SAE Aerospace
An SAE International Group

AEROSPACE MATERIAL SPECIFICATION

SAE AMS 3263A

Issued MAR 1997
Cancelled DEC 2002

Superseding AMS 3263

Sealing Compound, Polythioether, Ambient Cure or Immediate Heat Cure For Aircraft Structures, Fuel Resistant With Intermittent Use To 400 °F (204 °C)

CANCELLATION NOTICE

This specification has been "CANCELLED" by the Aerospace Materials Division, SAE, as of December 2002, without supersedure. The requirements of the latest issue of AMS 3263A shall be fulfilled whenever reference is made to the cancelled AMS 3263. By this action, this document will remain listed in the Numerical Section of the Index of Aerospace Material Specifications.

Cancelled specifications are available from SAE.

TO PLACE A DOCUMENT ORDER:
Tel: 877-606-7323 (inside USA and Canada)
Tel: 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: custsvc@sae.org
SAE WEB ADDRESS: http://www.sae.org

1. SCOPE:

1.1 Form:

This specification covers two classes of a fuel resistant polythioether sealing compound supplied as a two-component system.

1.2 Application:

These products have been used typically for manufacture and repair of metal and composite aircraft structures where autoclave co-cure or adhesive bonding procedures are used and concurrent sealant application is advantageous, but usage is not limited to such applications. The sealant can be cured at temperatures up to 350 °F (177 °C) immediately after application and is suitable for sealing seams, joints, fasteners, and faying surfaces. Also, for rapid field repair direct heat can be applied by hand held heat gun or heat blanket immediately after sealant application. Sealant will also cure rapidly at ambient and low temperatures down to 20 °F (-7 °C). The sealing compound can be used in fuel tank and non-fuel tank areas. An adhesion primer is supplied with the sealing compound and must be applied prior to sealing compound. The sealing compound is useable from -67 to 320 °F (-55 to 160 °C), with short term (up to six hours) exposures up to 400 °F (204 °C). Periodic spike temperatures at 420 °F (216 °C) totaling two hours can be tolerated.

1.2.1 Notice: This material is mix-ratio sensitive and also will cure at very low temperatures. Normal mix freeze operations that are used with polysulfide sealants are not adequate for this material.

1.3 Classification:

The sealing compounds shall be of the following classes:

Class A - None

Class B - Suitable for application by extrusion gun or spatula; available in Class B-2 with a normal application time of two hours.

Class C - Suitable for application by extrusion gun, spatula, brush or roller and used for fay surface sealing only; available in Class C-4 with a normal application time of four hours.

1.3.1 Product supplied shall be the class ordered.

1.4 Safety - Hazardous Materials:

While the materials, methods, applications, and processes described or referenced in this specification may involve the use of hazardous materials, this specification does not address the hazards which may be involved in such use. It is the sole responsibility of the user to ensure familiarity with the safe and proper use of any hazardous materials and to take necessary precautionary measures to ensure the health and safety of all personnel involved.

2. APPLICABLE DOCUMENTS:

The following publications form a part of this specification to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order.

2.1 SAE Publications:

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

AMS 2471	Anodic Treatment of Aluminum Alloys, Sulfuric Acid Process, Undyed Coating
AMS 2629	Fluid, Jet Reference
AMS 3021	Fluid, Reference, for Testing Di-Ester (Polyol) Resistant Material
AMS 3276	Sealing Compound, Integral Fuel Tanks and General Purpose, Intermittent Use to 360 °F (182 °C)
AMS 3819	Cloths, Cleaning, for Aircraft Primary and Secondary Structural Surfaces
AMS 4037	Aluminum Alloy Sheet and Plate, 4.4Cu - 1.5Mg - 0.60Mn (2024 -T3 Flat Sheet, -T351 Plate), Solution Heat Treated
AMS 4045	Aluminum Alloy Sheet and Plate, 5.6Zn - 2.5Mg - 1.6Cu - 0.23Cr (7075 -T6 Sheet, -T651 Plate), Solution and Precipitation Heat Treated
AMS 4049	Aluminum Alloy Sheet and Plate, Alclad, 5.6Zn - 2.5Mg - 1.6Cu - 0.23Cr (Alclad 7075 -T6 Sheet, -T651 Plate), Solution and Precipitation Heat Treated
AMS 4901	Titanium Sheet, Strip and Plate, Annealed, 70 ksi (485 MPa) Yield Strength
AMS 5516	Steel Sheet, Strip, and Plate, Corrosion Resistant, 18Cr - 9.0Ni (SAE 30302), Solution Heat Treated
AS7001	National Aerospace and Defense Contractors Accreditation Program (NADCAP) Program Description
AS7002	National Aerospace and Defense Contractors Accreditation Program (NADCAP) Rules for Implementation
AS7003	National Aerospace and Defense Contractors Accreditation Program (NADCAP) Program Operation
AS7201	National Aerospace and Defense Contractors Accreditation Program (NADCAP) Requirements for Accreditation of Pass-Thru Distributors
AS7202	National Aerospace and Defense Contractors Accreditation Program (NADCAP) Requirements for Accreditation of Value Added Distributors
AS7200/1	National Aerospace and Defense Contractors Accreditation Program - Audit and Inspection Checklists for the Sealant Manufacturers Accreditation Program

2.2 ASTM Publications:

Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

ASTM D 412	Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers - Tension
ASTM D 792	Specific Gravity (Relative Density) and Density of Plastics by Displacement
ASTM D 2240	Rubber Property - Durometer Hardness

2.3 U.S. Government Publications:

Available from DODSSP, Subscription Services Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

L-P-390	Plastic, Molding and Extrusion Material, Polyethylene and Copolymers (Low, Medium, and High Density)
CCC-C-419	Cloth, Duck, Unbleached, Plied-yarns, Army and Numbered
PPP-B-636	Box, Shipping Fiberboard
PPP-C-96	Can, Metal, 28 Gage and Lighter
PPP-D-729	Drums, Shipping and Storage, Steel, 55 Gallon (209 Liters)
PPP-P-704	Pail, Metal (Shipping Steel, 1 through 12 gallon)
MIL-A-9962	Abrasive Mats, Non-woven, Non-metallic
MIL-P-23377	Primer Coating, Epoxy Polyamide, Chemical and Solvent Resistant
MIL-C-27725	Coating, Corrosion Preventive, for Aircraft Integral Fuel Tanks
MIL-C-38334	Corrosion Removing Compound, Prepaint, For Aircraft Aluminum Surfaces
MIL-S-38714	Sealant Cartridge for Two Component Materials
MIL-C-38736	Compound, Solvent, for Use in Integral Fuel Tanks
MIL-C-81706	Chemical Conversion Materials for Coating Aluminum and Aluminum Alloys
MIL-H-83282	Hydraulic Fluid, Fire Resistant, Synthetic Hydrocarbon Base, Aircraft
MIL-C-87936	Cleaning Compounds, Aircraft Exterior Surfaces, Water Dilutable
MIL-STD-453	Inspection and Radiographic
MIL-STD-2073-1	DOD Materiel, Procedures for Development and Application of Packaging Requirements
AN 4	Bolt and Machine, Aircraft

2.4 AIAA Publications:

Available from National Standards Association, Inc., 1321 14th Street, NW, Washington, DC 20005.

NAS 679	Nut, Self-locking, Hexagon - Low Height
NAS 1154	Screw, Machine - Flat 100 Deg Head, Close Tolerance, Short Thread, Torque Set

3. TECHNICAL REQUIREMENTS:

3.1 Materials:

The basic ingredient shall be polythioether polymer. The sealing compound shall cure by the addition of a curing agent to the base compound, and 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 sealant shall be red or pink in color. A primer, as recommended by the manufacturer, is required and shall be included as part of the package.

3.2 Properties:

The sealing compound, when mixed in accordance with the manufacturer's instructions and cured as in 4.5.2.8 and 4.5.2.8.1 shall conform to the requirements shown in Table 1, determined in accordance with the indicated test methods:

TABLE 1 - Properties

Paragraph	Property	Requirement	Test Method
3.2.1	Specific Gravity, max	1.50	4.5.4
3.2.2	Hardness, Shore Durometer A Scale, Instantaneous, min	40	4.5.5
3.2.3	Nonvolatile Content (% by weight), min		4.5.6
	Class B	97%	
	Class C	97%	
3.2.4	Viscosity of Base Compound		4.5.7
	Class B	9000 to 18,000 poises (900 to 1800 Pa·s)	
	Class C	1000 to 4000 poises (100 to 400 Pa·s)	
3.2.5	Viscosity of Curing Agent	700 to 1600 poises (70 to 160 Pa·s)	4.5.8
3.2.6	Flow		4.5.9
	Class B	0.10 to 0.75 inches (2.5 to 19.05 mm)	
	Class C, minimum	0.010 inch (0.25 mm)	
3.2.7	Application Time, minimum		4.5.10
3.2.7.1	Class B - From the beginning of mixing, not less than 15 grams per minute shall be extruded		
	B-2	2 hours	

TABLE 1 - Properties (Continued)

Paragraph	Property	Requirement	Test Method
3.2.7.2	Class C - From the beginning of mixing, not less than 30 grams per minute shall be extruded		
	C-4	4 hours	
3.2.8	Assembly Time, min		4.5.11
	Class C-4	6 hours	
3.2.9	Tack-Free Time (from the beginning of mixing), max		4.5.12
	B-2	9 hours	
	C-4	24 hours	
3.2.10	Cure Time, max (to obtain Shore A 30, min)		4.5.13
3.2.10.1	Standard Cure Time		
	Class B-2	18 hours	
	C-4	30 hours	
3.2.11	Peel Strength, minimum	20 pounds force per inch (3503 N/m) with 100% cohesive failure	4.5.14
3.2.12	Chalking	None	4.5.15
3.2.13	Shear Strength, min Class C only		
	Standard cure in accordance with 4.5.2.8	200 psi (1379 kPa) average 100% cohesive failure	
	Standard Cure plus Heat Aged two hours at 400 °F (204 °C)	10 psi (689 kPa) average with 75% cohesive failure, minimum	
	Heat cure in accordance with 4.5.2.8.1	200 psi (1379 kPa) average with 100% cohesive failure	

TABLE 1 - Properties (Continued)

Paragraph	Property	Requirement	Test Method
3.2.14	Air Content, max	4%	4.5.17
3.2.15	Weight Loss, max	4%	4.5.18
3.2.15.1	Flexibility	No cracking or checking	4.5.18
3.2.15.2	Swell	5% to 25%	4.5.18
3.2.16	Resistance to Thermal Rupture	No blistering or sponging, 5/32 inch (3.96 mm) deformation, max	4.5.19
3.2.17	Resistance to Thermal Expansion	Sealant flush with groove within +0.010 and -0.003 inch (+0.25 and -0.08 mm) at the wide end of the test block and within +0.005 and -0.003 inch (+0.13 and -0.08 mm) at the narrow end.	4.5.20
3.2.18	Heat Reversion Resistance	The sealant shall not revert to a liquid or paste-like consistency, nor shall it become brittle or lose adhesion.	4.5.21
3.2.19	Tensile Strength and Elongation, min		4.5.22
	Standard Cure in accordance with 4.5.2.8	250 psi (1724 kPa)/250% elongation	
	Heat Cure in accordance with 4.5.2.8.1	250 psi (1724 kPa)/250% elongation	
	Standard Cure + 12 days at 140 °F (60 °C) + 60 hours at 160 °F (71 °C) + six hours at 180 °F (82 °C) All in JRF	125 psi (862 kPa)/100% elongation	

TABLE 1 - Properties (Continued)

Paragraph	Property	Requirement	Test Method
	Standard Cure + 12 days at 140 °F (60 °C) + 60 hours at 160 °F (71 °C) + six hours at 180 °F (82 °C) All in JRF 24 hours at 120 °F (49 °C) + Standard Heat Cycle in accordance with 4.5.1.2	150 psi (1034 kPa)/100% elongation	4.5.22
	Standard Heat Cycle in accordance with 4.5.1.2	150 psi (1034 kPa)/50% elongation	
	Standard Cure + two hours at 420 °F (216 °C)	150 psi (1034 kPa)/100% elongation	
3.2.20	Sponging	No visible evidence of chemical sponging, non-cutting or other degradation	4.5.22
3.2.21	Low Temperature Flexibility	No visible evidence of cracking or loss of adhesion	4.5.24
3.2.22	Hydrolytic Stability, min	Shore A durometer 80% of original	4.5.25
3.2.23	Corrosion	No corrosion under sealant or signs of sealant deterioration	4.5.26
3.2.24	Repairability, min	10 pounds force per inch (1751 N/m), 100% cohesive failure	4.5.27
3.2.25	Radiographic Density		4.5.28
	Difference between plate and plate plus sealant, max	1.00	
	Through sealant in the slot, approximately	3.00	
3.2.26	Storage Stability		4.5.29

TABLE 1 - Properties (Continued)

Paragraph	Property	Requirement	Test Method
3.2.26.1	Accelerated Storage		4.5.29.1
	Viscosity of Base Compound	Same as 3.2.4	4.5.7
	Viscosity of Curing Agent	Same as 3.2.5	4.5.8
	Flow	Same as 3.2.6	4.5.9
	Application Time, min	Same as 3.2.7	4.5.10
	Assembly Time, min	Same as 3.2.8	4.5.11
	Cure Time, max	Same as 3.2.10	4.5.13.1
	Peel Strength, min	Same as 3.2.11	4.5.14.5
3.2.26.2	Long Term Storage		
	Application Time, min	Same as 3.2.7	4.5.10
	Assembly Time, min	Same as 3.2.8	4.5.11
	Cure Time, max	Class B-2 - 24 hours	4.5.13.1.1
	(to obtain Shore A 30, min)	Class C-4 - 40 hours	
	Peel Strength, min	Same as 3.2.11	4.5.14.5

3.3 Shelf Life:

The unmixed sealing compound shall have a minimum of nine months shelf life from the date of packaging.

3.4 Quality:

The base compound and the curing agent as received by purchaser 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

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection:

The manufacturer of the sealing compound shall supply all samples and shall be responsible for all required tests. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the sealing compound conforms to the requirements of this specification.

4.1.1 Source Inspection: Sealing compound shall be third party approved prior to shipment, to ensure that the material meets the acceptance tests. The third party approval shall be by a third party accreditation process in accordance with AS7001, AS7002, AS7003, and AS7200/1. Sealant shall be from a manufacturer that currently holds a third party accreditation and shall be from a batch of material that has been third party source inspected in accordance with AS7200/1. Distributors supplying sealant to this specification shall supply material from an accredited manufacturer and from a batch of material that has been third party source inspected. Distributors shall also be third party accredited in accordance with AS7201 or AS7202, whichever is applicable.

4.1.2 Shelf-life Surveillance and Updating:

4.1.2.1 Sampling: The minimum number of samples to be tested during shelf-life surveillance and updating is shown in Table 2.

TABLE 2 - Shelf-Life Surveillance Samples

Items in Stock	Samples to be Tested
up to 100, excl	3
100 to 500, incl	5
over 500	7

4.1.2.2 Testing: The following inspections are to be conducted for shelf-life surveillance and updating.

a. Condition of Container
b. Application Time
c. Standard Cure Time
d. Assembly Time (Class C)
e. Viscosity of Base Compound (not possible with sectional-type containers)
f. Viscosity of curing agent (not possible with sectional-type containers)
g. Peel Strength - two aluminum panels sulfuric acid anodized in accordance with AMS 2471, coated with material conforming to MIL-C-27725 cured at standard conditions (4.5.1.1) for seven days. After the sealant is applied and cured, age in JRF for seven days at 140 °F (60 °C).

4.1.2.2.1 Tests are to be conducted in accordance with the test methods outlined herein for acceptance tests. 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 tests are passed, the shelf-life will be extended an additional three months. Up to three updatings will be allowed.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Requirements shown in Table 3 are acceptance tests and shall be performed on each batch. A batch shall be the quantity of material run through a mill or mixer at one time.

TABLE 3 - Acceptance Tests

Requirement	Paragraph Reference
Hardness	3.2.2
Nonvolatile content	3.2.3
Viscosity of the base compound[1]	3.2.4
Viscosity of the curing compound[1]	3.2.5
Flow	3.2.6
Application time	3.2.7
Assembly time (C-4 only)	3.2.8
Tack-free time	3.2.9
Standard cure time	3.2.10
Peel strength[2]	3.2.11
Shear strength (Class C only)	3.2.13
Air content	3.2.14
Weight loss, flexibility and swell	3.2.15

[1] Testing need not be performed on material packaged in sectionalized containers or small size containers of less than eight ounces (237 mL).

[2] Test in accordance with 4.5.14.5.

4.2.2 Qualification Tests: All technical requirements are qualification tests and shall be performed prior to the initial shipment of sealing compound to a purchaser, when a change in ingredients and/or processing requires reapproval as in 4.4.2, and when purchaser deems confirmatory testing to be required (See 8.1).

4.2.2.1 The first material that a manufacturer must qualify is Class B-2. That material must meet all the requirements of this specification with the exception of those requirements that are for other classes. Once qualification for Class B-2 is obtained, Class C may be qualified. The formulation shall be the same as that for the Class B-2, except for minor variations necessary for the viscosity and application life. It will not always be necessary for the qualifying agency to conduct all tests on the other class. In general, the acceptance tests plus any tests specific to that class of material will be sufficient, although additional tests can be required. The manufacturer shall show proof that all requirements are met prior to requesting qualification approval for any class. This includes assurance that the material will cure at standard conditions. After the compound has been accepted for qualification, approval will be granted and the material will be identified by reference to the manufacturer's identification.

4.2.2.2 For direct U.S. Military procurement and for procurement on U.S. Military contracts, the sealant shall be a product that has been tested, has passed the qualification tests of 4.2.2 and has been listed or approved for listing on applicable U.S. Military qualified products list.

4.3 Sampling and Testing:

Shall be as follows:

4.3.1 For Acceptance Tests: Sufficient sealing compound shall be taken at random from each lot or batch to perform all the required tests. The number of determinations for each requirement shall be as specified in the applicable test procedure or, if not specified therein, not less than three. Multiple testing is not required for viscosity, application time, flow, tack-free time and hardness.

4.3.1.1 Materials for testing shall be mixed, as much as possible, in the same containers in which the sealing compounds were procured.

4.3.1.2 If the material is being procured in plastic injection kits, such as those conforming to MIL-S-38714, all the tests shall be conducted on material that has been packaged and mixed in the initial sample injection kits except for viscosity of base compound and viscosity of curing agent. During filling of the initial sample injection kits, base compound and curing agent shall be placed in 1-quart (1-L) cans for viscosity tests. If more than one size of injection kits are to be packaged from a particular batch, it is necessary to test material from only one size kit.

4.3.1.3 If the material is being procured in cans, pails, or drums, the batch shall be tested on the material placed in 1-quart (1-L) cans.

4.3.1.4 If the material is being procured in both type containers, the quality conformance tests shall be conducted on the material packaged in plastic injection kits (See 4.3.1.2).

4.3.1.5 A statistical sample plan, acceptable to the purchaser, may be used in lieu of sampling as in 4.3.1.

4.3.1.6 U.S. Government Procurement: Each batch shall be subjected to both initial and final acceptance testing. Sufficient material for initial acceptance testing shall be packaged in the same type containers that are being procured. Initial acceptance tests are those listed in Table 3. Final acceptance testing shall be conducted on the final packaged product and consists of application time, tack-free time, standard cure time, and air content (Class B only). After successful completion of the initial quality conformance tests, the batch shall be released for final packaging. During packaging, test kits shall be picked at random to perform final acceptance tests as shown in Table 4.

TABLE 4 - Final Acceptance Tests

Property	Value
Application Time	3.2.7
Tack-Free Time	3.2.9
Standard Cure Time	3.2.10
Air Content	3.2.14

4.3.1.6.1 If the batch is being packaged in different type and/or different size containers, the final acceptance tests shall be conducted on each type and/or each size containers. If the material is being procured under different purchase orders, but the purchase orders call for the same type and size containers, it is only necessary to conduct the final acceptance tests once.

4.3.2 For Qualification Tests: Samples shall consist of 80 six ounce two component kits with the appropriate amount of primer plus three 1-quart (1-L) cans. Samples for U.S. Government procurement shall be identified as follows and forwarded to the activity responsible for testing as designated in the letter of authorization from that activity:

SEALING COMPOUND, POLYTHIOETHER, AMBIENT CURE OR IMMEDIATE HEAT CURE FOR AIRCRAFT STRUCTURES, FUEL RESISTANT WITH INTERMITTENT USE TO 400 °F (204 °C)

Specification AMS 3263, Class _____
Manufacturer's Identification
Name of Manufacturer
Lot Number
Date of Manufacture
Submitted by (name) (date) for qualification tests in accordance with AMS 3263 under authorization (reference authorizing letter).

4.4 Approval:

4.4.1 Sealing compound shall be approved by purchaser before sealing compound for production use is supplied, unless such approval be waived by purchaser. For direct Military procurement and for procurement for use on U.S. Military contracts, the sealing compound shall be listed, or approved for listing, on the applicable U.S. Military qualified products list. Results of the tests on the production sealing compound shall be essentially equivalent to those on the approved sample.

4.4.2 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. If necessary to make any change in ingredients, in type of equipment for processing, or in manufacturing procedures, manufacturer shall submit for reapproval a statement of the proposed changes in ingredients and/or processing and, when requested, sample of sealing compound. Production sealing compound made by the revised procedure shall not be shipped prior to receipt of reapproval.

4.5 Test Methods:

Shall be as follows:

4.5.1 Standard Conditions:

4.5.1.1 Test Conditions: Standard laboratory test conditions shall be 77 °F ± 2 (25 °C ± 1) and 50% ± 5 relative humidity. Except as otherwise specified herein, all test specimens shall be prepared and cured under these conditions. Test specimens shall be prepared at 77 °F ± 5 (25 °C ± 3) and immediately upon completion of preparation, shall be placed into standard conditions for cure. Except as otherwise specified herein, tests shall be performed at 77 °F ± 5 (25 °C ± 3).

4.5.1.2 Standard Heat Cycle: Standard heat cycle shall consist of the cure cycle of 4.5.2.8 and the following cycle which shall be repeated six times.

Four hours at 260 °F (127 °C)
40 minutes ± 2 at 320 °F (160 °C)
30 minutes ± 2 at 400 °F (204 °C)
Cool to under 100 °F (38 °C)

4.5.1.3 Standard Tolerances: Unless otherwise specified, the tolerances shown in Table 5 shall apply.

TABLE 5 - Standard Tolerances

Unit	Tolerance
Temperatures	±2 °F (1 °C)
Days	± two hours
Hours	± five minutes
Minutes	± 10 seconds
Inches (mm)	± 0.010 inch (0.25 mm)

4.5.2 Preparation of Test Specimens:

4.5.2.1 Chemical conversion Coating Application on Aluminum Alloy Panels:

4.5.2.1.1 Coating Preparation: A chemical conversion coating conforming to MIL-C-81706, Class IA, Form II, Method C prepared according to the manufacturer's instructions shall be used. The pH of the resulting solution shall be adjusted to 1.5 using nitric acid.

4.5.2.1.2 Panel Preparation: Vapor or solvent degrease using a suitable solvent. Then 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 to 100 °F (16 to 38 °C), and check for cleanliness by observing for a water break free surface. If a water break occurs on the panel surfaces, return them to the detergent solution and repeat the cleaning procedure until a water break free surface is obtained. Immediately transfer the cleaned panels to a deoxidizing solution consisting of the following:

Butyl alcohol - 35% by weight
Distilled or deionized water - 22% by weight
Isopropyl alcohol - 25% by weight
Phosphoric acid (85% by weight) - 18% by weight

Acid deoxidizer conforming to MIL-C-38334 may also be used. Allow the panels to remain in the above solution for three to five minutes. rinse the panels thoroughly under flowing tap water.

4.5.2.1.3 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 three to five minutes or until a light straw color develops. (Color development time will vary with the aluminum alloy being conversion coated.) After removal from the conversion coating solution, immediately rinse the panels in an upright position to permit them to drain dry. Apply the test materials to the conversion coated surfaces within 48 hours.

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

4.5.2.2 Preparation of Composite Panels:

4.5.2.2.1 Graphite Epoxy: AS4/3501-6 test panels shall be fabricated using eight plies of unidirectional tape laid (0°, 45°, 90°, 135°) symmetrical. Size of the test panels shall be 0.040 x 2.75 x 6 inches (1.02 x 69.8 x 152 mm). Cure as in 4.5.2.2.2.1.

4.5.2.2.2 Graphite Bismaleimide (BMI): IM7/5250-4 BMI test panels shall be fabricated using eight plies of unidirectional tape laid (+45°, 90°, -45°, 0°) symmetrical. Size of the test panels shall be 0.040 x 2.75 x 6 inches (1.02 x 69.8 x 152 mm). Cure as in 4.5.2.2.2.1.

4.5.2.2.2.1 Install peel ply to bag surface of laminate. Nylon peel ply is acceptable. Apply a vacuum of not less than 28 inches (711 mm) of mercury and 85 psi (386 kPa) pressure. Heat to 375 °F ± 10 (190 °C ± 5) at a rate of 1 to 4 F (0.5 to 2 C) degrees per minute. From 320 °F (160 °C) to 375 °F (190 °C) heat at a rate of less than 1 F (0.5 C) degrees per minute. Keep free air temperature at or below 390 °F (199 °C). Hold laminate at 375 °F (190 °C) for 360 minutes ± 20. Cool laminate to 150 °F (65 °C) or below at an average rate less than or equal to 5 F (3 C) degrees per minute while maintaining a minimum of 25 psi (172 kPa) pressure. Remove peel ply.

4.5.2.3 Composite Panel Conditioning: Composite panels shall be conditioned a minimum of 14 days at standard conditions (4.5.1.1) prior to preparation of sealant test panels.

4.5.2.4 Preparation of Sealing Compound:

4.5.2.4.1 Qualification Tests: Sealing compound in section type containers are to be machine mixed in accordance with the sealant manufacturer's instructions.

4.5.2.4.2 Acceptance Tests: Sealing compound shall be hand mixed as thoroughly as possible according to manufacturer's instructions. MIL-S-38714 containers shall be used when applicable.

4.5.2.5 Cleaning of Test Panels: All test panels shall be cleaned by scrubbing and rinsing using MIL-C-38736 solvent and clean AMS 3819 Grade A cloths. The panels shall be wiped dry immediately with clean AMS 3819 A cloths. Titanium, stainless steel, BMI and epoxy graphite panels shall be scrubbed with abrasive mats and MIL-C-38736 solvent. After scrubbing, the panels shall be rinsed using MIL-C-38736 solvent and clean cloth, and then wiped dry. The abrasive mats shall conform to MIL-A-9962, Type I, Class 1, Grade A for stainless steel and epoxy and BMI graphite and MIL-A-9962, Type III, Class 1, Grade A for the titanium.

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

4.5.2.6 Application of Primer: The panel surface shall always be treated with the manufacturer's recommended adhesion primer. This shall be done immediately after the panel is cleaned by wetting a clean AMS 3819 Grade A cloth and wiping the surface. Allow adhesion primer to air dry at least 30 minutes, but no more than two hours, before applying the sealant. If more than two hours has elapsed, reclean and reapply the adhesion primer before applying the sealant.

4.5.2.7 Application of Sealing Compound: Unless otherwise specified herein, test panels shall be given an application of sealing compound to produce a coating having a total thickness of 1/8 inch ± 1/64 (3.2 mm ± 0.5) when cured.

4.5.2.8 Cure of Sealing Compound: The sealing compound shall be cured for seven days at standard conditions (4.5.1.1) unless otherwise specified. An accelerated cure of 24 hours at standard conditions (4.5.1.1) plus 24 hours at 140 °F (60 °C) may be used for acceptance tests. Tests on the cured sealing compound shall commence not more than two days after the completion of the specified cure.

4.5.2.8.1 Heat Cure: The sealing compound shall be cured for one hour at 302 °F (150 °C). The cast specimens shall be placed in the oven two hours after mixing. Allow the cured sealant to cool 16 to 48 hours at standard conditions (4.5.1.1) before testing.

4.5.3 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 Type II shall be used for the chalking test (4.5.15).

4.5.4 Specific Gravity: Three test specimens approximately 0.125 x 1 x 1 inch (3.18 x 25 x 25 mm) in size shall be cut out with a sharp razor blade from a sheet of the sealing compound that has been cured in accordance with 4.5.2.8. Determine the specific gravity of each sample in accordance with ASTM D 792, Method A and report the average value. Inspect to the requirements of 3.2.1.

4.5.5 Hardness: The instantaneous hardness shall be determined in accordance with ASTM D 2240 after the sealing compound is cured in accordance with 4.5.2.8. The reading shall be taken on double back-to-back, 0.125 inch (3.18 mm) thick specimen making the total 0.25 inch (6.4 mm). Inspect to the requirements of 3.2.2.

4.5.6 Nonvolatile Content: Within five minutes after mixing, 11 to 12 grams of mixed sealing compound shall be transferred as rapidly as possible to a previously weighted (W1) aluminum dish approximately two inches (51 mm) in diameter. The Class C sealant shall be poured into the dish. The Class B sealant shall be extruded from a plastic cartridge fitted with 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 milligram. Immediately following weighing the sample and dish shall be placed in a circulating air oven preheated to 160 °F (71 °C), and allowed to dwell for three days. Following this, the sample and dish shall be removed from the oven and allowed to cool in a desiccator to room temperature. Final weight (W3) shall be determined on the same balance used for the initial weights. All weights shall be recorded to the nearest milligram.

Percent nonvolatile content shall be determined from the average of three samples and calculated in accordance with Equation 1.

$$\text{Percent nonvolatile} = \frac{W3 - W1}{W2 - W1} \times 100 \qquad \text{(Eq. 1)}$$

Inspect to the requirements of 3.2.3.

4.5.7 Viscosity of Base Compound:

4.5.7.1 Shall be determined with the base compound placed in a 1-quart (1-L) can. The can shall be filled with the base compound to within 0.5 inch (13 mm) of the top, covered, and stored at 77 °F (25 °C) for not less than eight hours. The base compound shall be thoroughly mixed by stirring slowly for not less than three minutes after which the can shall be closed and the base compound shall be allowed to stand for one hour.

4.5.7.2 The Brookfield Model RVF viscosimeter, or equivalent, shall be used. The reading obtained shall be converted to poises (Pa·s). For Class B material, the No. 7 spindle, at two rpm, shall be used. For Class C material, the No. 6 spindle, at two rpm, shall be used. The reading shall be taken after the instrument has run in the base compound for one minute. Inspect to the requirements of 3.2.4.

4.5.8 Viscosity of the Curing Agent: The viscosity of the curing agent shall be determined in accordance with 4.5.7 except a No. 7 spindle at 10 rpm shall be used. Inspect to the requirements of 3.2.5.

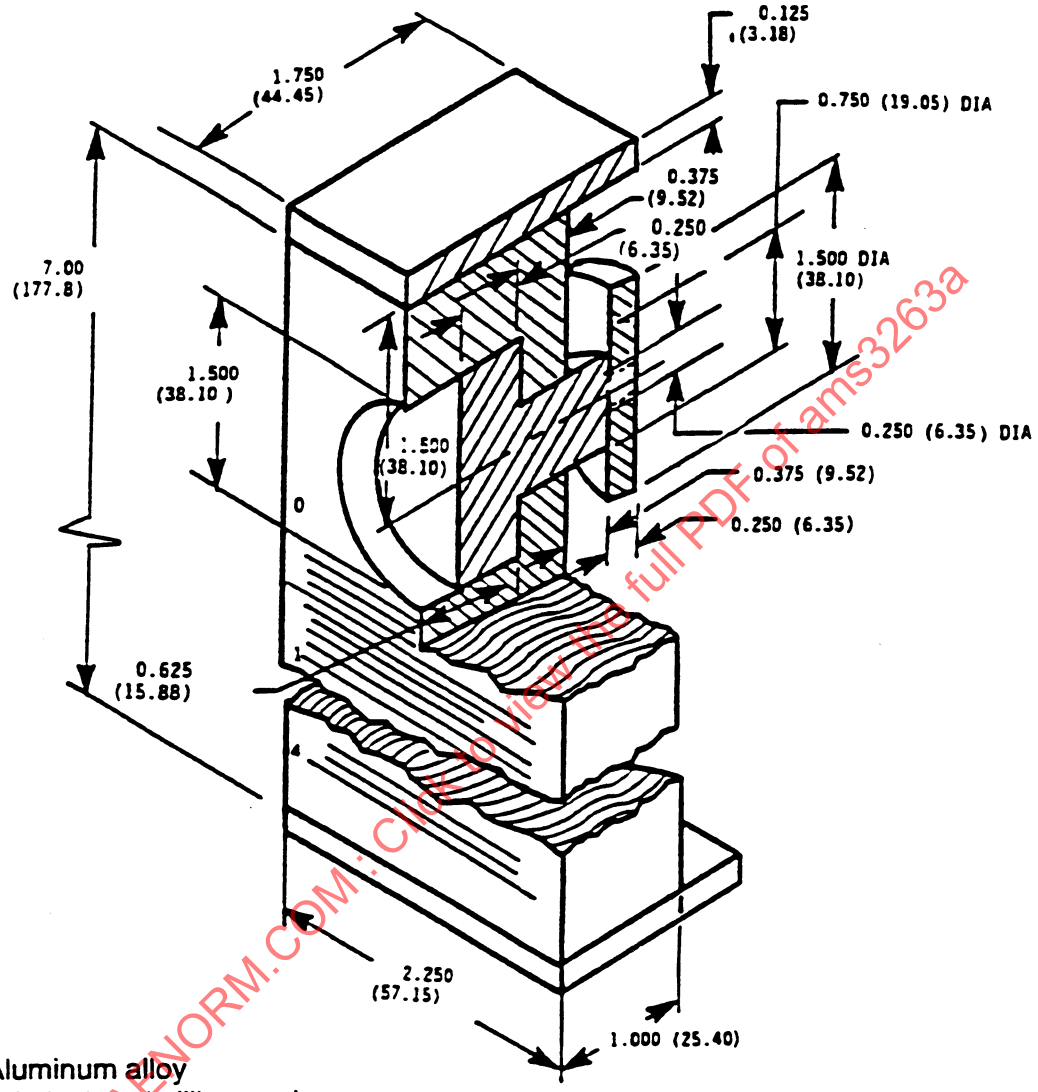
4.5.9 Flow Class B and C:

4.5.9.1 Class B: 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 in Figure 1. Depth of the plunger tolerance is critical and shall be controlled within the tolerance during all tests. The flow fixture shall be placed on a table with the front face upward and the plunger depressed to the limit of its travel. Within 15 minutes after the beginning of 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 with the block. The test at this interval shall be considered the initial flow of the sealing compound. 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 flow measurement shall be taken exactly 30 minutes after the sealing compound has been applied to the test fixture. The flow shall be measured from tangent to the lower edge of the plunger to the farther point to which the flow has advanced. As the sealing compound progresses in its application time, the flow test shall be repeated at the time intervals specified below. All time intervals, other than for the initial test, shall be measured from the end of the mixing period.

B-2 - Initial, 50 minutes, 90 minutes

Inspect to the requirements of 3.2.6.

4.5.9.2 Class C: A 0.015 to 0.020 inch (0.38 to 0.51 mm) layer of freshly mixed sealant shall be applied to an AMS 4049 aluminum alloy panel measuring 0.040 x 2.75 x 6 inches (1.02 x 69.8 x 152 mm). Immediately place the panel in a vertical position and allow to stand for eight hours. Measure the sealant thickness at its thinnest spot for conformance to 3.2.6.



Material: Aluminum alloy
Dimensions in inches (millimeters)
Tolerances: Decimals ±0.016 inch (±0.41 mm)

(NOT TO SCALE)

FIGURE 1 - Flow-Test Fixture

4.5.10 Application Time:

4.5.10.1 Class B and C Material:

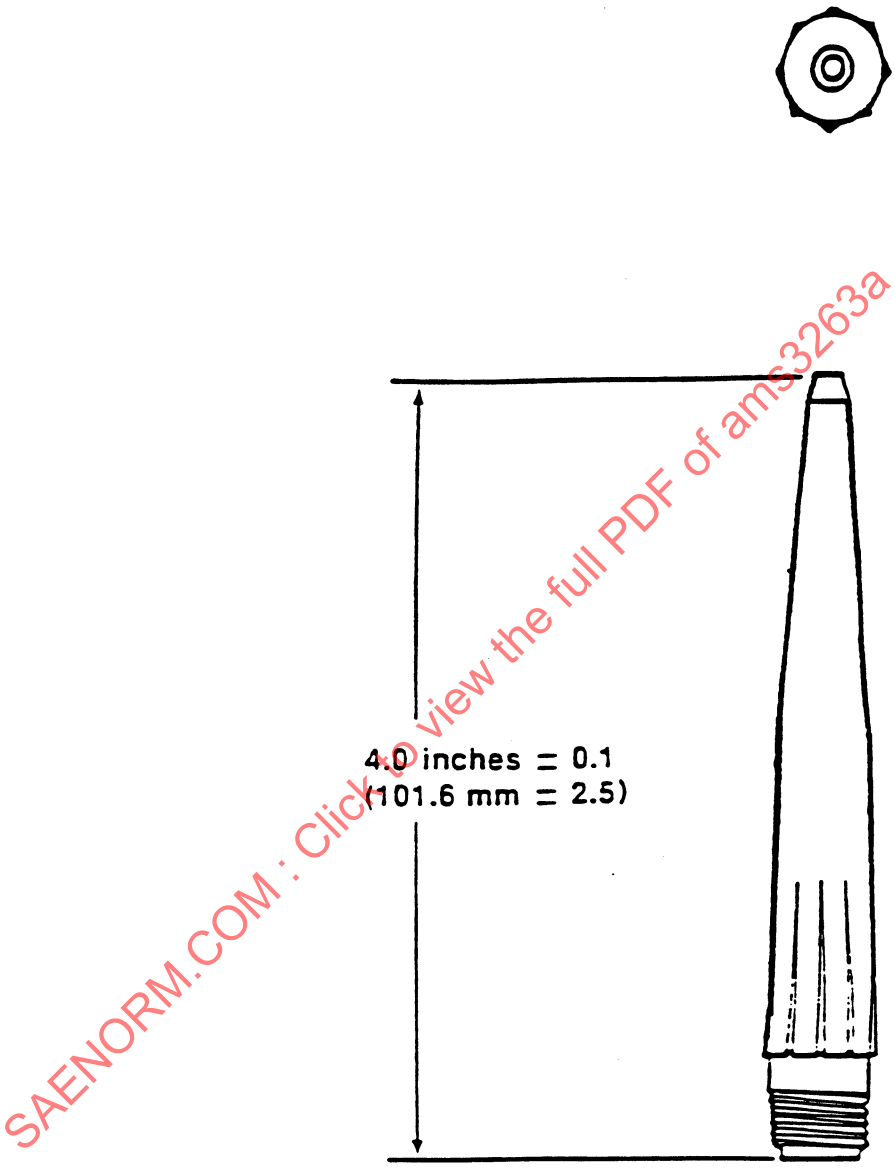
4.5.10.1.1 The base compound, curing agent, and application gun shall be stabilized at standard conditions (4.5.1.1) for at least eight hours after which at least 250 grams of the base compound is mixed with the proper amount of curing agent.

4.5.10.1.2 The mixed sealing compound shall be used to fill a standard sealing gun cartridge, having a nozzle (See Figure 2) with an orifice of 0.125 inch ± 0.004 (3.18 mm ± 0.10). The gun and sealing compound shall be maintained at standard conditions (4.5.1.1) throughout the test. The gun shall be attached to a constant air supply of 90 psi ± 5 (621 kPa ± 34). From two to three inches (51 to 76 mm) of sealing compound shall be extruded initially to clear any entrapped air. At the end of two hours for B-2 and four hours for C-4, measured from the beginning of the mixing period, the sealing compound shall be extruded onto a previously weighed suitable receptacle for one minute and the weight of extruded sealing compound determined. Inspect to the requirements of 3.2.7.1 and 3.2.7.2.

4.5.11 Assembly Time (Class C only): Six test panels 0.040 x 1.5 x 4 inches (1.02 x 38 x 102 mm) in size shall be prepared from AMS 4049 aluminum alloy. Drill two holes with a number 11 drill, 1.2 inches (30 mm) from one end with centers 0.75 inch (19 mm) apart and 0.38 inch (9.6 mm) from each side. Deburr and clean in accordance with 4.5.2.6. Accurately determine the thickness of the panels around the holes. Apply approximately 0.015 inch (0.38 mm) of freshly mixed sealant to the drilled end of three specimens and allow to cure for 0.5 hour. Place the other cleaned panels on those with sealant so that the holes line up and results in a one inch (25 mm) overlap. Sealant shall cover the entire one inch (25 mm) faying surface overlap area. Insert two steel bolts (10-32) that have been heat treated to at least 160 ksi (1103 MPa) into the holes and tighten nuts (NAS 679-A3) only until sealant starts to squeeze out. The thickness of the assembly shall be measured at this time and the thickness of the sealant shall be 0.010 to 0.015 inch (0.25 to 0.38 mm). Expose the specimens to standard conditions (4.5.1.1) for six hours. Tighten nuts to a torque value of 40 inch pounds (4.5 N·m). Measure the thickness of the assembly at the bolts with a micrometer and from this thickness subtract the thickness of the panels to determine the final sealant thickness. The sealant must squeeze out to a thickness of 0.005 inch (0.13 mm) or less at the bolts. The mixed sealing compound shall have an assembly time as stated in 3.2.8. The sealant must squeeze out to a thickness of 0.005 inch (0.13 mm) or less at the bolts.

4.5.12 Tack-Free Time:

4.5.12.1 A 0.040 x 2.75 x 6 inch (1.02 x 69.8 x 152 mm) AMS 4049 aluminum alloy panel shall be cleaned in accordance with 4.5.2.5 and sealing compound applied in accordance with 4.5.2.7. The sealant shall be cured at standard conditions (4.5.1.1) for the times specified in 3.2.9.



NOTES:

1. **Orifice diameter shall be 0.125 inch ± 0.004 (3.18 mm ± 0.10)**
2. **Material shall be polyethylene conforming to L-P-390.**

FIGURE 2 - Standard Test Nozzle

4.5.12.2 At the end of the tack-free time (See 3.2.9) two 1 x 7 inch (25 x 178 mm) strips of polyethylene 0.005 inch ± 0.002 (0.13 mm ± 0.05) thick, cleaned with AMS 3819 cloth wipes and MIL-C-38736 solvent, shall be applied to the sealing compound and held in place at a pressure of approximately 0.5 ounces per square inch (0.0002 N/mm2) for two minutes.

4.5.12.3 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. Inspect to the requirements of 3.2.9.

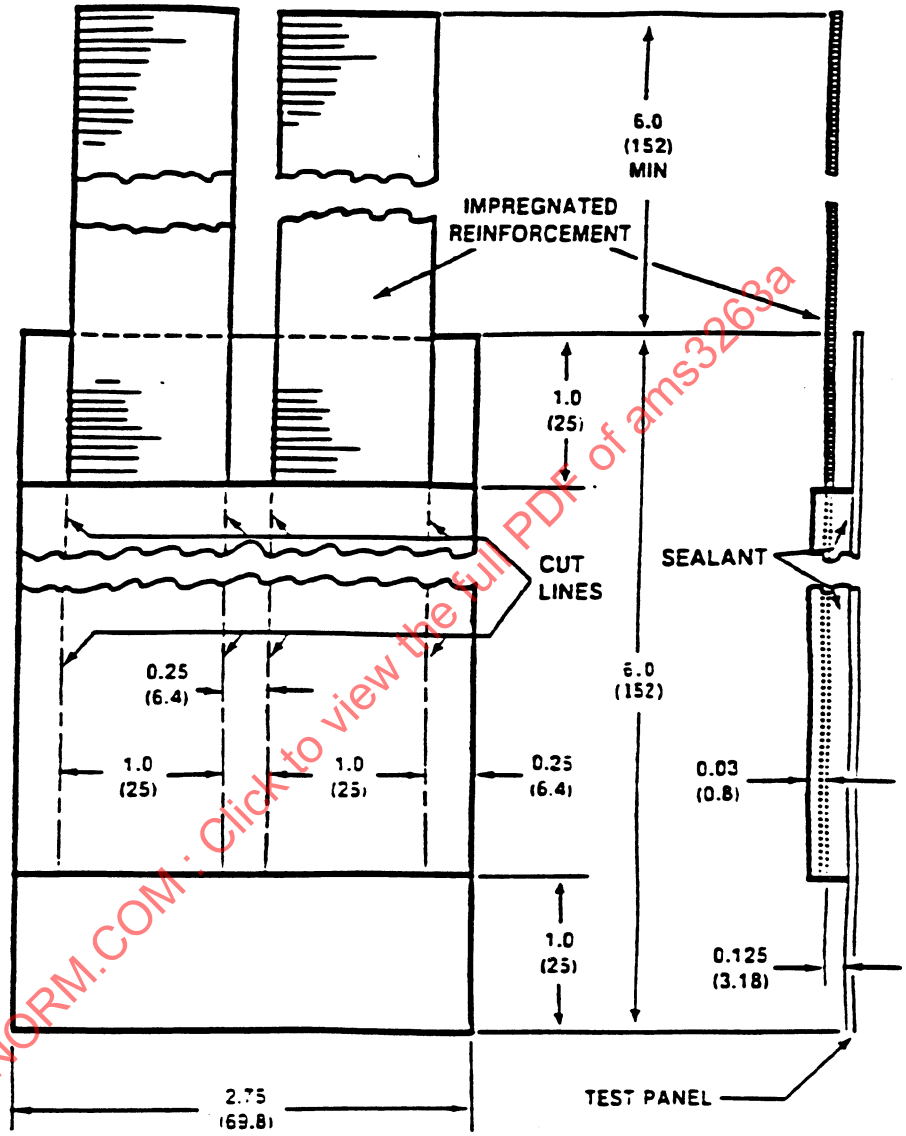
4.5.13 Cure Time:

4.5.13.1 Standard Cure Time: The instantaneous hardness shall be determined in accordance with ASTM D 2240 (instantaneous) using a Type A durometer after the sealing compound is allowed to cure at standard conditions (4.5.1.1) for 18 hours for Class B-2 or 30 hours for Class C-4 compound. The reading shall be taken on a double back-to-back, 0.125 inch (3.18 mm) thick specimen. Inspect to the requirements of 3.2.10.1.

4.5.13.1.1 After Long Term Storage: Hardness readings shall be taken after 24 hours for Class B-2 or 40 hours for Class C-4 compound.

4.5.14 Peel Strength:

4.5.14.1 The type and quantity of panels listed in Table 6 shall be used for evaluation of peel strength. All panels shall be used as described in Figure 3. The manufacturer's recommended adhesion primer shall be applied in accordance with 4.5.2.6. The center four inches (102 mm) of the panel shall be coated on one face with a 0.125 inch (3.18 mm) thickness of sealing compound. An optional configuration consists of coating the bottom approximate five inches (127 mm) of the panel with sealant (Figure 3). A 2.75 x 12 inch (69.8 x 305 mm) strip of wire screen [20 to 40 mesh (850 to 425 mm) aluminum or monel wire fabric] or cotton duck cloth conforming to CCC-C-419, Type III, shall be impregnated with the sealing compound, so that approximately five inches (127 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 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 inch (0.79 mm) thick. The sealant shall be given a standard cure in accordance with 4.5.2.8.



NOTES:

1. Dimensions are in inches (millimeters).
2. Unless otherwise specified, dimensions shown shall be nominal.
3. Sealant and fabric covers lower 1 inch (25 mm) of panel in the optional specimen.

FIGURE 3 - Peel Specimen Configuration

TABLE 6 - Peel Strength Panels

Quantity	Panel Material	Panel Thickness
6	AMS 4045 aluminum alloy sulfuric acid anodized in accordance with AMS 2471	0.040 inch (1.02 mm)
6	AMS 5516 steel	0.025 to 0.040 inch (0.64 to 1.02 mm)
10	AMS 4901 titanium	0.025 to 0.040 inch (0.64 to 1.02 mm)
10	AMS 4045 aluminum alloy sulfuric acid anodized in accordance with AMS 2471, coated with MIL-C-27725	0.040 inch (1.02 mm)
14 #	Epoxy graphite in accordance with 4.5.2.2. Test both ply side and tool side. Do not test both sides of the same panel.	0.040 inch (1.02 mm)
10 #	BMI/graphite composite in accordance with 4.5.2.2	0.040 inch (1.02 mm)

4.5.14.2 At the end of the sealing compound cure, two panels of each substrate listed in Table 6 shall be subjected to each of the test conditions listed below:

a. Seven days at 140 °F (60 °C) in JRF.
b. Seven days at 140 °F (60 °C) in equal parts JRF and 3% aqueous sodium chloride solution.
c. 100 hours at 140 °F (60 °C), 10 hours at 160 °F (71 °C), one hour at 180 °F (82 °C) in equal parts JRF and 3% aqueous sodium chloride solution. Repeat cycle five times (six cycles total) using new fluid each time.

In addition, two panels of each of the substrates, AMS 4901 titanium, AMS 4045 aluminum alloy and epoxy graphite substrates as shown in Table 6 shall be subjected to each of the following test conditions:

a. 70 days at 140 °F (60 °C) in JRF with fluid change every 14 days.
b. 70 days at 140 °F (60 °C) in equal parts JRF and 3% aqueous sodium chloride solution with fluid change every 14 days.

4.5.14.2 (Continued):

In addition, two panels of each of the substrates marked with a # in Table 6 shall be subjected to each of the following test conditions:

a. 72 hours at 140 °F (60 °C) in MIL-H-83282 fluid.
b. 72 hours at 140 °F (60 °C) in AMS 3021 fluid.

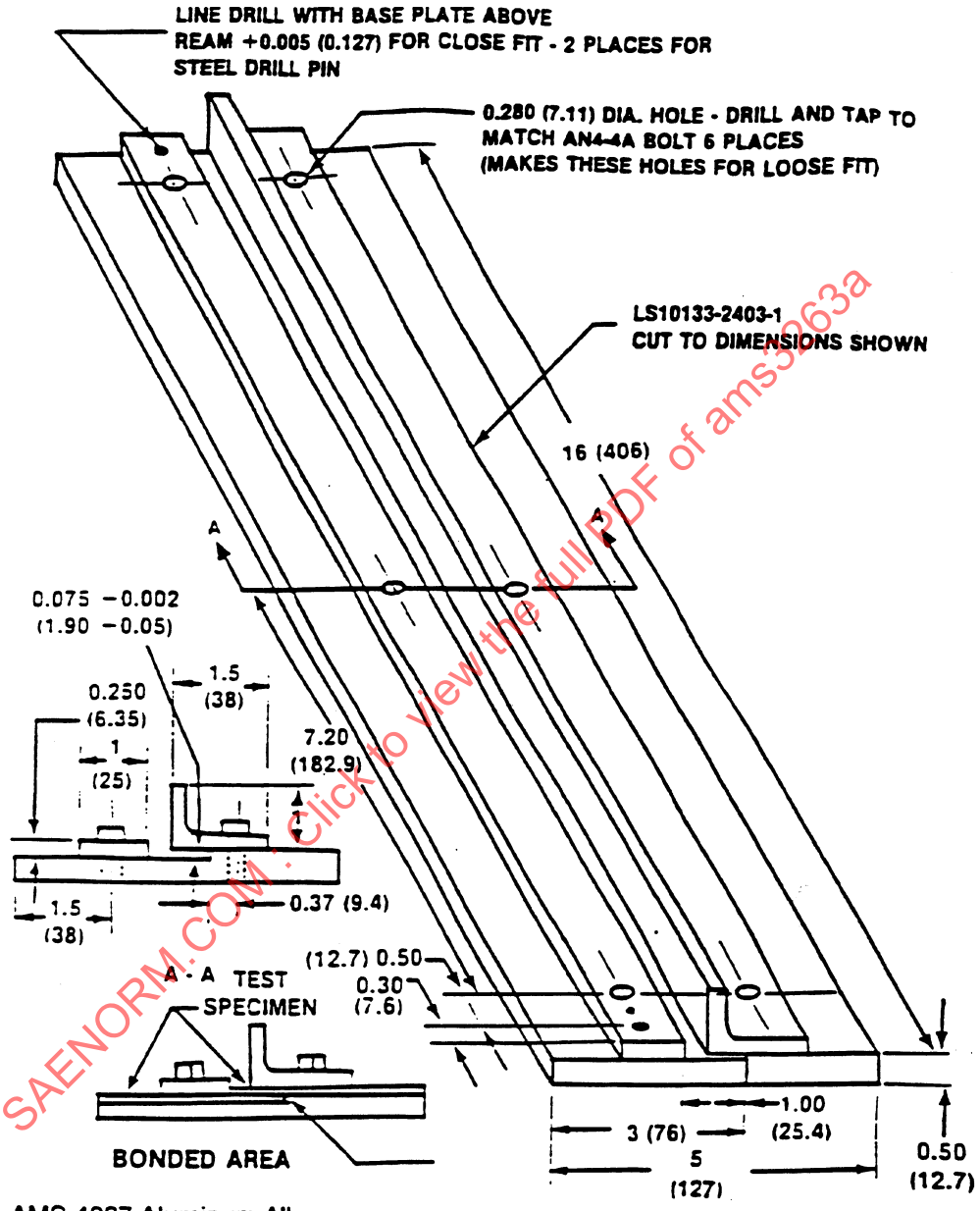
4.5.14.3 Two 1-inch (25-mm) wide strips shall be cut through the sealing compound and wire screen or fabric to the metal and extended the full length of the wire screen or fabric.

4.5.14.4 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 two inches per minute (0.8 mm/s). During the peel strength testing, three cuts shall be made through the sealing compound to the panel in an attempt to promote adhesive failure. The cuts shall be at approximately 1-inch (25-mm) intervals. The results shall be the numerical average of the peak loads during cohesive failure. Failure of the sealant compound to the fabric shall not be included in the peel strength values. Inspect to the requirements of 3.2.11.

4.5.14.5 Peel Strength Acceptance Tests: Prepare four AMS 4045 aluminum alloy panels measuring 0.040 x 2.75 x 6 inches (1.02 x 69.8 x 152 mm), sulfuric acid anodize in accordance with AMS 2471 and coat with MIL-C-27725. Prepare peel panels in accordance with 4.5.14.1. Soak two panels in JRF and two panels in JRF/salt water for seven days at 140 °F (60 °C). Test the panels in accordance with 4.5.14.3 and 4.5.14.4. Inspect to the requirements of 3.2.11.

4.5.15 Chalking: Four 0.125 x 0.125 x 5 inch (3.18 x 3.18 x 127 mm) specimens shall be cut from a sheet of the sealing compound that has been cured in accordance with 4.5.2.8. The specimens shall be suspended on a nylon cord in a closed glass container with 900 mL of JRF Type II so that the specimens are totally immersed in the fluid. A suitable plastic film (e.g., Teflon) 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 140 °F (60 °C) and the test duration shall be five days. The fluid shall be changed after 48 hours during the test period. 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 to the requirements of 3.2.12. Use an original specimen for comparison with the specimens under test to detect chalking.

4.5.16 Shear Strength (Class C only): Six AMS 4049 aluminum alloy test panels 0.040 x 1 x 3 inches (1.02 x 25 x 76 mm) in size shall be prepared. Apply a coat of sealant 0.010 to 0.020 inch (0.25 to 0.51 mm) thick to one end of three panels covering approximately one inch (25 mm) on each panel. Overlap the sealant with another panel making a one square inch (645 square mm) lap test specimen. The fixture shown in Figure 4 can be used. Reduce the thickness of the sealant to 0.005 to 0.010 inch (0.13 to 0.25 mm). Cure three test panels each in accordance with 4.5.2.8 and 4.5.2.8.1 and determine the shear strength by pulling in shear at a speed of two inches (51 mm) per minute. Inspect to the requirements of 3.2.13.



Material: AMS 4037 Aluminum Alloy

Dimensions are in inches (millimeters).
Unless otherwise specified, tolerances are ±0.015 inch (±0.38 mm).

FIGURE 4 - Shear Specimen Fixture

4.5.16.1 Heat Aged: Prepare an additional three shear test panels in accordance with 4.5.16. Cure them in accordance with 4.5.2.8. Afterwards, expose the panels for two hours at 400 °F (204 °C). After oven aging, allow the test panels to cool for 16 to 48 hours at standard conditions (4.5.1.1). Test in accordance with 4.5.16 and inspect to the requirements of 3.2.13.

4.5.17 Air Content: The equipment used for the air content test shall be:

Sealing cartridge, 3-1/2 ounce (104 mL)
Nozzle, 2.5 inch (64 mm) with a 0.125 inch (3.18 mm) orifice
Dasher Rod, with valve assembly and separate plug and ramrod from a six inch (152 mm) section cartridge conforming to MIL-S-38714

The test method shall conform to the following steps and shall refer to Figure 5 for the various steps:

a. Test shall be performed at standard conditions in accordance with 4.5.1.1.

b. Test sealant shall be stabilized at standard conditions (4.5.1.1) for at least eight hours prior to the test.

c. Fill sealant into cartridge being careful not to introduce air. Attach a 2.5 inch (64 mm) nozzle with a 0.125 inch (3.18 mm) orifice to the cartridge. Cut 1.125 inch (28.58 mm) off the tip of the nozzle. Extrude approximately two inches (51 mm) of sealant from the cartridge to remove entrapped air.

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

e. 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.

f. 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.

g. 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 5).

h. Insert the ramrod into the dasher rod and push until the valve is in full open position (as shown in Figure 5).

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

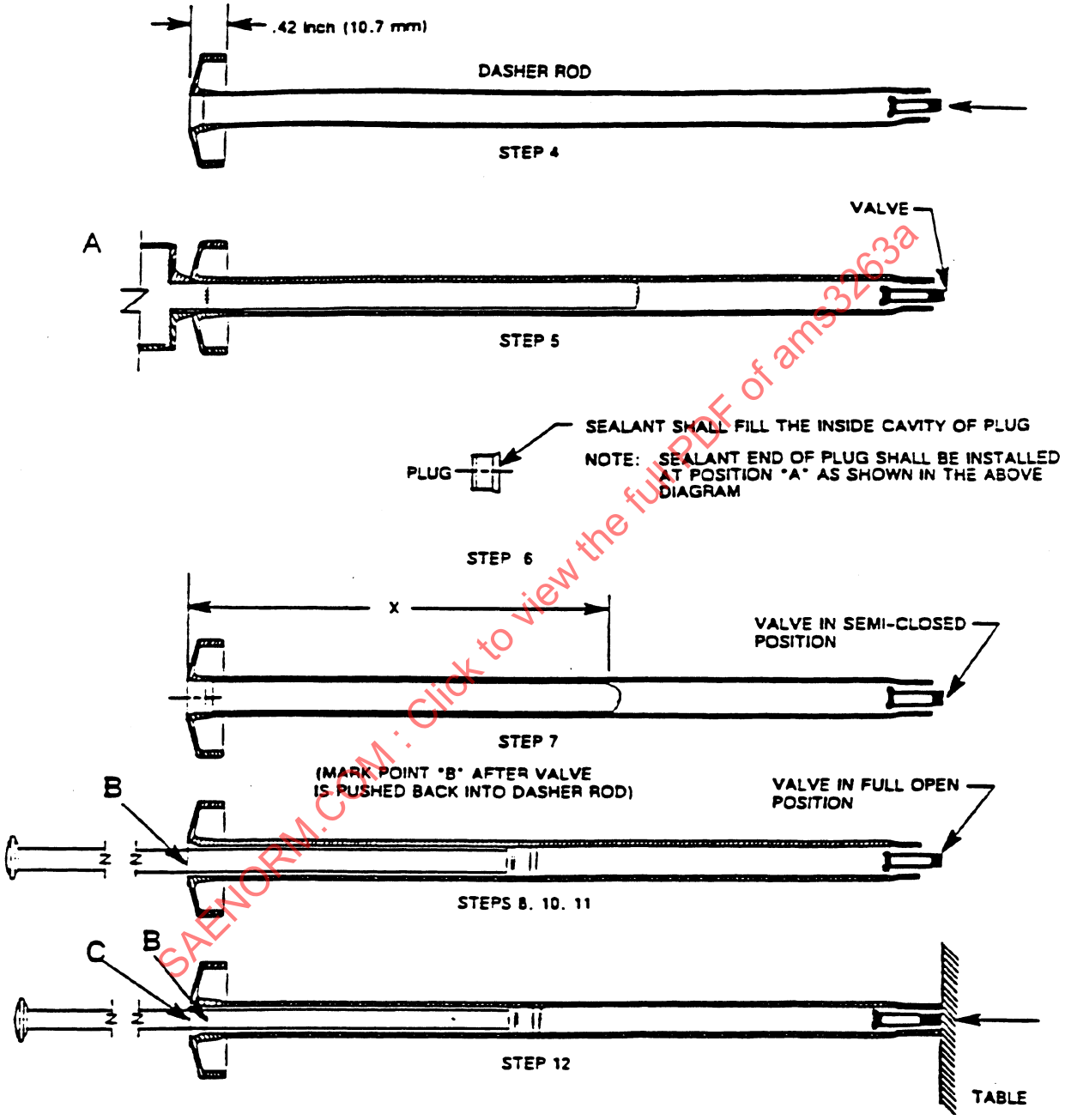


FIGURE 5 - Diagram of Stages in Filling Dasher Rod

4.5.17 (Continued):

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

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

l. 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”.

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

CALCULATION:The percent of air present in the sealant material can be calculated using

$$\text{Percent Air Present} = \frac{\text{Distance between the two marks (BC) on the ramrod}}{\text{Original length of the sealant in the dasher rod}} \times 100 \qquad \text{(Eq. 2)}$$

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.

Inspect to the requirements of 3.2.14.

4.5.18 Weight Loss, Flexibility and Swell:

4.5.18.1 Four 0.125 x 1 x 5 inches (3.18 x 25 x 127 mm) specimens shall be cut from a sheet of the sealing compound that has been cured in accordance with 4.5.2.8.

4.5.18.2 The specimens shall be weighed in air (W1) and in water (W2) and then shall be dried. The specimens shall be immersed in 900 mL of JRF for a period of seven 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 (W3) and in water (W4). They shall then be dried for 24 hours at 120 °F (49 °C). The specimens shall be cooled to standard conditions (4.5.1.1) in a desiccator and weighed (W5). The percent swell shall be calculated using Equation 3:

$$\text{Percent Swell} = \frac{(W2 + W3) - (W1 + W4)}{W1 - W2} \times 100 \qquad \text{(Eq. 3)}$$

Percent weight loss shall be calculated using Equation 4:

$$\text{Percent Weight Loss} = \frac{(W1 - W5)}{W1} \times 100 \qquad \text{(Eq. 4)}$$

4.5.18.3 After weighing, the specimens shall be bent 180 degrees over a 0.125 inch (3.18 mm) mandrel and inspected to the requirements of 3.2.15.

4.5.19 Resistance to Thermal Rupture:

4.5.19.1 Two specimens shall be prepared, each having a fillet approximately 0.125 inch (3.18 mm) thick by two inches (51 mm) in diameter, applied to a test panel of AMS 4045 aluminum alloy. The test panels shall be 0.040 x 3.5 x 3.5 inches (1 x 89 x 89 mm) in size, with a hole 0.25 inch (6.4 mm) in diameter in the center of the panel. The hole in the test panel shall be filled with sealant.

4.5.19.2 The sealing compound fillets shall be cured in accordance with 4.5.2.8 and tests shall begin not more than two days after cure cycle.

4.5.19.3 One of the panels shall then be placed in JRF for 120 hours ± 4 at 140 °F (60 °C), followed by 60 hours ± 4 at 160 °F (71 °C), and followed by six hours ± 1 at 180 °F (82 °C).

4.5.19.4 The panel shall then be removed from the fluid and immediately applied to the fixture, shown in Figure 6, using a suitable gasket. The panel shall be positioned on the fixture such that the sealant is within the fixture chamber.

4.5.19.5 The fixture shall be placed in an oven at 400 °F (204 °C). Ten psi (69 kPa) air pressure shall be applied using an air regulator. The clamp fixture shall be maintained in the oven for one hour after the pressure is applied.

4.5.19.6 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.

4.5.19.7 The test shall be repeated on the panel not immersed in the JRF.

4.5.19.8 Inspect for blistering, sponging, and deformation.

4.5.20 Resistance to Thermal Expansion: The thermal expansion block shown in Figure 7 shall be sulfuric acid anodized in accordance with AMS 2471 and overcoated with MIL-P-23377 primer. Fill the groove in the block with sealant. (Care shall be taken to prevent air entrapment during filling.) The sealant shall be cured seven days at standard conditions (4.5.1.1) and the surface trimmed flush with the block, if necessary. Expose the specimen to a standard heat cycle in accordance with 4.5.1.2, remove from the oven and measure the amount of sealant expansion two inches (51 mm) from each end of the block. Allow the block to cool to 77 °F (25 °C) and repeat the measurements. The expansion (or contraction) shall be within the limits specified in 3.2.17.

4.5.21 Heat Reversion Resistance: Two AMS 4045 aluminum panels, anodized in accordance with AMS 2471 and coated with 0.001 inch (0.025 mm) of MIL-C-27725, measuring 0.040 x 3 x 12 inches (1.02 x 76 x 305 mm) shall be coated with freshly mixed sealing compound applied over one surface of one panel and the other panel positioned over the sealant covered surface to form a sandwich with a layer of sealing compound approximately 0.010 inch (0.25 mm) thick. The panels shall be heat cured in accordance with 4.5.2.8.1 and then exposed to a standard heat cycle in accordance with 4.5.1.2. The panels shall be cooled to room temperature and then shall be peeled apart in a tensile testing machine at a jaw separation rate of two inches (51 mm) per minute and inspected to the requirements of 3.2.18. Report the peak load value.

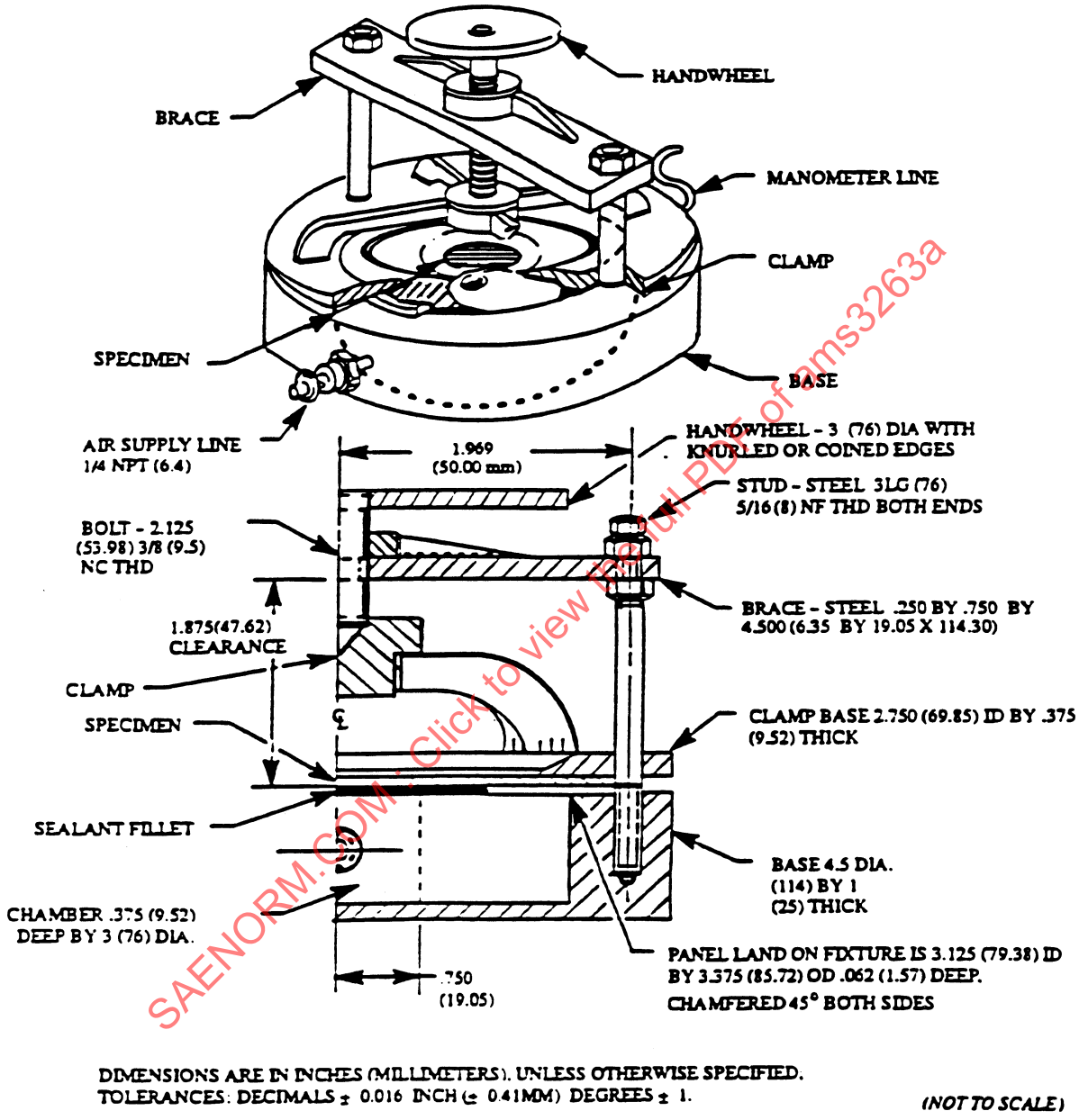


FIGURE 6 - Thermal Rupture Fixture

4.5.22 Tensile Strength and Elongation:

4.5.22.1 Mixed sealing compound shall be cast to provide cured sheets 0.125 inch ± 0.015 (3.18 mm ± 0.4) thick by pressing between two polyethylene sheets, removing the top sheet at the end of the tack-free time, and curing a sheet of sealing compound for each test condition indicated below. Eighteen tensile specimens shall be cut from the cast sheets using die C, as specified in ASTM D 412. Three specimens shall be used for each of the following test conditions:

a. As cured.
b. Heat cure in accordance with 4.5.2.8.1. Allow to cool 16 to 48 hours at standard conditions (4.5.1.1) before testing.
c. Cure in accordance with 4.5.2.8 plus 12 days at 140 °F (60 °C) + 60 hours at 160 °F (71 °C) + six hours at 180 °F (82 °C) all in JRF.
d. Condition three + 24 hours at 120 °F (49 °C) + standard heat cycle in accordance with 4.5.1.2.
e. Standard heat cycle in accordance with 4.5.1.2.
f. Cure in accordance with 4.5.2.8 plus two hours at 420 °F (215 °C) (Ac).

4.5.22.2 Where fluid immersion is specified, the specimens shall be immersed in 400 mL of JRF. Specimens to be tested after the fluid immersion shall be cooled for 24 hours at 77 °F (25 °C) and tested within five minutes after removal from the fluid.

4.5.22.3 Specimens to be tested after oven aging shall be allowed to cool for 16 to 48 hours at standard conditions (4.5.1.1) before testing.

4.5.22.4 The tensile and elongation tests shall be conducted at standard conditions (4.5.1.1) in accordance with ASTM D 412 at a jaw separation rate of 20 inches ± 1 per minute (8.5 mm/s). Inspect to the requirements of 3.2.19.

4.5.23 Sponging: Three specimens shall be cast in an open mold 0.25 x 1 x 2 inches (6 x 25 x 51 mm) in size then covered with an appropriate plastic film. After two hours at standard conditions (4.5.1.1) the filled covered molds shall be placed in an oven for one hour at 302 °F (150 °C). Upon completion of the heating, the specimens shall be cooled to standard conditions (4.5.1.1) and removed from the molds. Each specimen shall then be sectioned using a knife or other sharp instrument and shall be inspected to the requirements of 3.2.20.