INCH POUND

MIL–S–83318A(USAF)
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SUPERSEDING
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MILITARY SPECIFICATION

SEALING COMPOUND, LOW TEMPERATURE CURING, QUICK REPAIR INTEGRAL FUEL TANKS AND FUEL CELL CAVITIES

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

1. SCOPE

1.1 Scope. This specification covers a two component, temperature–resistant –65°F to +250°F (–54°C to +120°C), low temperature (20°F minimum) curing synthetic rubber compounds for quick repair of aircraft integral fuel tanks and fuel cell cavities. During application, the sealing compounds shall be a suitable, fluid consistency

1.2 Classification. The sealing compound shall be of the following classes, as specified (see 6.2).

a. Class A – Sealing material, suitable for brush application.
b. Class B – Sealing material, suitable for application by extrusion–gun and spatula

1.2.1 Dash numbers. The following dash numbers shall be used to designate the minimum application time in hours:

a. Class A dash numbers shall be –1/6.
b. Class B dash numbers shall be –1/6.

The sealing compound shall be thus identified as either A–1/6 or B–1/6.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: ASD/ENES, Wright–Patterson AFB, Ohio 45433–6503 by using the self–addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A FSC 8030

2. APPLICABLE DOCUMENTS

2.1 Government documents

2.1.1 Specifications, standards. The following specifications and standards form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of these documents shall be those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation.

SPECIFICATIONS

FEDERAL

QQ–A–250/12	Aluminum Alloy 7075, Plate and Sheet
QQ–A–250/13	Aluminum Alloy Alclad 7075, Plate and Sheet
CCC–C–419	Cloth, Duck, Cotton, Unbleached, Plied Yarns, Army and Numbered
PPP–C–96	Can, Metal, 28 Gage and Lighter

MILITARY

MIL–S–5059	Sheet, Corrosion–Resistant (18–8), Plate, Sheet and Strip
MIL–C–5541	Chemical Conversion Coating on Aluminum and Aluminum Alloys
MIL–S–8802	Sealing Compound, Temperature Resistant, Integral Fuel Tanks and Fuel Cell Cavities, High Adhesion
MIL–T–9046	Titanium and Titanium Alloy, Sheet, Strip and Plate
MIL–A–9962	Abrasive Mats, Non–Woven, Non–Metallic
MIL–C–27725	Coating, Corrosion Preventive, For Aircraft Integral Fuel Tanks
MIL–C–38334	Corrosion Removing Compound, Prepaint, For Aircraft Aluminum Surfaces
MIL–P–38714	Packaging and Packing of Two component Materials in Semkits
MIL–C–38736	Compound, Solvent; For Use in Integral Fuel Tanks
MIL–C–81706	Chemical Conversion Materials for Coating Aluminum and Aluminum Alloys
MIL–C–87936	Cleaning Compounds, Aircraft Exterior Surfaces, Water Dilutable

STANDARDS

FEDERAL

FED–STD–601	Rubber: Sampling and Testing

MILITARY

MIL–STD–129	Marking for Shipment and Storage

(Unless otherwise indicated, copies of federal and military specifications, and standards are available from Standardization Documents Order Desk, Bldg 4D, 700 Robbins Avenue, Philadelphia PA 19111–5094.)

2.2 Non–Government publications. The following documents form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of the documents which are DOD adopted shall be those listed in the issue of the DODISS specified in the solicitation. Unless otherwise specified, the issues of documents not listed in the DODISS shall be the issue of the nongovernment documents which is current on the date of the solicitation.

SOCIETY OF AUTOMOTIVE ENGINEERS (SAE)

AMS 2629	Jet Reference Fluid
AMS 3100	Adhesion Promoter for Polysulfide Sealing Compounds
AMS 3819	Cloths, Cleaning for Aircraft Primary and Secondary Structural Surfaces
AMS 4049	Aluminum Alloy Sheet and Plate, Alclad 5.6Zn – 2.5Mg – 1.6Cu 0.23Cr (Alclad 7075; – T6 Sheet – T651 Plate)

(Applications for copies should be addressed to the Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096.)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D412	Test Method for Rubber Properties in Tension (DoD adopted)
ASTM D792	Specific Gravity and Density of Plastics by Displacement (DoD adopted)
ASTM D2240	Rubber Property – Durometer Hardness (DoD adopted)

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

UNIFORM CLASSIFICATION COMMITTEE, AGENT

Uniform Freight Classification Rules

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

(Nongovernment standards and other publications are normally available from the organizations which prepare or which distribute the documents. These documents also may be available in or through libraries or other informational services.)

2.3 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein (except for associated detail specifications, specification sheets or MS standards), the text of this specification shall take precedence. Nothing in this specification, however, shall supersede applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Qualification. The sealing compounds furnished under this specification shall be products which are authorized by the qualifying activity for testing on the applicable qualified products list at the time of the award of contract (see 4.3 and 6.3).

3.2 Materials. The basic ingredient used in the manufacture of the sealing compound shall be synthetic rubber of the polysulfide type. The sealing compound shall cure by the addition of a curing agent to the base compound, shall not depend on solvent evaporation for curing. The compound shall contain no lead compounds. The curing agent shall possess sufficient color contrast to the base compounds to permit easy identification of an unmixed or incompletely mixed sealing compound. Neither the base compound nor the cured sealing compound shall be red or pink in color.

3.2.1 Appearance. The base compound and the curing compound (accelerator) shall each be of uniform blend and shall be free of excessive air, skins, lumps, and gelled or coarse particles. There shall be no separation of ingredients which cannot be readily dispersed.

3.3 Physical properties. NOTE: THIS PARAGRAPH DOES NOT APPLY TO PURCHASES MADE BY THE U.S. GOVERNMENT. The physical properties are divided into two categories: performance requirements and application requirements. Performance requirements define those properties of the cured sealant and how the material will perform in service. Application requirements define those properties of the uncured sealant and affect the application parameters of the sealant, but have little or no effect on the performance properties of the cured sealant. Reference paragraphs for the two categories are as follows:

a. Performance requirements:

3.3.1	Specific gravity
3.3.2	Non–volatile content
3.3.9	Peel strength
3.3.10	Chalking
3.3.11	Air content (Class B only)
3.3.12	Weight loss and flexibility
3.3.13	Fluid rupture resistance

3.3.14 Tensile strength and elongation
3.3.15 Low temperature flexibility
3.3.16 Hydrolytic stability
3.3.17 Corrosion
3.3.18 Repairability
3.3.19 Accelerated storage stability
3.3.20 Long term storage

b. Application requirements:

3.3.3 Viscosity of base compound
3.3.4 Flow (Classes B material only)
3.3.5 Application time
3.3.6 Tack–free time
3.3.7 Cure time
3.3.8 Fluid immersed curing time

3.3.1 Specific gravity. When tested in accordance with 4.9.1, the specific gravity of the cured sealing compound shall be 1.65 maximum.

3.3.2 Nonvolatile content. When tested in accordance with 4.9.2, the nonvolatile content of the freshly mixed sealing compound shall be 87 percent by weight for Class A and 92 percent by weight for Class B, minimum.

3.3.3 Viscosity of base compound. When tested in accordance with 4.9.3, the viscosity of the base compound shall be 1000 to 4000 poises (100 to 400 Pa.s) for Class A material and 8000 to 14000 poises (800 to 1400 Pa.s) for Class B material.

3.3.4 Flow (Classes B material only) When tested in accordance with 4.9.4, freshly mixed sealing compound shall exhibit an initial flow within the limits of 0.1 inch to 0.75 inch (2.5 to 19.0 mm).

3.3.5 Application time. When tested in accordance with 4.9.5, the mixed sealing compound shall have an application time consistent with their dash number classifications. Application time is defined as that time after which the compound extrusion rate drops to 100 grams per minute for Class A and 15 grams per minute for Class B material.

3.3.6 Tack–free time. When tested in accordance with 4.9.6, the mixed sealing compound shall cure to a tack–free condition in not more than the time in hours specified in table I.

3.3.7 Cure time. When tested in accordance with 4.9.7. the mixed sealing compound shall have a hardness of not less than Shore A–30 after curing at the temperature and times specified in table I.

TABLE I. Curing Conditions

Temperature	Tack–free time, hours, maximum	Curing time, hours, maximum
77	3	8
40	12	24
20	48	96

3.3.8 Fluid immersed curing time. When tested in accordance with 4.9.8, the sealing compound shall have a hardness of not less than Shore A–25 after curing for 6 hours and not less than Shore A–35 after curing for 24 hours.

3.3.9 Peel strength When tested in accordance with 4.9.9, the cured sealing compound shall have a minimum peel strength of 10 pounds per inch width for 7 day immersion and 5 pound per inch width for 70 day immersion. It shall exhibit 100 percent cohesive failure, expect for failures due to bubbles, knife cuts, and other causes that are obviously not the fault of the sealing compound.

3.3.10 Chalking. The rating criteria for sealant chalking are:

Slight Chalk – Initial observation of white or light gray formation, usually starting at edges of the sealant.

Moderate Chalk – The white or light gray formation has spread to about 1/4 to 1/2 of the surface area.

Heavy Chalk – The white or light gray formation has spread to about 3/4 or more of the surface.

The sealant shall not chalk to a moderate or heavier level, when tested in accordance with 4.9.10 in less than 5 days.

3.3.11 Air Content (Class B only). When tested in accordance with 4.9.11 the sealing compound shall have an air content of not more than 4 percent(%).

3.3.12 Weight loss and flexibility. When tested in accordance with 4.9.12, the sealing compound weight loss shall not be more than 8 percent, maximum. The specimens shall not crack when bent 180 degrees over an 1/8–inch mandrel.

3.3.13 Fluid rupture resistance. When tested in accordance with 4.9.13, the sealing compound shall retain the AMS 2629 jet reference fluid for a minimum of 24 hours at 10 psig pressure.

3.3.14 Tensile strength and elongation. When tested in accordance with 4.9.14, the ultimate tensile strength and elongation of the cured compound shall not be less than the values shown in table II.

TABLE II. Tensile strength and elongation.

Condition	Tensile strength, psi	Elongation Percent
Standard Cure	200 (1380 kPa)	150
14 day immersion in jet reference fluid (see 4.8) at 140°F (60°C)	180 (1240 kPa)	100
7 days in air at 250°F (121°C)	300 (2070 kPa)	50

3.3.15 Low–temperature flexibility. When tested in accordance with 4.9.15, the sealing compound shall withstand the low–temperature flexibility test at –65°F (–54°C) without cracking, checking, or loss of adhesion.

3.3.16 Hydrolytic stability. When tested in accordance with 4.9.16, the sealing compound shall have a type A hardness of not less than Shore A–30.

3.3..17 Corrosion. When tested in accordance with 4.9.17, there shall be no corrosion under the sealing compound and the sealing compound shall show no sign of deterioration.

3.3.18 Repairability. When tested in accordance with 4.9.18, the sealing compounds shall be suitable for repairing minor breaks in themselves or each other and in all other fuel–aged sealing compound previously qualified under this specification and sealants qualified to MIL–S–8802. Peel panels prepared in accordance with 4.9.9, shall have a minimum peel strength of 10 pounds per inch.

3.3.19 Accelerated storage stability. After storing in accordance with 4.9.19, the base compound shall show no skinning, hardening, separation, nor settling of the material. The aged curing compound shall not be adversely affected and shall be capable of being restored by normal agitation to a condition suitable for use. The aged base compound and the aged curing compound, when mixed, shall meet the requirements for application time, tack free time, and curing time specified in 3.3.5, 3.3.6 and 3.3.7 respectively. The peel strength shall have a minimum peel strength of 10 pounds per inch width and shall exhibit 100 percent cohesive failure.

3.3.20 Long term storage. After storing for 6 months in accordance with 4.9.20, the base compound and curing compound shall show no skinning or hardening and shall be capable of being restored by normal agitation to a condition suitable for use. The aged base compound and aged curing compound, when mixed, shall meet the requirements for application time, tack–free time, and cure time specified in 3.3.5, 3.3.6, and 3.3.7, respectively. The peel strength panels shall have a minimum peel strength of 10 pounds per inch width and shall exhibit 100 percent cohesive failure.

3.4 Health and Safety. The material shall have no adverse effect on the health of personnel when used in conformance with the supplier's Material Safety Data Sheet and for its intended purpose. Questions pertinent to material effects on personnel health shall be referred by the contracting activity to the appropriate departmental medical service who will act as an advisor to the contracting agency.

3.5 Workmanship. The workmanship shall be in accordance with high–grade manufacturing practice covering this type of material. It shall be suitable for its intended use and free of defects which may affect its functionability.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by 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.

4.1.1 Responsibility for compliance. All items must meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of assuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling in quality conformance does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to acceptance of defective material.

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

a. Qualification inspection (4.4).

b. Quality conformance inspection (4.5).

4.3 Inspection conditions. Minor variations in applications requirements during quality conformance inspection (see 4.5) may not be cause for rejection if approved by the procuring agency.

4.3.1 Shelf–life surveillance and updating

4.3.1.1 Sampling. An inspection lot shall consist of items produced by a single manufacturer and bearing the same lot or batch identification number. The minimum number of samples to be tested from each inspection lot during shelf–life surveillance and updating shall be as follows:

Items in stock	Samples to be tested
up to 100	3
100 to 500	5
more than 500	7

4.3.1.2 Shelf–life surveillance and updating tests. The following inspections are to be conducted for shelf–life surveillance and updating:

a. Condition of container
b. Application time
c. Tack–free time
d. Standard curing time
e. Peel strength, (two aluminum panels coated with material conforming to MIL–C–27725, aged in jet reference fluid seven days at 140°F (60°C).

Tests are to be conducted in accordance with test methods outlined in this specification for quality conformance tests (see 4.5.4). If the tests are being performed at the end of the stated shelf–life to update the shelf–life of the sealing compound, and all test are passed, the shelf–life will be extended and additional three months. Up to three updating shall be allowed.

4.3.2 Minor variations. Minor variations in applications requirements during quality conformance inspection (see 4.5) may not be cause for rejection if approved by the procuring agency.

4.3.3 Identification of qualification samples. Qualification samples shall be identified as specified herein and forwarded to the activity responsible for qualification testing as designated in the letter of authorization form that activity (see 6.2).

4.4 Qualification inspection

4.4.1 Qualification tests. Tests to determine conformance to all technical requirements of this specification are classified as qualification tests and shall be performed prior to or on the initial shipment of sealing compound to a purchaser. The manufacturer shall use ingredients, manufacturing procedures, processes, and methods of inspection on production sealing compound which are essentially the same as those used on the approved (qualified) sample. If necessary to make any change in the ingredients in type of equipment for processing, or in manufacturing procedures, the manufacturer shall submit for reapproval a statement of the proposed changes in material, processing or both and, when requested, a sample of sealing compound. Production sealing compound made by the revised procedure shall not be shipped prior to receipt of reapproval.

4.4.2 Qualification test samples. Unless otherwise specified, the qualification test samples shall consist of three 1–quart (1 liter) kits of the compound and 12 sectional–type (MIL–S–38714) containers. The sectional–type containers shall be the 6 ounce size filled with 3–1/2 ounces of sealing compound. Qualification samples shall be identified as follows

SEALING COMPOUND, LOW TEMPERATURE CURING, QUICK REPAIR, INTEGRAL FUEL TANKS AND FUEL CELL CAVITIES

Class and Dash No.
Specification MIL–S–83318A(USAF)
Manufacturer's Code No.
Name of Manufacturer
Lot Number
Date of Manufacture
Submitted by (name) (date) for qualification tests in accordance with MIL–S–83318A(USAF) under authorization (reference authorizing letter)

4.5 Quality conformance inspection

4.5.1 Lot. A lot shall consist of all material of the same identity, from the same batch, and submitted at the same time for inspection.

4.5.2 Batch. A batch shall be the quantity of material run through a mill or mixer at one time.

4.5.3 Sampling for quality conformance tests. Each lot shall be tested as specified in 4.5.4. Samples shall be selected from the materials which are packaged in sectional–type containers conforming to MIL–S–38714. A sufficient number of containers shall be selected from each lot in order to conduct all the tests specified.

4.5.4 Quality conformance tests. Quality conformance tests for acceptance of individual batches shall consist of the following tests:

Test	Test procedure
a. Flow (Class B only)	4.9.4
b. Application time	4.9.5
c. Tack–free time	4.9.6
d. Cure time	4.9.7
e. Fluid immersed curing time	4.9.8
f. Peel strength (4 aluminum panels, QQ–A–250/12, T6 chemical filmed in accordance with MIL–C–5541, type II, class I (dichromate sealed) coated with material conforming to MIL–C–27725, 7 day immersion test only.)	4.9.9
g.. Chalking 1/	4.9.10
h. Air Content (Class B only)	4.9.11

1/ In lieu of the 14–day cure specified, specimens shall be subjected to an accelerated cure of 48 hours at 77°F (25°C) and 50 percent relative humidity followed by 24 hours at 140°F (60°C).

4.5.4.2 THIS PARAGRAPH DOES NOT APPLY TO PURCHASES MADE BY THE U.S. GOVERNMENT. Minor variations in application requirements (viscosity of base compound and curing compound, flow, application time, assembly time, tack–free time, standard curing time, and fluid immersed curing time) may not be cause for rejection of a particular batch if the minor variation is acceptable to and approved by the procuring agency.

4.6 Test conditions. Standard laboratory test conditions shall be 77°F (25°C) and 50 ±5 percent relative humidity. Unless otherwise specified, all test specimens shall be prepared and cured under these conditions. In addition, application time, tack–free time, and standard curing time shall be tested under standard laboratory conditions. Unless otherwise stated, other tests shall be conducted at a temperature of 77°F (25°C).

4.6.1 Standard tolerances. Unless otherwise specified, the following are standard tolerances:

Temperature	±2°F (1°C)
Days	± 2 hours
Hours	± 5 minutes
Minutes	± 10 seconds
Inches (mm)	± 0.010 inch (0.20 mm)

4.7 Preparation of test specimens

4.7.1 Chemical conversion coating application for aluminium panels

4.7.1.1 Coating preparation. A chemical conversion coating conforming to MIL–C–81706, Class IA, Form II, Method C shall be used for aluminium panels. It shall be prepared according to the manufacturer's instructions.

4.7.1.2 Panel preparation

a. Vapor degrease using 1–1–1 trichloroethane or solvent degrease using 1–1–1 trichloroethane or methyl ethyl ketone (MEK).

b. Alkaline detergent clean using MIL–C–87936 type I material or an equivalent commercially available alkaline cleaner. The cleaning may be accomplished by brushing, swabbing or soaking the panels in the detergent solution or by a combination of the above techniques. Rinse the cleaned panels in warm flowing tap water 60°F to 100°F, (16°C to 38°C) and check for cleanliness by observing for waterbreak free surface. If a waterbreak occurs on the panel surfaces, return them to the detergent solution and repeat cleaning procedure until a waterbreak free surface is obtained.

c. Immediately transfer the cleaned panels to a deoxidizing solution consisting of the following:

Butyl alcohol – 35 percent by weight
Distilled or deionized water – 22 percent by weight
Isopropyl alcohol – 25 percent by weight
(H_3PO_4) 85 by weight – 18 percent by weight

Acid deoxidizer conforming to MIL–C–38334 may also be used. Allow the panels to remain in the above solution for 3 to 5 minutes. Rinse the panels thoroughly under flowing tap water.

4.7.1.3 Coating application (immersion). Transfer the deoxidized panels immediately to the chemical conversion coating solution conforming to MIL–C–81706. Immerse the panels in the solution at standard temperature for 3 to 5 minutes or until a light straw color develops. (Color development time will vary with aluminum alloy being conversion coated.) After removal from conversion coating solution, immediately rinse thoroughly in flowing distilled or deionized water. Arrange the panels in an upright position to permit them to drain dry. Apply test materials to the conversion coated surfaces within 48 hours.

NOTE: Mix the conversion coating solution in either 18–8 stainless steel, polyethylene or other compatible plastic containers. DO NOT MIX IN GLASS CONTAINERS.

4.7.2 Preparation of sealing compound

4.7.2.1 Sealing compound preparation. Sealing compound shall be prepared by machine mixing sectional–type (MIL–S–38714) containers in accordance with the manufacturers instructions, for the following tests:

a. Application time
b. Tack–free time
c. Cure time
d. Fluid immersion curing time
e. Fluid rupture resistance
f. Accelerated storage

The rest of the samples shall be prepared from the 3 quarts of the sealing compound and shall be hand mixed in accordance with the manufacturer’s instructions. The mixed sealing compound shall have a minimum inclusion of air. Where applicable, the sealing compound, immediately after mixing, shall be placed into cartridges for extrusion from a sealant gun.

4.7.2.2 Quantity of sealing compound. Unless otherwise specified, the quantity of sealing compound required for qualification conformance tests shall be prepared by machine mixing sectional–type (MIL–S–38714) containers in accordance with the manufacturer's instructions.

4.7.3 Cleaning of test panels.

4.7.3.1 Cleaning of all test panels. All test panels shall be cleaned by scrubbing and rinsing using MIL–C–38736 solvent and AMS 3819 cleaning cloths which are free of sizing or any other contaminant. The panels shall be wiped dry immediately with clean AMS 3819 cloths.

NOTE: When organic coatings specified for the test panels, the coatings shall be fully cured as defined by the applied coating specification before cleaning. The applied coatings shall be at least 14 days old and a maximum of 6 months old when stored at ambient indoor temperatures.

4.7.3.2 Special cleaning of stainless steel and titanium peel strength panels. Stainless steel panels and titanium panels that are used for peel strength testing have to receive special cleaning. The special cleaning shall be scrubbing with abrasive mats and MIL–C–38736 solvent. After scrubbing, the panels shall be rinsed using MIL–C–38736 solvent and clean gauze. The panels shall be wiped dry. The abrasive mats shall conform to MIL–A–9962, type I, class I, grade A for the stainless steel and MIL–A–9962, type III, Class 1, grade A for the titanium.

4.7.4 AMS 3100 adhesion promoter. When specified, the panel surface shall be treated with AMS 3100 adhesion promoter. This shall be done immediately after the panel has been cleaned. The adhesion promoter shall be applied by wetting a clean AMS 3819 cloth with adhesion promoter and wiping the surface. Allow the AMS 3100 to air dry at least 30 minutes but not more than two hours before applying sealant. If more than two hours have elapsed, re–clean and re–apply the AMS 3100 before applying sealant.

4.7.5 Application of sealing compound. Unless otherwise specified herein, test panels shall be given an application of sealing compound to produce a coating having total thickness of 0.125 inch $\pm$0.016 (3 $\pm$0.5mm) cured.

4.7.6 Cure of sealing compound. The sealing compound shall be cured for 14 days at 77°F (25°C) and 50 $\pm$5 percent relative humidity. Tests on the cured sealing compound shall commence not more than 2 days after completion of the specified cure

4.8 Jet reference test fluid. The jet reference fluid (JRF) required for conducting fluid immersion tests shall conform to AMS 2629. Type I fluid shall be used for conducting all tests requiring fluid except for the chalking test. Type II fluid shall be used for the chalking test.

4.9 Test methods

4.9.1 Specific gravity. Three test specimens approximately 0.125 x 1 x 1 inch (3.2 x 25.4 x 25.4 mm) in size shall be cut out with a sharp razor blade from a sheet of the sealing compound that has been cured as specified in 4.7.6. Determine the specific gravity of each sample in accordance with ASTM D 792, method A and report the average value.

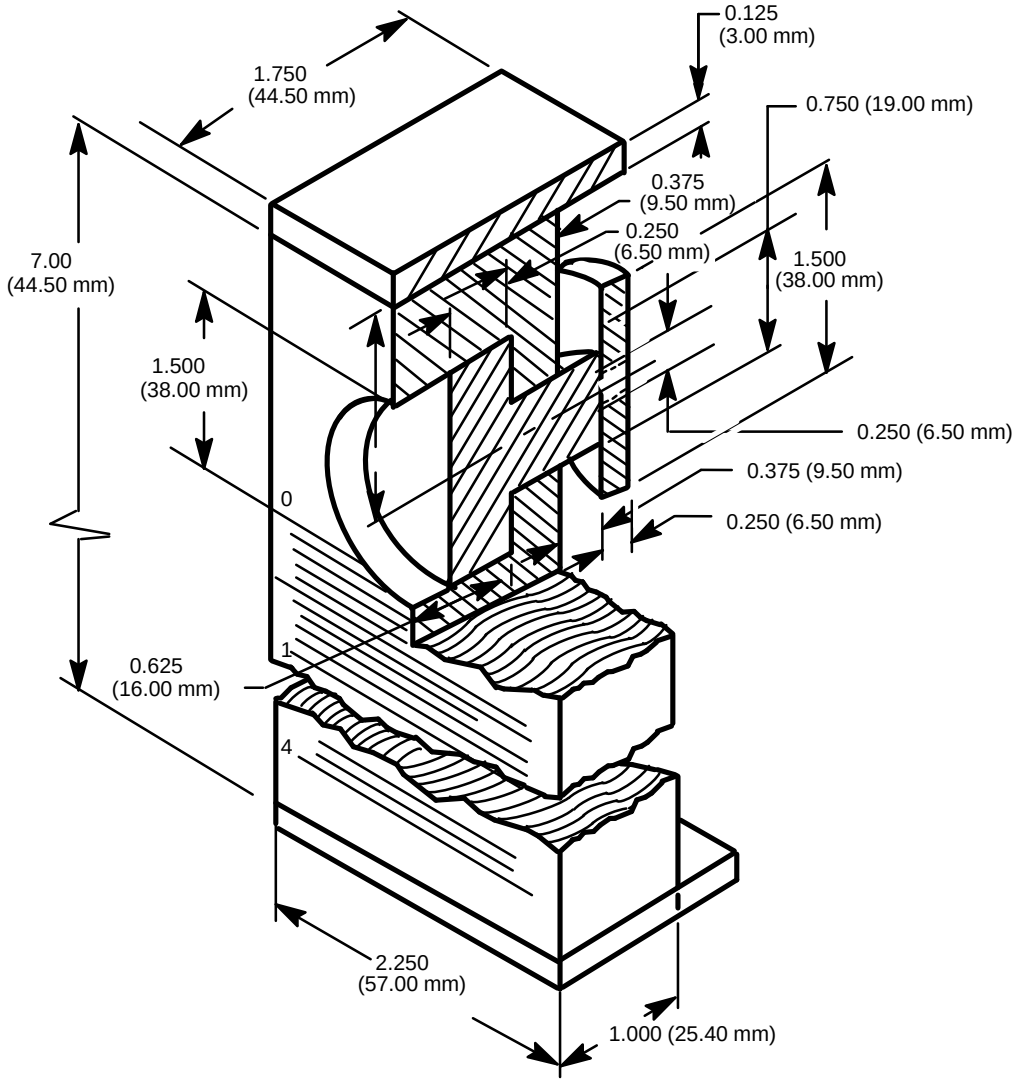
4.9.2 Nonvolatile content. Within 5 minutes after mixing, 11 to 12 grams of mixed sealing compound shall be transferred as rapidly as possible to a previously weighed (W1) aluminum dish approximately 2 inches (50 mm) in diameter. The Class A sealant shall be poured into the dish. The Class B sealant shall be extruded from a plastic cartridge fitted with a 0.125 inch (3.18 mm) orifice nozzle, filling the bottom of the dish to a uniform depth. The initial weight (W2) shall be determined using an analytical balance accurate within ±1 mg. Immediately following weighing, the sample and dish shall be placed in a circulating air oven pre–heated to 160°F (70°C), and allowed to dwell for 168 ±2 hours (7 days). Following this, the sample and dish shall be removed from the oven and allowed to cool in a desiccator for 1 hour. Final weight (W3) shall be determined on the same balance used for initial weights. All weights shall be recorded to the nearest milligram.

Percent nonvolatile shall be determined from the average of three (3) samples calculated as follows:

$$\text{Percent Nonvolatile} = \frac{(W3 - W1)}{W2 - W1} \times 100$$

4.9.3 Viscosity of base compound. The viscosity shall be determined with base compound placed in a pt. (1/2 L) can. The can shall be filled with base compound to within 1/2 inch (12 mm) of the top, covered and stored at 77°F (25°C) for not less than 8 hours. The base compound shall then be thoroughly mixed by stirring slowly for not less than 3 minutes after which the can shall then be closed and the base compound shall be allowed to stand for not less than 1 hour. The Brookfield Model RVF viscosimeter, or equal, shall be used. The readings obtained shall be converted to poises. Pa.s) For Class A material, the No. 6 spindle at 10 revolutions per minute (rpm) shall be used for the test. For Class B material, the No. 7 spindle at 2 rpm shall be used. The highest reading shall be taken after the instrument has run in the base compound for not less than 1 minute.

4.9.4 Flow (class B only). A standard sealant gun cartridge, fitted with a suitable nozzle, shall be filled with freshly mixed sealing compound. The gun and sealing compound shall be maintained at standard conditions throughout the test. The test shall be conducted with a flow–test fixture as shown on figure 1 and under flow conditions specified in 3.3.4. Depth of plunger tolerance is critical and shall be controlled within the tolerance during all tests. The flow–test fixture shall be placed on a table with the front face upward and plunger depressed to the limit of its travel.



MATERIAL: ALUMINUM ALLOY
DIMENSIONS IN INCHES (MILLIMETERS)
UNLESS OTHERWISE SPECIFIED, TOLERANCES;
DECIMALS ± 0.016 INCH (± 0.40 MM).

(NOT TO SCALE)

FIGURE 1. Flow–test fixture.

Immediately after mixing, enough of the mixed sealing compound shall be extruded from the application gun to fill the recessed cavity of the fixture and leveled off even with the block. Within 10 seconds after the leveling operation, the fixture shall be placed on its end and the plunger immediately advanced to the limit of its forward travel. The initial flow shall be measured. The flow shall be measured from tangent to the lower edge of the plunger to the farthest point to which flow has advanced.

4.9.5 Application time method. The base compound, curing compound, and application gun shall be stabilized at standard conditions (see 4.6) for not less than 8 hours before not less than 250 g of the base compound is mixed with the proper amount of curing compound. The mixed sealing compound shall be promptly used to fill a standard sealing compound gun cartridge, having a nozzle with an orifice diameter of 0.125 ±0.005 inch (3.18 ±0.13 mm). 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 ±5 psi (600 ±35 KPa). From 2 to 3 inches (50 to 75 mm) of sealing compound shall be extruded initially to clear trapped air. At the end of 1/6 hour, measured from the beginning of the mixing period, the sealing compound shall be extruded onto a previously weighed suitable receptacle for 1 minute and the weight of extruded sealing compound determined.

4.9.6 Tack–free time. An aluminum alloy test panel conforming to AMS 4049 and measuring 0.040 by 2–3/4 by 6 inches (1.0 by 70 by 150 mm) in size shall be cleaned in accordance with 4.7.1. Sealing compound applied in accordance with 4.7.5 shall cover the cleaned panel surface to a dept of 0.125 inch ±0.016. The sealant shall be cured at standard conditions (see 4.7.6). At the end of the specified tack–free time (see 3.3.6), two 1–inch by 7–inch (25 by 175 mm) pieces of polyethylene film 0.005 ±0.002 inch (0.10 ±0.05 mm) thick shall be applied to the sealing compound and held in place using a pressure of approximately 0.5 ounces per square inch for 2 minutes. The strips shall then be slowly and evenly withdrawn at right angles to the sealing compound surface. The polyethylene shall come away clean and free of sealing compound.

4.9.7 Cure time. The instantaneous hardness shall be determined in accordance with method 3021 of FED–STD–601 after the sealing compound is allowed to cure at standard conditions as specified in 3.3.7 and table I. The reading shall be taken on a double back–to–back 0.125 inch (3 mm) thick specimen.

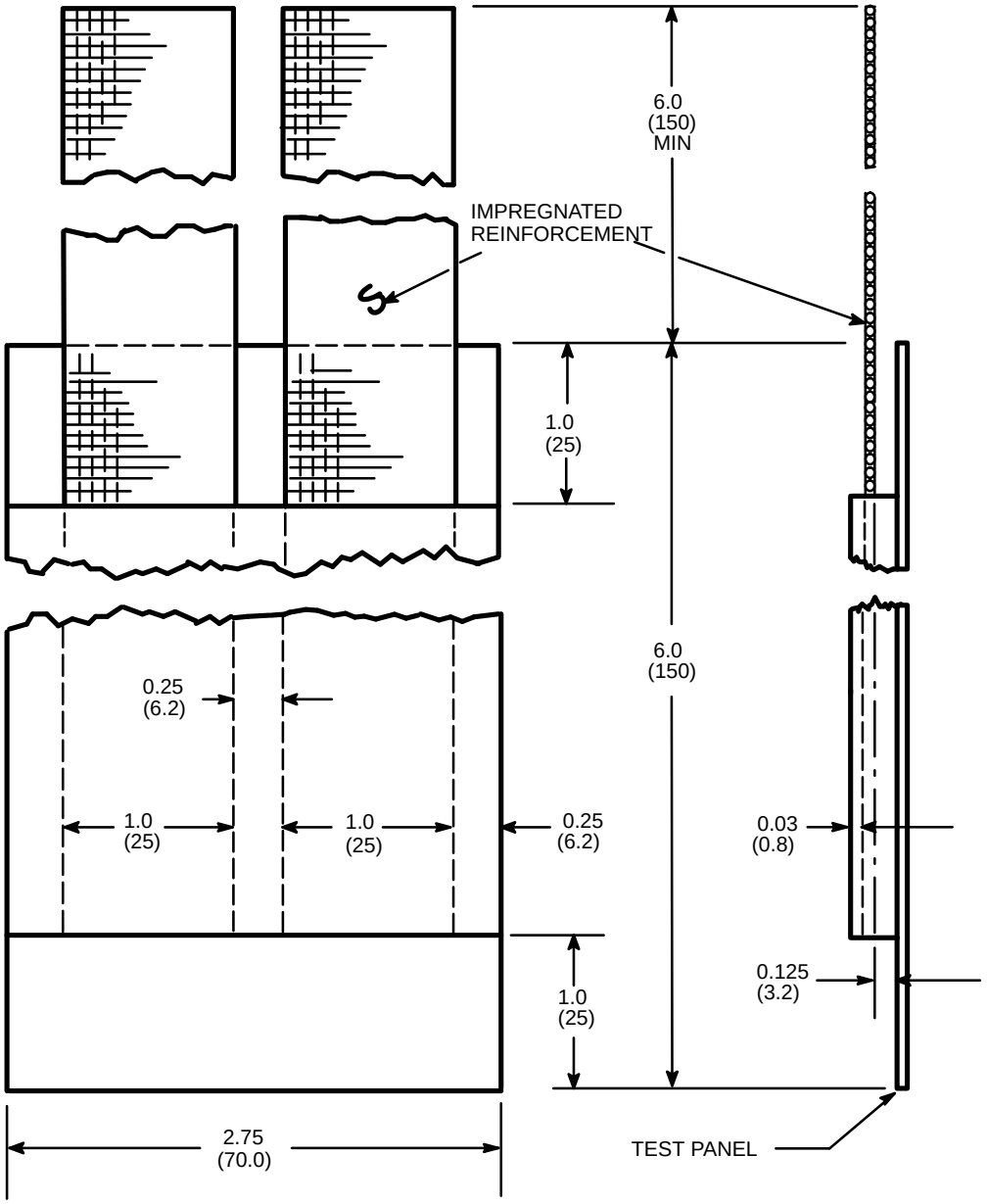
4.9.8 Fluid immersed curing time. An aluminum test panel conforming to temper T6 of QQ–A–250/13 and measuring 0.040 by 2.75 by 6 inch (1.00 by 70 by 150 mm) shall be cleaned in accordance with 4.7.1 and covered with sealing compound to a depth of 0.25–inch (6.3 mm) in one application. After curing at standard conditions for 2 hours, the test panel shall be immersed in jet reference fluid at 77°F (25°C). The hardness shall be determined after a total of 6 hours (4 hours in fluid) and after a total of 24 hours (22 hours in fluid) in accordance with method 3021 of FED–STD–601.

4.9.9 Peel strength. The type and quantity of panels listed in table III shall be used for evaluation of peel strength. All panels shall be as described in figure 2. The thickness of the panels shall be as listed in table III. The panels shall be prepared in accordance with 4.7.1. The adhesion promoter shall be applied as specified in 4.7.4. Sealing compound shall cover 5 inch (125 mm) of one side of the panel surface to a depth of 0.125 inch $\pm$0.016 (3.0 $\pm$ 0.5 mm). A 2.75 x 12 inch (70 x 300 mm) strip of cotton duck, conforming to CCC–C–419, type III, or a strip of wire screen (20– to 40– mesh aluminum or model wire fabric) shall be impregnated with the sealing compound, so that approximately 5 inch (125 mm) at one end is completely covered on both sides. The sealant coated end of the fabric shall be placed on the sealant coated panel, and smoothed down on the layer of the sealing compound, taking care not to trap air beneath the fabric. An additional coating of sealing compound shall be applied over the fabric approximately 0.031 in (0.8 mm) thick. The sealant shall be given a standard cure as specified in 4.7.6. At the end of the sealing compound cure, two panels of each substrate listed in table III shall be completely immersed in covered glass vessel in the following fluids and under the following conditions. (Immersion in wide–mouth quart jars with 2 panels in each jar is suitable.)

1. 7 days at 140°F (60°C) in jet reference fluid
2. 7 days at 140°F (60°C) in equal parts jet reference fluid and 3% aqueous sodium chloride solution

In addition, the panels coated with MIL–C–27725 shall be subjected to each the following test conditions:

1. 70 days at 140°F (60°C) in jet reference fluid with fluid change every 14 days
2. 70 days at 140°F (60°C) in equal parts jet reference fluid and 3% aqueous sodium chloride solution with fluid change every 14 days



NOTES:
1. DIMENSIONS ARE IN inch (MILLIMETERS).
2. UNLESS OTHERWISE SPECIFIED, DIMENSIONS SHOWN SHALL BE NOMINAL.
3. SEALANT AND FABRIC COVERS LOWER 1 IN. (25 MM) OF PANEL IN THE OPTIONAL SPECIMEN.

FIGURE 2. Peel Specimen Configuration

After the specified exposures the panels shall be cooled in the fluid for 24 hours at standard conditions. The peel strength shall be measured within 10 minutes after removal from the test fluid. Two 1 inch (25 mm) wide strips shall be cut through the sealing compound and fabric to the metal and extended the full length of the fabric. The specimens shall be stripped back at an angle of 180 degrees to the metal panel in a suitable tensile testing machine having a jaw separation rate of 2 inch (50 mm) per minute. During the peel strength testing, three cuts shall be made though the sealing compound to the panel in an attempt to promote adhesive failure. The cut shall be at approximately 1 inch (25 mm) intervals. The results shall be the numerical average of the peek loads during cohesive failure. Failure of the sealant compound to the fabric shall not be included in the peel strength values.

TABLE III. Peel strength panels

Quantity	Panel Material	Panel Thickness
4	Aluminum alloy QQ–A–250/13, T6	0.040 inch (1.00 mm)
4	Aluminum alloy QQ–A–250/12, T6 chemical treated in accordance with MIL–C–5541.	0.040 inch (1.00 mm)
4	Stainless steel MIL–S–5059, composition 304 finish 2B	0.025–0.040 inch (0.60–1.00 mm)
4	Titanium MIL–T–9046, type I, composition B	0.025–0.040 inch 0.60–1.00 mm)
4	Aluminum Alloy QQ–A–250/12, T6, chemical filmed in accordance with MIL–C–5541.	0.040 inch (1.00 mm)
8	Aluminum Alloy QQ–A–250/12, T6, chemical filmed in accordance with MIL–C–5541. Coated with material conforming to MIL–C–27725.	0.040 inch (1.00 mm)

4.9.10 Chalking. Four 0.125 x 0.125 x 5 inch (3 by 3 by 125 mm) specimens shall be cut from a sheet of the sealing compound that has been cured as specified in 4.7.6. The specimens shall be suspended on nylon cord in a closed glass container with 900 ml of jet references fluid conforming to AMS 2629 type II so that the specimens are totally immersed in the fluid. Aluminum foil shall be used to seal the lids of the containers. No metal items shall be allowed to be in contact with the fluid or specimens during the immersion period. The specimens shall not touch each other, so that all sides are exposed to the fluid. The immersion temperature shall be 77°F (25°C). The tests shall be started on a Wednesday and the fluid changed on the following Friday. The specimens shall be examined for chalking on the following Monday. Remove specimens from the fluid and allow the fluid to evaporate. The specimens are not to be blotted or wiped. Examine strips in a well lighted area. Use an original specimen for comparison with the specimens under test to detect chalking.

4.9.11 Air content (Class B only). The equipment used for the air content test shall be:

Sealing Cartridge 3–1/2 ounce
2.5 inch (64 mm) nozzle with a 0.125 inch (3 mm) orifice
Dasher rod with valve assembly and separate plug and ramrod from a 6 inch sectional cartridge conforming to MIL–S–38714.

The test method shall conform to the following steps and shall refer to figure 3 for the various steps:

1. Test shall be performed at standard laboratory condition: as specified in 4.6

2. Test sealant material shall be stabilized at standard conditions for at least 8 hours prior to the test.

3. Fill sealant into cartridge being careful not to introduce air. Attach a 2.5 inch (64 mm) nozzle with a 0.125 inch (3 mm) orifice to the cartridge. Cut 1.125 inch (29 mm) off the tip of the nozzle. Extrude approximately two inch (50 mm) of sealant out, to remove entrapped air.

4. Prior to starting the test, the dasher rod should have the seal ring just contacting the dasher end and the valve is not closed.

5. Insert the tip of the filled cartridge firmly into the handle of the dasher rod and deliver sealant slowly until dasher is about 3/4 full. The sealant, however, should be filled completely into the handle end of the dasher.

6. Fill the wider flange side of the plug with sealant and place the plug in the rod behind the sealant with the wide flange side toward the sealant, taking care not to entrap air. Clean off excess sealant with a gauze pad wet with methyl ethyl ketone.

DIAGRAM OF STAGES IN FILLING SEALANT GUN CARTRIDGE DASHER

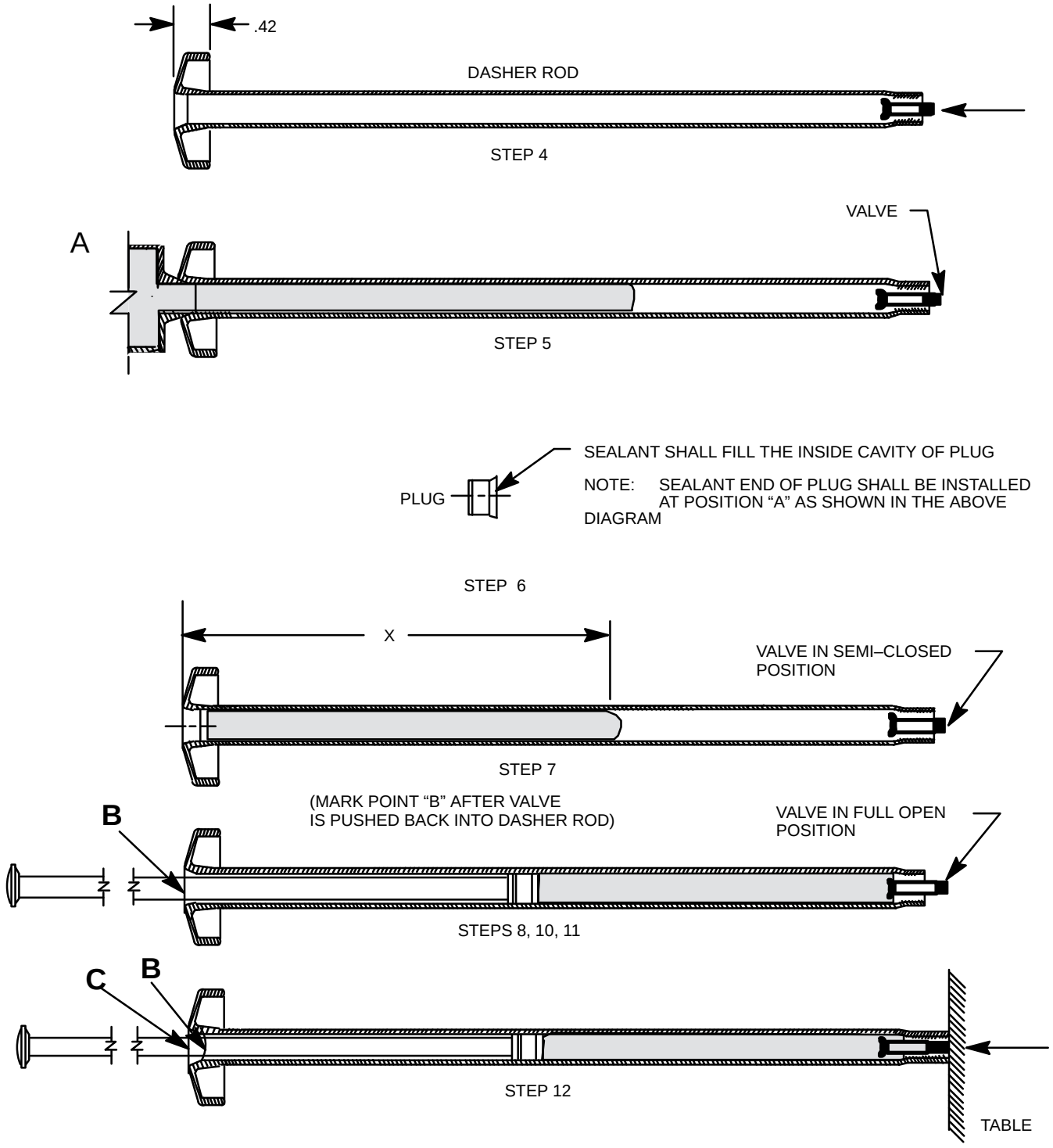


FIGURE 3. Diagram of stages in filling Sealant Gun Cartridge dasher rod.

7. Measure the length of the sealant in the dasher in millimeters. Measurements shall be between the interior bottom of the plug and the middle of the curve sealant bead at the other end of the dasher rod (length “X”, as shown in figure 3).

8. Insert ramrod into the dasher rod and push until the valve is in full open position (as shown in figure 3).

9. Remove ramrod and clean off any remaining excess sealant at the handle end of the dasher rod.

10. Slowly push the valve body into the dasher, finally forcing a seal.

11. Lightly insert the ramrod again into the dasher until it just touches the top of the plug. Make a mark ”B” on the ramrod at the handle end of the dasher.

12. Put firm hand pressure on the ramrod while the valve end of the dasher is held against a table edge. Make a second mark “C”.

13. Measure the distance between the two marks on the ramrod.

CALCULATION;

The percentage of air present in the sealant material can be calculated by determining the following ratio:

$$\% \text{ air present} = \frac{\text{Distance of the 2 marks (BC) on the ramrod}}{\text{Original length of sealant in dasher rod}} \times 100\%$$

Three test runs should be made and results averaged. Use fresh equipment for each run.

NOTE: Sample to be used for this compression test shall not be obtained from the sealant at the top of each drum or container.

4.9.12 Weight loss and flexibility. Four 0.125 by 1 by 5–inch (3 by 25 by 125 mm) specimens shall be cut from a sheet of the sealing compound that has been cured for 14 days as per 4.7.6. The specimens shall be weighed and immersed in 900 ml of jet reference fluid at 140°F (60°C) in a closed container for a period of seven days. At the end of the exposure period, the specimens shall be removed from the fluid and air dried for 72 hours at 120°F (49°C). The specimens shall then be cooled to standard test condition in a desiccator and weighed. After weighing, the specimens shall be bent 180 degrees over a 0.125–inch (3 mm) mandrel and examined for evidence of cracking.

4.9.13 Fluid rupture resistance. A 0.125 inch (3 mm) hole shall be drilled in the center of a 0.040 x 3.5 x 3.5 inch (1.00 x 88 x 88 mm) test panel conforming to QQ–A–205/12. A fillet of sealant 0.125 ± 0.15 inch (3 mm ± 0.4) thick and 0.50 inch (13 mm) in diameter shall be applied to the center of the panel covering the hole. After curing 1 hour at standard conditions, a 0.50 inch (13 mm) cork borer shall be used to trim excess sealant and the panel shall be installed in apparatus as shown in figure 4. This apparatus consist of a glass bulb fitted with a buna–N–o–ring. After installation of the panel, 100 millimeters of jet reference fluid shall be added to the apparatus, the plastic tubing attached, and 10 psig air pressure applied to the top of the fluid. This pressure shall be maintained for 24 hours at standard conditions.

4.9.14 Tensile strength and elongation . Mixed sealing compound 0.125 ±0.015 inch (3.0 ±0.4 mm) thick shall be prepared by pressing between 2 polyethylene sheets, removing the top sheet at the end of the tack–free time and allowing the sealing compound to cure as specified in 4.7.6. Nine tensile test specimens shall be cut from the sheet using die C, as specified in ASTM D412. Three specimens shall be exposed to each of the environmental conditions specified table II. Where fluid immersion is specified, the specimens shall be immersed in 400 ml of the jet reference fluid. Specimens to be tested after the fluid immersion shall be cooled for 24 hours at 77°F (25°C) and tested within 5 minutes after removal from the fluid. Specimens to be tested after oven aging shall be allowed to cool for 16 to 48 hours at standard conditions before testing. The tensile and elongation tests shall be conducted at a standard conditions in accordance with ASTM D412 at a jaw separation rate of 20 inch ± 1 (508 mm ±25) per minute.

4.9.15 Low–temperature flexibility. Four test panels 0.040 by 2.75 by 6 inch (1.00 by 70 by 150 mm) in size shall be prepared from aluminum alloy conforming to temper T6 of QQ–A–250/13. A coating of the sealing compound 00.1 x 1.5 x 4 inch (2.5 x 40 x 100 mm) thick shall be applied to the center of each of the 4 panels. Care shall be taken to maintain an accurate sample thickness of 0.1 inch (2.5 mm). At the end of a standard cure, as specified in 4.7.6, two of the specimens shall be immersed in 900 ml of jet reference fluid for 7 days at 250°F (121°C).. All four panels shall then be immediately placed in a low–temperature flexibility fixture as shown in figure 5, consisting of a clamp support that will grip both sides of both 6–inch (150 mm) edges of the panel for a distance of 3 inch (75 mm) from one end without touching the sealant as shown in figure 5.. The fixture shall be capable of flexing the panel through a 30 degree arc (15 degrees each side of the center) at a constant speed of 1 cycle per 5 seconds. The temperature shall be reduced to –65°F (54°C), stabilized at this temperature for 2 hours, and the panels flexed through 130 consecutive cycles .

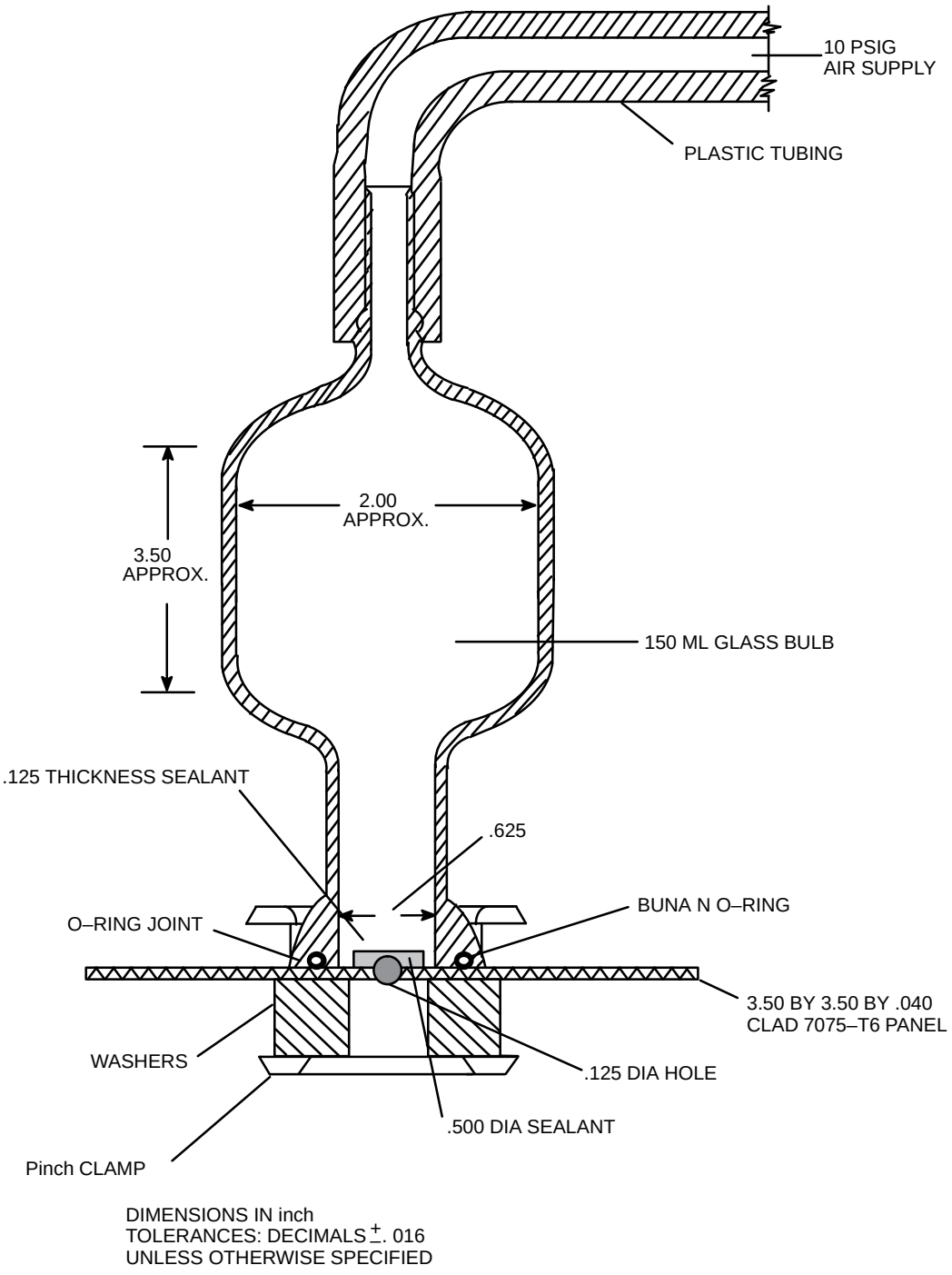
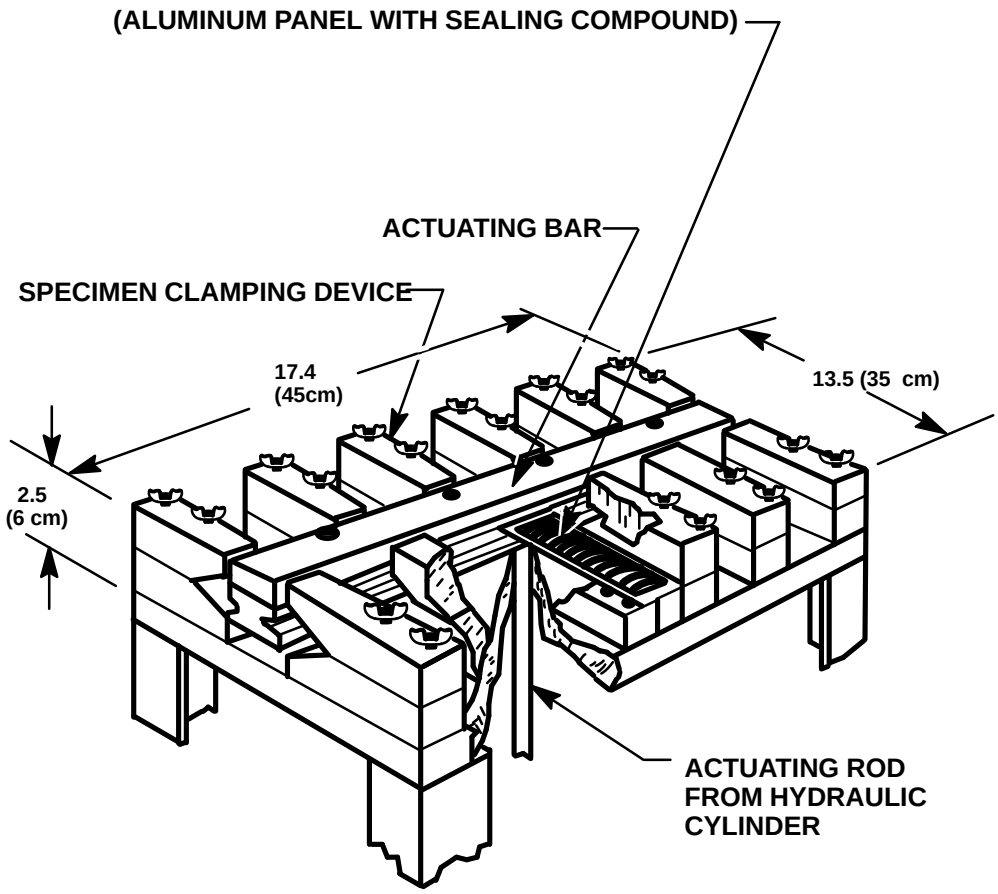


Figure 4. Fluid Rupture Apparatus



DIMENSIONS IN INCHES (CENTIMETERS).

FIGURE 5. Low temperature flexibility fixture.

4.9.16 Hydrolytic stability. A cured specimen of approximately 0.50 inch thick by 3 inch (12 by 7.5 cm) in diameter, shall be exposed for 120 days ±4 hours in an environment of 160°F (70°C) and 95% ±5 relative humidity. To do this, pour a 22% by weight glycerin in distilled water solution into a desiccator until the liquid level is 1 inch (25 mm) below the desiccator plate. Suspend the sealant specimen in the desiccator so that it does not touch anything. Apply vacuum grease to the lid and slide the lid in place. Loosely stopper the hole to prevent vacuum build up. Place the desiccator in a circulating air oven set at 160°F (70°C). When the temperature inside the desiccator reaches 160°F (70°C) tightly stopper the hole to prevent water evaporation. Change the glycerin solution every 30 days or when it becomes cloudy. After 120 days±4 hour remove the desiccator from the oven and allow to cool frequently loosening the stopper. Remove the specimen from the desiccator and hold it at standard conditions for 14 days. The instantaneous hardness shall be determine in accordance with ASTM D 2240 and reported.

4.9.17 Corrosion. Two aluminum panel conforming to QQ–A250/12 and measuring 0.040 by 2.75 by 6 inch (1.00 by 70 by 150 mm) in size shall be prepared as follows: A controlled area one inch wide by 5 inch long (25 x 125 mm) shall be masked in the center on one side of each panel and the remainder of the panel shall be chemical filmed in accordance with MIL–C–5541 followed by a corrosion protective coating MIL–C–27725. After the coating has cured, the adhesion promoter shall be applied and a 0.062 in (1.5 mm) thick layer of sealing compound shall be applied to the area, overlapping a minimum of 0.25 inch (6 mm) onto the coated protection. The sealant shall be given a standard cure and the panels conditions as follows: The panels shall be immersed vertically for 20 days in a covered glass vessel containing a 2–layer liquid consisting of 3 percent aqueous sodium chloride solution and jet reference fluid so that two inch (50 mm) of the panel is exposed to the salt solution, two inch (50 mm) is exposed to the jet reference fluid, and the remainder of the panel is exposed to the air–vapor mixture. The temperature of the fluid during the test shall be maintained at 140°F (60°C).

4.8.18 Repairability. Prepare sufficient number of QQ–A–250/13, of Aluminum–alloy peel panels measuring 0.40 x 2.75 x 6 inch (1 x 70 x 150 mm) so that there are 2 panels for each sealing compound already qualified to this specification, plus 2 panels for the material being qualified and 4 panels for material qualified to MIL–S–8802 (2 for type I and 2 for type II). Apply adhesion promoter as specified in 4.7.4 and overcoat one side of the panels with 0.125 inch ±0.016 (3 mm ± 0.5) of sealing compound so that 2 panels are coated with each class B–2 sealing compound already qualified to this specification. 4 panels are coated with sealing compound qualified to MIL–S–8802 (2 for type I and 2 for type II). and 2 panels are coated with the sealing compound being qualified.After a standard cure as specified in 4.7.6 exposed 1 panel of each sealing compound to jet reference fluid for 3 days at 140°F (60°C) followed by 3 days air drying at 120°F (50°C) then 7 days air aging at 250°F (121°C). Clean all panels as specified in 4.7.3, apply adhesion promoter as specified in 4.7.4 and apply a thickness of 0.125 ±0.016 inch (3 ±0.5 mm) of newly mixed sealing compound being qualified over the existing compound. A peel strength panel shall then be prepared in accordance with the method specified in 4.9.9 After a standard cure as specified in 4.7.6 the specimens shall be tested as specified in 4.9.9.

4.9.19 Accelerated storage. Five sectional–type containers (MIL–S–38714) filled with base compound and curing compound along with matching primer shall be stored for 14 days at 120°F (49°C) in a suitably vented oven . After cooling at standard conditions for at least 24 hours, tests shall be conducted in accordance with 4.9.5, 4.9.6, 4.9. Two QQ–A–250/13 aluminum–alloy peel panels shall also be prepared and tested, without fuel immersion, in accordance with 4.9.9.

4.9.20 Long term storage. Five sectional–type containers (MIL–S–38714) filled with base compound and curing compound along with matching adhesion promoter shall be stored at 77°F (25°C) for six months. At the end of the storage tests shall be conducted in accordance with 4.9.5, 4.9.6, and 4.9.7. Two QQ–A–250/13 aluminum alloy peel panels shall also be prepared and tested without fuel immersion in accordance with 4.9.9.

5. PACKAGING

5.1 Preservation and packaging. Preservation and packaging shall be Level A.

5.1.1 Level A

5.1.1.1 Sectional–type containers. The base compound and the curing compound shall be furnished in highly density polyethylene sectional–type 2.5 oz. (75 ml) or 6 oz. (175 ml) cartridges, conforming to MIL–S–38714, as specified in the purchase order. The total content of the base compound and the curing compound contained in each sectional–type container shall be as follows:

Size of container	Total content (base and curing)
2.5 oz. (75 ml)	2 fl oz. ± 1/8 (60 ml ±5)
6 oz. (175 ml)	3.5 fl oz. ± 1/8 (105 ml ±5)

Sufficient adhesion promoter in a glass vial will be provided with each sectional–type container.

5.2 Packing. Packing shall be level A, B, C or as specified (see 6.3).

5.2.1 Levels A . The sealing compound shall be packed in overseas–type shipping containers in accordance with the requirements of the appendix to PPP–C–96.

5.2.2 Levels B . The sealing compound shall be packed in domestic–type shipping containers in accordance with the requirements of the appendix to PPP–C–96.

5.2.3 Level C., The sealing compound shall be packed in a manner to insure carrier acceptance with safe delivery at destination. Containers shall be in accordance with Uniform Freight Classification Rules or Regulations of other carriers applicable to the modes of transportation.

5.3 Marking of shipment. In addition, to any special marking required by the contract or order, interior packages and exterior shipping containers shall be marked in accordance with MIL–STD–129. Marking shall include specification number, applicable class and dash number, name of manufacturer, date of manufacture (month and year), batch number, mixing instructions, and store below 80°F (26°C). The date of manufacture is defined as the date the quality conformance tests are completed by the sealant manufacturer.

6. NOTES

6.1 Intended use. The sealing compound covered by this specification is intended for use as a quick repair, low temperature curing sealants for repairing aircraft integral fuel tanks and fuel cell cavities that may be subjected to a service temperature range of –65°F to +250°F (–54°C to +121°C).

6.2 Acquisition requirements. Acquisition documents should specify the following:

a. Title, number (including latest revision letter), and date of the specification.

b. Quantity desired.

c. Applicable levels of packaging and packing (see 5.1 and 5.2).

d. Special marking if required (see 5.3).

e. Size of container (see 5.1.1.1.1).

6.3 Qualification. With respect to products requiring qualification, awards will be made only for products which are at the time set for opening of bids, qualified for inclusion in the applicable Qualified Products List whether or not such products have actually been so listed by that date. The attention of the suppliers 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 orders for the products covered by this specification. The activity responsible for the Qualified Products List is the Air Force Wright Aeronautical Laboratories, ATTN: WL/MLSE, Wright–Patterson AFB OH 45433–6533, and information pertaining to qualification of products may be obtained from that activity.

6.4 Subject term (key words) listing

Adhesion
Resistant
Sealant
Sealing compound
Temperature

6.5 Change from previous issue. Asterisks (or vertical lines) are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

Custodians:
Air Force –11

Preparing activity:
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