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MILITARY SPECIFICATION

SEALING COMPOUND, POLYSULFIDE, ACCELERATOR REQUIRED, FOR AIRCRAFT STRUCTURES

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

1.1 Scope. This specification covers compounds for
sealing aircraft structure against the passage of air, liquids and
vapors.

1.2 Classification. Sealing compound shall be furnished
in the following classes, as specified (see 6.2).

Class A - Suitable for brush application.

Class B - Suitable for application with injection or
extrusion gun, or spatula.

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

Class A - dash numbers shall be -1/2 and -2.

Class B - dash numbers shall be -1/2, -2, and -4.

Example: Class A-2 shall designate a brushable material
having an application time of 2 hours. Class B-1/2 shall designate an
extrusion gun material having an application time of 1/2 hour.

2. APPLICABLE DOCUMENTS

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

Beneficial comments (recommendations, additions, deletions) and any
pertinent data which may be of use in improving this document should be
addressed to: Engineering Specifications and Standards Department, Code
9321, Naval Air Engineering Center, Lakehurst, New Jersey 08733 by using
the self-addressed Standardization Document Improvement Proposal (DD
Form 1426) appearing at the end of this document or by letter.

FSC 8030

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SPECIFICATIONS

FEDERAL

P-D-680 -Dry Cleaning Solvent

QQ-A-250/12 -Aluminum Alloy 7075, Plate and Sheet

QQ-A-250/13 -Aluminum Alloy Alclad 7075, Plate and Sheet

SS-S-550 -Sodium Chloride, Technical, For Water Softening Units

TT-E-751 -Ethyl Acetate, Technical, Organic Coatings Use

TT-I-735 -Isopropyl Alcohol

TT-M-261 -Methy Ethyl Ketone, Technical

TT-N-97 -Naphtha, Aromatic

TT-P-1757 -Primer Coating, Zinc Chromate, Low Moisture Sensitivity

TT-S-735 -Standard Test Fluids, Hydrocarbon

CCC-C-419 -Cloth, Duck, Cotton, Unbleached, Plied-Yarns, Army and Numbered

PPP-B-585 -Box, Wood, Wirebound

PPP-B-591 -Box, Fiberboard, Wood-Cleated

PPP-B-601 -Box, Wood, Cleated-Plywood

PPP-B-621 -Box, Wood, Nailed and Lock-Corner

PPP-B-636 -Box, Fiberboard

PPP-C-96 -Can, Metal, 28-Gage and Lighter

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MIL-P-5425 -Plastic, Sheet, Acrylic, Heat Resistant

MIL-C-5541 -Chemical Conversion Coatings on Aluminum and Aluminum Alloys

MIL-S-1148

MIL-H-5606	-Hydraulic Fluid, Petroleum Base, Aircraft, Missile, and Ordnance
MIL-D-6998	-Dichloromethane, Technical
MIL-L-7808	-Lubricating Oil, Aircraft Turbine Engine, Synthetic Base
MIL-A-8625	-Anodic Coatings, for Aluminum and Aluminum Alloys
MIL-T-9046	-Titanium and Titanium Alloy, Sheet, Strip and Plate
MIL-L-10547	-Liners, Case, and Sheet, Overwrap, Watervaporproof or Waterproof, Flexible
MIL-L-23649	-Lubricating Oil, Aircraft Turbine Engines, Synthetic Base
MIL-S-25043	-Steel Plate, Sheet, and Strip, 17-7 PH, Corrosion Resistant, Precipitation Hardening
MIL-P-38714	-Packaging and Packing of Two-Component Materials in Semkits

STANDARDS

MILITARY

MIL-STB-105	-Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-129	-Marking for Shipment and Storage

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

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

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 2240	-Indentation Hardness of Rubber and Plastics by Means of a Durometer
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(Application for copies of ASTM Standards should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pennsylvania 19103.)

CONSOLIDATED CLASSIFICATION COMMITTEE

Uniform Freight Classification Rules

(Application for copies should be addressed to the Consolidated Classification Committee, 102 Chicago Union Station, 516 West Jackson Boulevard, Chicago, Illinois 60606.)

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

3. REQUIREMENTS

3.1 Qualification. The sealing compounds furnished under this specification shall be products which are qualified for listing on the applicable qualified products list at the time set for opening of bids (see 4.3 and 6.3).

3.2 Material. The sealing compound shall be a two component system consisting of a polysulfide base compound and curing agent. The system shall not be dependent upon solvent evaporation for curing.

3.3 Properties.

3.3.1 Properties before mixing.

3.3.1.1 Appearance. When supplied in separate containers, each component shall show no evidence of lumps, skins, agglomerates, settling, caking, separation, or other non-uniformity.

3.3.1.2 Color. The colors of the base compound and curing agent shall possess sufficient color contrast to provide easy differentiation between completely mixed or unmixed sealing compound.

3.3.1.3 Viscosity, base compound. Viscosity of the base compound when determined in accordance with 4.8.2, shall be:

Class A - 100 to 300 poises

Class B - 6,000 to 10,000 poises

3.3.2 Properties before cure.

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3.3.2.1 Nonvolatile content. The nonvolatile content of freshly mixed sealant specified in 4.8.3 shall be as follows:

<u>Class</u>	<u>Percent Min., by Weight</u>
A	98.0
B	97.0

3.3.2.2 Flow, Class B. Freshly mixed class B sealant shall exhibit an initial flow from 0.1 to 0.5 inch when tested as specified in 4.8.4.

3.3.2.3 Application life. Application life of mixed class A compounds shall be determined by viscometer. Application life of mixed class B compounds shall be determined by rate of extrusion. The requirement shall be as specified in Table I. Testing shall be in accordance with 4.8.5.

TABLE I - Application life.

<u>Class</u>	<u>Application time (hours)</u>	<u>Initial requirement</u>	<u>Application time requirement</u>	<u>Test para.</u>
		<u>Viscosity</u> <u>Poise</u>	<u>Viscosity</u> <u>Poise</u>	
A	1/2, 2	100-100	2,500 (max.)	4.8.5.1
		<u>Extrusion Rate</u> <u>grams/minute</u>	<u>Extrusion Rate</u> <u>grams/minute</u>	
B	1/2, 2, 4	00 (min.)	1 (min.)	4.8.5.2

3.3.2.4 Tack free time. When determined in accordance with 4.8.6, the mixed sealing compound shall cure to a tack free state within the time limits specified in Table II.

TABLE II. Tack free time.

<u>Class A</u>	<u>Tack free (hours)</u>	<u>Class B</u>	<u>Tack free (hours)</u>
1/2	16	1 -	16
2	24	-	24
		-	30

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3.3.3 Properties after cure. Properties after curing as specified in 4.7, shall be in accordance with Table III.

TABLE III. Properties after cure.

Property	Requirement		Test Para.
	Class A	Class B	
Hardness, points, range	30 to 45	30 to 50	4.8.7
Shrinkage, %, max.	20	10	4.8.8
	All classes		
Specific gravity, max.	1.65		4.8.9
Adhesion, pounds/inch width, min.			4.8.10
Cohesive failure			
As received 1/	20		
After immersion 1/	15		
Low temperature flexibility	No checking, cracking or separation from panel		4.8.11
Corrosion	No visual panel corrosion		4.8.12
Seal efficiency	No rupture or adhesion loss		4.8.13
Heat resistance	No blisters, cracking or sponging		4.8.14
Change in hardness after heat, points max.	+ 15		

1/ Requirement values are for all adherends except acrylic plastic which shall be 2 pounds per inch width, min. for each condition.

3.3.4 Accelerated crazing (Class B). Class B sealing compound shall not show evidence of crazing, cracking or other chemical degradation of acrylic plastic, when tested as specified in 4.8.15.

3.3.5 Reparability. The sealing compound shall be suitable for repairing minor breaks in itself. A second coat of the sealing compound applied over a freshly cured film of the material shall show satisfactory bonding, no lifting, blistering, loss of adhesion, or other film irregularities, and shall have a minimum adhesion strength value of 20 pounds per inch of width, when tested as specified in 4.8.16.

3.3.6 Accelerated storage. The base compound and curing agent shall show no hardening, separation, or settling of material, when tested as specified in 4.8.17. After the accelerated storage period, the sealing compound shall meet the requirements for viscosity (3.3.1.3), flow (3.3.2.2), application life (3.3.2.3) and hardness (Table III).

3.4 Workmanship. The sealing compound shall be manufactured by such processes to meet the requirements of this specification.

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4. QUALITY ASSURANCE PROVISIONS

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

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

- a. Qualification inspection (see 4.3).
- b. Quality conformance inspection (see 4.4).

4.3 Qualification inspection. The qualification inspection shall consist of all the tests specified in Table IV.

TABLE IV. Qualification tests.

Test	Requirement paragraph	Test paragraph
Materials	3.2	4.8.1
Color	3.3.1.1	4.8.1
Appearance	3.3.1.2	4.8.1
Viscosity	3.3.1.3	4.8.2
Nonvolatile content	3.3.2.1	4.8.3
Flow	3.3.2.2	4.8.4
Application life	3.3.2.3	4.8.5
Tack free time	3.3.2.4	4.8.6
Hardness	Table III	4.8.7
Shrinkage	Table III	4.8.8
Specific gravity	Table III	4.8.9
Adhesion	Table III	4.8.10
Low Temperature flexibility	Table III	4.8.11
Corrosion	Table III	4.8.12
Seal efficiency	Table III	4.8.13
Heat resistance	Table III	4.8.14
Accelerated crazing	3.3.4	4.8.15
Reparability	3.3.5	4.8.16
Accelerated storage	3.3.6	4.8.17
Workmanship	3.4	4.8.1

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4.3.1 Qualification test samples. Qualification test samples shall consist of 8 quarts of the base compound, and appropriate curing agent, selected at random, for each class for which qualification is desired. The compound and curing agent shall be furnished in containers of the type to be used in filling contract orders. Samples shall be forwarded to the Commander, Naval Air Development Center, Warminster, Pennsylvania 18974. Attention: ACSTD (6062). The samples shall be plainly and durably marked with the following information:

Samples for Qualification test

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Specification MIL-S-7124B

Class

Application time

Date of manufacture

Name and address of manufacturer

Manufacturer's identification (Base and Curing agent)

Mixing Instructions (parts per hundred by weight, curing agent to base)

Submitted by (name) (date) for qualification tests in accordance with the requirements of Specification MIL-S-7124B under authorization (reference authorizing letter).

4.3.2 Manufacturer's data.

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

4.3.2.2 Instructions for use. Duplicate copies of the manufacturer's instructions for use of the compound shall be furnished with the qualification sample for approval.

4.3.3 Retention of qualification. In order to retain qualification of products approved for listing on the Qualified Products List (QPL), the manufacturer shall verify by certification and existing quality assurance data to the qualifying activity that his product(s) comply with the requirements of this specification. Unless otherwise specified by the qualifying activity, the time of periodic verification by certification shall be in two-year intervals from the date of original qualification.

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4.4 Quality conformance inspection.

4.4.1 Lot formation. Unless otherwise specified, a lot shall consist of all sealant manufactured at one time from one batch, forming part of one contract or order, and submitted for acceptance at the same time and place.

4.4.2 Sampling.

4.4.2.1 Sampling for physical property tests. A sufficient number of containers shall be selected at random to allow preparation of specimens for the tests specified in table V. The sample shall be examined as specified in 4.4.3.1.

4.4.2.2 Packaging.

4.4.2.2.1 Unit containers. A random sample of filled unit containers (base compound and curing agent) shall be selected from each lot in accordance with Inspection Level I of MIL-STD-105 and examined as specified in 4.4.3.2. The lot size shall be the total number of the same type unit containers.

4.4.2.2.2 Shipping containers. Shipping containers, just prior to closure, shall be randomly selected from each lot in accordance with Inspection Level I of MIL-STD-105 for examination as specified in 4.4.3.2. Lot size shall be the number of shipping containers.

4.4.3 Examination of quality conformance samples.

4.4.3.1 Physical properties. The sample selected in 4.4.2.1 shall be tested to the requirements specified in Table V. In addition, the sample may be subjected to any other tests specified herein when considered necessary by the procuring activity. Nonconformance of a test specimen to a single requirement (table V) shall be cause for rejection of the lot represented by the sample.

TABLE V. Quality conformance tests.

Test	Test paragraph
Examination of product (material):	4.8.1
Nonvolatile content	4.8.3
Application life	4.8.5
Hardness	4.8.7
Shrinkage	4.8.8
Adhesion, as rec'd (adherent #1 only)	4.8.10

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4.4.3.2 Packaging. Samples selected in accordance with 4.4.2.2.1 and 4.4.2.2.2 shall be visually examined to the requirements in Table VI and all other applicable requirements to determine conformance to Section 5 of this specification. The Acceptable Quality Level (AQL) for this inspection shall be 2.5 percent defective except that unit containers with "fill" defects may be corrected. In addition, shipping containers fully prepared for delivery shall be inspected for closure defects.

TABLE VI. Packaging examination.

Examination	Defect
<u>Unit container</u>	
Fill	Not volume specified in contract or order Not in conformance with 3.1.1.2
Packaging	Wrong size cans or kits Material or construction not as specified Components damaged or missing Unit package closure incomplete or damaged Not level required by contract or purchase order Base compound and accelerator not properly separated
<u>Shipping container</u>	
Packing	Not level required by contract or purchase order Any nonconforming component, incomplete closures Bulged or damaged shipping containers
Count	Less than specified or indicated quantity per shipping container
Markings	Unit package and packing--omitted, illegible, incorrect, incomplete or not in accordance with contract requirements

4.5 Test conditions.

4.5.1 Temperature and humidity. Unless otherwise specified, all mixing, curing, conditioning and testing of the sealing compound shall be conducted at a temperature of $25 \pm 1^\circ\text{C}$ ($77 \pm 2^\circ\text{F}$) and a relative humidity of $50 \pm 5\%$. These conditions shall be considered standard conditions.

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4.5.2 Mixing. The base compound and the accelerator, both in their original unopened containers, together with the required mixing equipment shall be held at $25 \pm 1^\circ\text{C}$ ($77 \pm 2^\circ\text{F}$) for a minimum of 24 ± 1 hours. The base compound and accelerator shall then be thoroughly mixed in the proportions recommended by the manufacturer, taking care to avoid incorporation of air by too rapid stirring or folding action. Where applicable (class B) the mixed sealing compound may be placed into cartridges for extrusion using a Semco 250 gun, or equal, with a Semco 440 nozzle (0.125 ± 0.005 inch orifice chamber).

4.6 Preparation of test specimens.

4.6.1 Cleaning of metal test panels. Except where otherwise specified herein, metal panels shall be cleaned with lint-free cheesecloth using solvent formulated in accordance with Table VII. Immediately after rinsing, the panels shall be wiped dry with a clean, lint-free cloth.

TABLE VII. Formulation of cleaner.

Ingredient	Specification	Percent by volume
Aromatic petroleum naphtha	TT-N-97, Type 1, Grade B	50 ± 2.5
Ethyl Acetate	TT-E-751	20 ± 1.0
Methyl-Ethyl-Ketone	TT-M-261	20 ± 1.0
Isopropyl Alcohol	TT-I-735	10 ± 0.5

4.6.2 Cleaning of acrylic panels. Unless otherwise specified, solvent conforming to P-D-680 shall be used to clean acrylic plastic test panels.

4.7 Curing. Unless otherwise specified, all test specimens shall be cured as specified in Table VIII. Molded test specimens shall be removed from the mold following the first 24 hours of cure. Cure time shall be counted from start of mix.

TABLE VIII. Curing cycles.

Class	Cure
A	7 days at standard conditions, or 24 ± 1 hours at standard conditions plus 24 ± 1 hours at $49^\circ \pm 1^\circ\text{C}$ ($120^\circ \pm 2^\circ\text{F}$)
B	72 ± 1 hours at standard conditions

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4.8 Test methods.

4.8.1 Examination of product. The sealing compound shall be visually examined for conformance to 3.2, 3.3.1.1, 3.3.1.2 and 3.4. In addition, the sealing compound shall be examined with respect to requirements for which no test specimens are specified herein.

4.8.2 Viscosity of base compound. The viscosity shall be determined with the sample of base compound in a 1-quart can. The can shall be filled with base compound to within 1/2 inch of the top, covered, and stored at standard conditions for a minimum of 8 hours. The base compound shall be thoroughly mixed by stirring slowly for 3 minutes. The container shall be closed and the material allowed to stand for 1 hour. The Brookfield Model RVF Viscometer shall be used, and the reading obtained shall be in poises. For class A base compound, the No. 5 spindle at 10 rpm shall be used; for class B compound, the No. 7 spindle at 2 rpm shall be used. The reading shall be taken when the pointer first assumes a steady position after release of the clutch.

4.8.3 Nonvolatile content. Five to ten grams of the mixed sealing compound shall be transferred as soon as possible to a dish about 8 centimeters in diameter. A tight fitting cover shall immediately be placed over the dish and the weight determined to the nearest 0.001 gram. The cover shall then be removed and the sealing compound heated for 72 ± 1 hours at $70 \pm 1^\circ\text{C}$ ($158 \pm 2^\circ\text{F}$). It shall then be cooled in a desiccator, the cover replaced, and the weight determined to the nearest milligram. The percent nonvolatile content shall be calculated as follows:

$$\text{Percent nonvolatile content} = \frac{\text{Final weight}}{\text{Initial weight}} \times 100$$

4.8.4 Flow (Class B only). A 250 gram mass of class B sealing compound and curing agent shall be mixed and prepared for testing in accordance with 4.5.2. The test shall be conducted with a flow-test fixture as shown in figure 1. Depth of plunger tolerance is critical and shall be controlled within the tolerance during the test.

4.8.4.1 Procedure. The flow-test 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 even with the block. This test 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 farthest point to which flow has advanced.

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4.8.5 Application Life

4.8.5.1 Class A. The base compound and accelerator shall be held at standard conditions for at least 24 \pm 1 hours before a sample of base compound is mixed with the proper amount of accelerator sufficient to fill a standard 1/2-pint can (2 7/8 inches in diameter by 2 7/8 inches high) to within 1/2 inch of the top. This can shall be tightly covered except when testing the viscosity. Initial viscosity shall be determined immediately following the mix period. At the end of the rated application time (see 3.3.2.3) measured from the beginning of the mixing period, the sealing compound shall be tested for viscosity using a Brookfield Model RVF viscometer, or equal, with a No. 7 spindle at 10 rpm. One reading shall be taken after the instrument has run in the material for 1 minute.

4.8.5.2 Class B. The base compound, accelerator, and application gun shall be held at standard conditions for at least 24 \pm 1 hours before a minimum of 250 grams of base compound are mixed with the proper amount of accelerator. The mixed sealing compound shall be promptly used to fill a standard Semco sealing compound gun cartridge, or equivalent, having a Semco 440 nozzle with an orifice chamber of 0.125 \pm 0.005 inch. The gun shall be attached to a constant air supply of 90 pounds per square inch gage (psig), \pm 5 psig for line variation or gage error. From 2 to 3 inches of sealing compound shall be extruded initially to clear trapped air. At this time, the initial extrusion rate shall be determined by a 15 second extrusion of the sealing compound into a suitable, tared container and determining the weight. The initial extrusion rate (gram/minute) shall be 4 times the weighed sealing compound. At the end of the rated application time, measured from the beginning of the mixing period, the sealing compound shall be extruded onto a suitable receptacle for 1 minute and the weight in grams of extruded sealing compound determined.

4.8.6 Tack-free time. An aluminum test panel conforming to temper T6 of Specification QQ-A-250/13, and measuring 0.040 by 2.75 by 6 inches in size shall be cleaned in accordance with 4.6.1 and covered with freshly mixed sealing compound to a depth of 1/8 inch. The sealing compound shall be allowed to cure at standard conditions and at the rate specified in 4.7. At the end of the specified tack-free time, two 1-inch by 6 inch pieces of polyethylene film 0.004 \pm 0.002 inch thick shall be applied to the sealing compound and held in place at a pressure of 1/2 ounce per square inch for 2 minutes. The strips shall then be slowly and evenly withdrawn at right angles to the sealing compound surface. The polyethylene shall come away clean and free of sealing compound.

4.8.7 Hardness. Two specimens, 0.125 by 1 by 2 inch, shall be prepared in an open mold and cured as specified in 4.7. The specimens shall be plied and Shore A hardness determined in accordance with ASTM D2240.

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4.8.8 Shrinkage. Three class A specimens, 0.125 by 1 by 2 inches, and three class B specimens, 0.5 by 0.5 by 1 inch, shall be prepared, and cured as specified in 4.7. The volume shall be determined by means of an analytical or Jolly balance. The specimens shall then be placed in an air circulating oven for 96 ± 1 hours at $70 \pm 1^\circ\text{C}$ ($158 \pm 2^\circ\text{F}$). The percent shrinkage of each specimen shall be calculated as follows:

$$\text{Percent shrinkage} = \frac{(w_1 - w_2) - (w_3 - w_4)}{(w_1 - w_2)} \times 100$$

(Analytical balance) $(w_1 - w_2)$

$$\text{Percent shrinkage} = \frac{w_2 - w_4}{w_2} \times 100$$

(Jolly balance) w_2

Where: w_1 = initial weight of specimen in air.
 w_2 = initial weight of specimen in water.
 w_3 = weight of specimen in air after conditioning.
 w_4 = weight of specimen in water after conditioning.

4.8.9 Specific gravity. Three specimens, 1/8 inch by 1 inch by 2 inches, shall be prepared in an open mold and cured as specified in 4.7. The specimens shall be weighed in air and then in water by means of an analytical or Jolly balance. The specific gravity shall be computed by means of the following formulas:

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

(Analytical balance)

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

(Jolly balance)

4.8.10 Adhesion. Adhesion shall be determined "as received" and after immersion.

4.8.10.1 Specimen preparation. Test panel materials (size 0.064 by 3 by 6 inch) and the required number of specimens shall be as specified in Table IX. Each panel shall be coated with a 0.125 inch thickness of the sealing compound. A 3 inch by 6 inch area of 3 inch by 12 inch strips of cotton duck conforming to type III of CCC-C-419 shall be impregnated with the sealing compound. The sealant must be worked well into the fabric. The sealant-impregnated end of the fabric shall be placed on the sealant coated panel, and smoothed down on the layer of the sealant, taking care not to trap air beneath the fabric. An additional 0.031 inch thick coating of sealing compound shall be applied over the fabric. Curing shall be as specified in 4.7.

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TABLE IX. Adhesion panel materials and specimens required.

Specimen No.	Material identification	No. of panels required
1.	Aluminum alloy, QQ-A-250/12, Temper T6, chemically treated in accordance with MIL-C-5541, class 2 and coated in accordance with TT-P-1757.	8
2.	Aluminum alloy, QQ-A-250/12, Temper T6, chemically treated in accordance with MIL-C-5541, Class 2	2
3.	Aluminum alloy, QQ-A-250/12, Temper T6, chemically treated in accordance with MIL-A-8625, Type II.	2
4.	Aluminum alloy, QQ-A-250/13, Temper T6	2
5.	Stainless steel, MIL-S-25043	2
6.	Acrylic plastic, MIL-P-5425, finish A	2
7.	Titanium, MIL-T-9046, Type I, Composition A	2

4.8.10.2 Immersion procedure. After cure, one specimen from each panel material shall be used for "as received" adhesion. One specimen of each material shall be immersed in distilled water. The remaining specimens (Specimen No. 1 of Table IX) shall be immersed, one in each of the fluids specified in Table X. Immersion conditions for all specimens shall be 48 ± 1 hours at $60 \pm 1^\circ\text{C}$ ($140 \pm 2^\circ\text{F}$). After expiration of the test period, the fluids shall be cooled to standard conditions. The specimens shall then be removed and adhesion determined within 10 minutes after removal from the fluids. Two 1-inch wide strips shall be cut lengthwise through the fabric and sealing compound to the panel surface and extended the full length of the loose end of the fabric. The edges of the panel shall not be used as one edge of the test strip.

TABLE X. Immersion fluids.

Fluid	Specification
Hydrocarbon test fluid	TF-S-735 (Type III)
Hydraulic fluid	MIL-H-5606
Lubricating oil	MIL-L-7808
Lubricating oil	MIL-L-23699
Aqueous NaCl, 3 percent	SS-S-550
Isopropyl Alcohol	TT-I-735

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4.8.10.3 Adhesion test procedure. The specimens shall be individually tested in an autographic testing machine whose capacity shall be such that the tension at failure is not more than 85 percent nor less than 15 percent of the full scale load. If the machine is of the pendulum type, the weight shall swing as a free pendulum without engagement of the pawls. The rate of separation of the jaws shall be 2 inches per minute. Specimens shall be mounted in the machine so that the loose end of the 1-inch wide fabric strip will be folded 180 degrees as it is pulled from the panel. Each strip shall be pulled as follows: A cut through the sealant to the panel at the junction of separation shall be made at an angle of 45 degrees in the direction of separation. If the sealant separates from the fabric, similar 45-degree cuts shall be made to promote separation of the sealant from the panel. A minimum of 5 cuts shall be made. The adhesion in pounds shall be automatically recorded on a chart as a continuous curve. The adhesion value shall be calculated by averaging the maximum forces required to separate the sealant from the panel.

4.8.11 Low temperature flexibility. Sealing compound shall be applied to one side of each of three aluminum alloy panels, conforming to QQ-A-250/13, temper T6, measuring 1 by 6 by 0.032 inch in a manner which shall produce a thickness of 0.055 to 0.075 inch, leaving 1 inch at each end of the panels, uncoated. Upon completion of the curing time (4.7) the panels shall be placed in an air circulating oven and conditioned for 48 ± 1 hours at $82^\circ \pm 1^\circ\text{C}$ ($180^\circ \pm 2^\circ\text{F}$). The panels shall be removed from the oven and returned to $25^\circ \pm 1^\circ\text{C}$ ($77^\circ \pm 2^\circ\text{F}$). The panels shall be placed in a flexibility fixture as shown in figures 2 and 3, so that the uncoated side will contact the contour block and the weight will contact only the uncoated end of the panel. The flexibility fixture and panels shall be subjected to a conditioning temperature of $-51^\circ \pm 1^\circ\text{C}$ ($-60^\circ \pm 2^\circ\text{F}$) for 4 hours. After the specified conditioning, the specimens shall then be bent around the curved portion of the flexibility test fixture by releasing the fastening hook. The panels shall be removed and examined.

4.8.12 Corrosion. Two aluminum alloy panels, conforming to QQ-A-250/12, temper T6, 3 by 6 by 0.064 inch, shall be coated with a 1/8 inch thickness of the sealing compound. After curing as specified in 4.7, one panel shall be completely immersed in a 3 percent aqueous sodium chloride solution for 14 days at $60^\circ \pm 1^\circ\text{C}$ ($140^\circ \pm 2^\circ\text{F}$). The other panel shall be kept at standard conditions for 14 days. At the expiration of the immersion period, the sealant shall be stripped from the panel with dichloromethane conforming to MIL-D-6998. Immediately upon removal of the sealant from the panel, comparison shall be made with the coated panel not subjected to the immersion test, for conformance to the requirement in Table III.

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4.8.13 Seal efficiency.

4.8.13.1 Preparation of specimens. Three test specimens shall be prepared for the sealing compound using aluminum alloy, QQ-A-250/13, temper T6. Dimensions shall be as specified in figure 4. The sealing compound shall be applied to the panels to form a layer 1 inch in diameter by 0.125 inch thick, and cured as specified in 4.7.

4.8.13.2 Test procedure. The test specimen shall be placed on the top of the cylinder, figure 4. Separate specimens shall be totally immersed in water at $25^{\circ}\pm 1^{\circ}\text{C}$ ($77^{\circ}\pm 2^{\circ}\text{F}$), in water at $70^{\circ}\pm 1^{\circ}\text{C}$ ($158^{\circ}\pm 2^{\circ}\text{F}$), and in methyl alcohol at $-54^{\circ}\pm 1^{\circ}\text{C}$ ($-65^{\circ}\pm 2^{\circ}\text{F}$). At these conditions, the test fixture and specimen shall be subjected to an air pressure of 10 pounds per square inch for 1 hour.

4.8.14 Heat resistance. The specimens used for the hardness test (4.8.7) shall be placed in an air circulating oven and conditioned for 48 ± 1 hours at $82^{\circ} \pm 1^{\circ}\text{C}$ ($180^{\circ} \pm 2^{\circ}\text{F}$). The specimens shall be removed from the oven and returned to $25^{\circ}\pm 1^{\circ}\text{C}$ ($77^{\circ}\pm 2^{\circ}\text{F}$), and examined. The hardness shall be determined as specified in 4.8.7.

4.8.15 Accelerated crazing. Three plastic panels, plus one control panel, conforming to MIL-P-5425, Finish A, cleaned with dry cleaning solvent conforming to P-D-680, shall be inserted into the test apparatus, and stress loaded as indicated in figure 5. The upper surface of three panels directly above the central fulcrum shall be coated with a 1/16 inch layer of the sealing compound and covered with a piece of polyethylene sheeting. The panels shall be allowed to remain under stress in the manner indicated for a period of 7 ± 1 hours. After this period, and while still under stress, the panels shall be cleaned of the sealing compound by means of an acrylic plastic spatula and dry cleaning solvent. The panels shall then be examined for evidence of crazing, cracking, or other chemical degradation.

4.8.16 Reparability. A 3 by 6 by 0.004 inch aluminum alloy panel, QQ-A-250/12, temper T6, shall be coated with a 1/8 inch thickness of the sealing compound. Curing shall be as specified in 4.7. The panel shall be placed in an air circulating oven and conditioned for 48 ± 1 hours at $82^{\circ}\pm 1^{\circ}\text{C}$ ($180^{\circ} \pm 2^{\circ}\text{F}$). The specimen shall be removed from the oven and returned to standard conditions. The sealant shall be cleaned with isopropyl alcohol or solvent formulated in accordance with table VII, air dried for 2 hours, and another coating of newly mixed sealant shall be applied as above over the previously conditioned sealant. A 3 inch by 6 inch area of a 3 inch by 12 inch strip of cotton duck conforming to type III of CCC-C-419 shall be impregnated with the sealing compound. The sealant must be worked well into the fabric. The sealant-impregnated end of the fabric shall be placed on the sealant coated panel, and smoothed down on the layer of the sealant, taking care not to trap air beneath the fabric. An additional 1/32-inch thick

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coating of sealing compound shall be applied over the fabric. After the standard cure (4.7), the specimen shall be tested for adhesion in accordance with 4.8.10.3.

4.8.17 Accelerated storage. A 1-quart sample of sealing compound and the specified amount of curing agent shall be conditioned at $49^{\circ}\pm 1^{\circ}\text{C}$ ($120^{\circ}\pm 2^{\circ}\text{F}$) for 14 days. The samples shall be cooled to standard conditions and examined. If the curing agent shows signs of settling or hardening it shall be stirred. Failure of the curing agent to return to a smooth, workable consistency shall be construed as a failure. The stirred curing agent and the base shall be mixed and shall be tested for conformance with 3.3.6.

5. PACKAGING

5.1 Preservation-packaging. Preservation-packaging shall be Level A or C as specified (see 6.2).

5.1.1 Level A.

5.1.1.1 Unit protection. Except as specified in 5.1.1.3, the base compound and curing agent shall each be packaged in their own containers. Each curing agent container shall be packaged with one base compound container and shall constitute a unit of purchase. There shall be a suitable separator between the two containers to prevent accidental separation but which will permit easy separation for mixing purposes. The ratio of the quantity contained in the base compound container to the quantity contained in the attached curing agent container shall be the same as the recommended mixing ratio of the base compound and curing agent.

5.1.1.2 Unit package. The base compound shall be furnished in 1/2-pint, 1-pint, 1-quart, or 1-gallon metal cans, as specified in the contract or order. Metal cans shall conform to type V, class 2 of S; cification PPP-C-96, except that tinplate cans with paper labels may be used, unless specifically prohibited. The base compound contained in each size container shall be as follows:

<u>Size of container</u>	<u>Amount of base compound</u>	<u>Volume tolerance</u>
1/2 pint	6 fluid ounces	$\pm 1/8$ fluid ounce
1 pint	12 fluid ounces	$\pm 1/4$ fluid ounce
1 quart	24 fluid ounces	$\pm 1/2$ fluid ounce
1 gallon	96 fluid ounces	± 2 fluid ounces

The curing agent shall be furnished in glass jars or in suitable plastic containers approved by the procuring activity. The jars or plastic containers, as applicable, shall have vertical, smooth inside walls, and no internal projections nor internal lips exceeding 1/16 inch. The glass

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jars shall be closed with enameled metal or plastic continuous thread screw caps having nonabsorbent lining material. Caps shall be tightened adequately and further sealed with cellulose bands, or equivalent.

5.1.1.3 Sectional-type containers. The base compound and curing agent shall be furnished in sectional-type 2-1/2-ounce or 6-ounce non-metal containers conforming to MIL-P-38714 as specified in the contract or order. The total content of base compound and curing agent contained in each sectional-type container shall be as follows:

<u>Size of container</u>	<u>Total content</u> (base and curing agent)	<u>Volume tolerances</u>
2-1/2 ounce	2 fluid ounces	$\pm 1/8$ fluid ounce
6 ounce	1-1/2 fluid ounces	$\pm 1/8$ fluid ounce

5.1.2 Level C. The base compound and curing agent shall be packaged in accordance with the manufacturer's commercial practice.

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

5.2.1 Level A. Sealants shall be packed in overseas class or type shipping containers conforming to the requirements of Specification PPP-B-585, PPP-B-591, PPP-B-601, PPP-B-621 or PPP-B-636. As far as practical, containers shall be of minimum cube and tare consistent with the protection required and contain identical quantities. The gross weight of each pack shall be limited to approximately 200 pounds, except that when fiberboard containers are used the weight limitation of the applicable container specification will apply. Containers shall be provided with case liners conforming to Specification MIL-L-10547. Case liners shall be sealed in accordance with the appendix of the liner specification. Containers shall be closed and strapped in accordance with applicable container specification or appendix thereto.

5.2.2 Level B. Sealants shall be packed in domestic type or class shipping containers conforming to the requirements of Specification PPP-B-585, PPP-B-591, PPP-B-601, PPP-B-621 or PPP-B-636. As far as practical, containers shall be of minimum cube and tare consistent with the protection required and contain identical quantities. Containers shall be closed and strapped in accordance with applicable container specification or appendix thereto.

5.2.3 Level C. Base compound and curing agent, packaged in accordance with 5.1.1, shall be packed to afford protection against damage during direct shipment from the source of supply to the first receiving activity for immediate use. Containers shall comply to the Uniform Freight Classification Rules or other regulations applicable to the mode of transportation.

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5.3 Marking. In addition to any special marking required, packages and shipping containers shall be marked in accordance with Standard MIL-STD-129. Markings shall not be placed on the bottom or lids of the cans.

5.3.1 Special marking. In addition to the markings required in 5.3, the following shall be specified:

- a. Identification of the components
- b. Directions for use, including mixing and curing instructions, and special surface treatment requirements.
- c. Date of manufacture

6. NOTES

6.1 Intended use. The sealing compound covered by this specification is intended for sealing aircraft structures that may be subjected to a service temperature range of -65°F to 180°F, with limited use up to 200°F maximum. The sealing compound is not intended for integral fuel tanks; however, these compounds do resist fuel, hydraulic fluid and lubricating oil.

6.2 Ordering data. Procurement documents should specify the following:

- (a) Title, number and date of this specification.
- (b) Class of sealant required (see 1.2).
- (c) Mixing instructions (parts per hundred by weight, curing agent to base).
- (d) Application time (see 1.2.1).
- (e) Quantity or size desired.
- (f) Applicable levels of packaging and packing required (see 5.1 and 5.2).
- (g) Any special marking required (see 5.3 and 5.3.1).

6.3 Qualification. With respect to products requiring qualification, awards will be made only for products which are at the time set for opening of bids, qualified for inclusion in the applicable Qualified Products List whether or not such products have actually been

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so listed by that date. The attention of the contractors is called to these requirements, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. The activity responsible for the Qualified Products List is the Naval Air Systems Command, Washington, D.C. 20361; however, information pertaining to qualification of products may be obtained from the Commander, Naval Air Development Center, Warminster, PA 18974, Attn. ACSTD (Code 6062).

6.4 Curing time. The time and temperature specified as the cure time in 4.7 are for laboratory preparations. These conditions may be considered as the optimum for curing each class of compound. In actual field use, the curing cycle will be affected by changes in temperature and/or humidity.

6.5 Toxicity. The sealing compound shall have no adverse effect on the health of personnel when used for its intended purpose. Questions pertinent to this effect shall be referred by the procuring activity to the appropriate department medical service who will act as an adviser to the preparing activity.

6.6 Changes from previous issue. Asterisks are not used in this revision to identify all changes with respect to the previous issue, due to the extensiveness of the changes.

Custodians:

Army - MR
Navy - AS
AF - 99

Preparing activity

Navy - AS
(DOD Project No. 8030-0430)

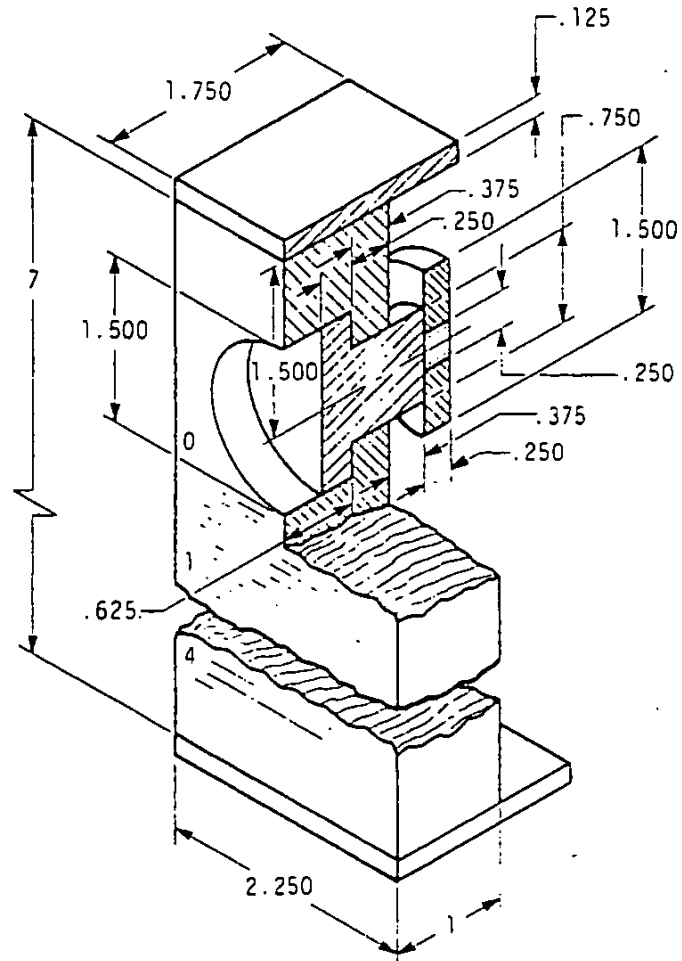
Review activities:

Army - MI, AV, AT
AF - 11

User activities:

Navy - OS

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MATERIAL: 4130 STEEL, CHROMIUM PLATED
 DIMENSIONS IN INCHES
 TOLERANCES: DECIMALS $\pm .016$

FIGURE 1. Flow-test fixture.

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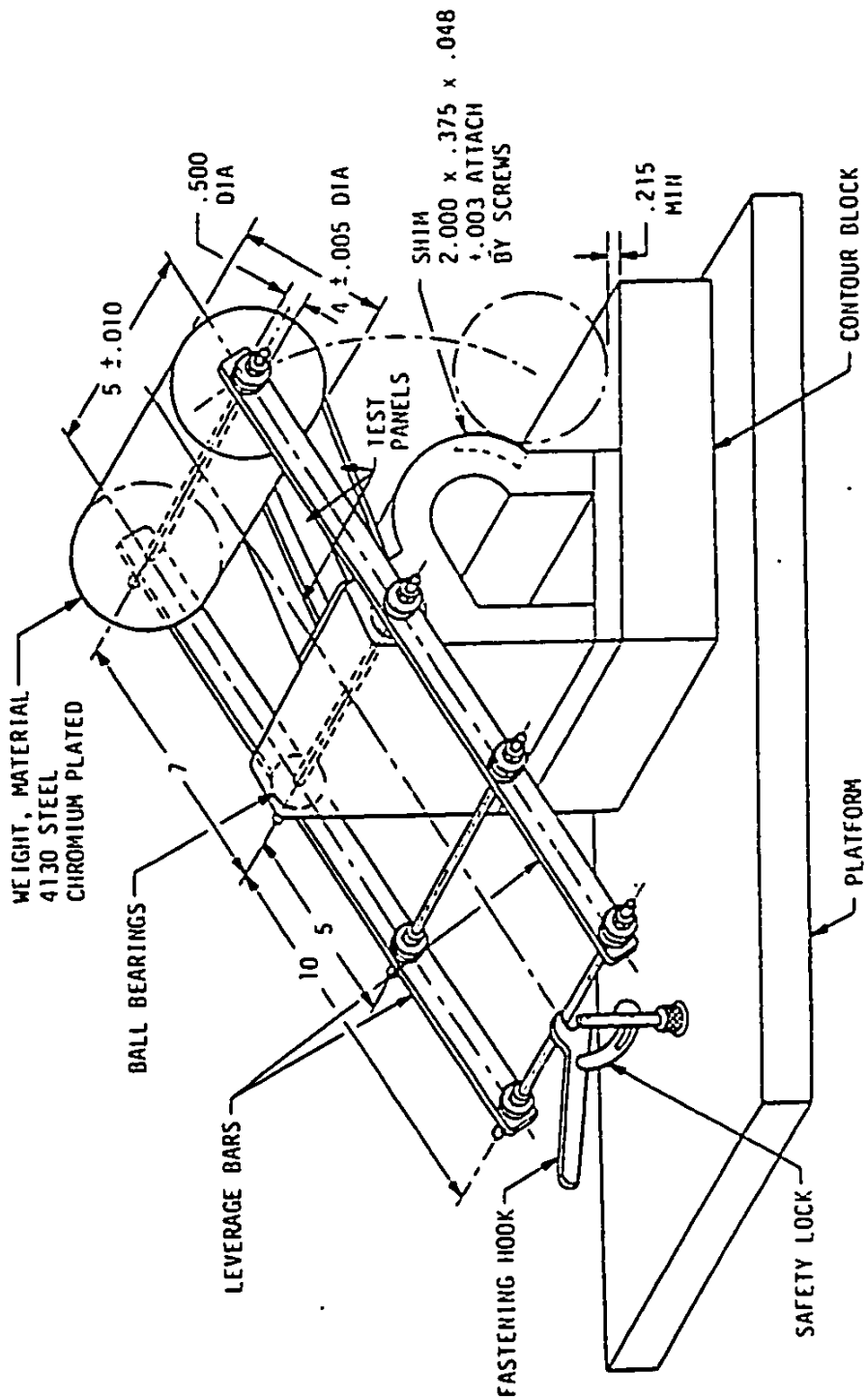
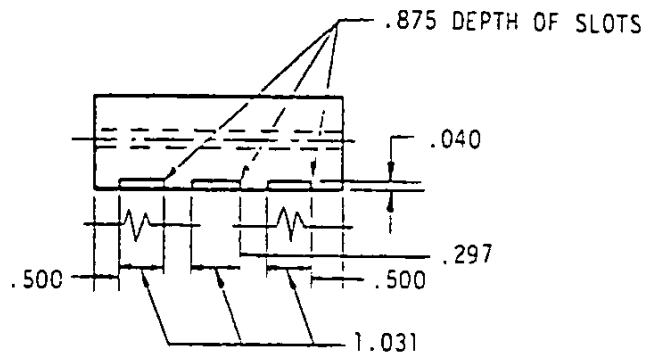
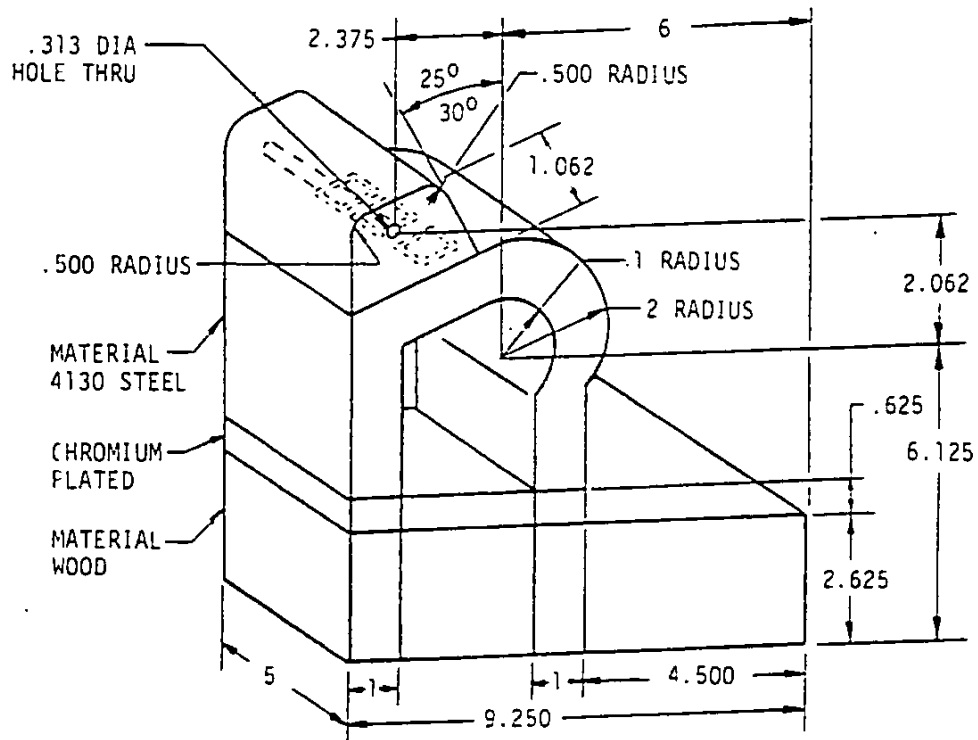


FIGURE 2. Low temperature flexibility apparatus.

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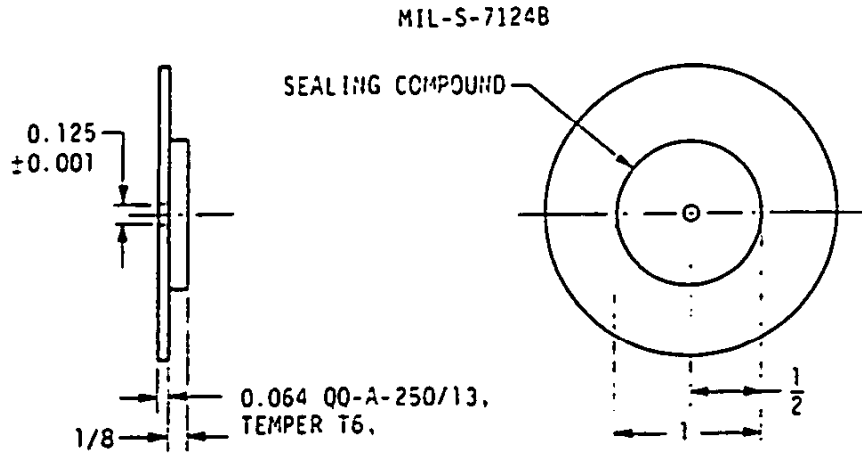


VIEW SHOWING SLOTS FOR PANELS



DIMENSION IN INCHES.

FIGURE 3. Contour block.



BLOWOUT SPECIMEN

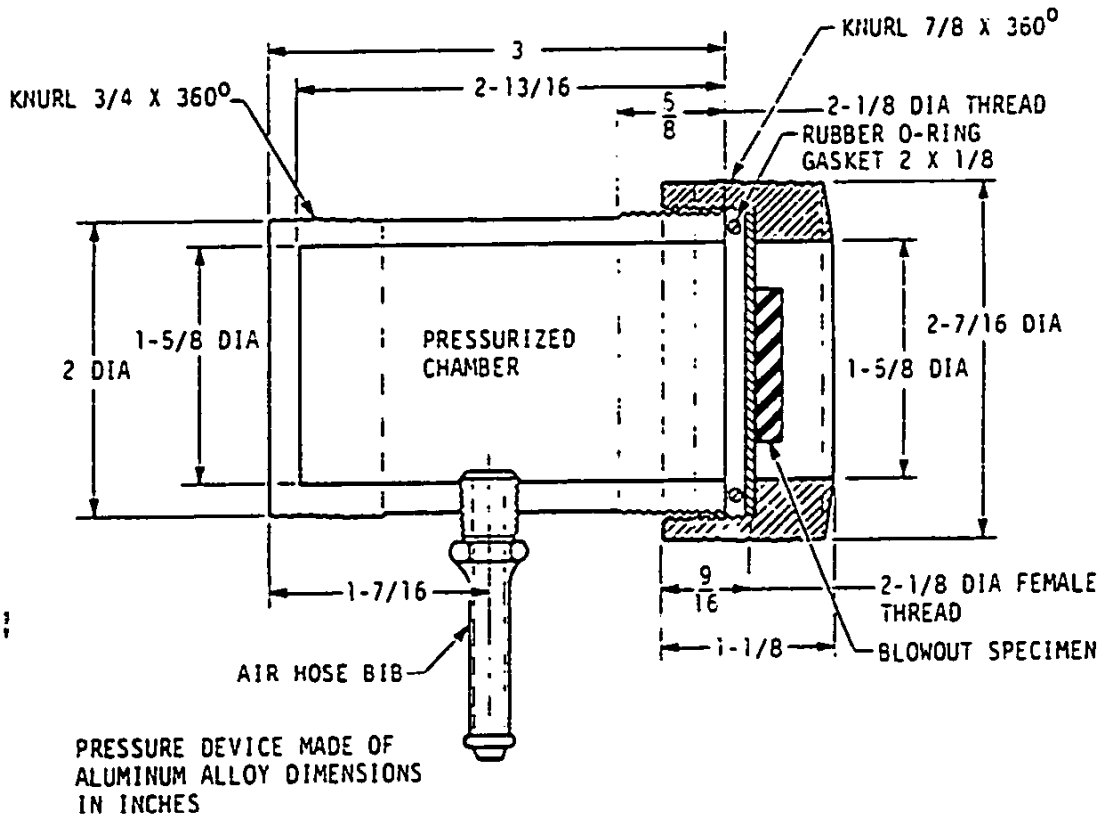


FIGURE 4. Seal efficiency apparatus.

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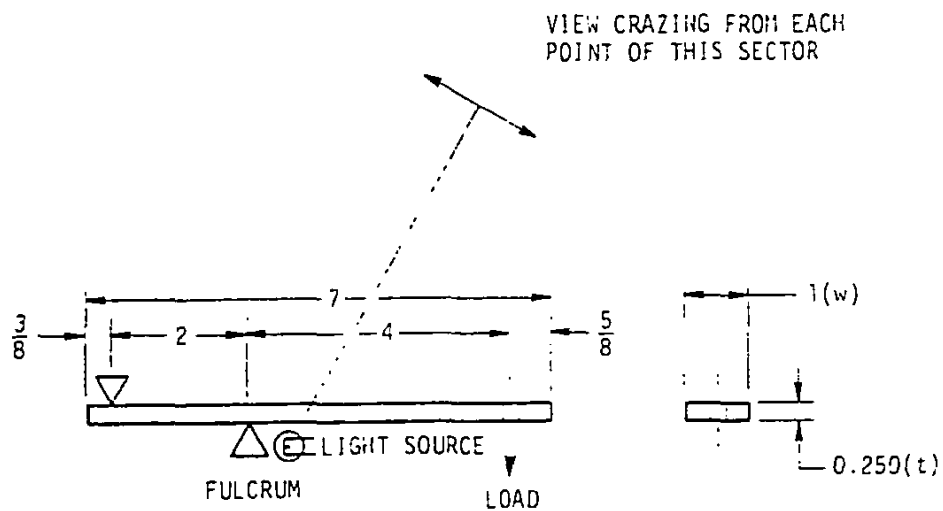


FIGURE 5. Loading condition for cantilever beam.

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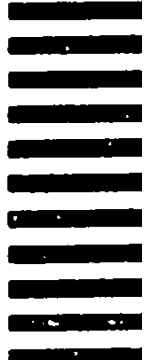
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a. Paragraph Number and Wording:

b. Recommended Wording:

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