

**Aerospace Standard Test Methods for Aerospace Sealants
Two-Component Synthetic Rubber Compounds**

TABLE OF CONTENTS

1. SCOPE	5
2. REFERENCES	5
3. CLASSIFICATION	5
3.1 Classes	5
3.1.1 Class A	5
3.1.2 Class B	5
3.1.3 Class C	5
3.1.4 Class D	5
3.1.5 Class E	5
3.2 Application Time or Worklife	5
4. PREPARATION OF SEALING COMPOUND	6
4.1 Qualification Testing	6
4.2 Acceptance Testing	6
4.3 Quick-Freezing of Sealing Compound	6
4.4 Thawing of Quick-Frozen Sealing Compound	7
5. APPLICATION PROPERTIES TEST METHODS	9
5.1 Nonvolatile Content	9
5.2 Air Content (Class B Sealant Base Compound Only)	9
5.3 Viscosity of Base Compound	11
5.4 Viscosity of the Curing Agent	12
5.5 Flow (Classes B, C and D)	12
5.5.1 Classes B and D	12
5.5.2 Class C	14

SAE Technical Standards Board Rules provide that: "This report is published by SAE to advance the state of technical and engineering sciences. The use of this report is entirely voluntary, and its applicability and suitability for any particular use, including any patent infringement arising therefrom, is the sole responsibility of the user."

SAE reviews each technical report at least every five years at which time it may be reaffirmed, revised, or cancelled. SAE invites your written comments and suggestions.

Copyright 2002 Society of Automotive Engineers, Inc.
All rights reserved.

Printed in U.S.A.

TO PLACE A DOCUMENT ORDER: (724) 776-4970

FAX: (724) 776-0790

SAE WEB ADDRESS: <http://www.sae.org>

SAE AS5127/1 Revision A

TABLE OF CONTENTS (Continued)

5.6	Application Time	14
5.6.1	Class A Material	14
5.6.2	Class B and C Material	16
5.7	Assembly Time (Class C Only)	16
5.8	Tack-Free Time	18
5.9	Standard Curing	18
5.10	Low-Temperature Cure Time (Classes A and B Only)	18
5.11	Fluid Immersion Cure Time (Classes A-1/4, A-1/2, B-1/4 and B-1/2 Only)	18
5.12	Soluble Chromate Level	19
5.12.1	Extraction	19
5.12.2	Titration	19
5.12.3	Calculation	19
5.12.4	Alternate Tests for Soluble Chromate	19
6.	PERFORMANCE PROPERTIES TEST METHODS	20
6.1	Specific Gravity	20
6.2	14-Day Hardness	20
6.3	Radiographic Density	20
6.3.1	Preparation of Test Panels	20
6.3.2	Application of Sealant	20
6.3.3	Test Procedure	20
6.4	Resistance to Thermal Expansion	21
6.5	Heat Reversion Resistance (Classes B and C Only)	21
6.6	Hydrolytic Stability	24
6.7	Shaving and Sanding (Class B Only)	24
6.8	Paintability	24
6.9	Weathering	25
7.	RESISTANCE TO HYDROCARBONS	26
7.1	Chalking	26
7.2	Resistance to Thermal Rupture	26
7.3	Fluid Rupture Resistance (Classes B-1/4 and B-1/2 Only)	27
7.4	Weight Loss and Flexibility	29
7.5	Volume Swell	29
7.6	Low-Temperature Flexibility	31
7.6.1	Alternate Low-Temperature Flexibility Testing	31
7.6.2	Low-Temperature Flexibility (Windshield Sealant)	35
7.7	Tensile Strength and Elongation	35
7.8	Shear Strength (Class C Only)	37
7.9	Corrosion	37

SAE AS5127/1 Revision A

TABLE OF CONTENTS (Continued)

7.10	Corrosion Stressed Assembly and Mixed Metals	39
7.10.1	Corrosion Stressed Assembly	39
7.10.2	Mixed-Metal Assemblies	39
7.11	Crazing	43
8.	PEEL STRENGTH PROPERTIES	43
8.1	Peel Strength Testing	43
8.1.1	Classes B, D and E	48
8.1.2	Classes A and C	48
8.1.3	Classes A-1/4, A-1/2, B-1/4 and B-1/2	48
8.2	Repairability	52
9.	STORAGE STABILITY	53
9.1	Accelerated Storage Stability	53
9.2	Long-Term Storage	53
TABLE 1	Typical Flow Test Requirements	15
TABLE 2	Weatherometer Settings	25
TABLE 3	Preparation Sequence of Corrosion Test Assemblies	39
TABLE 4	Mixed Metal Assemblies	42
TABLE 5	Peel Strength Panels	47
FIGURE 1	Plastic Disposable Cartridge, Plunger and Nozzle	7
FIGURE 2	Sealant Cartridge for Two Component Materials (Acceptable Type I and II Kit)	8
FIGURE 3	Diagram of Stages in Filling Dasher Rod	10
FIGURE 4	Flow Test Jig	13
FIGURE 5	Assembly Time Test Specimen	17
FIGURE 6	Radiographic Density	22
FIGURE 7	Thermal Expansion Block	23
FIGURE 8	Weathering Test Specimen	25
FIGURE 9	Thermal Rupture Fixture	28
FIGURE 10	Fluid Rupture Apparatus	30
FIGURE 11	Low Temperature Flexibility Test Specimen	31
FIGURE 12	Low Temperature Flexibility Jig	32
FIGURE 13	Low Temperature Flexibility Apparatus	33
FIGURE 14	Contour Block	34
FIGURE 15	Low Temperature Flexibility Test Jig	36
FIGURE 16	Shear Specimen Fixture	38
FIGURE 17	Assembly Configuration for Cycle and Exposure	40
FIGURE 18	Mixed Metal Assembly	41
FIGURE 19	Crazing Test Showing Transparency in Test Position	44

TABLE OF CONTENTS (Continued)

FIGURE 20 Loading Condition for Cantilever Beam	45
FIGURE 21 Crazing Test Jig.....	46
FIGURE 22 Five-Inch Peel Specimen Configuration	49
FIGURE 23 Four-Inch Peel Specimen Configuration	50
FIGURE 24 Peel Strength Test.....	51

SAENORM.COM : Click to view the full PDF of as5127_1a

1. SCOPE:

This standard describes test methods to determine the application and performance properties of two-component polysulfide or polythioether sealing compounds. It shall be used in conjunction with AS5127.

2. REFERENCES:

See Applicable Documents, AS5127A.

3. CLASSIFICATION:

The sealing compound may be of the following designations:

3.1 Classes:

3.1.1 Class A: Sealing compound suitable for application by brush.

3.1.2 Class B: Sealing compound suitable for application by extrusion gun, spatula, brush or roller.

3.1.3 Class C: Sealing compound suitable for application by extrusion gun, spatula, brush or roller.

3.1.4 Class D: Sealing compound suitable for application by extrusion gun or spatula.

3.1.5 Class E: Sealing compound suitable for application by automatic riveting equipment.

3.2 Application Time or Worklife:

Dash numbers following the sealing compound classification, e.g. B-2, shall be used to designate the maximum application time in hours for Classes A, B, D and E. Class C dash numbers represent application time and assembly time in hours, e.g. C-12/48.

4. PREPARATION OF SEALING COMPOUND:

The sealing compound must be mixed according to the manufacturer's instructions. The mix ratio of sealant base compound and the curing agent of two-part sealant shall be maintained as specified by the manufacturer.

NOTE: Catalyst and base must be mixed thoroughly to produce the expected properties in the cured sealant. In all cases, no swirling motion can be produced through stirring to aid in the mixing, thus every bit of base and catalyst must be moved physically by the stirring instrument and the container walls should be scraped frequently during the mixing process in order to blend the two parts together. A vital factor in the proper use of sealants is sufficient, effective blending to produce a uniform mixture – and to produce that uniform mixture without stirring in air (See AIR4069).

4.1 Qualification Testing:

It is preferable to machine mix Class B sealing compounds in sectional type containers (1/2 gallon and larger) conforming to PPP-C-96, using a rotary head automatic mixer such as a Semco Model 1394, or equivalent. When kit sizes are limited (1-qt or smaller) a dasher-rod type mixer such as a Semco Model 1350 or equivalent may be utilized. Manufacturer's instructions for mixer operation and mixing must be followed. Plastic disposable cartridges conforming to AS4491 as shown in Figure 1 shall be used to hold the mixed sealant, which can later be extruded from the cartridges for sealing application and specimen fabrication. Under special circumstances, sealing compound may be provided in cartridges for two component sealants conforming to MIL-S-38714 as shown in Figure 2 for Type I and Type II kits, and shall be mixed according to sealant manufacturer's instructions. All Classes A and C sealing compounds shall be hand-mixed using the appropriate ratio of base to curing agent.

4.2 Acceptance Testing:

Sealing compound supplied in sectional kits for acceptance testing may be machine mixed using a dasher rod type mixer, or may be hand-mixed using the appropriate ratio of base to curing agent.

4.3 Quick-Freezing of Sealing Compound:

If quick-freezing of the freshly mixed sealing compound is required, the AS4491 Size B (6 fluid ounce) plastic cartridges holding the sealant shall be tightly capped at both ends immediately after filling. The installed plunger of the type shown in Figure 1 constitutes a satisfactory plug in the large end of the cartridge. The sealant shall be quick frozen by immersion in ASTM D 329 acetone and dry ice or equivalent process maintained at -80 °F (-52 °C) or lower for 30 min. Cartridges shall be immersed in the fluid with the plugged nozzle end down. Approximately 1-in of the upper end of the cartridge should extend above the fluid. Cartridges may also be inserted into plastic bags prior to immersion in the fluid.

4.4 Thawing of Quick-Frozen Sealing Compound:

For tests on tack-free, curing rate, application time, and flow, Class B materials shall be stored according to the sealing compound specification for at least 16 h but not more than 48 h. When frozen sealant stored at -40°F (-40°C) is used for tests, it shall be further conditioned for 2 h at -67°F (-55°C) prior to the start of thawout. Thawout shall be accomplished by immersion of the frozen cartridge in a 120°F (49°C) water bath for 18 min with the plugs installed and the upper end of the cartridge 1 in above the liquid level. Time zero shall be considered as occurring at the end of the 18 min period and the timed tests begun. For all other tests, the storage time of the frozen material shall not exceed 10 days at the temperature in the sealing compound specification. Thawout shall be accomplished as stated above except sealant may be thawed to room temperature if desired.

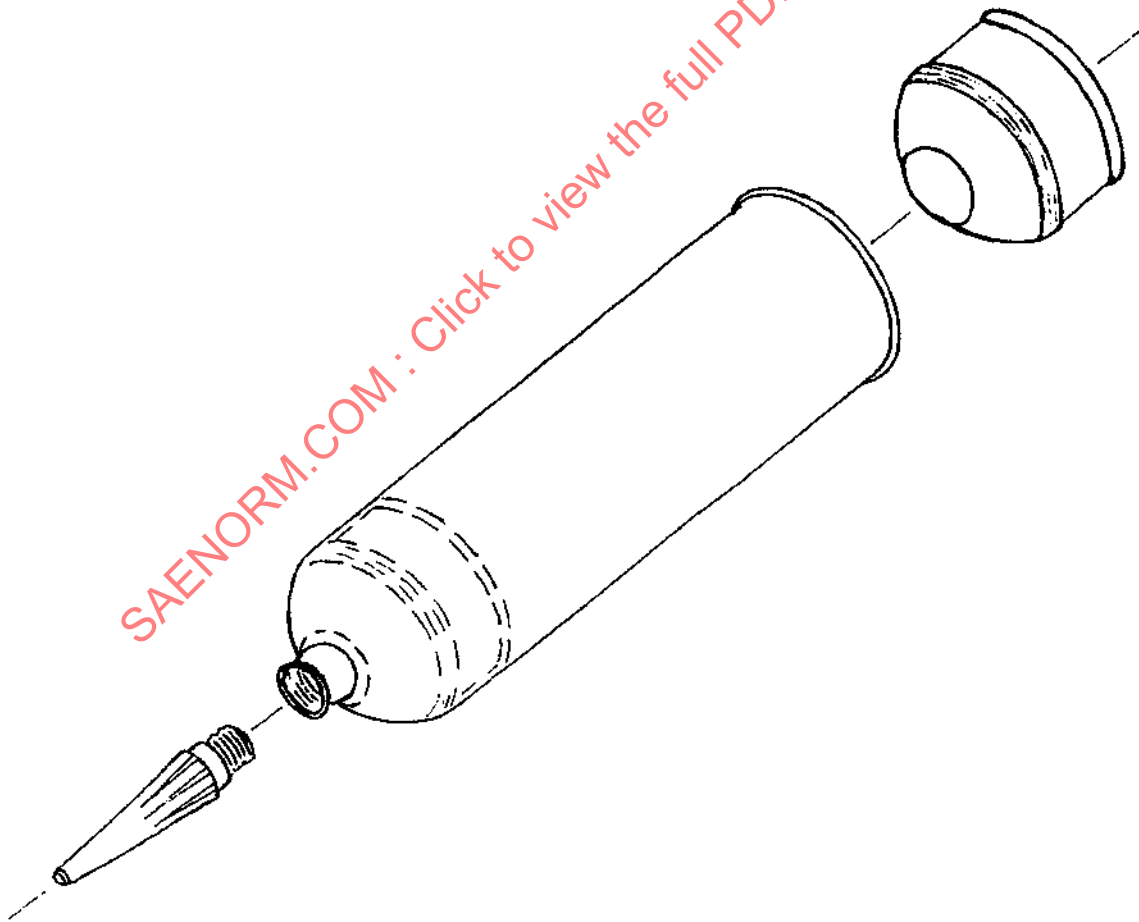


FIGURE 1 – Plastic Disposable Cartridge, Plunger and Nozzle

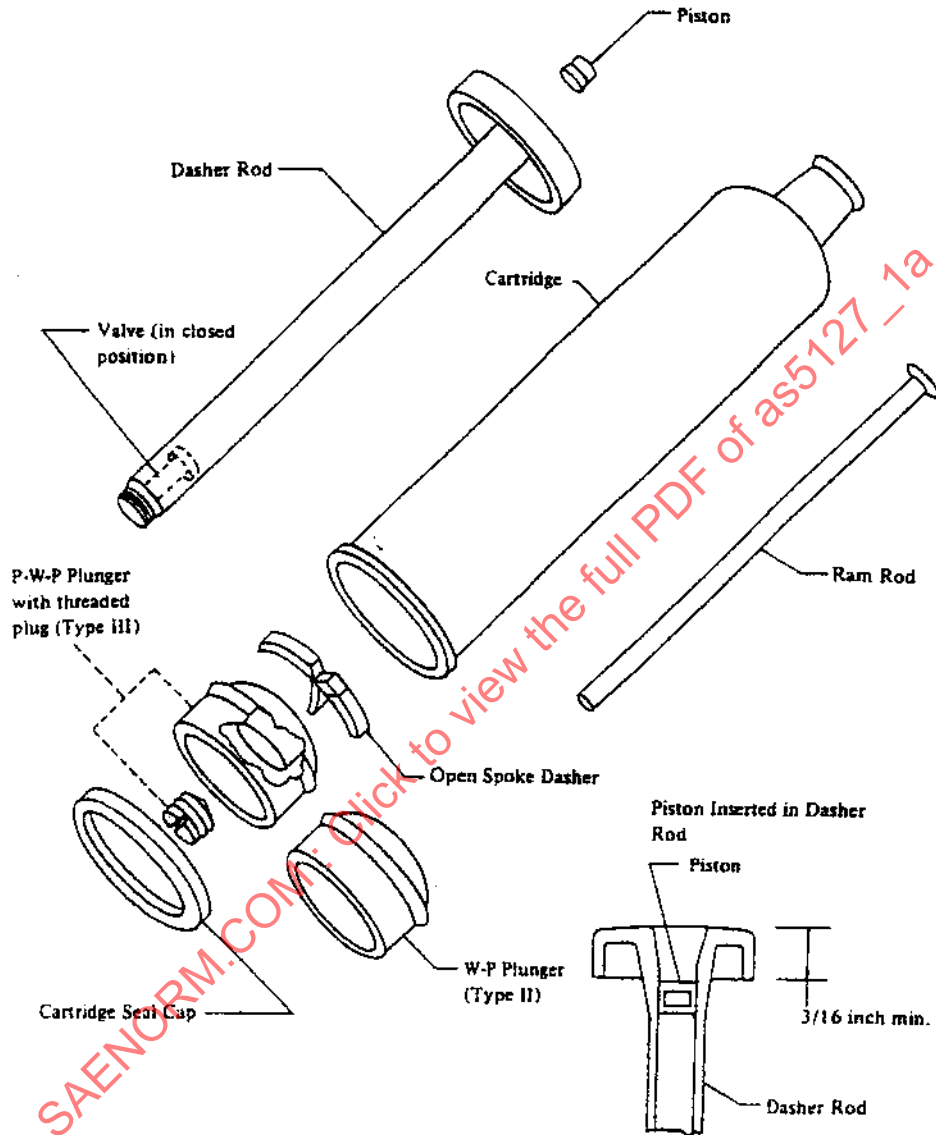


FIGURE 2 – Sealant Cartridge for Two Component Materials (Acceptable Type I & II Kit)

5. APPLICATION PROPERTIES TEST METHODS:

5.1 Nonvolatile Content:

Weigh a cup, approximately 3 in (76 mm) diameter and 0.75 in (19.0 mm) deep to the nearest 0.001 g (W_1). Transfer 11 to 12 g of mixed sealant to the cup as rapidly as possible, and weigh immediately to the nearest 0.001 g (W_2). Place the sealant and cup in an air circulating oven that has been preheated to 158 °F (70 °C) for 7 days. After heating for the specified time, place the sealant and cup in a desiccator and cool to room temperature. Weigh to the nearest 0.001 g (W_3). Determine ($W_2 - W_1$) and ($W_3 - W_1$). Calculate the percent nonvolatile content as shown in Equation 1:

$$\text{Percent nonvolatile} = \frac{W_3 - W_1 \times 100}{W_2 - W_1} \quad (\text{Eq. 1})$$

The measured value shall be checked for conformance to the sealing compound specification.

5.2 Air Content (Class B Sealant Base Compound Only):

The equipment used for the air content test shall be:

- Sealing Cartridge, AS4491 as shown in Figure 1
- Nozzle, AS4491 2.5 in (64 mm) with 0.125 in (3.18 mm) orifice shown in Figure 1
- Dasher Rod with valve assembly and separate plug and ramrod from a 6-fluid ounce (152 mL) sectional cartridge conforming to MIL-S-38714 shown in Figures 2 and 3.

NOTE: This test is not considered valid for low density (S.G. < 1.35) sealing compounds, since these compounds may contain compressible filler materials.

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

- Test shall be performed at standard conditions according to AS5127, 4.1.
- Sealant base compound to be tested shall also be stabilized at standard conditions for at least 8 h prior to the test. The test sample shall not be taken from the top of the sealant base container or drum.
- Fill sealant into cartridge being careful not to introduce air. Attach the nozzle with 0.125 in (3.18 mm) orifice to the cartridge. Cut 1.125 in (28.58 mm) off the tip of the nozzle. Extrude approximately 2 in (51 mm) of sealing compound to remove entrapped air.
- Prior to starting the test, the dasher rod should have the seal ring just contacting the dasher end and the valve is not closed.
- Insert the nozzle of the filled cartridge firmly into the handle of the dasher rod as shown in Figure 3, Step 5, 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.

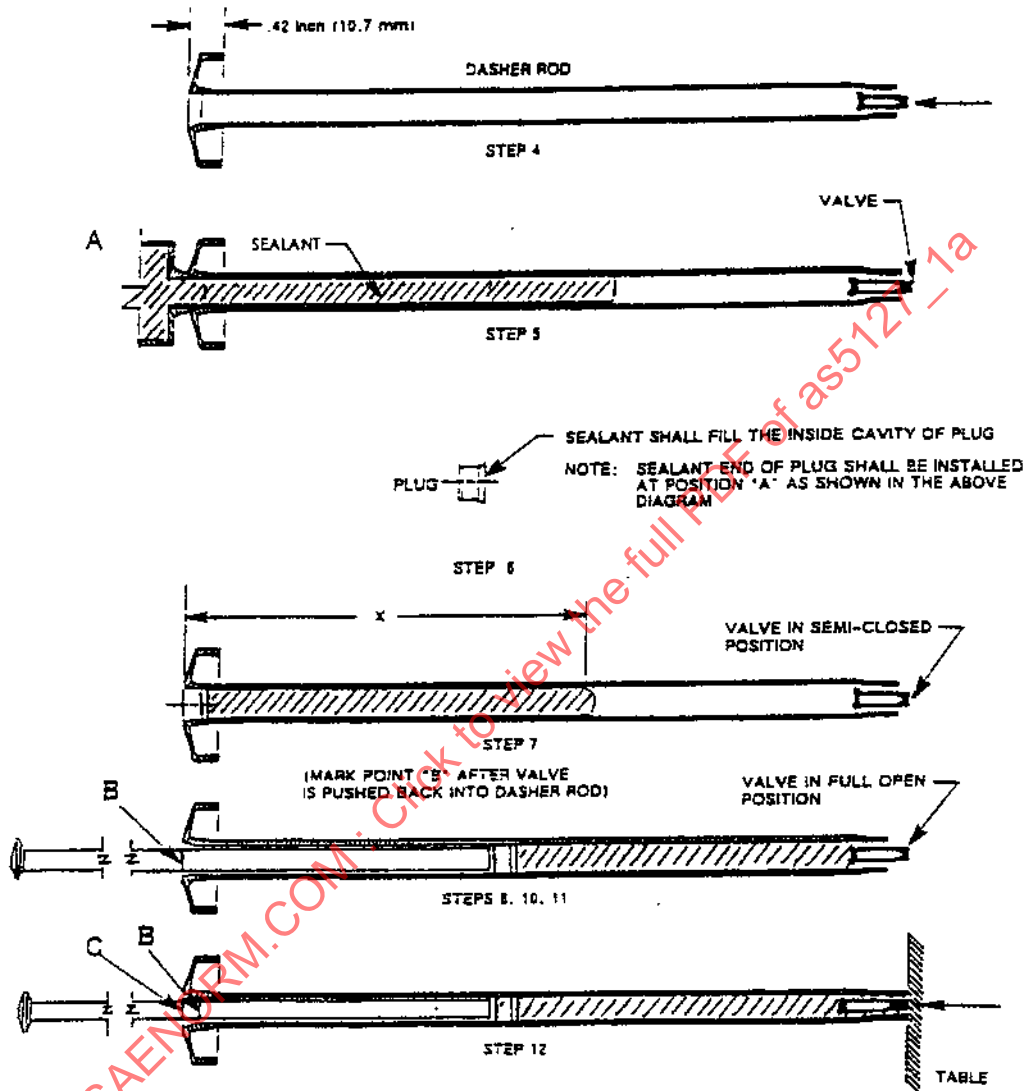


FIGURE 3 – Diagram of Stages in Filling Dasher Rod

5.2 (Continued):

6. Fill the wider flange side of the plug with sealant and place the plug in the dasher rod behind the sealant with the wide flange side of the plug toward the sealant, taking care not to entrap air. Clean off excess sealant.
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 curved sealant bead at the other end of the dasher rod (length "X", as shown in Figure 3).
8. Insert the ramrod into the dasher rod and push until the valve is in full open position as shown in Figure 3, Step 8.
9. Remove ramrod and clean off any remaining excess sealant at the handle end of the dasher ramrod.
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 percent of air present in the sealant material can be calculated using Equation 2.

$$\% \text{ Air Present} = \frac{\text{Distance between marks B and C on the ramrod}}{\text{Original length of the sealant in dasher rod}} \times 100 \quad (\text{Eq. 2})$$

Two repetitions shall be made and results of the three tests shall be averaged. Use fresh equipment for each repetition.

5.3 Viscosity of Base Compound:

Shall be determined with the base compound placed in a one pint (437 mL) or larger can. The can shall be filled with the base compound to within 0.5 in (12.7 mm) of the top, then covered and stored at 77 °F (25 °C) for not less than 8 h. The base compound shall be thoroughly mixed by stirring slowly for not less than 3 min after which the can shall be closed and the base compound shall be allowed to stand for not less than 1 h, and no more than 2 h.

The Brookfield Model RVF viscometer, or equivalent, shall be used. The readings obtained shall be converted to poises (Pa.s). Viscometer spindle size and speed of rotation to be used are defined in the material specification for the class and application time of sealing compound under test, according to sealant class. The highest reading shall be taken after the instrument has run in the fluid for 1 min. The measured value shall be checked for conformance to the sealing material specification.

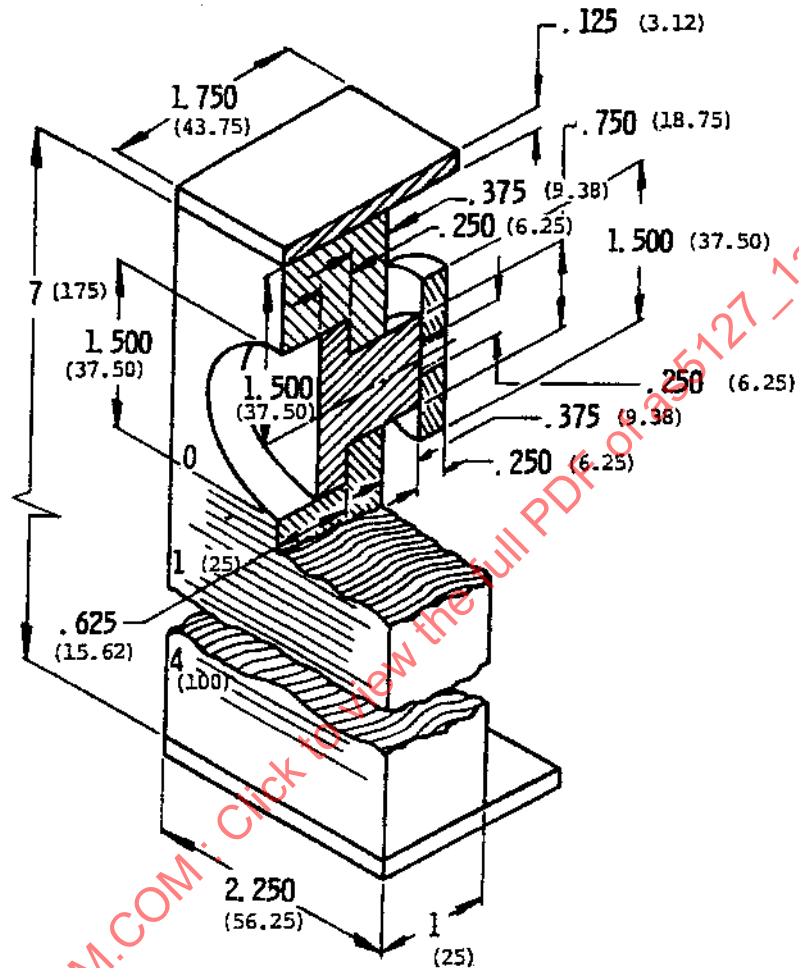
5.4 Viscosity of the Curing Agent:

The viscosity of the curing agent shall be determined using the same procedure as AS5127/1, 5.3. Spindle size and speed of rotation to be used are defined in the material specification for the class and application time of the sealing compound under test. The measured value shall be checked for conformance to the sealing compound specification.

5.5 Flow (Classes B, C and D):

- 5.5.1 Classes B and D: A standard AS4491 sealant gun cartridge, fitted with a 0.125 in orifice nozzle, shall be filled with freshly mixed sealing compound. The sealant gun, cartridge and enough sealing compound shall be maintained at standard conditions to complete all required flow determinations. The test shall be conducted using a clean flow test jig as shown in Figure 4. Depth of the fixture plunger is critical and shall be controlled within the tolerance specified in Figure 4 during all flow testing. The flow jig shall be placed on a table with the front face upward and the plunger depressed to the limit of its travel. Within 15 min of the beginning of sealant mixing, enough of the mixed sealing compound shall be extruded using the application gun to fill the cavity created by the depressed plunger. The sealant shall be leveled with the front surface of the flow jig. Within 10 s after the leveling operation, the jig shall be placed upright on its base and the plunger immediately advanced to the limit of its forward travel. The flow measurement shall be taken at exactly 30 min after the sealing compound has been applied to the flow test fixture. The test at this time interval will be considered the initial flow of the sealing compound. The flow shall be measured from the lower edge of the plunger to the farther point to which flow has advanced. The measured flow distance shall be within the required limits of the sealing compound specification.

If additional flow determinations are required according to the material specification, the flow fixture shall be cleaned then refilled at the specified time with sealing compound from the same mix used in the determination of initial flow. The flow measurement shall be taken at exactly 30 min after the sealing compound has been applied to the flow test fixture. For example, for 50 min flow, the fixture shall be refilled at exactly 50 min after mixing of the sealing compound, and the flow measurement shall be taken 30 min subsequent to filling of the fixture. Typical flow test requirements, according to application rates, are shown in Table 1. All time intervals, other than initial flow, are measured from the end of the mixing period.



MATERIAL ALUMINUM ALLOY

DIMENSIONS IN INCHES (MILLIMETRES). UNLESS OTHERWISE SPECIFIED,

TOLERANCES: LINEAR DIMENSIONS ± 0.016 In. (0.40 mm)

FIGURE 4 – Flow Test Jig

5.5.2 Class C: One AMS 4049 aluminum alloy panel measuring 0.040 in $\times$ 2.75 in $\times$ 6 in (1.02 mm $\times$ 69.8 mm $\times$ 152 mm) shall be solvent cleaned in accordance with AS5127, 6.1.1. A 0.015 to 0.020 in (0.38 to 0.51 mm) layer of freshly mixed sealant shall be applied to the panel after which the panel shall be immediately placed in a vertical position and allowed to stand for a period equivalent to the rated tack-free time defined in the material specification for the sealing compound under test. At the end of the tack-free time, the thickness of the remaining sealing compound on the upper one-third of the test panel shall be measured. The measured thickness shall be checked for conformance to the minimum thickness requirement of the material specification.

5.6 Application Time:

5.6.1 Class A Material: The base compound and curing agent shall be stabilized at standard conditions (AS5127, 4.1) for not less than 8 h before a sample of the base compound is mixed with the proper amount of curing agent sufficient to fill a standard 1 pint (0.5 L) can, 2.88 in (73 mm) in diameter to 2.88 in (73 mm) high to within 0.5 in (13 mm) of the top. This can shall be tightly covered except when testing for the viscosity.

At the end of the rated sealant application time, e.g., 0.25 h for A-1/4, measured from the beginning of the mixing period, the sealing compound shall be tested for viscosity using a Brookfield Model RVF viscometer, or equivalent. Spindle size and speed of rotation shall be defined in the sealing material specification. The highest reading shall be taken after the instrument has run in the sealing compound for 1 min. The measured viscosity shall be within the limits defined in the sealing compound specification.

TABLE 1 – Typical Flow Test Requirements

Flow Requirement	Flow Fixture Fill Time	Sealing Compound Class and Application Time							
		Flow Measurement Time ¹							
		B-1/4	B-1/2	B-1	B-2	B-4	B-6	B-12	
Initial	Within 15 mins. of start of mix	30 mins.	30 mins.	30 mins.	30 mins.	30 mins.	30 mins.	30 mins.	
30 mins.	30 mins. after mixing	---	---	60 mins.	---	---	---	---	
50 mins.	50 mins. after mixing	---	---	---	80 mins.	---	---	---	
90 mins.	90 mins. after mixing	---	---	---	120 mins.	---	---	---	
2 hours	2 hours after mixing	---	---	---	---	2.5 hours	---	---	
3 hours	3 hours after mixing	---	---	---	---	---	3.5 hours	---	
3.5 hours	3.5 hours after mixing	---	---	---	---	4 hours	---	---	
5.5 hours	5.5 hours after mixing	---	---	---	---	---	6 hours	---	
6 hours	6 hours after mixing	---	---	---	---	---	---	6.5 hours	
11.5 hours	11.5 hours after mixing	---	---	---	---	---	---	12 hours	

¹ All flow measurements shall be made 30 minutes after flow fixture is filled.

- 5.6.2 Class B and C Material: The base compound, curing agent, and application gun shall be stabilized at standard conditions (AS5127, 4.1) for not less than 8 h before not less than 250 g of the base compound is mixed with the proper amount of curing agent.

The mixed sealing compound shall be used to fill a standard AS4491 sealing gun cartridge, having an AS4491 nozzle with an orifice of 0.125 in $\pm$ 0.004 in (3.18 mm $\pm$ 0.10 mm). The gun and sealing compound shall be maintained at standard conditions (AS5127, 4.1) throughout the test.

The gun shall be attached to a constant air supply of 90 psi $\pm$ 5 psi (621 kPa $\pm$ 34 kPa). From 2 to 3 in (51 to 76 mm) of sealing compound shall be extruded initially to clear any entrapped air. At the end of the rated sealant application time, measured from the beginning of the mixing period, the sealing compound shall be extruded onto a previously weighed suitable receptacle for 1 min and the weight of extruded sealing compound determined within $\pm$ 0.1 g. The weight of sealant extruded per minute shall be within the limits of the material specification for the sealing compound under test.

- 5.7 Assembly Time (Class C only):

Six panels 0.125 in $\times$ 1.5 in $\times$ 4 in (3.18 mm $\times$ 38 mm $\times$ 102 mm) in size shall be prepared using AMS 4049 aluminum alloy. Drill two holes using a number 11 drill, 1.2 in (30 mm) from one end with centers 0.75 in (19 mm) apart and 0.375 in (9.5 mm) from each side. The panels are depicted in Figure 5. Deburr the holes and clean the panels according to AS5127, 6.1.1. Accurately determine the thickness of the panels around the holes. Apply approximately 0.015 in (0.38 mm) of freshly mixed sealant to the drilled end of three panels. Allow the sealant to flash-off for 0.5 h prior to further assembly. Place the remaining three cleaned panels on those with sealant so that the holes line up and result in a 2.4 in (61 mm) overlap (See Figure 5). Sealant shall cover the entire 2.4 in (61 mm) faying surface overlap area. Insert two size 10-32 steel bolts that have been heat treated to at least 160 ksi (1103 MPa) into the holes. Install and tighten (NAS 679-A3) nuts only until sealant starts to squeeze out. The thickness of each assembly shall be measured at this time and the thickness of the sealant shall be 0.010 to 0.015 in (0.25 to 0.38 mm). Allow the specimens to cure at standard conditions for the rated assembly time defined in the sealing material specification, then tighten the nuts to a torque value of 40 in-lb (4.5 N.m). Measure the thickness of the assembly at the bolts using a micrometer and from this thickness subtract the original thickness of the panels. The sealant must squeeze out to a thickness of 0.005 in (0.13 mm) or less at the bolts, in accordance with the material specification for the sealing compound under test.

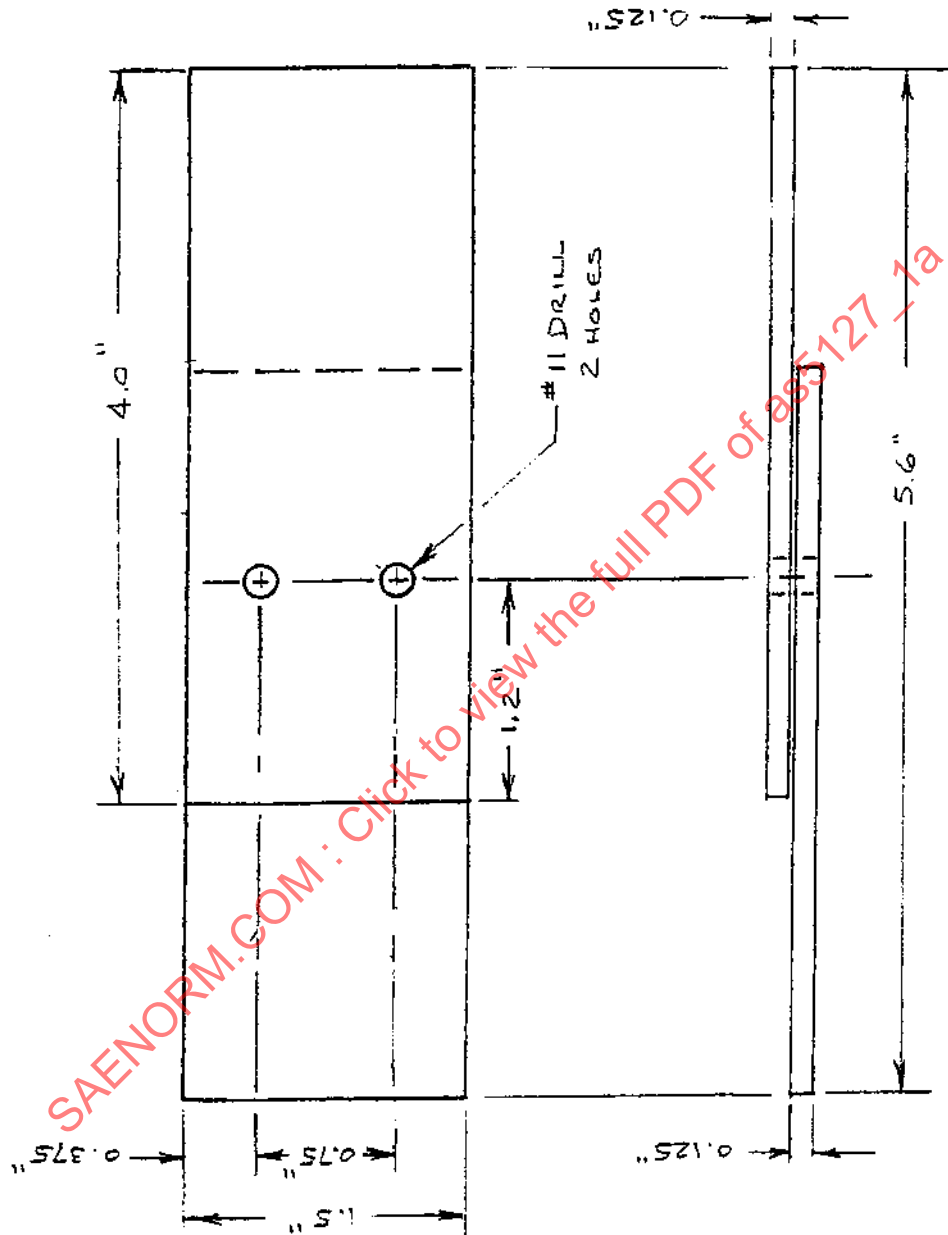


FIGURE 5 – Assembly Time Test Specimen

5.8 Tack-Free Time:

A 0.040 in × 2.75 in × 6 in (1.02 mm × 69.8 mm × 152 mm) AMS 4049 aluminum alloy panel shall be cleaned in accordance with AS5127, 6.1.1. Sealing compound, applied in accordance with material specification requirements for the sealing compound under test, shall be cured at standard conditions according to AS5127, 4.1, for the tack-free time defined in the material specification for the sealing compound under test.

At the end of the specified tack-free time, two 1 in × 7 in (25 mm × 178 mm) strips of L-P-390 polyethylene film 0.005 in ± 0.002 in (0.10 mm ± 0.05 mm) thick, cleaned with AMS 3819 cloth wipes and clean solvent conforming to AMS 3166 or A-A-59281, shall be applied to the sealing compound and held in place at a pressure of approximately 0.5 oz/in² (0.0002 N/mm²) for two min.

The strips shall then be slowly and evenly peeled back at right angles to the sealing compound surface. The polyethylene shall come away clean and free of sealing compound.

5.9 Standard Curing:

The instantaneous hardness shall be determined in accordance with ASTM D 2240 using a Type A Durometer after the sealing compound is allowed to cure at standard conditions in accordance with AS5127, 4.1, for the time defined in the sealing compound specification. The reading shall be taken on a two 0.125 in (3.18 mm) thick specimens, stacked to make a total thickness of 0.25 in (6.38 mm). The measured hardness shall be checked for conformance to the material specification for the sealing compound under test.

5.10 Low-Temperature Cure Time (Classes A and B only):

The instantaneous hardness shall be determined in accordance with ASTM D 2240 using a Type A Durometer after the sealing compound is applied at standard conditions according to the sealing compound specification and allowed to cure at the temperature and time defined in the sealing compound specification. The reading shall be taken on two 0.125 in (3.18 mm) thick specimens, stacked to make a total thickness of 0.25 in (6.38 mm). The measured hardness shall be checked for conformance to the material specification for the sealing compound under test.

5.11 Fluid Immersion Cure Time (Classes A-1/4, A-1/2, B-1/4, and B-1/2 only):

An AMS 4049 aluminum alloy test panel measuring 0.040 in × 2.75 in × 6 in (1.02 mm × 69.8 mm × 152 mm) shall be cleaned in accordance with AS5127, 6.1.1, and covered with sealing compound to a depth of 0.25 in (6.4 mm) in one application. After curing for 2 h at standard conditions in accordance with AS5127, 4.1, the test panel shall be immersed in AMS 2629, Type I jet reference fluid at 77 °F (25 °C). The Type A Durometer hardness of the sealant shall be determined after a total of 48 h (42 h in fluid) and after a total of 120 h (114 h in fluid). The measured hardness shall be checked for conformance to the sealing compound specification.

5.12 Soluble Chromate Level:

5.12.1 Extraction: Weigh 1 g of base compound into a centrifuge tube and add a 50/50 blend of dry ASTM D 740 methyl ethyl ketone (MEK) and ASTM D 836 benzene solution. Mix thoroughly with a microspatula. Centrifuge, decant, and repeat twice using new, dry solvent each time. After the third extraction, transfer the dry residue to a 500 mL beaker, add 300 mL of distilled water to the material in the beaker, and boil for 30 min. Repeat to be sure that the last extraction is colorless. Make up to 500 mL of total volume.

5.12.2 Titration: Transfer 200 mL of the extracted solution to a 600 mL beaker, cover with a watch glass, and gently boil for 10 min. Add 10 mL of a 0.25% silver nitrate solution (2.5 g of silver nitrate in 1000 mL of distilled water). Cautiously add 1.5 g of ammonium persulfate. Boil gently for an additional 10 min. Allow to cool, add 5 mL of 1:1 sulfuric acid for each 100 mL of solution, then titrate with 0.1 N ferrous ammonium sulfate solution. Use a platinum and Ag/AgCl electrode combination in a potentiometric titration to maximum deflection.

5.12.3 Calculation:

$$\frac{A \times B \times C \times D \times 100}{E} = \% \text{MgCrO}_4 \cdot 5\text{H}_2\text{O} \quad (\text{Eq. 3})$$

where:

- A = ml ferrous ammonium sulfate
- B = dilution factor (2 if 200 ml of a 400 ml extract was used in the titration)
- C = normality of ferrous ammonium sulfate
- D = 0.0768 (milliequivalent weight of $\text{MgCrO}_4 \cdot 5\text{H}_2\text{O}$)
- E = weight of sample in grams

The calculated value shall be checked for conformance to the requirements of the material specification.

5.12.4 Alternate Tests for Soluble Chromate: Soluble chromate level may also be determined using either of the following test methods:

- a. Lachat Quik-Chem® 10-124-13-1-A for Hexavalent Chromium
- b. Optical Emission Spectroscopy

6. PERFORMANCE PROPERTIES TEST METHODS:

6.1 Specific Gravity:

Three test specimens approximately 0.125 in $\times$ 1 in $\times$ 1 in (3.18 mm $\times$ 25 mm $\times$ 25 mm) in size shall be cut out with a sharp razor blade from a sheet of the sealing compound that has been cured at standard conditions in accordance with AS5127, 4.1, for the time defined in the sealing compound specification. Determine the specific gravity of each sample in accordance with ASTM D 792, Method A. The averaged value shall be checked for conformance to the material specification for the sealing compound under test.

6.2 14-Day Hardness:

The instantaneous Type A Durometer hardness shall be determined in accordance with ASTM D 2240 after the sealing compound has been cured for 14 days at standard conditions according to AS5127, 4.1. The reading shall be taken using two 0.125 in (3.18 mm) thick specimens, stacked to make a total thickness of 0.25 in (6.4 mm). The measured hardness shall be checked for conformance to the sealing compound specification.

6.3 Radiographic Density:

6.3.1 Preparation of Test Panels: A 6 in (152 mm) square plate, 0.25 in (6.4 mm) thick shown in Figure 6, shall be prepared from AMS 4049 aluminum alloy. A notch 0.25 in (6.4 mm) wide shall be milled to a depth of 0.125 in (3.18 mm) half way across the plate. A continuation of this notch shall be milled completely through the remaining half to form a slot in the plate.

6.3.2 Application of Sealant: After cleaning the test panel according to AS5127, 6.1.1, a sample of the sealant to be tested shall be machine mixed according to the manufacturer's recommended procedure, after which a strip 1 in (25 mm) wide and 0.125 in (3.18 mm) thick shall be applied over the entire length of the notched portion and slot in the test plate, ensuring that the notch and slot are also filled. A mold shall be used during application of the sealant to the plate to maintain uniform thickness of the sealant. Allow the sealant to cure at standard conditions in accordance with AS5127, 4.1, for the time specified in the material specification for the sealing compound under test.

6.3.3 Test Procedure: The prepared test panel shall be radiographed in accordance with ASTM E 1742 to obtain a 2% sensitivity through the plate at an H & D density of 2.5 ± 0.2 , using Dupont 510 or Kodak M film, or equivalent. All density measurements shall be measured with an Ansco-Sweet densitometer, or equivalent. Density measurements shall be checked for conformance to the sealing material specification.

6.4 Resistance to Thermal Expansion:

The thermal expansion block shown in Figure 7 shall be sulfuric acid anodized per AMS 2471 and overcoated with MIL-PRF-23377 primer. After cleaning the thermal expansion block according to AS5127, 6.2.2.1, the groove in the block shall be filled with sealant. (Care shall be taken to prevent air entrapment during filling.) The sealant shall be cured at standard conditions in accordance with AS5127, 4.1, for the time defined in the sealing material specification. After cure, the sealant surface shall be trimmed flush with the block, if necessary. Expose the specimen to the standard heat cycle specified in the material specification. Remove the block from the oven and measure the amount of sealant expansion at locations of 2 in (51 mm) from each end of the block. Allow the block to cool to 77 °F (25 °C) and repeat the measurements. The measured values shall be checked for conformance to the material specification for the class and application time of the sealing compound under test.

6.5 Heat Reversion Resistance (Classes B and C only):

Two AMS 4045 aluminum panels, measuring 0.040 in × 3 in × 12 in (1.02 mm × 76 mm × 305 mm), anodized per AMS 2471 and coated with 0.001 in (0.025 mm) of AMS-C-27725, shall be cleaned in accordance with AS5127, 6.2.1.1. Freshly mixed sealing compound shall be applied over approximately 9 in of one surface of each panel. Placing the uncoated sections at one end, position the sealant coated surface of the second panel over the sealant covered surface of the first panel to form a sandwich with a layer of sealing compound approximately 0.010 in (0.25 mm) thick. The panels shall be cured at standard conditions according to AS5127, 4.1, for the time defined in the sealing material specification, and then shall be exposed to the heat cycle defined in the sealing material specification. After the heat cycle has been completed, the panels shall be cooled to room temperature. Using the uncoated portions of the panels as tabs, the sandwich construction shall be peeled apart in a tensile testing machine at a jaw separation rate of 2 in (51 mm) per minute. The peak load value shall be checked for conformance to the material specification for the sealing compound under test.

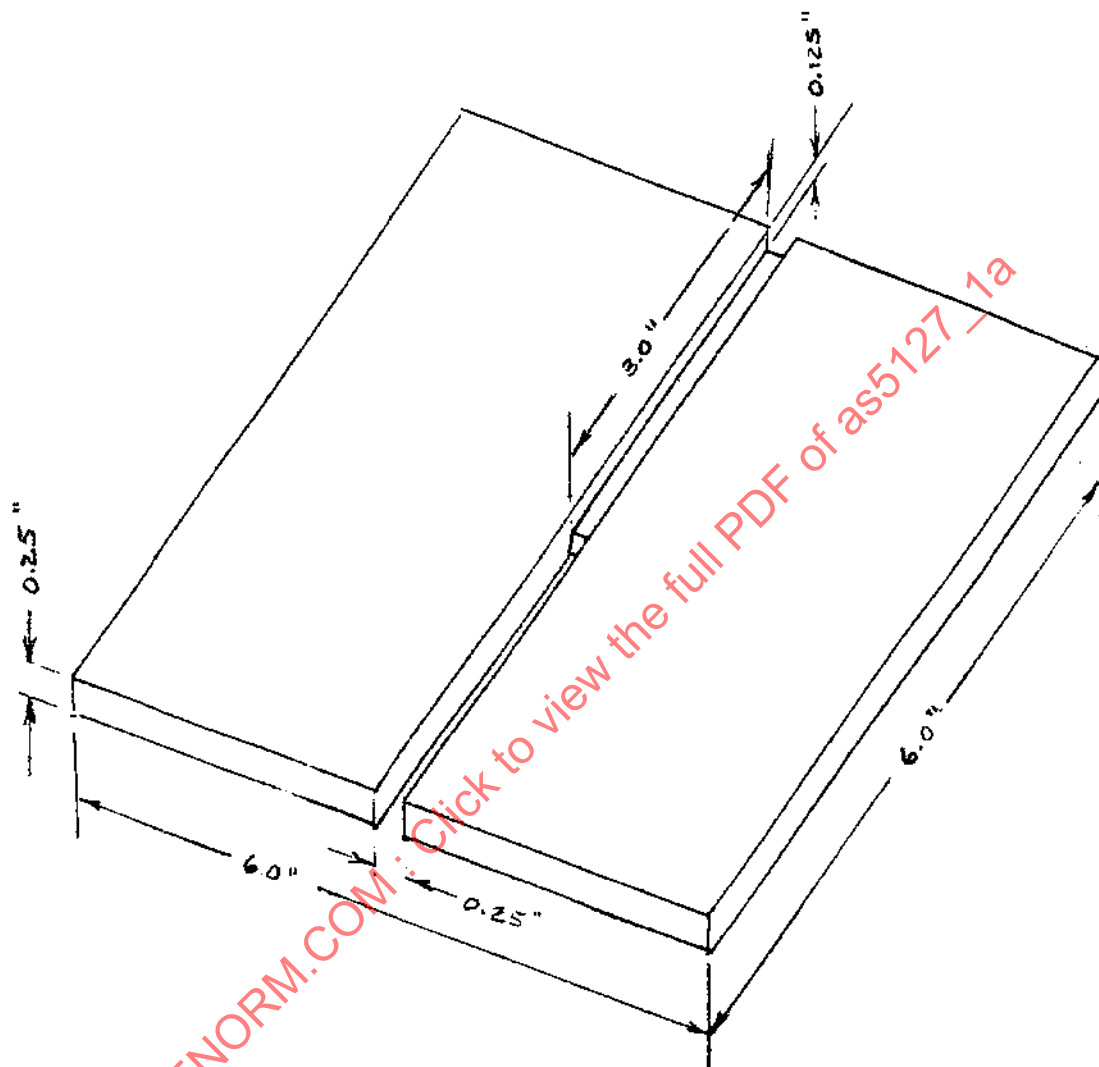


FIGURE 6 – Radiographic Density

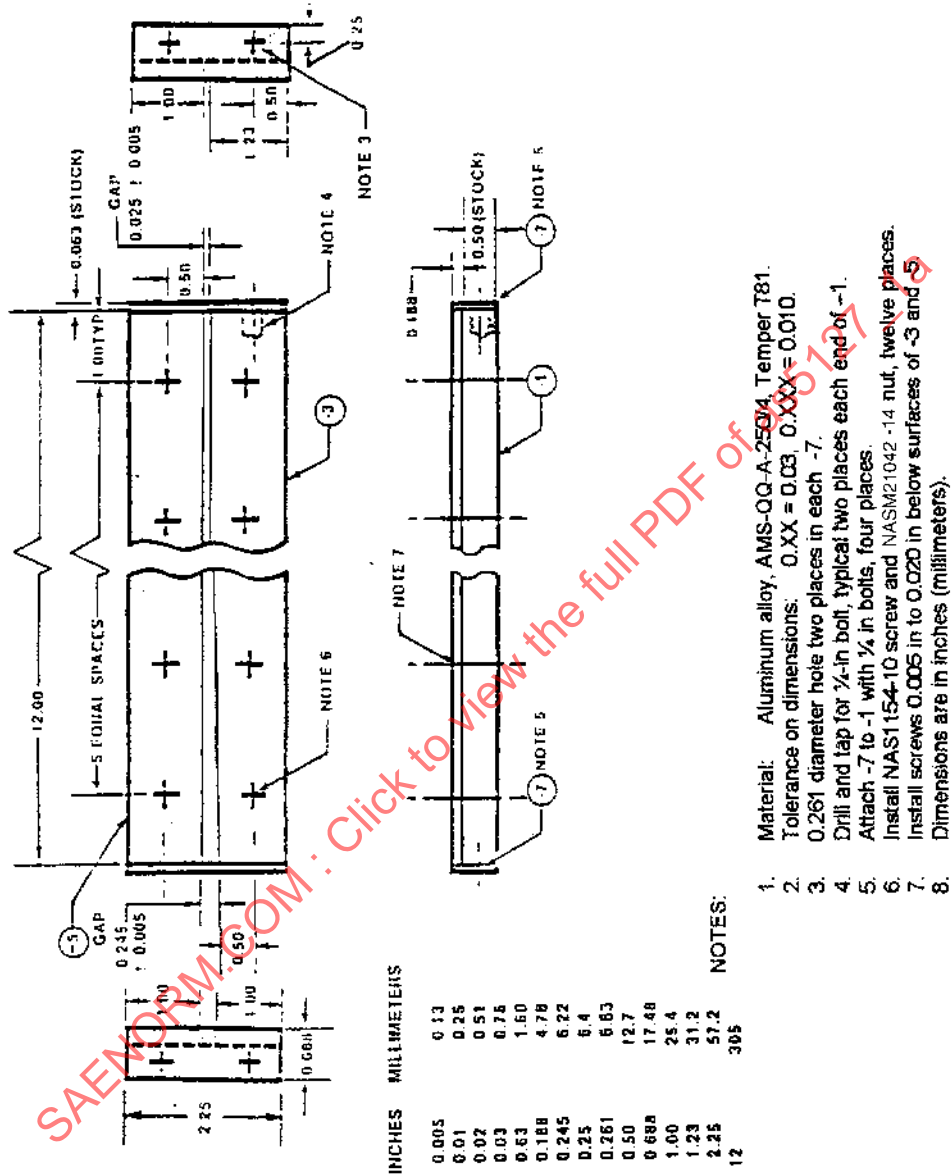


FIGURE 7 – Thermal Expansion Block

6.6 Hydrolytic Stability:

A sealing compound specimen approximately 0.50 in (12.7 mm) thick $\times$ 3 in (76 mm) in diameter shall be cured at standard conditions in accordance with AS5127, 4.1, for the time defined in the sealing material specification, after which it shall be exposed for 120 days in an environment of 160 °F (70 °C) and 95% $\pm$ 5% relative humidity. These conditions may be obtained using a standard humidity cabinet or through the use of chemical additives to create the desired humidity level. As an example, the required condition of humidity may be obtained by adding a 22% by weight glycerin in distilled water solution to a desiccator until the liquid level is 1 in (25 mm) below the desiccator plate. Suspend the sealant specimen in the desiccator so that it cannot contact any part of the desiccator. Apply vacuum grease to the desiccator cover and install the cover in place. The desiccator vent shall be opened to prevent pressure 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), the desiccator vent shall be closed to prevent water evaporation. Change the glycerin solution every 30 days or when it becomes cloudy. After 120 days remove the desiccator from the oven and allow to cool to room temperature, frequently opening and closing the vent. After cooling, remove the specimen from the desiccator and hold it for 14 days at standard conditions in accordance with AS5127, 4.1). The instantaneous Type A Durometer hardness shall be determined according to ASTM D 2240. The measured hardness shall be checked for conformance to the material specification for the sealing compound under test.

6.7 Shaving and Sanding (Class B only):

The groove and screw heads of a thermal expansion block (Figure 7), coated with MIL-PRF-23377, shall be filled with sealant allowing a small excess for shaving and sanding. After being cured at standard conditions in accordance with AS5127, 4.1, for the time defined in the sealing material specification, the excess sealant shall be shaved off using a non-metallic scraper and the surface shall then be sanded with 400 grit abrasive paper on a sanding block. The sanded surface shall be visually inspected. There shall be no rolling or tearing of the sealing compound.

6.8 Paintability:

Two 0.040 in $\times$ 2.75 in $\times$ 6 in (1.02 mm $\times$ 69.8 mm $\times$ 152 mm) AMS 4045 aluminum alloy panels shall be sulfuric acid anodized per AMS 2471 and coated with AMS-C-27725. After cleaning according to AS5127, 6.2.1.1, a thin layer of sealant, approximately 0.031 in (0.79 mm) thick, shall be applied to one surface and allowed cure to at standard conditions in accordance with AS5127, 4.1, for the time defined in the sealing material specification. After curing, the sealant coated surface of one panel shall be painted with MIL-PRF-23377 primer. The sealant coated surface of the other panel shall be coated with MIL-PRF-23377 primer followed by overcoating with MIL-PRF-85285 polyurethane coating. When the coatings have been cured according to the appropriate coating specifications, they shall be tested for adhesion using a "wet tape adhesion test" in accordance with ASTM D 1475. The painted surface shall not fail adhesively following immersion for 24 h in distilled water

6.9 Weathering:

Two AMS 4045 aluminum panels, 0.040 in by 2.75 in by 6.0 in (1.0 mm $\times$ 70 mm $\times$ 150 mm) shall be sulfuric acid anodized according to AMS 2471 and overcoated with MIL-PRF-23377 primer. The coating shall be cured in accordance with the coating specification. After cleaning in accordance with AS5127, 6.2.4, a coating of sealing compound 1.5 in wide by 6.0 in long by approximately 0.10 in thick (40 mm $\times$ 150 mm $\times$ 2.5 mm) shall be applied lengthwise along the center of each panel as shown in Figure 8. After curing at standard conditions in accordance with AS5127, 4.1, for the time defined in the sealing compound specification, the test specimens shall be exposed in an Atlas Weatherometer or equivalent for 30 days. Specimen temperature shall be maintained at 140 °F (60 °C) with 17 min of light followed by 3 min of light and water spray.

TABLE 2 - Weatherometer Settings

Controls	Light Cycle
Automatic irradiance	0.55 W/m ² @ 340 nm
Black panel temperature	140 °F (60 °C)

NOTE: If an Atlas Weatherometer is used, a No. 10 can will provide the required 17 min of light followed by 3 min of light with specimen water spray.

Following exposure, the sealant shall be checked for signs of chalking (AS5127, 6.1), or for other deterioration according to the requirements of the material specification.

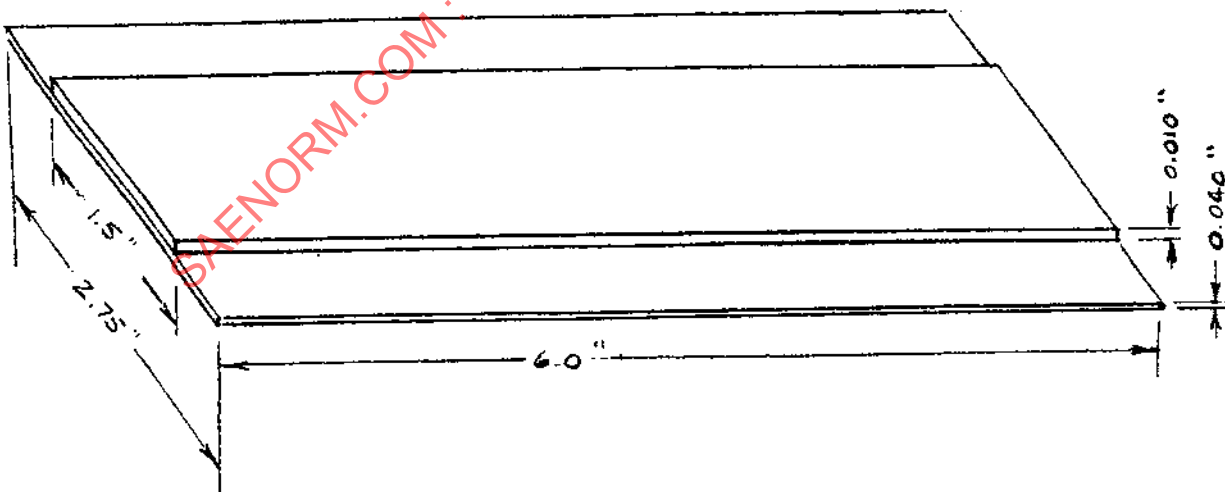


FIGURE 8 – Weathering Test Specimen

7. RESISTANCE TO HYDROCARBONS:

7.1 Chalking:

Four 0.125 in × 0.125 in × 5 in (3.18 mm × 3.18 mm × 127 mm) specimens shall be cut from a sheet of the sealing compound that has been cured for at standard conditions in accordance with AS5127, 4.1, for the time defined in the sealant material specification. The specimens shall be suspended on a nylon cord in a closed glass container with 900 mL of AMS 2629, Type II jet reference fluid so that the specimens are totally immersed in the fluid. Aluminum foil shall be used to seal the lids of the containers. No metal (other than the metal ions in solution in AMS 2629, Type II) shall be allowed to be in contact with the fluid or sealant 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 AMS 2629, Type II fluid shall be replaced after 48 h, and the sealant specimens shall be immersed for an additional 72 h. Remove the specimens from the fluid and allow the fluid to evaporate. The specimens are not to be blotted or wiped. Inspect strips in a well-lighted area, using an original, unexposed specimen for comparison with the specimens under test to detect chalking. The rating criteria for sealant chalking are:

- a. Slight Chalk - Initial observation of white or light gray formation, usually at the edges of the sealant.
- b. Moderate Chalk - The white or light gray formation has spread to 1/4 to 1/2 of the surface area.
- c. Heavy Chalk - The white or light gray formation has spread to 3/4 or more of the surface.

NOTE: To facilitate a normal 40 h work schedule, it is suggested that the chalking test be started on a Wednesday. Fluid change would take place on the following Friday, and the chalking evaluation would be completed on Monday.

7.2 Resistance to Thermal Rupture:

Two AMS 4045 panels, 0.040 in × 3.5 in × 3.5 in (1 mm × 89 mm × 89 mm) in size, with a hole 0.25 in (6.4 mm) in diameter in the center of the panel shall be prepared. After cleaning according to AS5127, 6.1.1, a fillet of sealing compound, approximately 0.125 in (3.18 mm) thick by 2 in (51 mm) in diameter, shall be applied to the center of the test panel, filling the hole with sealant.

The sealing compound fillets shall be cured at standard conditions in accordance with AS5127, 4.1, for the time defined in the sealing compound specification, and tests shall begin not more than 2 days after cure has been complete.

One panel shall be placed in AMS 2629, Type I jet reference fluid for 120 h ± 4 h at 140 °F (60 °C), followed by 60 h ± 4 h at 160 °F (70 °C), and followed by 6 h ± 1 h at 180 °F (82 °C).

The panel shall be removed from the fluid and immediately applied to the fixture, shown in Figure 9, using a suitable gasket. The panel shall be positioned on the fixture such that the sealant is within the fixture chamber.

7.2 (Continued):

The fixture shall be placed in an air circulating oven that has been preset to the temperature defined in the sealing material specification. Using a regulated air supply, air pressure at a value defined in the sealing material specification, shall be applied to the fixture. After the pressure is applied, the clamp fixture shall be maintained in the oven for the time designated in the sealing material specification.

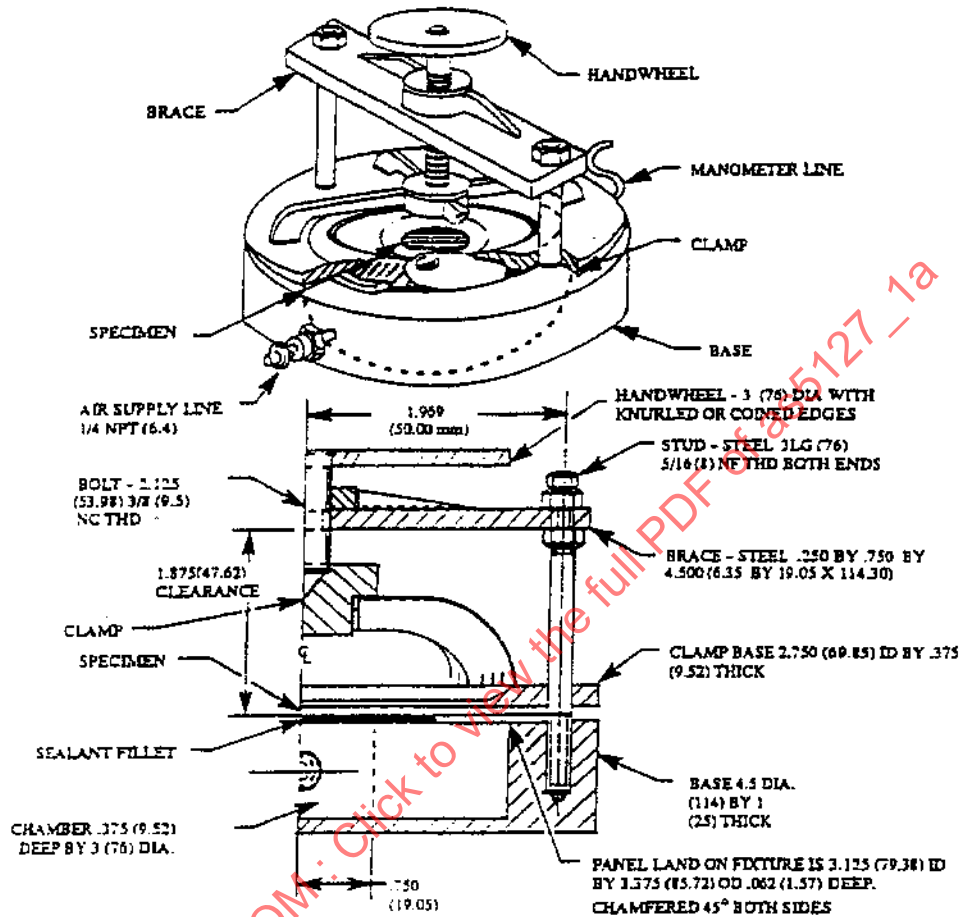
Deformation shall be measured from the surface of the test panel not exposed to pressure, to the point of maximum deformation of the sealant compound under pressure. Deformation shall be measured while the fixture is at the preset temperature and under the defined air pressure. The sealant shall show no blistering or sponging, and deformation shall be checked for conformance to the sealing compound specification.

The test shall be repeated using the remaining panel that has not been immersed in the jet reference fluid. The sealant shall show no blistering or sponging, and deformation shall be checked for conformance to the specification.

7.3 Fluid Rupture Resistance (B-1/4 and B-1/2 only):

A 0.125 in (3.18 mm) hole shall be drilled in the center of a 0.040 in × 3.5 in × 3.5 in (1.02 mm × 89 mm × 89 mm) AMS 4045 aluminum alloy test panel. After cleaning according to AS5127, 6.1.1, a fillet of sealant 0.125 in (3.18 mm) thick and 0.50 in (13 mm) in diameter shall be applied to the center of the panel covering the hole. Curing shall be 1 h for B-1/4, or 2 h for B-1/2 at standard conditions in accordance with AS5127, 4-1, after which a 0.50 in (13 mm) cork borer shall be used to trim excess sealant and the panel shall be installed in the apparatus shown in Figure 10. The apparatus consists of a glass bulb fitted with a Buna-N O-ring. After installation of the panel in the fixture, 100 mL of AMS 2629, Type I jet reference fluid shall be added to the apparatus. Plastic tubing shall be attached, and the apparatus shall be pressurized to 10 psi (69 kPa) pressure using a regulated air supply. This pressure shall be maintained for 24 h at standard conditions. The test apparatus shall be checked for loss of AMS 2629 fluid or loss of pressure according to the requirements of the material specification for the sealing compound under test.

SAE AS5127/1 Revision A



DIMENSIONS ARE IN INCHES (MILLIMETERS), UNLESS OTHERWISE SPECIFIED.
TOLERANCES: DECIMALS ± 0.016 INCH (± 0.41 MM) DEGREES ± 1 .

(NOT TO SCALE)

FIGURE 9 – Thermal Rupture Fixture

7.4 Weight Loss and Flexibility:

Five 0.125 in × 1 in × 5 in (3.18 mm × 25 mm × 127 mm) specimens shall be cut from a sheet of the sealing compound that has been cured at standard conditions in accordance with AS5127, 4.1, for the time defined in the sealing material specification.

The specimens shall be weighed in air (W_1) and in water (W_2) and then shall be dried. The specimens shall be immersed in 900 mL of AMS 2629, Type I jet reference fluid for a period of 7 days at 140 °F (60 °C) in a closed container. At the end of the exposure period, the specimens shall be removed from the fluid, dipped momentarily in methyl alcohol and reweighed in air (W_3) and in water (W_4). They shall then be dried for 24 h at 120 °F (49 °C). The specimens shall be cooled in a desiccator to standard conditions according to AS5127, 4.1 and then reweighed (W_5). The percent volume swell shall be calculated using Equation 4.

$$\text{Percent Swell} = \frac{(W_2 + W_3) - (W_1 + W_4)}{W_1 - W_2} \times 100 \quad (\text{Eq. 4})$$

Percent weight loss shall be calculated using Equation 5.

$$\text{Percent Weight Loss} = \frac{(W_1 - W_5)}{W_1} \times 100 \quad (\text{Eq. 5})$$

After all weighing has been completed, the specimens shall be bent 180° over a 0.125 in (3.18 mm) mandrel to determine flexibility of the sealing compound. The specimens shall be visually examined for evidence of cracking or checking. The percent weight loss, percent volume swell and visual appearance of the sealant shall be checked for conformance to the material specification for the sealing compound under test.

7.5 Volume Swell:

When volume swell is listed as a separate requirement of a sealing material specification, the following procedure shall be used. Five 0.125 in × 1 in × 3 in (3.18 mm × 25 mm × 76 mm) specimens shall be cut from a sheet of the sealing compound that has been cured for 14 days in accordance with AS5127, 4.1.

The specimens shall be weighed in air (W_1) and in water (W_2) and then shall be dried. The specimens shall be immersed in 900 mL of AMS 2629 Type I jet reference fluid for a period of 7 days at 140 °F (60 °C) in a closed container. At the end of the exposure period, the specimens shall be removed from the fluid, dipped momentarily in methyl alcohol and reweighed in air (W_3) and in water (W_4). The percent volume swell shall be calculated using Equation 4 of AS5127/1, 7.4. The percent volume swell shall be checked for conformance to the sealing material specification.

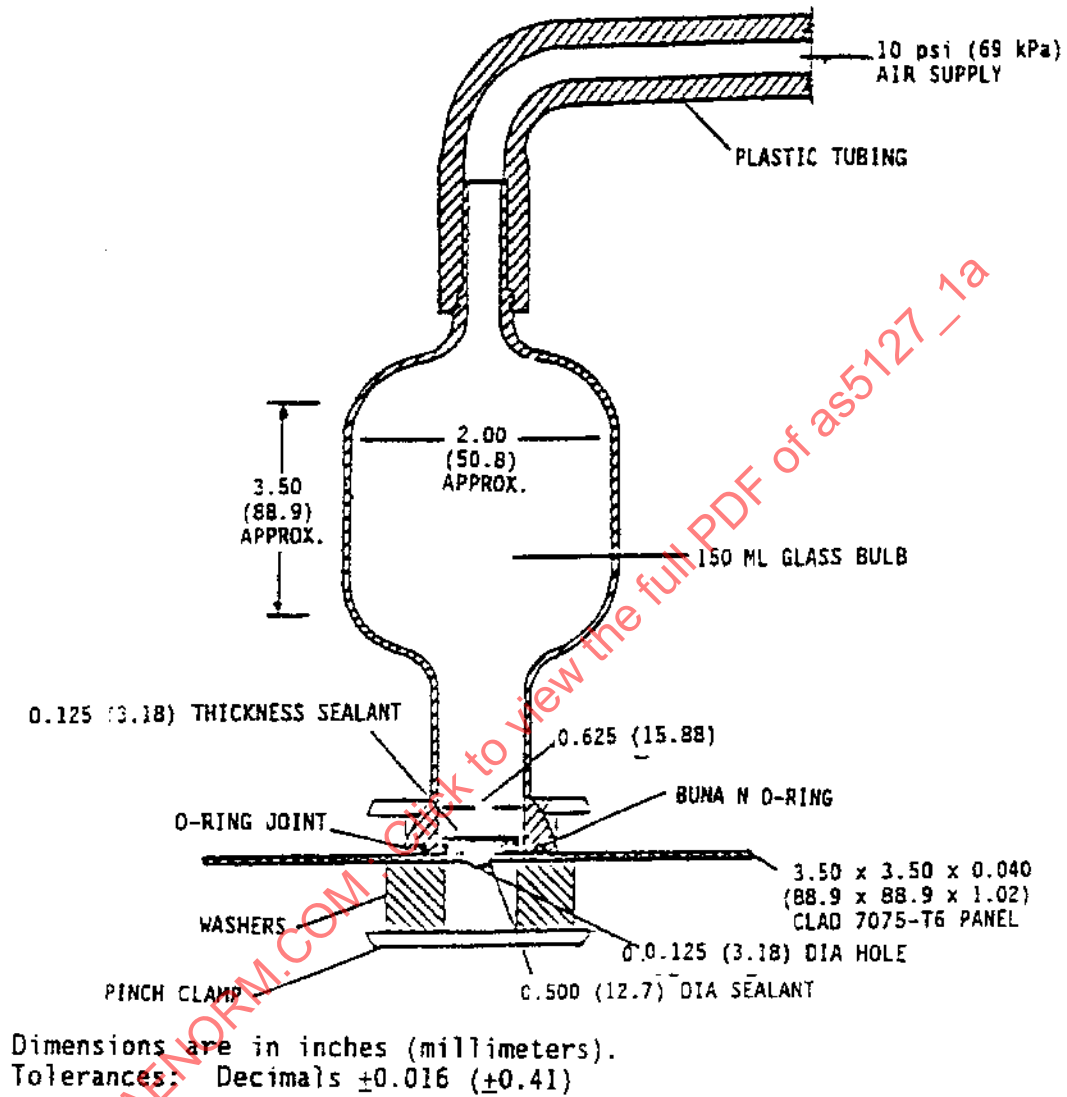


FIGURE 10 – Fluid Rupture Apparatus

7.6 Low-Temperature Flexibility:

Four AMS 4049 aluminum alloy test panels 0.040 in $\times$ 2.75 in $\times$ 6 in (1.02 mm $\times$ 69.8 mm $\times$ 152 mm) in size shall be prepared. After cleaning in accordance with AS5127, 6.1.1, a coating of the sealing compound 0.1 in $\times$ 1.5 in $\times$ 4 in (2.5 mm $\times$ 38 mm $\times$ 102 mm) shall be applied to the center of each of the four panels as shown in Figure 11. Care shall be taken to maintain an accurate sample thickness of 0.1 in (2.5 mm). After curing at standard conditions in accordance with AS5127, 4.1, for the time defined in the sealing material specification, the specimens shall be environmentally exposed according to the requirements of the sealing material specification. At the completion of the environmental exposure, all four panels shall then be immediately placed in a low-temperature cabinet containing a low temperature flexibility fixture (See Figure 12) consisting of a clamp support that will grip both sides of both 6 in (152 mm) edges of the panel for a distance of 3 in (76 mm) from one end without touching the sealant. The fixture shall be capable of flexing the panel through a 30° arc (15° each side of the center) at a constant speed of 1 cycle per 5 s. The cabinet temperature shall be reduced to -65 °F (-54 °C), then stabilized at this temperature for at least 2 h, after which the panels shall be flexed through 130 consecutive cycles. At the completion of testing, the panels shall be visually examined for cracking, checking or loss of adhesion according to requirements of the material specification.

- 7.6.1 Alternate Low Temperature Flexibility Testing: When sealing material specifications require alternate methods to determine low temperature flexibility, the test fixture shown in Figures 13 and 14 may be employed. At the completion of testing, the panels shall be visually examined for cracking, checking or loss of adhesion according to requirements of the material specification.

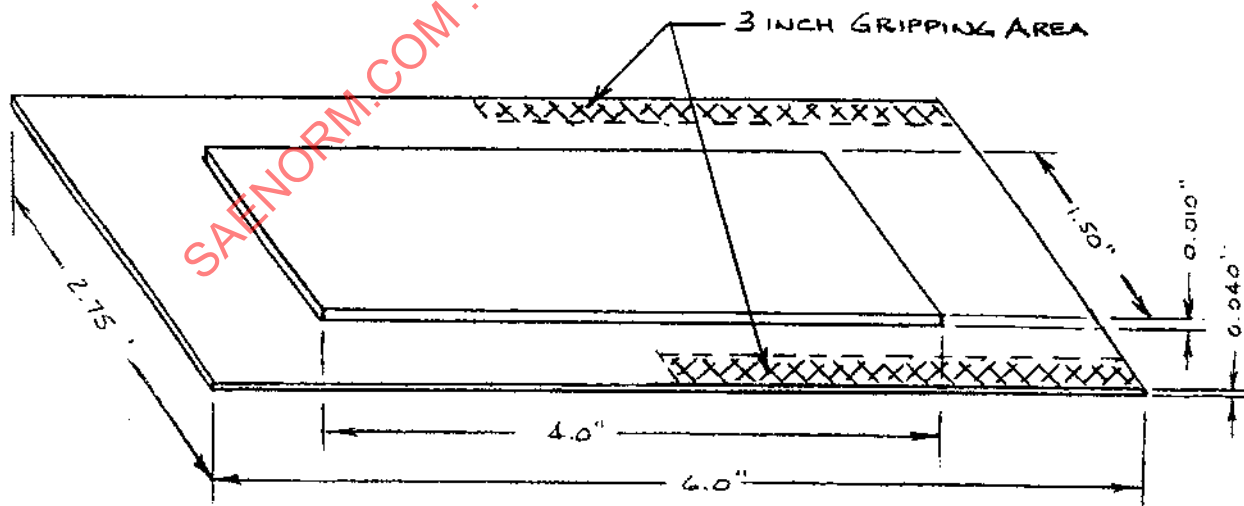
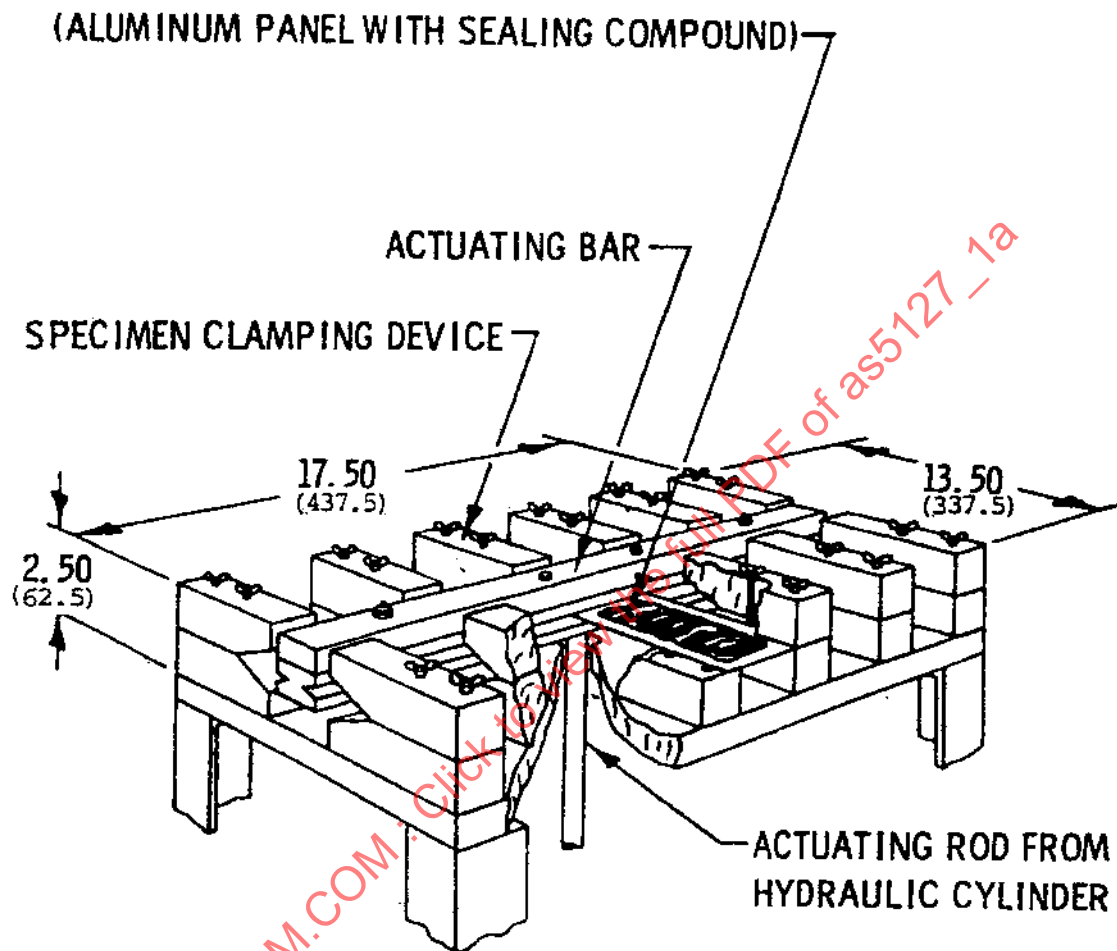


FIGURE 11 – Low Temperature Flexibility Test Specimen



DIMENSIONS IN INCHES (MILLIMETRES). UNLESS OTHERWISE SPECIFIED,

TOLERANCES: $\pm .015$ IN. (0.38 mm)

FIGURE 12 – Low Temperature Flexibility Jig

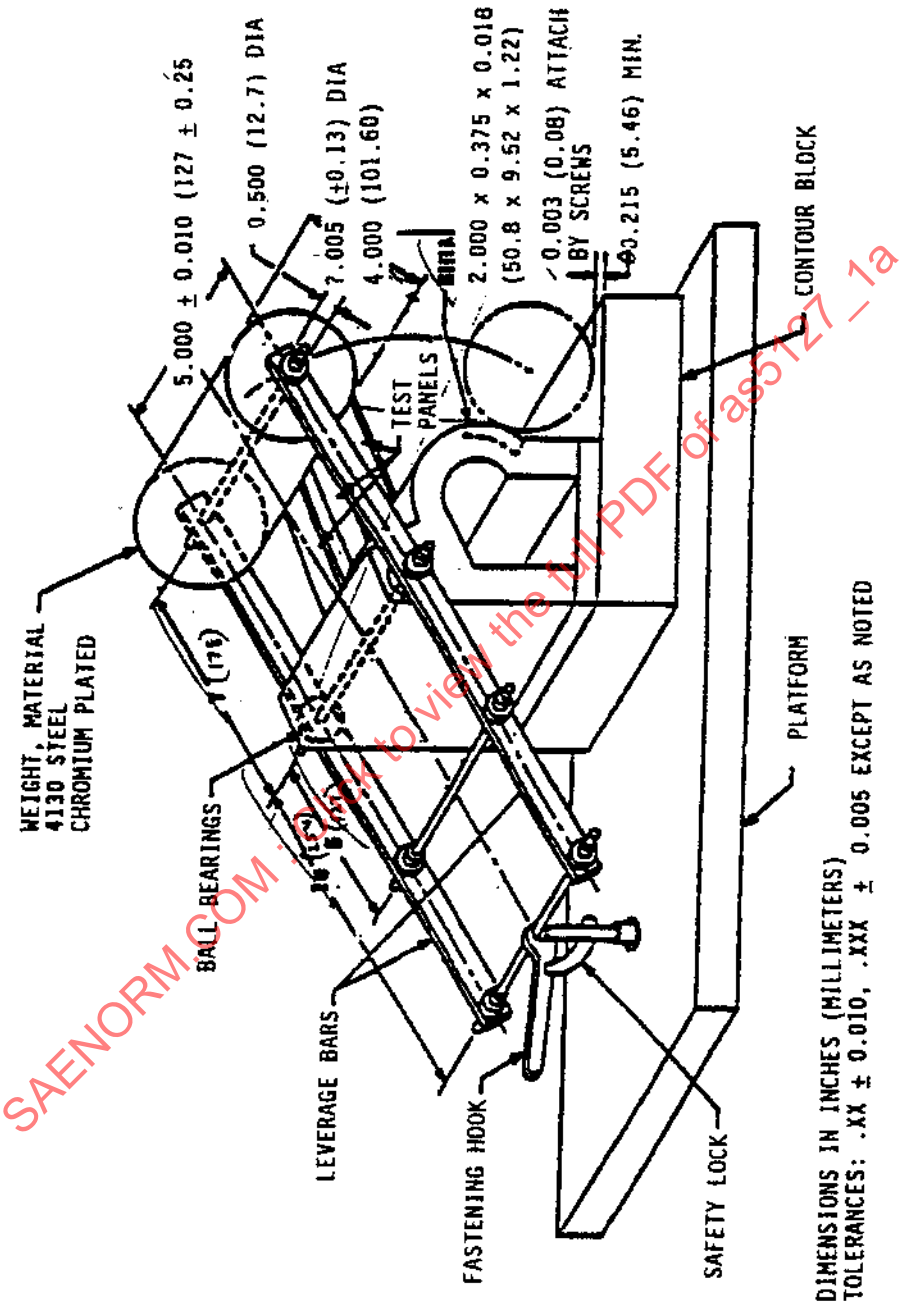


FIGURE 13 – Low Temperature Flexibility Apparatus

Inches	Millimeters
0.040	1.02
0.297	7.54
0.313	7.95
0.500	12.70
0.625	15.88
0.875	22.22
1	25
1.031	26.19
1.062	26.94
2	51
2.062	52.37
2.375	60.32
2.625	66.68
4.500	114.30
5	127
6	152
6.125	155.58
9.250	234.95

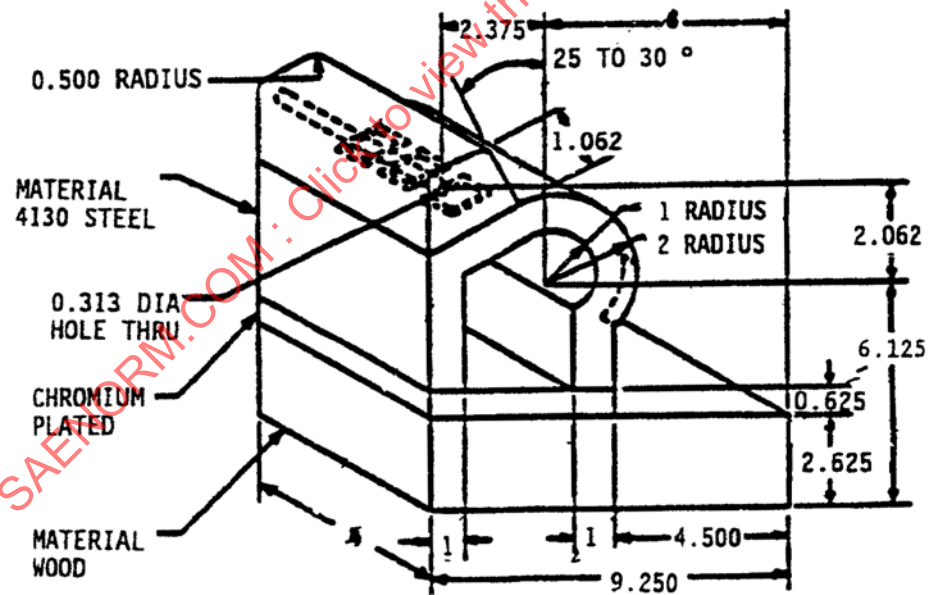
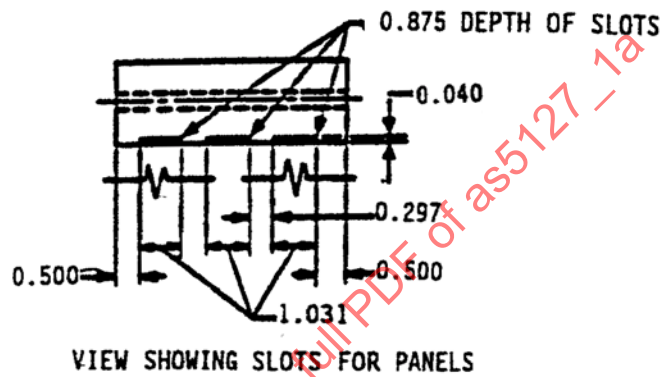


FIGURE 14 – Contour Block

7.6.2 Low-Temperature Flexibility (Windshield Sealant): Four 0.040 in $\times$ 2-3/4 in $\times$ 6 in (1.02 mm $\times$ 69.8 mm $\times$ 152 mm) AMS 4049 aluminum alloy panels shall be cleaned in accordance with AS5127, 6.1.1. Sealing compound shall cover one side of the panels so that a 1.5 in $\times$ 4 in (38 mm $\times$ 102 mm) coating is centered on the panels to a depth of 0.125 in $\pm$ 0.016 in (3.2 mm $\pm$ 0.4 mm). After curing at standard conditions in accordance with AS5127, 4.1, for the time defined in the sealing compound specification, two of the panels shall be conditioned at 248 °F $\pm$ 2 °F (120 °C $\pm$ 1 °C) for an additional seven days. The panels and test jig shown in Figure 15 shall be stabilized at -67 °F (-55 °C) for 2 h. While at that temperature, each panel shall be tested by placing the panel in the slot (with the sealant coated side facing up) and rapidly bending it once around the curved portion of the jig. Each panel shall then be examined for evidence of cracking, checking or loss of adhesion according to requirements of the material specification.

7.7 Tensile Strength and Elongation:

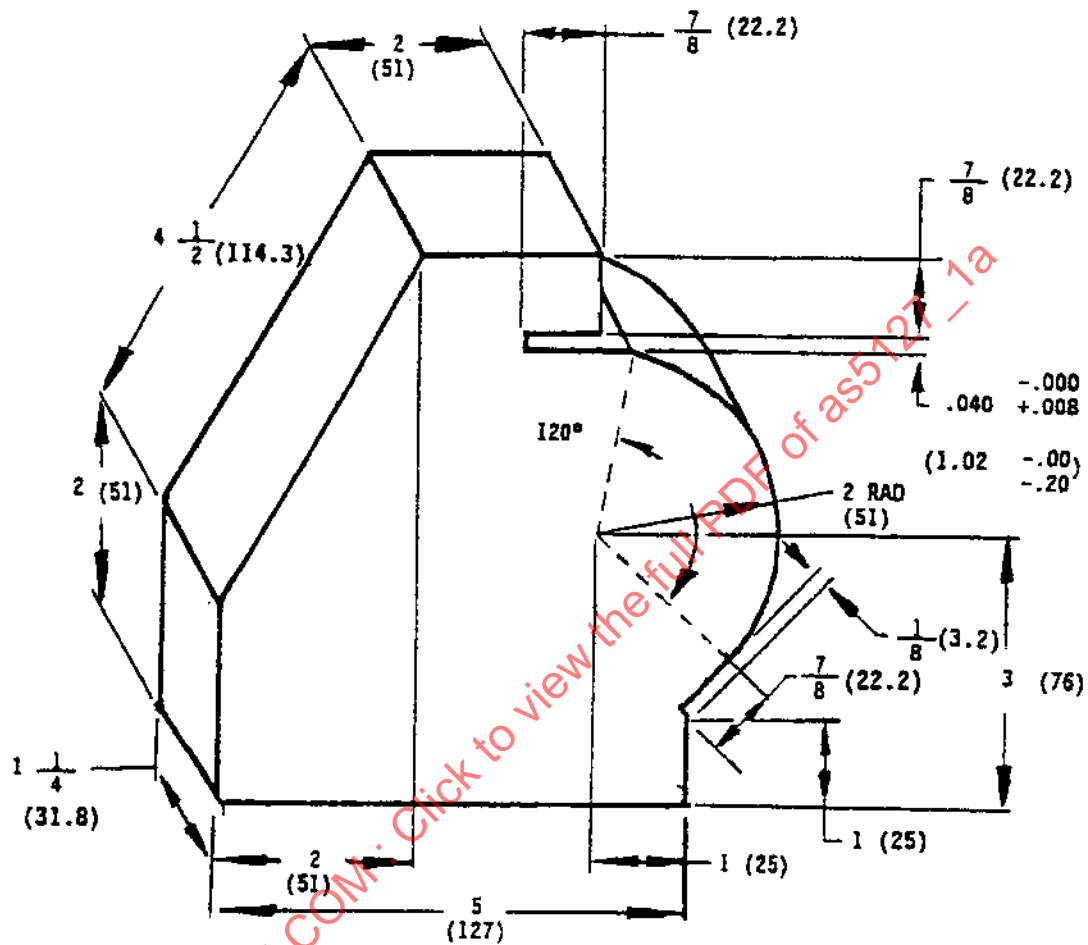
Mixed sealing compound 0.125 in $\pm$ 0.015 in (3.18 mm $\pm$ 0.4 mm) thick shall be prepared by pressing freshly mixed sealing compound between two ASTM D 4976 polyethylene sheets. The top sheet shall be removed at the end of the sealant tack-free time, and the sealing compound shall be cured at standard conditions in accordance with AS5127, 4.1, for the time defined in the sealing compound specification. Sufficient tensile specimens shall be cut from the sheet, using Die C as specified in ASTM D 412. Three specimens shall be exposed to each of the environmental conditions defined in the material specification.

Where fluid immersion is specified, the specimens shall be immersed in at least 900 mL of fluid. Specimens to be tested after the fluid immersion shall be cooled for 24 h at 77 °F (25 °C) and tested within 5 min after removal from the fluid.

Specimens to be tested after oven aging shall be allowed to cool for 16 to 48 h at standard conditions in accordance with AS5127, 4.1 before testing.

The tensile and elongation tests shall be conducted at standard test conditions in accordance with AS5127, 4.1 and tested in accordance with ASTM D 412 using a jaw separation rate of 20 in $\pm$ 1 in (508 mm $\pm$ 25 mm) per minute.

All tensile strength and elongation measurements shall be checked for conformance to the sealing compound specification. Determine conformance to the requirements of the sealing compound specification.



MATERIAL: ~~MAPLE~~ WOOD

DIMENSIONS IN INCHES (MILLIMETERS).

TOLERANCES: $\pm 5\%$

FIGURE 15 - Low Temperature Flexibility Test Jig

7.8 Shear Strength (Class C only):

Six AMS 4049 aluminum alloy test panels 0.040 in × 1 in × 3 in (1.02 mm × 25 mm × 76 mm) in size shall be prepared. After cleaning according to AS5127, 6.1.1, a coating of sealant 0.010 in to 0.020 in (0.25 mm to 0.51 mm) thick shall be applied to one end of the six panels covering approximately 1 in (25 mm) on each panel. Three shear strength specimens shall be formed by mating the sealant coated ends using two panels for each assembly, creating a 1 in² (645 mm²) overlap for each specimen. The fixture shown in Figure 16 can be used to control dimensional tolerances. Squeeze out excess sealant to reduce the thickness of the sealant to 0.005 in to 0.010 in (0.13 mm to 0.25 mm). Cure the sealant at standard conditions in accordance with AS5127, 4.1, for the time defined in the sealing compound specification. Shear strength shall be determined using a tensile test machine operated at a jaw separation speed of 2 in (51 mm) per min.

7.9 Corrosion:

Two AMS 4045 aluminum alloy panels measuring 0.040 in × 2.75 in × 6 in (1.02 mm × 69.8 mm × 152 mm) in size shall be prepared. A controlled area 1 in (25 mm) wide by 5 in (127 mm) long shall be masked in the center on one side of each panel and the remainder of the panel shall be chemical conversion coated according AS5127, 6.1, and overcoated with urethane conforming to AMS-C-27725. The coating shall be cured according to the coating specification. The panels shall be cleaned according to AS5127, 6.1.1. Adhesion promoter conforming to AMS 3100 shall be applied according to AS5127, 6.7, followed by a 0.062 in (1.57 mm) thick layer of sealing compound applied to the area, overlapping a minimum of 0.25 in (6 mm) onto the AMS-C-27725 coated portion of the panels. The sealant shall be cured at standard conditions in accordance with AS5127, 4.1, for the time defined in the sealing compound specification. After the sealant cure has been completed, the panels shall be conditioned as follows: The panels shall be immersed vertically in a covered glass vessel containing a two layer liquid consisting of a AMS 2629 Type I jet reference fluid and 3% by weight aqueous sodium chloride solution so that 2 in (51 mm) of the panel are exposed to the salt solution, 2 in (51 mm) are exposed to the jet reference fluid, and the remainder of the panel is exposed to the air-vapor mixture. The temperature of the fluid shall be 140 °F (60 °C) for 12 days followed by 60 h at 160 °F (72 °C) and 6 h at 180 °F (82 °C). Immediately upon removal from the liquid, the sealant shall be removed by mechanical means using a non-metallic scraper. The panels shall be visually examined for signs of corrosion or physical deterioration according to the requirements of the sealing compound specification.

SAE AS5127/1 Revision A

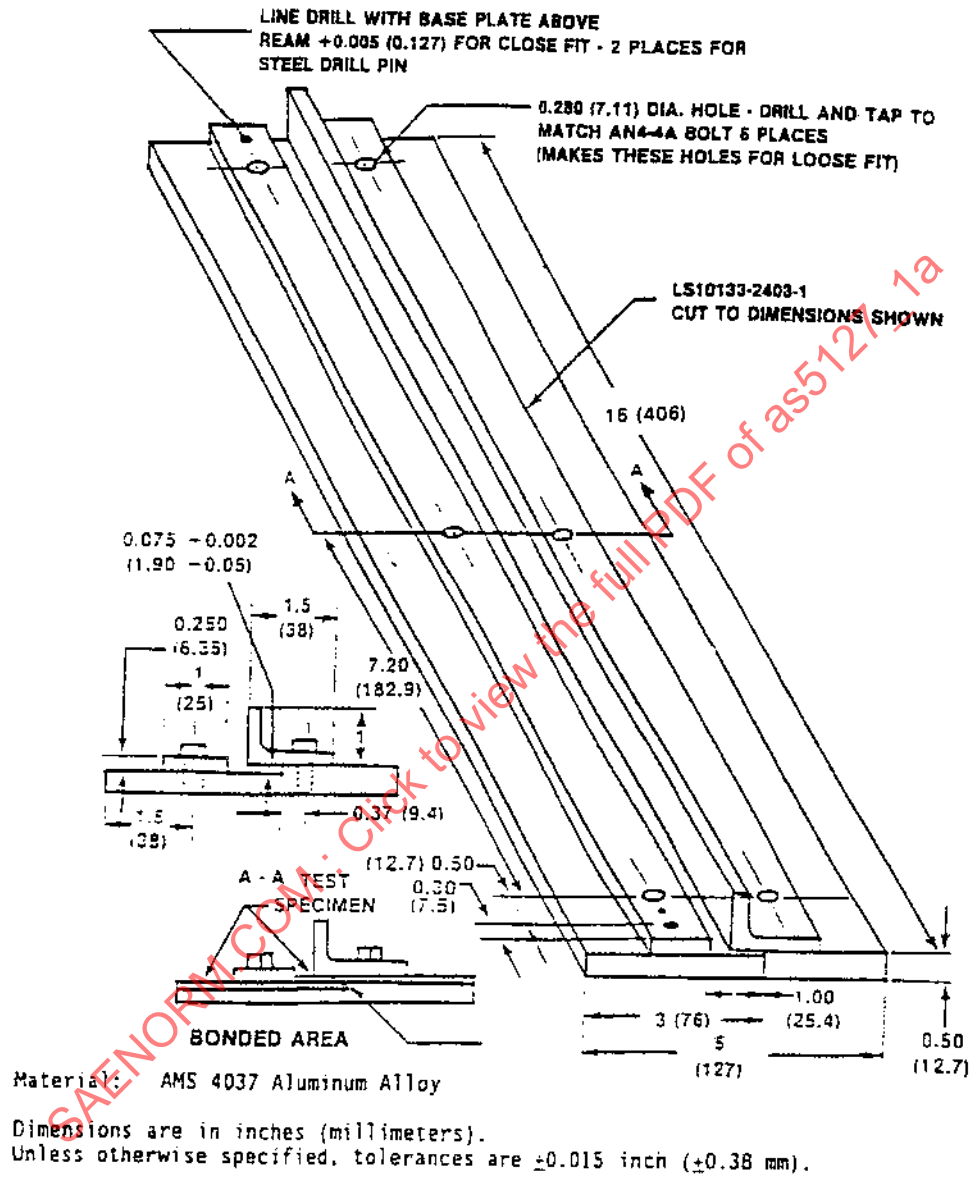


FIGURE 16 – Shear Specimen Fixture

7.10 Corrosion Stressed Assembly and Mixed Metals:

7.10.1 Corrosion Stressed Assembly: Corrosion testing shall consist of stressed aluminum assemblies, as shown in Figure 17, undergoing exposure to a corrosive environment. Sufficient panels conforming to AMS 4045, prepared in accordance with AS51276.1.1 shall be used to produce two assemblies for corrosion testing. Each assembly shall be prepared using four classes of sealing compound according to the following procedure in Table 3.

The assemblies shall be installed vertically in the jaws of a machine capable of cycling between 0 and 5000 pounds for 250 cycles with a loading rate of 10 in (254 mm) per min. The assembly shall be subjected to 250 cycles at a temperature of -65 °F (-54 °C) following a 30-min soak time at -65 °F (-54 °C) under no load.

7.10.2 Mixed-Metal Assemblies: Two mixed metal assemblies, as indicated in Table 4 and configured as shown in Figure 18, shall be used for each sealant. Sealant 0.005 in to 0.007 in (0.5 mm to 0.6 mm) thick shall be applied to one side of each metal shown in Figure 18. The coated portions shall be mated using inert non-metal fasteners (e.g., nylon) tightened to produce a total sealant thickness of approximately 0.007 in (0.6 mm). Excess sealant shall be carefully removed from the panel surface. The sealant assemblies shall be cured at standard conditions in accordance with AS5127, 4.1, for the time defined in the sealing compound specification.

TABLE 3 - Preparation Sequence of Corrosion Test Assemblies

Sequence Step	Assembly Preparation
	Two assemblies shall be prepared as follows:
1	Approximately 0.005 in (0.5 mm) sealing compound shall be applied to one side of each panel by spatula.
2	Threaded fasteners conforming to NASM7839 shall be installed wet with sealing compound, then inserted into the freshly mated panels and torqued to 40 in-lb (4.5 N·m)
3	Sealing compound shall be applied by gun to the butt joint. Using a spatula, cover over and around the fastener head, backs (nuts) and all edges.
4	Brush sealing compound over the entire assembly to a thickness of 0.005 in to 0.007 in (0.13 to 0.18 mm).
5	Cure the assembly at standard conditions in accordance with AS5127, 4.1, for the time defined in the sealing compound specification.
6	After curing, scribe one half of the front side of each assembly as shown in Figure 17. Assemblies are now ready for cyclic loading.

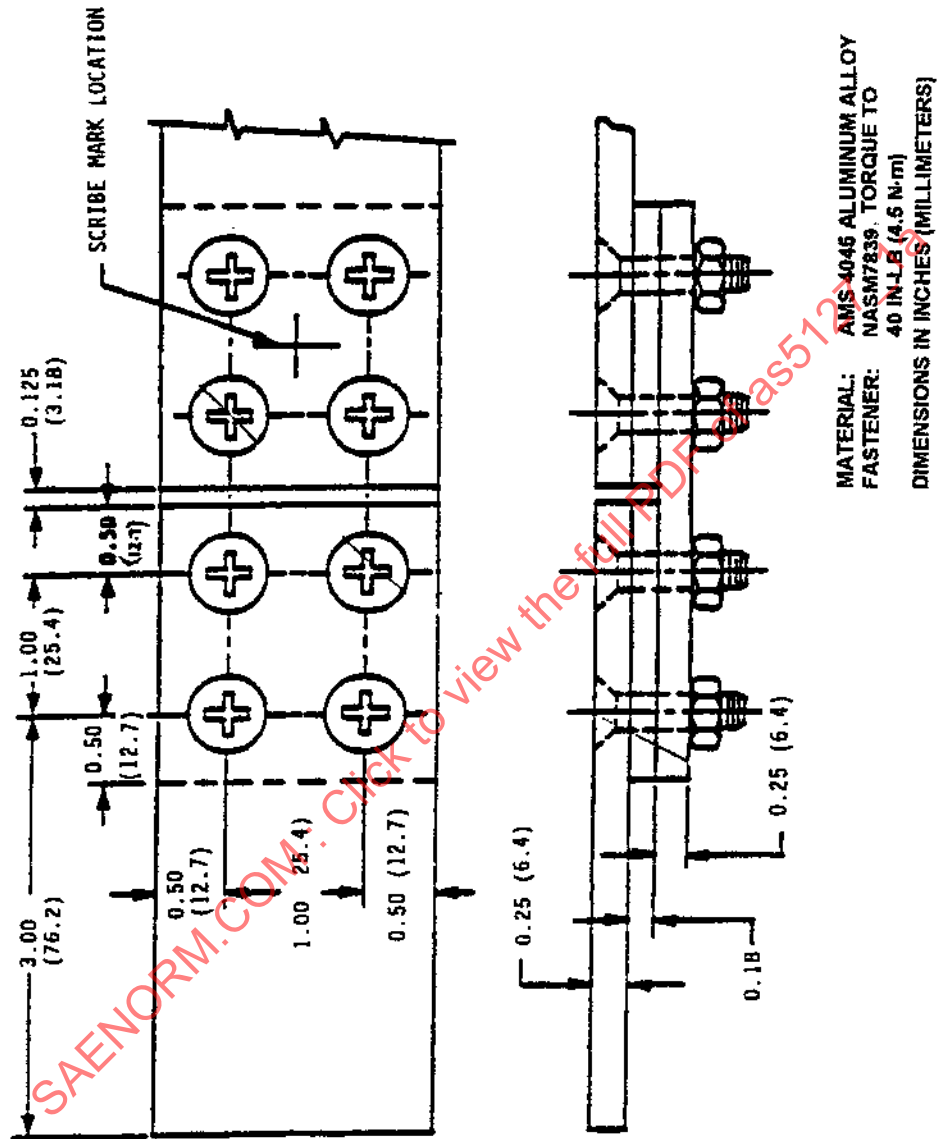


FIGURE 17 - Assembly Configuration for Cycle and Exposure

SAE AS5127/1 Revision A

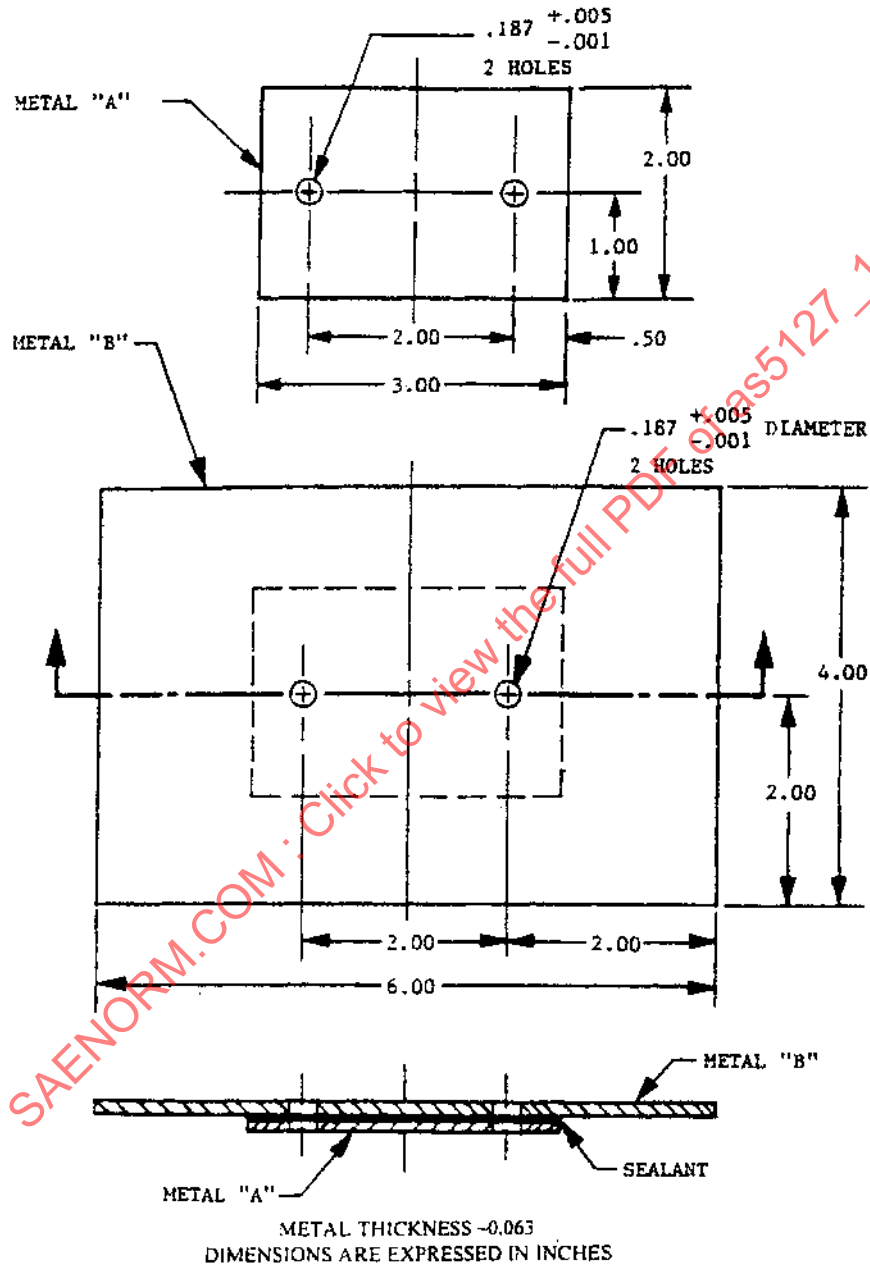


FIGURE 18 – Mixed Metal Assembly

TABLE 4 - Mixed Metal Assemblies

Assembly	Metal B (Figure 3)	Metal A (Figure 3)
1	Aluminum ¹	Titanium ²
2	Aluminum ¹	Magnesium ³

¹ AMS 4045 chemically treated in accordance with AS5127, 6.1.2, followed by cleaning in accordance with AS5127, 6.1.1.

² AMS 4901 cleaned in accordance with AS5127, 6.4.

³ AMS 4377, chemically treated in accordance with AS5127, 6.1.2, followed by cleaning in accordance with AS5127, 6.1.1.

7.10.3 The mixed-metal assemblies shall be cured at standard conditions in accordance with AS5127, 4.1, for the time defined in the sealing compound specification. Exposure of the prestressed or mixed metal assemblies shall then include a period of 4 weeks in a salt-SO₂ spray cabinet meeting the requirements of ASTM B 117 Appendix 1. The butt joints of both sealant assemblies shall be masked with wax prior to salt-SO₂ exposure. The test shall be conducted under the following conditions:

- Salt solution: 5% by weight sodium chloride
- Cabinet temperature: 95 °F (35 °C).
- Saturator tower temperature: 115 °F (46 °C).
- Cycle: Continuous spray; sulfur dioxide injected for 1 h in every 6 h (4X daily) at a flow rate of 1 cc/min/ft³ of box.

NOTE: The collected solution in the cabinet shall be tested weekly and shall conform to the following conditions:

- (1) 1 to 2 ml/hr collection rate
- (2) pH of 2.5 to 3.2
- (3) Specific gravity 1.02 to 1.04

At the end of the required exposure to salt spray, each assembly shall be disassembled. After the sealant has been carefully stripped from all surfaces, the assembly shall be evaluated for corrosion with respect to sealant function (i.e. fasteners, faying surface, etc.). Countersinks as well as adjacent areas, and faying surfaces shall be examined under a zoom microscope up to 30X magnification. All surfaces shall be examined for compliance to the sealing compound specification.