.3.

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3.3.2.2 Electrical properties. The electrical properties of the cured silicone compounds shall be as specified in table III.

Table III. Electrical properties

Property	Requirements		Test paragraph
	Type I	Type II	
Volume resistivity at $73.4^{\circ} \pm 3.6^{\circ}\text{F}$ , ohm/cm	$1 \times 10^{13}$ min.	$1 \times 10^{13}$ min.	4.5.3.1
Dielectric constant 100 to 100,000 Hertz	3.25 max.	3.25 max.	4.5.3.1
Dissipation factor 100 to 100,000 Hertz	.02 max.	.02 max.	4.5.3.1
Dielectric strength, Volts/mil at $77^{\circ} \pm 2^{\circ}\text{F}$ 75 mil thickness	300 min.	300 min.	4.5.3.2

3.3.3 Primer. The primer shall conform to the requirements specified in table IV.

Table IV - Physical properties of primers

Property	Type I	Type II	Inspection Paragraph
Color (see 6.2)	Clear or light straw or red	Clear or fluorescent pink	4.4.1
Specific gravity at $25^{\circ}\text{C}$ ( $77^{\circ}\text{F}$ )	0.75 - 0.78	0.84 - 0.86	4.5.3.2
Total solids content (percent)	3 - 7	15 - 18	4.5.3.2.2



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3.4 Marking. A label or tag shall be attached to each container of silicone compound and each container of primer with data as follows:

- (a) Color and type of silicone compound, or color and type of primer as applicable.
- (b) Brief instructions for the storage and care of silicone compound or primer (as applicable) prior to use.
- (c) If required, a warning relative to toxicity (see 3.5).
- (d) A warning as to corrosion and fluid resistance (see 6.1.1).
- (e) Instructions for use.

3.4.1 In addition, each unit container of primer shall be marked as follows:

"CAUTION: APPLY ONLY IN A WELL VENTILATED AREA. KEEP AWAY FROM HEAT SPARKS AND OPEN FLAME".

3.5 Toxicity. The silicone compound and primer shall have no adverse effect on the health of personnel when used for its intended purpose (see 4.5.3.2.9)

3.6 Workmanship. The uncured silicone compound furnished under this specification shall be uniform in quality and consistency and shall be free of agglomerates or foreign particles. The cured compound shall present an appearance of smooth homogeneity. There shall be no other defect present which might render the end product unsuitable for its intended purpose. The primer shall be homogeneous and contain no foreign matter.

#### 4. QUALITY ASSURANCE PROVISIONS

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

4.2 Lot. A lot of silicone compound or primer shall consist of that quantity of material produced in one continuous operation from one batch of raw materials at one place of manufacture and offered for delivery at one time.

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4.3 Sampling.

4.3.1 For examination. Unless otherwise specified a random sample of filled containers shall be selected for examination in accordance with level 1 of MIL-STD-105.

4.3.2 Sampling for tests. Two representative containers of one type of silicone compound and a representative container of primer shall be selected from each lot for all required tests (see 4.5.3).

4.4 Examination.

4.4.1 Silicone compound and primer (if required). Sample units selected in accordance with 4.3.1 shall be examined for defects and at the acceptable quality levels shown in table V.



Table V - Classification of defects

Item	Adl percent	Classification of defect		Defect	Method of inspection
		Critical	None defined		
Silicone compound (see 4.3.1, 3.2.1, and 3.6)	1.0	Major 101	Wrong type		Visual
		Major 102	Wrong color		Visual
		Major 103	Not uniform		Visual
		Major 104	Not free from agglomerates or foreign particles		Visual
		Major 105	Not homogeneous		Visual
Primer (see 4.3.1 and 3.3.3 and 3.6)	1.0	Major 106	Color not as specified		Visual
		Major 107	Wrong type		Visual
		Major 108	Not homogeneous		Visual
		Major 109	Contains foreign matter <sup>1/</sup>		Visual

<sup>1/</sup> Some white precipitate with age is normal, and this should not be considered foreign matter.

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4.5 Tests.

4.5.1 Preparation of specimens. Samples of uncured silicone compound selected as specified in 4.3.2 and conditioned as specified in 4.5.2.1 shall be used for the test. The equipment shall consist of a hydraulic or mechanical press and an open-face mold with a cavity  $0.075 \pm 0.010$  inch deep. The mold cavity shall be not less than 6 inches long by 4 inches wide. Specimens may be prepared by either procedure A (4.5.1.1) or procedure B (4.5.1.2).

4.5.1.1 Procedure A.

- (a) Lay a piece of polyethylene coated paper that is larger than the face of the mold against the bottom of the mold.
- (b) Apply a solution (Duponol WAW (see 6.6) diluted with 5 per cent alcohol or equal is satisfactory) to the polyethylene coated paper to act as a release agent and allow to air dry for a minimum of 5 minutes. The mold release shall be of uniform thickness and free of entrapped air and imperfections.
- (c) Place the chase frame on the mold.
- (d) Fill the mold with the silicone compound and spread it to fill the chase (knife spread if type I thixotropic paste) Molded sheet shall be of uniform thickness and free of entrapped air and surface irregularities.
- (e) Type I. For type I (thixotropic paste) silicone compound, remove the chase when the sample has been spread into the chase and place the material on a rack that provides air exposure.

Type II. For type II (self-leveling liquid) silicone compound keep the chase frame in position until the compound is cured, then remove the chase and place the paper with the material on a rack that provides air exposure.

4.5.1.2 Procedure B.

- (a) Spray mold with Poly Lease 77 or an equivalent release agent.
- (b) Prepare release paper by soaking a sheet of Ozalid reproduction paper (APECO Positive Paper No. 2, or equivalent) in distilled water for 1 to 5 minutes.
- (c) Place wet release paper on upper face of mold with gelatin surface facing the silicone compound. Wipe excess water from the release paper.
- (d) Fill the mold cavity with the silicone compound. Close the mold and press with approximately 50 psi pressure.

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- (e) After 1 hour lift the upper face of the mold and carefully remove the paper from the sheet. Leave the sheet in the mold with upper face exposed until the sheet is well cured. This usually requires 6 to 18 hours. Leave the sheet in the mold no longer than 24 hours.

#### 4.5.2 Conditioning of specimens.

4.5.2.1 Uncured silicone compound. The uncured silicone compound before being tested shall be conditioned at  $77^{\circ} \pm 2^{\circ}\text{F}$  ( $25^{\circ} \pm 1.1^{\circ}\text{C}$ ) and  $50 \pm 5$  percent relative humidity for not less than 48 hours.

4.5.2.2 Cured silicone compound. Before being tested the silicone compound prepared as specified in 4.5.1 shall be cured at  $77^{\circ} \pm 2^{\circ}\text{F}$  ( $25 \pm 1.1^{\circ}\text{C}$ ) and  $50 \pm 5$  percent relative humidity. The cure time shall be  $72 \pm 4$  hours (3 days  $\pm 4$  hours).

4.5.3 Classification of tests. Tests for the silicone compound and primer shall be classified as follows:

- (a) First article tests (see 4.5.3.1)
- (b) Lot acceptance tests (4.5.3.2)

4.5.3.1 First article tests. First article tests shall be conducted on the first article sample (see 3.1) and also at the discretion of the procuring activity (see 6.2). If a lot should fail a first article test no further lot will be accepted until the supplier has presented sufficient evidence to show that the condition which caused the failure has been corrected. The first article tests shall consist of all tests of this specification. (Namely, the lot acceptance tests (see 4.5.3.2) and the additional tests as indicated in table VI.)

Table VI - Additional tests for complete inspection

Characteristic	Requirement	Test Method
Brittle point	3.3.2.1	4.5.3.1.1
Resistance to heat	3.3.2.1.1	4.5.3.1.2
Hydrolytic stability physical	3.3.2.1.2	4.5.3.1.3
Volume resistivity	3.3.2.2	ASTM D257
Dielectric constant	3.3.2.2.	ASTM D150
Dissipation factor	3.3.2.2	ASTM D150
Storage life (uncured compound)	3.3.1.1	4.5.3.2.8

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4.5.3.1.1 Brittle point. Samples of uncured silicone compound shall be prepared as specified in 4.5.1. The silicone compound shall be allowed to cure for  $168 \pm 4$  hours (7 days  $\pm 4$  hours) at  $77^\circ \pm 5^\circ\text{F}$  ( $25^\circ \pm 2.8^\circ\text{C}$ ) and  $50 \pm 5$  percent relative humidity. Modified T-50 specimens shall be die punched from the pads. Tests shall be in accordance with procedure B of ASTM Method D 746.

4.5.3.1.2 Resistance to heat. Specimens of the silicone compound prepared as specified in 4.5.1 and cured as specified in 4.5.2.2 shall be oven aged as specified in ASTM D 573 for the duration and temperature as specified in 3.3.2.1.1. At the end of the exposure time the test specimens shall be brought to and tested at room temperature for compliance with the requirements of 3.3.2.1.1.

4.5.3.1.3 Hydrolytic stability, physical. Specimens of the silicone compound prepared as specified in 4.5.1 and cured as specified in 4.5.2.2 shall be placed vertically in a suitable holder on a tray in a suitable glass desiccator (250mm). The bottom of the desiccator shall contain a glycerine (22 percent by weight) in water solution which will produce a relative humidity (RH) of 95 percent at the test temperature. The desiccator containing the specimens shall be closed and then placed in an air circulating oven maintained at  $200 \pm 3^\circ\text{F}$  ( $93 \pm 2^\circ\text{C}$ ) for a period of 28 days  $\pm 4$  hours. At the end of the exposure period the desiccator shall be removed from the oven and cooled to  $77^\circ \pm 2^\circ\text{F}$  ( $25 \pm 1.1^\circ\text{C}$ ) for 16 to 24 hours. The specimens shall then be removed from the desiccator and tested for hardness, tensile strength and elongation as specified in 3.3.2.1.2.

4.5.3.2 Lot acceptance tests. Lot acceptance tests shall be made on each lot of silicone compound and together with the examinations (see 4.4.1 and 4.6.1.3) shall be the basis for acceptance or rejection of the lot. Lot acceptance tests shall consist of the tests indicated in table VII.

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Table VII. Lot acceptance tests

Characteristic	Requirements		Test paragraph
	Type I	Type II	
<u>Uncured compound</u>			
Total solids content	3.3.1	3.3.1	4.5.3.2.1
Extrusion rate	3.3.1	-	4.5.3.2.3
Flow	3.3.1	-	4.5.3.2.4
Viscosity	-	3.3.1	4.5.3.2.5
Tack free time	3.3.1	3.3.1	4.5.3.2.6

Cured compoundType I and type II

Hardness	3.3.2.1	ASTM D 2240
Tensile strength	3.3.2.1	ASTM D 412 (Die C)
Elongation	3.3.2.1	ASTM D 412 (Die C)
Peel strength	3.3.2.1	4.5.3.2.7
Dielectric strength	3.3.2.2	ASTM D 149

Primer (when required)Type I, and type II

Specific gravity	3.3.3	ASTM D 1298
Total solids content	3.3.3	4.5.3.2.2

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4.5.3.2.1 Total solids (silicone compound). Three specimens shall be tested and results averaged. Each specimen shall be tested as follows: Transfer 5 to 10 grams of the uncured silicone compound as rapidly as possible to a cup approximately 3 inches in diameter and 3/4 inch in depth. Place a fitted cover immediately over the cup and determine the weight accurately. The weight of the cup and the cover shall be determined accurately prior to using, and subtracted from the initial and final weights in order to calculate the net sample weight. Then remove the cover and heat the sealing compound for  $24 \pm 1$  hour at  $158^\circ \pm 2^\circ\text{F}$  ( $70 \pm 1.1^\circ\text{C}$ ). Cool the sealing compound and cup in a desiccator, replace the cover and weigh accurately. Calculate the percent of total solids as follows:

$$\text{Percent of solids} = \frac{\text{Final weight} \times 100}{\text{Initial weight}}$$

4.5.3.2.2 Total solids (primer). Three specimens of either type I or type II primer shall be tested by method (a) or (b) as applicable and the results averaged.

- (a) Type I. The test for total solid content of type I primer shall be made as specified in 4.5.3.2.1 except that the primer shall be heated for 6 hours  $\pm 5$  minutes at  $115^\circ \pm 2^\circ\text{F}$  ( $46.1^\circ \pm 1.1^\circ\text{C}$ ).
- (b) Type II. Quickly transfer  $1.0 \pm 0.2$  grams weighed accurately of the primer from a weighing bottle into a tared aluminum dish measuring approximately 58 mm in diameter by 18mm in depth. Place the dish containing the primer in a circulating air oven at  $150^\circ \pm 5^\circ\text{C}$  ( $302^\circ \pm 9^\circ\text{F}$ ) for  $45 \pm 5$  minutes. Cool the dish and residue in a desiccator, then weight accurately to determine the final weight. Calculate the percentage of total solids as follows:

$$\text{Solids (percent)} = \frac{(A-B) \times 100}{C}$$

A = Final weight of dish and residue

B = Weight of aluminum dish

C = Weight of primer



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4.5.3.2.3 Extrusion rate (type I sealant only). The uncured silicone compound and application gun shall be stabilized at  $77^{\circ} \pm 2^{\circ}\text{F}$  and  $50 \pm 5$  percent relative humidity for at least 8 hours. A minimum of 250 grams of the compound shall be promptly used to fill a standard Semco or equal sealing-compound-gun cartridge having a Semco 440 nozzle (or equivalent), with an orifice diameter of  $0.125 \pm 0.005$  inch. The gun and sealing compound shall be maintained at standard conditions throughout the test. The gun shall be attached to a constant air supply of  $90 \pm 5$  psi for line variation or gage error. From 2 to 3 inches of sealing compound shall be extruded initially to clear trapped air. The sealing compound shall be extruded onto a suitable receptacle for 1 minute and the amount of extruded sealing compound determined.

4.5.3.2.4 Flow (type I sealant only). The flow test shall be conducted with a flow test jig as shown in figure 1. Depth of plunger tolerance is critical and shall be controlled within the tolerance during all tests. The flow test jig shall be placed on a table with the front face upward and with the plunger depressed to the limit of its travel. Enough of the silicone compound to fill the recessed cavity of the jig shall be rapidly transferred from a representative sample container. The compound should not be worked with a spatula but shall be leveled off even with block by scraping with a spatula in two passes, each starting in the center and moving toward the sides of the jig. Within 10 seconds after the leveling operation, the jig shall be placed on its base and the plunger immediately advanced to the limit of its forward travel. The cylindrical section formed in the flow-test jig shall be allowed to flow under its own weight on a vertical surface.

The flow test shall begin when the plunger is advanced to the limit of its forward travel, and the flow measurement shall be taken immediately after the expiration of 30 minutes. The flow shall be measured from tangent to the lower edge of the plunger to the farthest point to which flow has occurred. The measurement after the indicated interval shall be considered the initial flow of the silicone compound.

4.5.3.2.5 Viscosity (type II sealant only). The viscosity of the sealing compound shall be determined in accordance with ASTM D 1084, method B. The viscosimeter model, spindle number and speed shall be reported as part of the viscosity determination.

4.5.3.2.6 Tack-free time. At the end of the rated tack-free time of the uncured silicone compound a 1-inch by 6-inch polyethylene film measuring  $0.004 \pm 0.002$  inch thick shall be applied and held in place at a pressure of 1/2 ounce per square inch for 2 minutes on each of several silicone compound specimens. The film shall then be slowly withdrawn at right angles to the surface of the sealing compound. The polyethylene shall come away clean and free of sealing compound.



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4.5.3.2.7 Peel strength. Tests for peel strength shall be as specified in ASTM method D 903 except for the following: Panels shall be of aluminum alloy conforming to QQ-A-250/4; and of cold rolled No. 1 finish (dull) sheet steel conforming to QQ-S-698. Clean, prime (if required) and air-dry the panels in accordance with directions from the manufacturer. Examine the primer (if required) for compliance with 3.2.2. Coat each panel with approximately 1/16 inch of silicone compound. Place primed (if primer is required) 30-mesh, 10-mil wire aluminum screens on the silicone compound immediately. Apply a second coat 1/16 inch thick and cure as specified in 4.5.2.2. Test the peel strength in accordance with ASTM D 903, except that the rate of separation shall be 2 inches per minute.

4.5.3.2.8 Storage life. Unless otherwise specified (see 4.5.3.2.8.1) 2 samples of the uncured silicone compound and a sample of the primer (if required) shall be stored in their original containers for 6 months at a temperature of  $77^{\circ} \pm 2^{\circ}\text{F}$  and a relative humidity of  $50 \pm 5$  percent and then tested for compliance with 3.3.1.1.

4.5.3.2.8.1 Certification. When specified (see 4.5.3.2.8) the supplier shall submit to the procuring activity a letter certifying that the silicone compound and primer (if required) shall meet the storage life requirements specified in 3.3.1.1. The letter shall be signed by a responsible agent of the certifying organization and shall be accompanied by evidence of this agent's authority to bind his principal. The Government reserves the right to check test material submitted by the supplier under certification.

4.5.3.2.9 Toxicity. The supplier shall either (1) furnish the toxicological data and formulations required to evaluate the safety of the silicone compound and primer (when required) for the proposed use or (2) the supplier shall provide assurance that the silicone compound and primer (when required) comply with the following:

- a. An acceptable toxicologic study has been made. (see 6.7)
- b. The product is not toxic to personnel when used as specified (see 3.5).

4.5.4 Rejection criteria. Failure of any test specimen or sample to meet the test requirements specified herein shall be cause for rejection of the lot represented.

#### 4.6 Inspection of preparation for delivery.

##### 4.6.1 Quality conformance inspection of pack.

4.6.1.1 Unit of product. For the purpose of inspection, a completely processed pack prepared for shipment shall be considered a unit of product.

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4.6.1.2 Sampling. Sampling for examination shall be in accordance with MIL-STD-105.

4.6.1.3 Examination. Samples selected in accordance with 4.6.1.2 shall be examined for the defects and at the acceptable quality level indicated in table VIII.

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Table VIII - Classification of defects, preparation for delivery requirements

Item	AQL percent	Classification of defect	Defect	Method of inspection
Unit containers of sill-cone compound and primer (see 5.1)	2.5	CRITICAL	NONE DEFINED	
		Major 110	Improper type	Visual
		Major 111	Improper size <sup>1/</sup>	Visual
		Major 112	Improper fill <sup>2/</sup>	Approved scale <sup>2/</sup>
		Major 113	Leakage	Visual
Intermediate packaging <sup>3/</sup> (see 5.1.1.1.1)	2.5	Major 114	Improper closure	Visual
		Major 115	Wrong type	Visual
		Major 116	Wrong size	Visual
		Major 117	Improperly closed	Visual
		Major 118	Wrong type	Visual
Box open (see 4.3.1 and 5.2)	2.5	Major 119	Improper size	Visual
		Major 120	Wrong quantity	Visual
		Major 121	Pads or separators missing <sup>3/</sup>	Visual
		Major 122	Lack of or improper strapping	Visual
		Major 123	Improperly closed	Visual
Box closed (see 4.3.1, 5.2 and 5.3)		Major 124	Gross weight, max.	Approved scale <sup>2/</sup>
		Major 125	Pallets missing or improper <sup>3/</sup>	Visual
		Major 126	Improper marking	Visual

<sup>1/</sup>The actual weight of a container filled with the minimum required quantity of silicone compound or primer shall be the basis for determining the acceptable weight of subsequent containers.

<sup>2/</sup>Approved by Procuring activity.

<sup>3/</sup>When applicable.

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## 5. PREPARATION FOR DELIVERY

(The preparation for delivery requirements specified herein apply only to direct purchases by or direct shipments to the Government)

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

### 5.1.1 Level A

5.1.1.1 Silicone compound. The silicone compound shall be packaged in tubes, cartridges, pails or drums as specified (see 6.2). The tubes shall conform to requirements of MIL-T-3689, type and class as specified (see 6.2), and the filled tubes shall be packaged in accordance with the level A requirements of MIL-T-3689. The discharging gun cartridge shall be aluminum foil wrapped. Pails shall be 5-gallon capacity and shall conform to PPP-P-704, type 1, class 2. The drums shall be 30-gallon capacity conforming to PPP-D-705 or 55-gallon capacity conforming to either PPP-D-729 or PPP-D-732. Pails and drums shall have sufficient outage to prevent leakage of contents or distortion of containers as a result of expansion of contents during transit or storage.

5.1.1.1.1 Intermediate packaging. Tubes and discharging gun cartridges of the same size shall be packaged in snug-fitting boxes conforming to the water resistant variety of either PPP-B-566 or PPP-B-676 at the option of the contractor. Quantities and arrangement shall be in accordance with commercial practice. Box closures shall be as specified in the box specification.

5.1.1.2 Primer. The primer (when required) shall be packaged in either cans or bottles of the size specified (see 6.2). The cans shall conform to PPP-C-96 type V, class 4 and the cans shall be packaged in accordance with the level A requirements of the appendix to PPP-C-96. Bottles and their packaging shall be in accordance with level A requirements of PPP-C-300.

### 5.1.2 Level C

5.1.2.1 Silicone compound and primer. The silicone compound and primer (if required) in the size containers and quantities specified (see 6.2) shall be packaged to provide adequate protection against deterioration and damage from the supplier to the initial destination. The suppliers commercial practice may be used when it meets these requirements.

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

### 5.2.1 Level A

5.2.1.1 Silicone compound. Silicone compound tubes or cartridges packaged as specified (see 5.1) shall be packed in boxes conforming to PPP-B-601, over-seals type, style I in quantities as specified (see 6.2). Pails and drums will not require any additional packing.

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5.2.1.2 Primer. Primer (when required) packaged in cans as specified in 5.1 shall be packed in accordance with level A requirements of the appendix to PPP-C-96 except that the exterior shipping containers shall conform to the requirements of PPP-B-601 overseas type, style I. Primer packaged in bottles as specified in 5.1 shall be packed in accordance with the level A requirements of PPP-C-300.

5.2.1.3 Palletization. When specified (see 6.2) 5-gallon pails of the silicone compound shall be palletized in accordance with requirements of MIL-STD-147, load type IV.

## 5.2.2 Level B.

5.2.2.1 Silicone compound. Silicone compound in tubes or cartridges and packaged as specified (see 5.1) shall be packed in fiberboard boxes conforming to PPP-B-636 style W5c. Fiberboard boxes shall not exceed the weight limitation of the box specification. Pails and drums will require no overpacking.

5.2.2.2. Primer. Primer (when required) packaged in cans or bottles as specified in 5.1 shall be packed in accordance with level A requirements of the appendix to PPP-C-96 (for cans) or in accordance with level A requirements of PPP-C-300 (for bottles) as applicable.

5.2.2.3 Palletization. When specified (see 6.2) 5-gallon pails of the silicone compound shall be palletized as specified in 5.2.1.3.

5.2.3 Level C. Silicone compound and primer shall be packed to assure carrier acceptance and safe delivery to destination at lowest rates in compliance with Uniform Freight Classification Rules and National Motor Freight Classification.

5.3 Marking. In addition to any special marking required by the contract or order or herein, interior packages and exterior shipping containers shall be marked in accordance with MIL-STD-129. A label or tag shall be attached to each exterior container of silicone compound and primer (if required) with additional data as follows:

- (a) Number and title of this specification.
- (b) Compound type and nomenclature.
- (c) Expiration date of shelf life.
- (d) Brief instructions for the storage and care of the silicone compound or primer as applicable prior to use.
- (e) Cure time if other than that specified (see 4.5.2.2).
- (f) If required, a warning relative to toxicity.
- (g) Color of silicone compound or primer (as applicable).



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## 6. NOTES

6.1 Intended use. Since the silicone compounds are available as thixotropic pastes or as self-leveling liquids, they lend themselves to a variety of application techniques which are easily adapted to specialty uses as well as to production line methods. The materials are currently used in a wide variety of applications in the automotive, marine-appliance, metal working, aerospace, aircraft, building-construction, communication, computer, electrical, electronic and other industries.

Some typical uses include: Sealing flues on gas appliances; sealing windows in oven doors; bonding silicone rubber gaskets to range and refrigerator doors; adhering auto trim in place, including metal trim as well as fabric-backed plastics; filleting and caulking joints in sheet-metal stacks, ductwork and equipment housings. They are used in sealing instrument cases, as weather sealants for sealing electrical devices, as terminal sealants for potting electronic components, and as high-temperature sealants. They are also used for conformal coatings (flowable types) as adhesives for silicone rubber pressurization sealants, as connector pottings, as cable splice sealants, as expansion joint sealants, as window sealants, as moisture barriers, and as thermal barriers.

6.1.1 Precaution. These compounds are not resistant to many types of fluid such as fuel and hydraulic fluid. When cured in contact with certain metals such as copper and other sensitive metals, a slight corrosion may occur. This condition should be thoroughly investigated for electrical performance.

6.1.2 Primer. The use of a primer is recommended for various substrates to achieve consistent results and obtain optimum adhesion when the silicone compound is exposed to water, high humidity and elevated temperature conditions. Primers should be used only as directed by the manufacturer, and should be used only with the sealant for which the primer was supplied. The use of silicone compound and primer combinations other than those recommended by the manufacturer may lead to loss of adhesion or bond failure.

6.1.3 Thickness and glue lines. With these one-component silicone compounds, which require moisture from the air to cure, the thicknesses should be limited to 1/2 inch, and the glue lines limited to 1 inch between non-porous substrates.

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6.2 Ordering data. Procurement documents should specify the following:

- (a) Title, number and date of this specification.
- (b) Type, (see 1.2.1) color (see 6.4) of silicone compound required
- (c) Quantity of silicone compound required.
- (d) Quantity of primer (if required) (see 6.1.2).
- (e) Whether the silicone component is to be packaged in tubes, cartridges, pails or drums (see 5.1.1.1).
- (f) If the silicone compound is packaged in tubes the type and class required (see 5.1.1.1).
- (g) Size of containers required for silicone compound and primer (5.1).
- (h) Type and color of primer (if required) (see 3.3.3 and 6.1.2).
- (i) Level of packaging and level of packing required (see 5.1 and 5.2).
- (j) If level A, quantity of silicone compound (see 5.2.1.1) and primer (if required) (see 5.2.1.2) to be packed in a container.
- (k) Whether 5-gallon pails shall be palletized (see 5.2.1.3 or 5.2.2.3 as applicable).
- (l) Responsibility for the performance of first article inspection (see 3.1, 6.2.1 and 6.3).

6.2.1 Contracts or orders shall specify the following provisions for First Article inspection.

6.2.1.1 Whether First Article inspection is required. When a contractor is in continuous production of the silicone compound from contract to contract, consideration should be given to waive the First Article inspections. If inspection is required, indicate:

- (a) Where the First Article inspection is to be conducted (at the Contractor's plant or Government or commercial laboratory).
- (b) That the approval of First Article samples or the waiving of the First Article inspection shall not relieve the contractor of his obligation to fulfill all other requirements of the specification and contract.

6.3 Data. For the information of Contractors and Contracting Officers, any of the data specified in (a) subparagraphs below, (b) applicable documents listed in Section 2 of this specification, or (c) referenced lower-tier documents need not be prepared for the Government and shall not be furnished to the Government unless specified in the contract or order. The data to be furnished shall be listed on DD Form 1423 (Contractor Data Requirements Lists), which shall be attached to and made a part of the contract or order.



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6.3.1 First Article data. When First Article samples are submitted (see 6.2), they should be accompanied by a complete inspection report showing the results of the Contractor's inspections. The inspection report shall include the following:

- (a) Report of inspections graphically presented, when possible, together with a detailed statement indicating compliance or extent of noncompliance with all requirements of this specification, referring specifically to paragraph numbers. Wherever a requirement is considered to be not applicable, the report shall so state.
- (b) Diagrams of inspection set-ups. A complete description of inspection equipment and inspection procedures
- (c) Reproducible outline and description conditions. Where inspections specified in this specification are not considered applicable, the reason, and the substituted inspection should be clearly described.
- (d) Copies of inspection log sheets.
- (e) Photographs when available.

6.4 Color of silicone compound. Each manufacturer has his own colors for silicone compounds. These colors, not all made by one manufacturer, include white, red, black, translucent, aluminum, gray and special colors.

6.5 Class of compound. This specification covers types of silicone compounds intended for use at temperatures between -80°F and 392°F.

6.6 Dupanol WAW. Dupanol WAW is manufactured by E.I. DuPont De Nemours & Co, Inc., Wilmington 98 Del.

6.7 Toxicity. Questions pertinent to the effect of the material on the health of personnel will be referred by the procuring activity to the appropriate department medical service who will act as an advisor to the procuring activity.

**Custodians:**

Army - MR  
Navy - AS  
Air Force - 11

**Preparing activity**

Army - MR

**Review activities:**

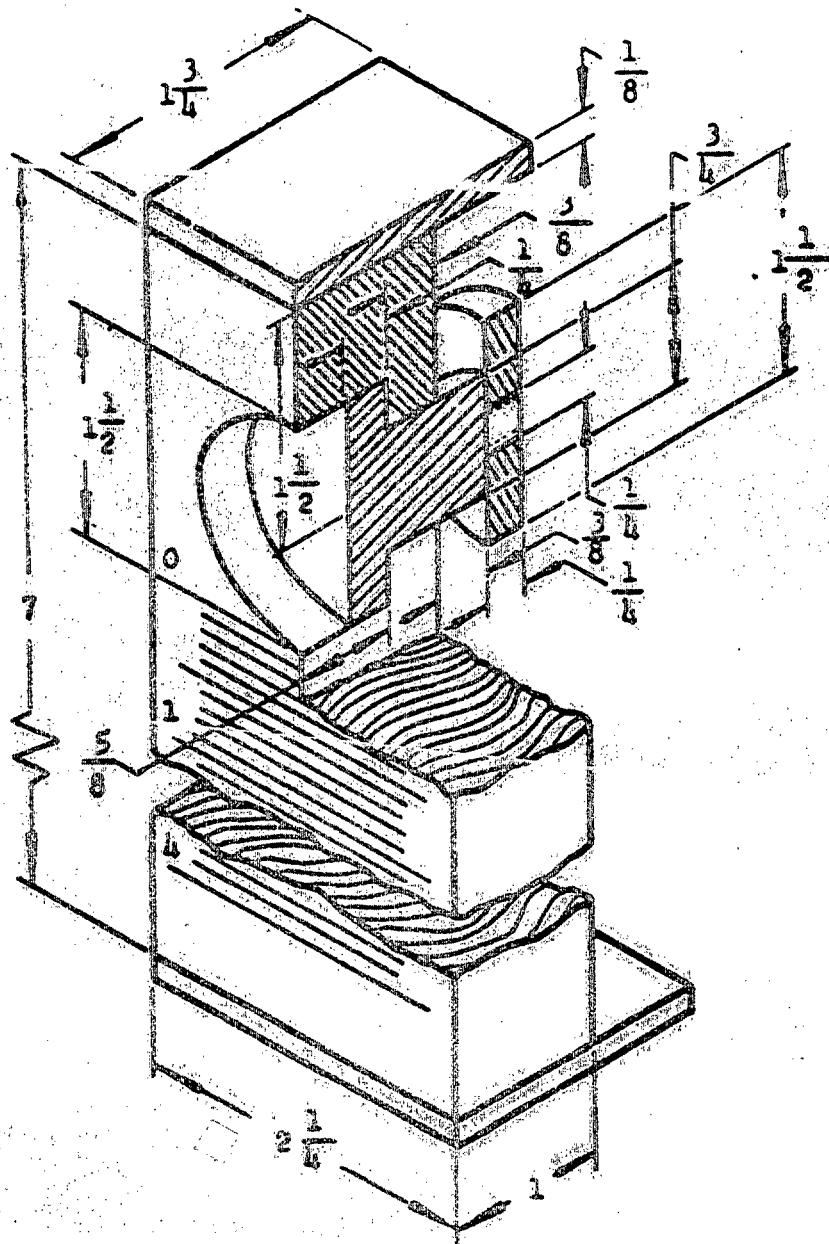
Army - WC, ME, MU  
Navy - AS, EC  
Air Force - 11, 84

Project No. 8040-0267

**User activities:**

Army - CE, MI  
Navy - OS, SE, YD  
Air Force - 17

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MATERIAL: ALUMINUM ALLOY  
 DIMENSIONS IN INCHES. UNLESS OTHERWISE SPECIFIED, TOLERANCES:  
 $\pm 0.003$  INCH.

FIGURE 1. Flow test jig

## STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions - Reverse Side)

1. DOCUMENT NUMBER

2. DOCUMENT TITLE

3a. NAME OF SUBMITTING ORGANIZATION

4. TYPE OF ORGANIZATION (Mark one)

☐ VENDOR☐ USER☐ MANUFACTURER☐ OTHER (Specify)

b. ADDRESS (Street, City, State, ZIP Code)

## 5. PROBLEM AREAS

a. Paragraph Number and Wording:

b. Recommended Wording:

c. Reason/Rationale for Recommendation:

## 6. REMARKS

7a. NAME OF SUBMITTER (Last, First, MI) - Optional

b. WORK TELEPHONE NUMBER (Include Area Code) - Optional

c. MAILING ADDRESS (Street, City, State, ZIP Code) - Optional

8. DATE OF SUBMISSION (YYMMDD)

(TO DETACH THIS FOR CUT ALONG THIS LINE.)