

MIL-S-85420(AS)

14 October 1980

MILITARY SPECIFICATION

SEALING COMPOUNDS, QUICK REPAIR, LOW TEMPERATURE CURING POLYSULFIDE, FOR AIRCRAFT STRUCTURES

This specification is approved for use by the Naval Air System Command, Department of the Navy and is available for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification establishes requirements for two types and classes of a two component, low temperature curing, polysulfide, sealing compound for use as a quick-repair material for aircraft structure.

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

1.2.1 Types.

Type I - Dichromate cure system
Type II - Manganese cure system

1.2.2 Classes.

Class A - Suitable for brush application
Class B - Suitable for application with extrusion gun or spatula

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 this 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 93), Naval Air Engineering Center, Lakehurst, NJ 08733, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

NO INFORMATION REQUIREMENTS

FSC 8030

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SPECIFICATIONS

FEDERAL

O-S-1926	-Sodium Chloride, Technical
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
TT-E-751	-Ethyl Acetate, Technical
TT-I-735	-Isopropyl Alcohol
TT-M-261	-Methyl Ethyl Ketone, Technical
TT-N-97	-Naphtha, Aromatic
TT-S-735	-Standard Test Fluids, Hydrocarbon
TT-T-548	-Toluene, Technical
CCC-C-419	-Cloth, Duck, Cotton, Unbleached, Plied-Yarns, Army and Numbered
PPP-B-636	-Boxes, Shipping, Fiberboard

MILITARY

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, Water-vaporproof or Waterproof, Flexible
MIL-P-23377	-Primer Coating, Epoxy Polyamide, Chemical and Solvent Resistant
MIL-L-23699	-Lubricating Oil, Aircraft Turbine Engines, Synthetic Base

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MIL-P-25690	-Plastic, Sheets and Parts, Modified Acrylic Base, Monolithic, Crack Propagation Resistant
MIL-P-38714	-Packaging and Packing of Two-Component Materials in Semkits.
MIL-C-81706	-Chemical Conversion Materials for Coating Aluminum and Aluminum Alloys
MIL-C-81773	-Coatings, Polyurethane, Aliphatic, WeatherResistant
MIL-C-87962	-Cloths, Cleaning, for Aircraft Fuel Tanks

STANDARDS

FEDERAL

FED-STD-791	-Lubricant, Liquid Fuel and Related Products, Methods of Testing
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MILITARY

MIL-STD-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 acquisition functions should be obtained from the acquisition 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 412-75	-Rubber Properties in Tension
ASTM D 2240-75	-Rubber Property Durometer Hardness

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

CONSOLIDATED CLASSIFICATION COMMITTEE

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Uniform Freight Classification Rules

(Application for copies should be addressed to the Consolidated Classification Committee, 202 Chicago Union Station, 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 quick repair sealing compound furnished under this specification shall be a product which is 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 Materials. The sealing compound shall consist of a base compound which will cure to an elastomeric state upon addition of a separate curing agent.

3.2.1 Base compound. The base compound shall be primarily a synthetic rubber of the polysulfide type furnished in the as manufactured color.

3.2.2 Curing agent. The curing agent shall be of sufficiently different color from the base compound to easily identify an incompletely mixed system.

3.2.3 Primer. The use of a primer, as recommended by the manufacturer, is permissible. The primer shall be included as part of the package (see 5.1.1.2) and shall be identified on the Qualified Products List.

3.3 Examination of product. After mixing and extrusion, the compound shall be uniform, free of skins, lumps, gels or coarse particles.

3.4 Performance characteristics.

3.4.1 Application time. Application time of the sealing compound, as received and after long term storage, shall be determined by rate of extrusion. The sealing compound shall have an application time of 10 minutes, measured from the start of mix. When tested as specified in 4.8.2, the minimum application time, in grams per minute, shall be as follows:

<u>Class</u>	<u>Grams per minute, min.</u>
A	100
B	15

3.4.2 Cure rate characteristics. Cure rate characteristics, as received and after long term storage, shall be as specified in table 1.

TABLE 1. Cure rate characteristics (as received and after storage).

Property	TYPE I (see 1.2.1)				TYPE II (see 1.2.1)			
	Standard temperature cure conditions <u>1/</u>		Low temperature cure conditions <u>2/</u>		Standard temperature cure conditions <u>1/</u>		Low temperature cure conditions <u>2/</u>	
	4 hour, max As received	4 hour max After storage	8 hour, max As received	8 hour, max After storage	4 hour, max As received	4 hour, max After storage	6 hour, max As received	8 hour, max After storage
Tack free time hours, (see 4.8.3.1):								
Class A	2	2	4	4	2	2	4	8
Class B	2	1-1/2	6	6	1-1/4	2	4	8
Hardness, pts, min (see 4.8.3.2):								
Class A	20	20	7	7	20	15	10	10
Class B	25	25	7	7	25	25	12	15
Pressure, rupture, psi, min (4.8.3.3):								
Class A	25	25	8	10	25	25	25	5
Class B	28	28	10	15	28	28	28	7

1/ Standard temperature cure: $77^{\circ} \pm 2^{\circ}\text{F}$ ($23.4^{\circ} \pm 1^{\circ}\text{C}$) and 50 ± 5 percent relative humidity.

2/ Low temperature cure: $45^{\circ} \pm 2^{\circ}\text{F}$ ($7.2^{\circ} \pm 1^{\circ}\text{C}$) and 50 ± 5 percent relative humidity.

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3.4.3 Physical property characteristics.

3.4.3.1 Nonvolatile content. The minimum percent nonvolatile content of the freshly mixed compound, when tested in accordance with 4.8.4, shall be as follows:

<u>Class</u>	<u>Percent Nonvolatile content</u>
A	87
B	92

3.4.3.2 Flow (class B only). When tested as specified in 4.8.5, the class B sealing compound shall flow within the limits of 0.1 to 0.75 inch within the specified test time.

3.4.3.3 Specific gravity. The specific gravity of the cured polysulfide shall be no greater than 1.65 when determined in accordance with 4.8.6.

3.4.3.4 Peel strength. The peel strength of the compound, when tested as specified in 4.8.7, shall meet the requirements specified in table II.

TABLE II. Peel strength requirements.

<u>Adherends (see 4.8.7.1)</u>	<u>Peel strength, lbs per inch width, minimum</u>		
	<u>As received</u>	<u>After immersion</u>	
		<u>Class A</u>	<u>Class B</u>
1	15	12	15
2	15	12	15
3	15	12	15
4	15	12	15
5	10	10	10
6 (Class B only)	2	-	2

3.4.3.5 Tensile strength and elongation. Tensile strength and elongation minimum values when tested as specified in 4.8.8, shall be as follows:

	<u>Minimum properties</u>	
	<u>As received</u>	<u>After heat aging</u>
Tensile strength, psi	200	125
Elongation, percent	150	50 - Class A, 100 - Class B

3.4.3.6 Corrosion. When tested as specified in 4.8.9, there shall be no corrosion on the panel under the layer of sealing compound. Additionally, the sealing compound shall show no signs of deterioration.

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3.4.3.7 Low-temperature flexibility. The compound shall withstand the bend test as specified in 4.8.10 without cracking, checking, or separation from the panel.

3.4.4 Accelerated crazing (class B). When tested as specified in 4.8.11, the sealing compound shall not craze, crack, or otherwise chemically degrade the stressed plastic panels.

3.4.5 Hydrolytic stability. When tested for hardness after exposure as specified in 4.8.12, the specimens shall retain 80 percent of their original hardness.

3.4.6 Repairability. The sealing compound shall repair minor breaks in itself and other sealing compounds qualified to this specification. A second coating of sealing compound, applied over a freshly cured film of material as specified in 4.8.13, shall show satisfactory bonding, no lifting, blistering, loss of adhesion or other film irregularities. The film shall have a 10 pounds per inch width minimum peel strength.

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.

4.1.1 Source inspection. Materials procured by the Government under this specification must be source inspected so there is assurance that the sealing compound meets the quality conformance inspection prior to leaving the manufacturer's plant. Note that the material shall be packaged and mixed in containers specified in section 5 of this specification.

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 III.

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TABLE III. Qualification inspection.

Inspection	Paragraph	
	Requirement	Test
Materials	3.2	4.8.1
Examination of product	3.3	4.8.1
Application time	3.4.1	4.8.2
Tack free time	Table I	4.8.3.1
Hardness	Table I	4.8.3.2
Pressure rupture	Table I	4.8.3.3
Nonvolatile content	3.4.3.1	4.8.4
Flow (class B)	3.4.3.2	4.8.5
Specific gravity	3.4.3.3	4.8.6
Peel strength	3.4.3.4	4.8.7
Tensile strength	3.4.3.5	4.8.8
Elongation	3.4.3.5	4.8.8
Corrosion	3.4.3.6	4.8.9
Low temp flexibility	3.4.3.7	4.8.10
Accelerated crazing (class B)	3.4.4	4.8.11
Hydrolytic stability	3.4.5	4.8.12
Repairability	3.4.6	4.8.13
Long term storage	Table I and 3.4.1	4.8.14

4.3.1 Qualification test samples. Qualification test samples shall consist of 32 sectional type containers with the proper ratio of sealing compound to curing agent, along with the required primer, packaged in accordance with section 5, 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, PA 18974, Attention: ACSTD (6062), the qualifying laboratory. The samples shall be plainly and durably marked with the following information:

Samples for Qualification Testing

SEALING COMPOUND, QUICK REPAIR, LOW TEMPERATURE CURING,
POLYSULFIDE, FOR AIRCRAFT STRUCTURES

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Type

Class

Date of manufacture

Name and address of manufacturer

Manufacturer's identification (base and curing agent)

Submitted by (name) (date) for qualification tests in
accordance with the requirements of MIL-S-85420(AS)
under authorization (reference authorizing letter)
(see 6.3).

4.3.2 Manufacturer's data.

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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 and the appropriate primer shall be furnished with the qualification samples 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 to the qualifying activity that his product complies with the requirements of this specification. The time of periodic verification by certification shall be in two-year intervals from the date of original qualification. The Government reserves the right to re-examine the qualified product whenever deemed necessary to determine that the product continues to meet any or all of the specification requirements.

4.4 Quality conformance.

4.4.1 Lot formation. Unless otherwise specified herein or in the contract, a lot shall consist of all the sealing compound formulated from the same components, under essentially the same conditions, forming part of one contract or order, and submitted for acceptance at one time.

4.4.2 Sampling.

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

4.4.2.2 Sampling for packaging.

4.4.2.2.1 Unit containers. A random sample of filled containers 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 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 Testing and examination of quality conformance samples.

4.4.3.1 Testing. The sample selected in 4.4.2.1 shall be tested to the requirements specified in table IV. Nonconformance of a test specimen to a single requirement (see table IV) shall be cause for rejection of the lot represented by the sample.

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TABLE IV. Quality conformance testing.

Property	Test paragraph
Examination of product	4.8.1
Application time	4.8.2
Cure rate characteristics	4.8.3
Tack free time	4.8.3.1
Hardness	4.8.3.2
Pressure rupture	4.8.3.3
Nonvolatile content	4.8.4
Peel strength (as rec'd, adherend number 1 only)	4.8.7

4.4.3.2 Packaging examination. 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 V and all other applicable container specification 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.

4.5 Test conditions.

4.5.1 Standard conditions. Standard laboratory conditions shall be $25^{\circ} \pm 1^{\circ}\text{C}$ ($77^{\circ} \pm 2^{\circ}\text{F}$) and a relative humidity (RH) of 50 ± 5 percent. Unless otherwise specified herein, all mixing and testing of the sealing compound shall be at standard conditions.

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 conforming to MIL-C-87962 using solvent formulated in accordance with table VI. Immediately after rinsing, the panels shall be wiped dry with a clean, lint-free cloth.

4.6.2 Cleaning of acrylic panels. Solvent conforming to P-D-680 or equivalent shall be used to clean acrylic plastic test panels.

4.6.3 Mixing. The sealing compound and curing agent in the sectional cartridge along with all spatulas, molds, and other related equipment shall be conditioned at standard conditions (see 4.5.1) for at least 24 hours. After conditioning, the mixing of the sealing compound shall be at standard conditions in accordance with the manufacturer's instructions.

4.7 Curing conditions.

4.7.1 Cure rate characteristic tests. Curing conditions for as received and after long term storage shall be as specified in table I. Low temperature specimens shall be mixed at standard conditions followed by curing in the low temperature environment.

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TABLE V. Packaging examination.

Examination	Defect
<u>Unit container:</u>	
Fill	Not volume specified in contract or order.
Packaging	Wrong size kits. Primer package not as specified or missing. Material or construction not as specified. Components damaged or missing. Intermediate package closure incomplete or damaged. Not level required by contract or purchase order.
<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 and intermediate package and packing--omitted, illegible, incorrect, incomplete or not in accordance with contract requirements.

TABLE VI. Formulation of cleaner.

Ingredient	Specification	Percent by volume
Aromatic petroleum naphtha	TT-N-97, type I, grade B	50 \pm 2.5
Ethyl acetate	TT-E-751	20 \pm 1.0
Methyl-ethyl-ketone	TT-M-261	20 \pm 1.0
Isopropyl alcohol	TT-I-735	10 \pm 0.5

4.7.2 Tests other than cure rate characteristics. All sealing compounds shall be mixed as specified in 4.6.3, applied to test panels or other surfaces and allowed to cure for 14 days at standard conditions (see 4.5.1) prior to testing. An alternate cure of 48 \pm 1 hours at standard conditions plus 24 \pm 1 hours at 60° \pm 1°C (140° \pm 2°F) may be used.

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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 and 3.3.

4.8.2 Application time. The sectional cartridge shall be mixed as specified in 4.6.3, then allowed to stand for a total time (from start of mix) of 10 minutes. The extrusion rate shall be determined by a 15 second extrusion of the sealing compound into a suitable tared container. The extrusion rate (grams/minute) shall be 4 times the obtained weight of sealing compound.

4.8.3 Cure rate characteristics testing. Cure rate test specimens shall be conditioned prior to testing, as follows:

- | | |
|---------------------------|---|
| Standard temperature cure | - Test immediately at end of time specified in table I. |
| Low temperature cure | - Remove from cold chamber at time specified in table I, place in standard condition environment and initiate tests within 15 minutes after removal from low temperature environment. |

4.8.3.1 Tack-free time. An aluminum test panel conforming to temper T6 of 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 till the end of the specified tack-free time (see table I), conditioned as specified above, then two 1 by 6 inch pieces of polyethylene film 0.004 ± .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 withdrawn at right angles to the sealing compound surface. The polyethylene shall come away clean and free of sealing compound.

4.8.3.2 Hardness. Two specimens, 0.25 by 1 by 2 inches, shall be prepared in an open mold and cured for the time and temperature specified in table I. Instantaneous hardness shall be determined in accordance with ASTM D 2240 after conditioning as specified in 4.8.3.

4.8.3.3 Pressure rupture.

4.8.3.3.1 Specimen preparation. A 1 inch diameter by 0.125 inch thick layer of sealing compound shall be molded on a QQ-A-250/13, temper T6 aluminum alloy panel, dimensioned as specified in figure 1. The specimens shall be cured in accordance with table I and conditioned as specified in 4.8.3 prior to testing.

4.8.3.3.2 Test procedure. The test specimen shall be mounted in the pressure rupture fixture as shown in figure 1. The air hose bib of the apparatus shall be connected, using appropriate tubing, to a pressure gage or manometer, and a variable pressure source. Starting at atmospheric

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pressure, the pressure on the apparatus shall be uniformly increased at the rate of 0.5 psi per 15 seconds until failure occurs. Failure shall be indicated by a rapid drop in pressure. The pressure applied at the time of failure shall be recorded. Test two additional specimens in the same manner. The average pressure of the three specimens shall be reported to the nearest 1.0 inch (25.4 mm) of mercury.

4.8.4 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 be placed immediately 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 $70^\circ \pm 1^\circ\text{C}$ ($158^\circ \pm 2^\circ\text{F}$). 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:

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

4.8.5 Flow (class B only). One cartridge of class B sealing compound and curing agent shall be mixed and prepared for testing in accordance with 4.6.3. The test shall be conducted with a flow-test fixture as shown in figure 2. Depth of plunger tolerance is critical and shall be controlled within the tolerance during the test.

4.8.5.1 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 10 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. 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.

4.8.6 Specific gravity. Three specimens, 1/8 by 1 by 2 inches, shall be prepared in an open mold and cured as specified in 4.7.2. 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:

$$\text{Specific gravity (Analytical balance)} = \frac{\text{Weight in air}}{\text{Weight in air} - \text{Weight in water}}$$

$$\text{Specific gravity (Jolly balance)} = \frac{\text{Weight in air}}{\text{Weight in water}}$$

4.8.7 Peel strength.

4.8.7.1 Adherends, and surface treatment. The adherends, surface treatment and number of specimens shall be as specified in Table VII.

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TABLE VII. Adherends, surface treat and specimens for peel strength

Adherend No.	Substrate and surface treat	No. of specimens
1.	Aluminum alloy, 7075-T6, conforming to QQ-A-250/12, chemically treated with materials conforming to MIL-C-81706, class 1A.	6
2.	Aluminum alloy, QQ-A-250/13, T6.	2
3.	Aluminum alloy, 7075-T6, conforming to QQ-A-250/12, chemically treated in accordance with MIL-A-8625, type 11.	2
4.	Titanium, MIL-T-9046, type III, composition C (6Al-4V).	2
5.	Aluminum alloy, 7075-T6, conforming to QQ-A-250/12, primed in accordance with MIL-P-23377 and topcoated in accordance with MIL-C-81773.	2
6.	Acrylic plastic, MIL-P-25690.	2

4.8.7.2 Specimen preparation. Test panel materials (size, 0.064 by 3 by 6 inches) and the required number of specimens shall be as specified in 4.8.7.1. Each panel shall be coated with a 0.125 inch thickness of the sealing compound. A 3 by 6 inch area of 3 by 12 inch strips of cotton duck conforming to type III of CCC-C-419 or wire screen (20 to 40 mesh aluminum or monel wire fabric) 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 approximately 1/32 inch thick coating of sealing compound shall be applied over the fabric. Curing shall be as specified in 4.7.2.

4.8.7.3 Immersion procedure. After cure, one specimen from each panel material shall be used to determine initial peel strength. One specimen of each adherend shall be immersed in immersion fluid number 1 of table VIII. Additionally, adherend number 1 panels shall be immersed in fluid numbers 2, 3, 4 and 5 of table VIII. After expiration of the test period specified in table VIII, the fluids shall be cooled to standard conditions. The specimens shall then be removed and peel strength 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.

4.8.7.3.1 Formulation of jet reference fluid. The jet reference fluid required for conducting the fuel resistance test and fluid immersion tests of this specification shall be formulated as follows:

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Toluene (TT-I-548)	30 volumes
Cyclohexane (technical grade)	60 volumes
Iso-octane (TT-S-735, type I)	10 volumes
Tertiary butyl disulfide (doctor sweet)	1 volume
Tertiary butyl mercaptan	0.15 ± 0.0015 weight percent of other four components.

TABLE VIII. Immersion fluids and test conditions.

Fluid	Specification	Immersion condition
1. Aqueous NaCl, 3 percent	O-S-1926	48 hours at 60° ± 1°C (140° ± 2° E)
2. Hydraulic fluid	MIL-H-5606	48 hours at 60° ± 1°C (140° ± 2°F)
3. Lubricating fluid	MIL-L-7808	48 hours at 60° ± 1°C (140° ± 2°F)
4. Lubricating fluid	MIL-L-23699	48 hours at 60° ± 1°C (140° ± 2°F)
5. Jet reference fluid	4.8.7.3.1	7 days ± 1 hour at 60 ± 1°C (140° ± 2°F)

4.8.7.3.2 Jet reference fluid tests. The mercaptan sulfur content, when tested in accordance with method 5206 of FED-STD-791, shall be 0.0050 ± 0.0005 weight percent of the jet fluid. The total sulfur content, when tested in accordance with method 5201 of FED-STD-791, shall be 0.400 ± 0.005 weight percent of the jet fluid. The fluid should be stored out of contact with light and in containers which are inert to the fluid ingredients. (Welded aluminum, nongalvanized welded steel, or glass containers are suitable.) Fluid older than 90 days shall be retested for mercaptan and total sulfur content.

4.8.7.4 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.

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4.8.8 Tensile properties. Tensile properties shall be determined on as received and after heat aging samples. Molded sheets approximately 0.075 inch in thickness shall be cured in accordance with 4.7.2. Tensile strength and elongation determinations shall be determined in accordance with ASTM D 412 using specimens cut with die C.

4.8.8.1 Heat aging. Tensile specimens, prepared as specified in 4.8.8, shall be exposed in a circulating air oven at $120^{\circ} \pm 1^{\circ}\text{C}$ ($248^{\circ} \pm 2^{\circ}\text{F}$) for a period of 7 days, removed from the oven and allowed to remain at standard conditions, prior to testing as specified in 4.8.8.

4.8.9 Corrosion. Two aluminum alloy panels, conforming to QQ-A-250/12, temper T6, 3 by 6 by 0.065 inch, shall be coated with a 1/8 inch thickness of the sealing compound. After curing as specified in 4.7.2, one panel shall be completely immersed in a two phase liquid system consisting of jet reference fluid (see 4.8.7.3.1) and 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 specified in 3.4.3.6.

4.8.10 Low-temperature flexibility. Sealing compound shall be applied to one side of each of three 7075-T6 aluminum panels conforming to QQ-A-250/12, treated with MIL-A-8625, Type I, measuring 1 inch by 6 inches by 0.032 inch in a manner which shall produce a thickness of approximately 0.075 inch leaving 1 inch at each end of the panels uncoated. Upon completion of the curing time (4.7.2), the panels shall be placed in an air-circulating oven and conditioned for 48 ± 1 hours at $93^{\circ} \pm 2^{\circ}\text{C}$ ($200^{\circ} \pm 5^{\circ}\text{F}$). The panels shall then be placed in a flexibility fixture as shown in figures 4 and 5 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 $-54^{\circ} \pm 1^{\circ}\text{C}$ ($-65^{\circ} \pm 2^{\circ}\text{F}$) for 4 hours. After the specified conditioning, the specimens shall then be bent around the curved portions of the flexibility fixture by releasing the fastening hook. The panels shall be removed and examined for conformance to 4.3.7.

4.8.11 Accelerated crazing. Three plastic panels, plus one control panel, conforming to MIL-P-25690, cleaned with dry cleaning solvent conforming to P-D-680, shall be inserted into the test apparatus, and stress loaded as indicated in figure 3. The upper surface of three panels directly above the central fulcrum shall be coated with an approximate 1/16 inch layer of the class B sealing compound. The sealant shall not be applied within 1/16 inch of the side edges of the panel. The panels shall be allowed to remain under stress in the manner indicated for a period of 72 ± 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.

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4.8.12 Hydrolytic stability.

4.8.12.1 Specimen preparation. Sufficient base compound and curing agent shall be mixed to prepare 3 test specimens, 2.5 inch diameter by 0.5 inch thick. Each specimen shall be subjected to cure of 4.7.2. Hardness shall be determined using a type A durometer in accordance with ASTM D 2240 after 3 second application time. Hardness shall be determined at the same locations, before and after exposure.

4.8.12.2 Procedure. After determining hardness before exposure, the specimens shall be placed vertically on a tray in a suitable glass desiccator. The desiccator shall contain a glycerine (22 percent by weight) in water solution, in the bottom, which shall produce a relative humidity (RH) of 95 percent at the test temperature. The desiccator, containing the specimens, shall then be closed and inserted into an air circulating oven maintained at $71^{\circ} \pm 1^{\circ}\text{C}$ ($160^{\circ} \pm 2^{\circ}\text{F}$) for a period of 30 days \pm 4 hours. At the end of the exposure period, the desiccator shall be removed from the oven and cooled to standard conditions for 16 to 24 hours. Hardness shall be determined as specified in 4.8.12.1 and the obtained values for each specimen shall be in accordance with the requirements of 3.4.5.

4.8.13 Repairability. A 3 by 6 by 0.064 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 4.7.2. 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 VI, air dried for 2 hours, and another coating of newly mixed sealant shall be applied as above over the previously conditioned sealant. A 3 by 6 inch area of a 3 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 coating of sealing compound shall be applied over the fabric or wire mesh. After the 4.7.2 cure period, the specimen shall be tested as specified in 4.8.7.4.

4.8.14 Long term storage. Six filled sectional type containers (base compound and curing agent) shall be stored at standard conditions for 6 months. At the end of this time, the material shall be mixed and tested for conformance to the requirements of 3.4.1 and the applicable sections of table I.

5. PACKAGING

5.1 Preservation-packaging. Preservation-packaging shall be level A.

5.1.1 Level A.

5.1.1.1 Unit container for sealant. The base compound and curing agent shall be furnished in sectional-type 6 ounce non-metal containers

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conforming to MIL-P-38714. The total content of base compound and curing agent in the container shall be 3-1/2 fluid ounces \pm 1/8 fluid ounce.

5.1.1.2 Primer container. Primer, when required, shall be packaged in a suitable glass bottle with screw cap top sealed with an appropriate plastic banding.

5.1.1.3 Intermediate package. The intermediate package shall be a heat sealable aluminum foil material in accordance with MIL-P-38714. The unit container and the primer container shall be included in the intermediate package.

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

5.2.1 Level A. Material packaged as specified in 5.1 shall be packed in overseas class or type shipping containers conforming to PPP-B-636. There shall be 24 intermediate packages per shipping container, separated by slotted fiberboard. Shipping containers shall be provided with case liners conforming to 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. Materials shall be packed as specified in 5.2.1, except that shipping containers shall be domestic class or type of PPP-B-636.

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.

5.3 Marking. In addition to any special marking required, packages and shipping containers shall be marked in accordance with MIL-STD-129.

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

- 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 use as a quick repair, low temperature curing aircraft structural sealant which gives "fly-away" capability in 2 to 3

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hours when cured at temperatures of at least 75°F. When cured as low as 45°F, type II sealants provide a 4 hour "fly-away" capability and type I - 8 hours.

6.1.1 Storage characteristics. The sealing compounds have a minimum shelf life of 6 months when stored at temperatures below 80°F. After the 6 month storage period, the material should be tested to determine its usefulness. In addition, the 6 month shelf life can be extended by storage at refrigeration temperature (approximately 40°F).

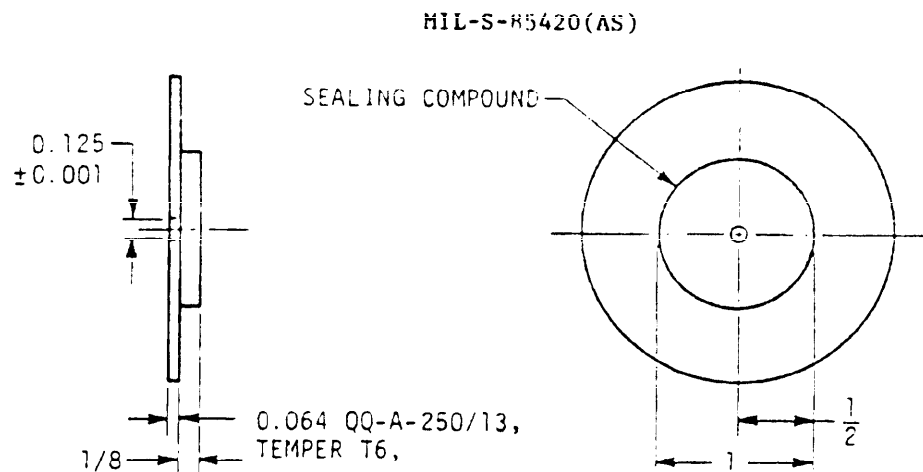
6.1.2 Primer. The sealing compounds furnished under this specification are to be used with the manufacturer's recommended primer to obtain optimum results.

6.2 Ordering data. Acquisition documents should specify the following:

- a. Title, number and date of this specification.
- b. Type and class of sealant required (see 1.2).
- c. Quantity desired.
- d. Applicable levels of packing required (see 5.2).
- e. 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 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 19874, Attn: ACSTD (Code 6062), the qualifying laboratory.

Preparing activity
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(Project No. 8030-N075)



BLOWOUT SPECIMEN

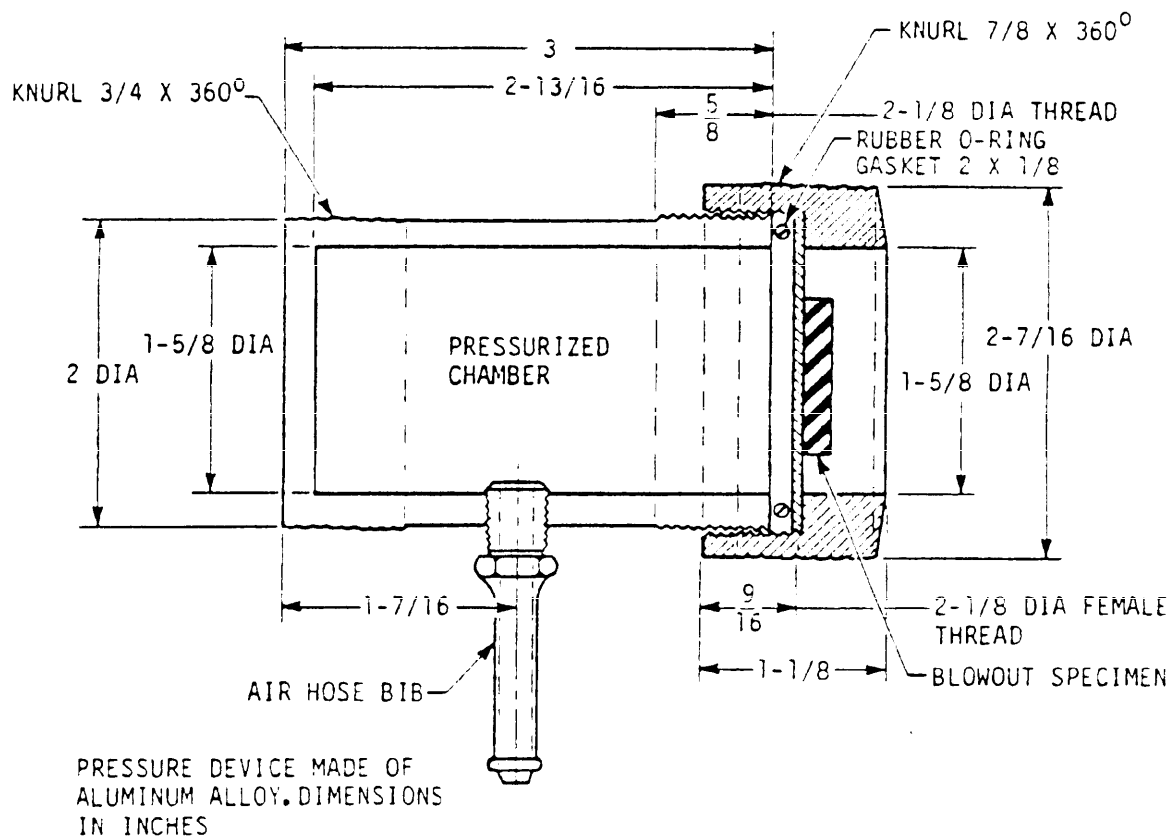
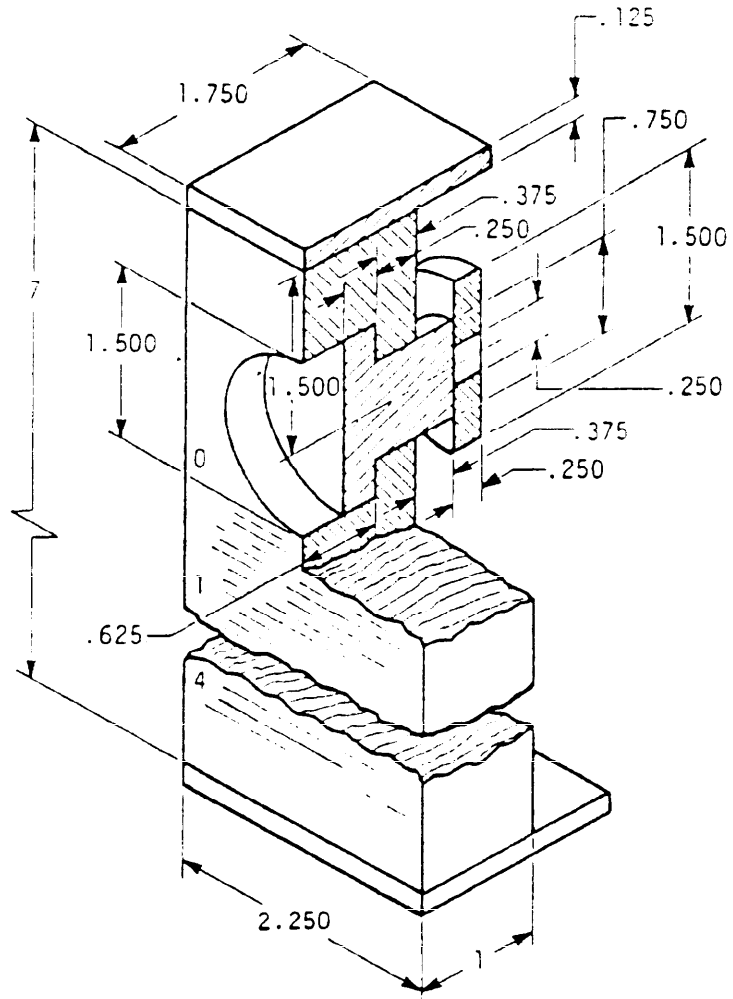


FIGURE 1. Pressure rupture apparatus.

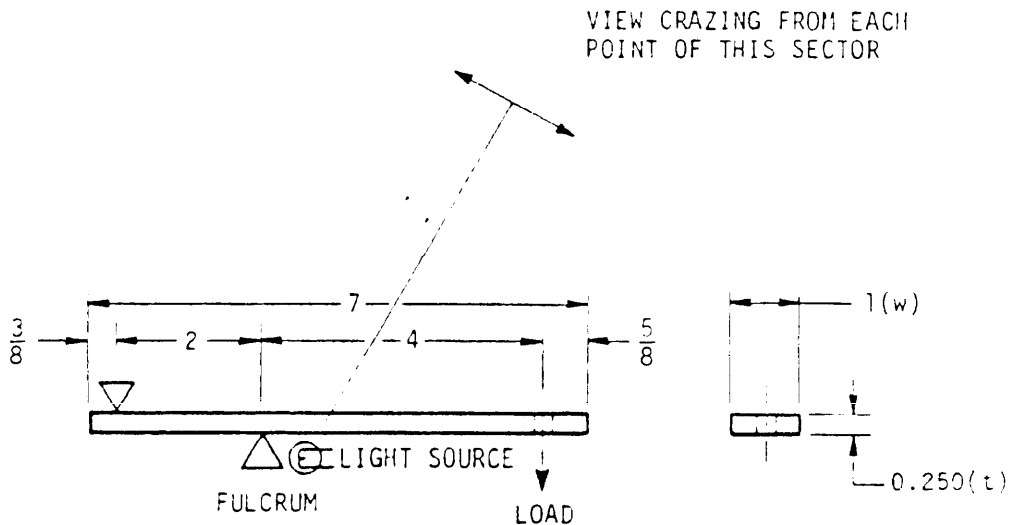
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MATERIAL: 4130 STEEL, CHROMIUM PLATED
 DIMENSIONS IN INCHES
 TOLERANCES: DECIMALS $\pm .016$

FIGURE 2. Flow-test fixture.

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LOAD - OUTER FIBER STRESS OF 2,000 PSI

$$\text{FORMULA: LOAD (POUNDS)} = \frac{2,000 \text{ wt}^2}{24}$$

w = Width of panel (measured to nearest 0.001 inch)

t = Thickness of panel (measured to nearest 0.001 inch)

Dimensions in inches. Tolerances on all dimensions ± 0.030 inch, except thickness dimension which shall be ± 0.025 inch.

FIGURE 3. Loading condition for cantilever beam.

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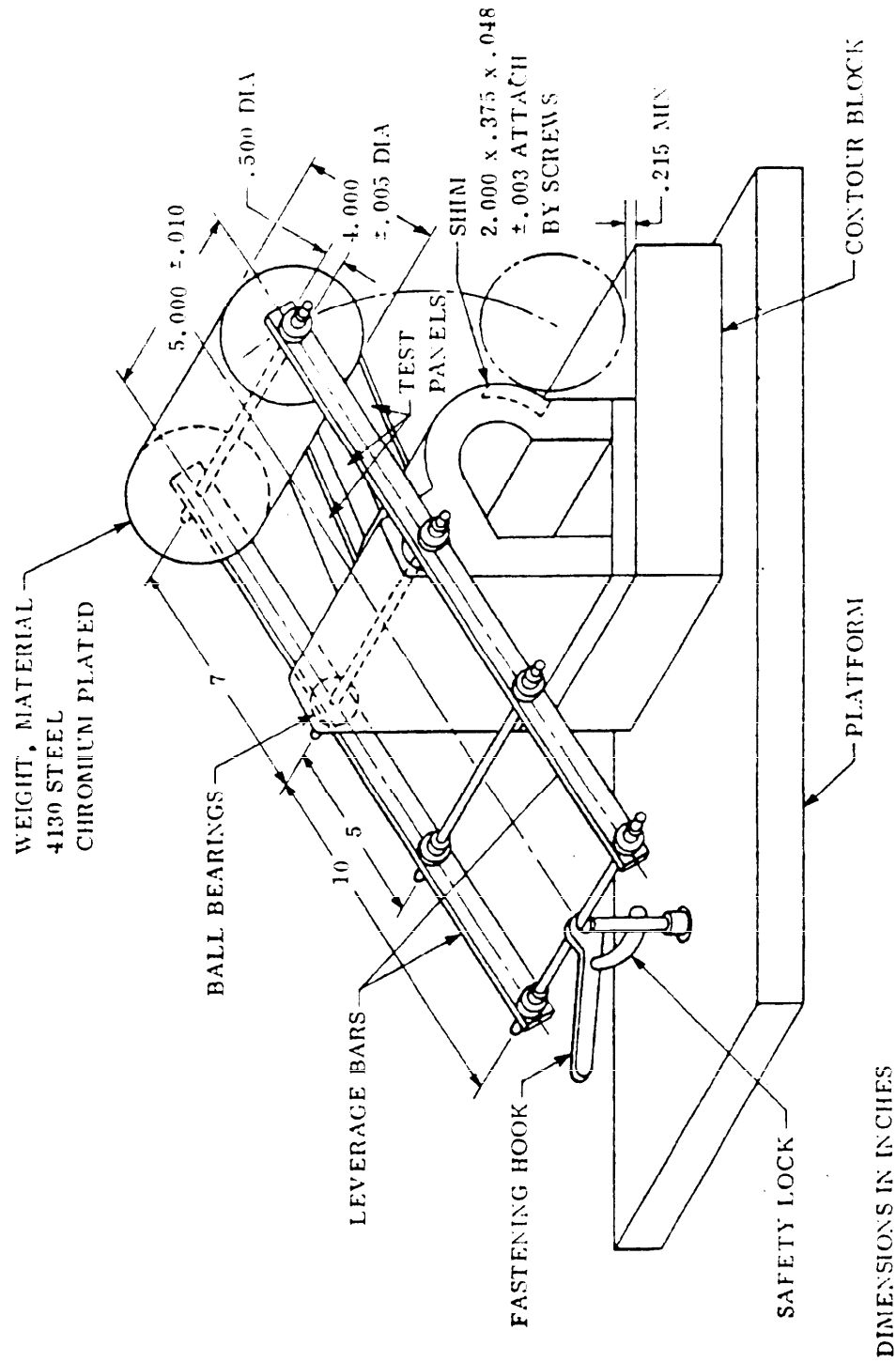
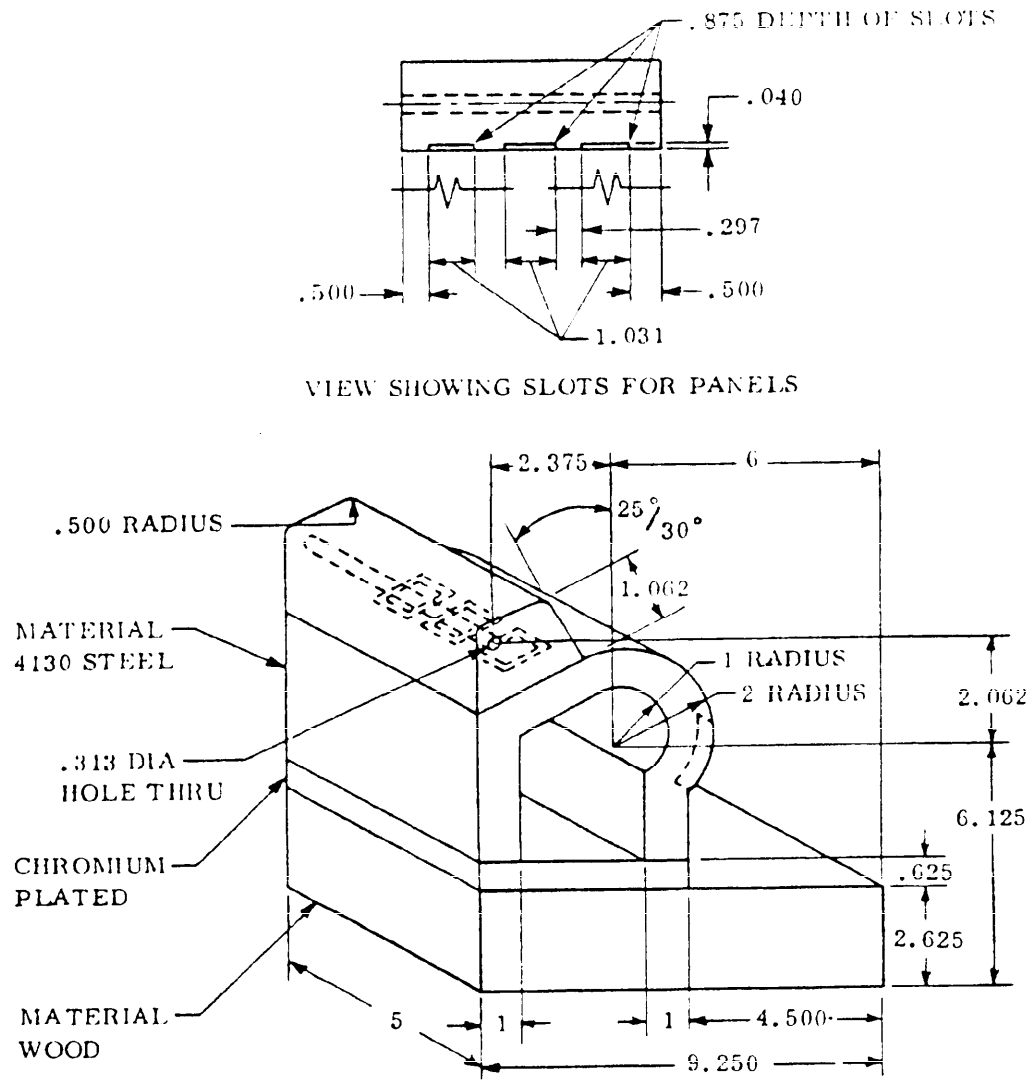


FIGURE 4. Low Temperature Flexibility Apparatus

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DIMENSIONS IN INCHES

FIGURE 5. Contour Block

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