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PERFORMANCE SPECIFICATION

PLASTIC, SHEETS AND FORMED PARTS, MODIFIED ACRYLIC BASE, MONOLITHIC, CRACK PROPAGATION RESISTANT

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

1. SCOPE

1.1 Scope. This specification covers the requirements for two classes of transparent monolithic, modified, methyl methacrylate flat stretched sheets that may be formed into parts having superior crack propagation and craze resistance as a result of proper hot stretching (see 6.4.2).

1.2 Classification.

1.2.1 Classes.

Class 1 - Standard moisture resistant stretched material.

Class 2 - Improved moisture resistant stretched material.

1.2.2 Types.

Sheets. Stretched acrylic sheets are specified by thickness (see 3.3.2).

Forms. Stretched acrylic formed parts (fabricated assemblies) are specified in the contract or order (see 6.2d).

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications, standards and handbooks. The following specifications and standards form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation (see 6.2h).

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commanding Officer, Naval Air Warfare Center Aircraft Division Lakehurst, Systems Requirements Department, Code SR3, Lakehurst, NJ 08733-5100, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A

FSC 9330

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SPECIFICATIONS

FEDERAL

- A-A-55057 - Panels, Wood/Wood Based, Construction and Decorative
- TT-I-735 - Isopropyl Alcohol
- TT-T-548 - Toluene, Technical
- TT-W-572 - Wood-Preservative, Water-Repellent
- PPP-B-585 - Box, Wood, Wirebound
- PPP-B-591 - Boxes, Shipping, Fiberboard, Wood-Cleated
- PPP-B-601 - Boxes, Wood, Cleated Plywood
- PPP-B-621 - Box, Wood, Nailed and Lock Corner
- PPP-B-636 - Box, Shipping, Fiberboard
- PPP-T-97 - Tape, Pressure Sensitive Adhesive, Filament Reinforced

MILITARY

- MIL-P-116 - Preservation, Methods of
- MIL-P-8184 - Plastic Sheet, Acrylic, Modified
- MIL-L-10547 - Liner, Case and Sheet, Overwrap, Water Vaporproof or Waterproof, Flexible

STANDARDS

MILITARY

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

(Unless otherwise indicated, copies of federal and military specifications, and standards are available from the DODSSP - Customer Service, Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

2.2 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DoD adopted are those listed in the issue of the DoDISS cited in the solicitation. Unless otherwise specified, the issues of the documents not listed in the DoDISS are the issues of the documents cited in the solicitation (See 6.2h).

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D637	-	Surface Irregularities of Flat Transparent Plastic Sheets
ASTM D638	-	Tensile Properties of Plastics
ASTM D1003	-	Haze and Luminous Transmittance of Transparent Plastics
ASTM D1718	-	Isobutyl Acetate

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

UNIFORM CLASSIFICATION COMMITTEE, AGENT

Uniform Freight Classification Rules

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

(Non-Government standards and other publications are normally available from the organizations that prepare or distribute the documents. These documents may be available in or through libraries or other informational services.)

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

3. REQUIREMENTS

3.1 Qualification. The acrylic material furnished under this specification shall be products which are authorized by the qualifying activity for listing on the applicable Qualified Products List at the time of award of contract (see 4.3 and 6.3).

3.1.1 First article inspection. The first formed part of a specific configuration produced under a contract or purchase order shall be subjected to first article inspection as specified in 4.3.5.

3.2 Materials. The plastic shall be prepared from modified acrylic sheets qualified to Type I, class 1 or Type I, class 2 of MIL-P-8184, except that optical uniformity requirements of the unstretched material may be specified by the purchaser (see 6.2i). The MIL-P-8184 material used to prepare the qualification sample shall be identified to the Qualifying Laboratory (see 4.3.1.1).

3.2.1 Sheets. The sheets shall be formed by mechanically hot stretching MIL-P-8184 material (see 3.2) using processes that will consistently produce sheets having the properties specified herein. Once produced, the stretched product shall be cut to specific dimensions as sized flat sheet for direct delivery to the Government or cut into blanks to be further processed into formed parts.

3.2.2 Formed parts. Parts shall be formed from cut blanks by processes that consistently produce items meeting the requirements specified in this document or on the applicable contractual document (see 6.2d). The stretched sheet used to manufacture the parts shall be identified to the contracting activity.

3.3 Dimensions and tolerances.

3.3.1 Surface dimensions. Dimensions and tolerances of sheets or formed parts shall be as specified in the applicable drawings, specifications, or purchase orders (see 6.2c). When tolerances are not specified for sized flat sheets or formed parts being delivered directly to the Government the following shall apply:

A tolerance of ± 0.062 inch will be permitted for length and width when the maximum dimension is 40 inches or less.

A tolerance of ± 0.125 inch will be permitted for length and width when the maximum dimension is greater than 40 inches.

3.3.2 Thickness. The thickness of the sized flat sheet or formed part shall be as specified in the applicable contractual document. The actual thickness of sized flat sheet intended for direct delivery to the Government, at any point, shall be the nominal thickness ± 10 percent for thicknesses of 0.250 inch and above, and ± 0.020 inch for all thicknesses below 0.250 inch. The thickness tolerance for formed parts shall be as specified by the acquisition activity (see 6.2c).

3.4 Color. Unless otherwise specified by the acquisition activity, the material shall not contain any added pigments or dyes (See 6.2e).

3.5 Optical uniformity.

3.5.1 Minor optical defects. The total number of minor optical defects shall not be more than 1 per square foot. Minor defects include any imbedded particles, bubbles or scratches which reduce visibility through the plastic, and those localized imperfections which cause a variation in angular deviation of more than 5 minutes within a distance of not more than 20 inches on the screen when tested as specified in 4.6.3. It is not intended that the entire sheet be quantitatively surveyed for such variation in deviation but that localized imperfections which are suspected of being detrimental be evaluated by means of this test. Blemishes which do not individually reduce visibility through the plastic shall be disregarded (not subject to angular deviation) unless they are grouped in a pattern which appears to affect deviation. Minor defects within 2 inches from the nominal trimmed flat sheet shall be disregarded. Acceptance of minor defects adjacent to the trimmed edge of formed parts shall be as specified by the acquisition activity (see 6.2i).

3.5.2 Angular deviation. Unless otherwise specified by the acquisition activity, the material shall contain no major defect. Major defects shall be any variations in the material which cause angular deviations either side of the undeviated position in excess of the limits specified in table I. Angular deviation of formed parts shall be in accordance with the requirements stated on the applicable drawings.

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3.5.3 Optical distortion. Unless otherwise specified by the acquisition activity, the optical distortion limits (rate of change of angular deviation) in a sheet or formed part shall not exceed 14 minutes of arc over any 6 inch distance on the surface of the transparency.

3.5.4 Luminous transmittance and haze. The luminous transmittance and haze of colorless material before and after weathering shall be as specified in table II when tested in accordance with 4.6.4 and 4.6.11.3.

3.6 Long term water absorption. When tested as specified in 4.6.5, Class 2 materials shall not absorb more than 2.90 percent water.

TABLE I. Angular deviation requirement.

Sheet thickness	Limits of permissible deviation ^{1/}
0.060 inch through 0.220 inch	7 minutes at any location more than 2 inch from the edge of the sheet
Over 0.220 inch through 0.250 inch	7 minutes at any location more than 3 inches from the edge of the sheet and 9 minutes between 3 inches and 2 inches of the edge
Over 0.250 inch through 0.375 inch	7 minutes at any location more than 3 inches from the edge and 12 minutes between 3 inches and 2 inches of the edge
Over 0.375 inch through 0.675 inch	7 minutes at any location more than 3 inches from the edge and 14 minutes between 3 inches and 2 inches of the edge
Over 0.675 inch through 1.000 inch	12 minutes at any location more than 3 inches from the edge and 20 minutes between 3 inches and 2 inches of the edge
Over 1.000 inch	20 minutes at any location more than 3 inches from the edge and 25 minutes between 3 inches and 2 inches of the edge

^{1/} Major defects within 2 inches from the edge shall be disregarded.

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TABLE II. Luminous transmittance and haze.

Characteristic	Condition of specimen		Test paragraph
	as rec'd	after natural weathering	
Luminous transmittance percent min:			4.6.4
thickness, inch			
0.060 through 0.220	91	89	
over 0.220 through 0.250	90	88	
over 0.250 through 0.375	90	88	
over 0.375 through 0.675	89	87	
over 0.675 through 1.000	88	86	
over 1.000	88	85	
Haze, percent, max	3	4	4.6.4

3.7 Craze resistance. Stress to craze values when tested as specified in 4.6.10 shall be as follows:

	Isopropanol (TT-I-735)		Toluene/Isobutylacetate (TT-T-548/ASTM D1718)	
	Dry	Wet	Dry	Wet
Class 1, psi, min	3000	2000	2500	1750
Class 2, psi, min	3000	2500	2500	2000

3.8 Physical properties. Physical properties shall be as specified in Table III.

3.9 Resistance to natural weathering. After testing as specified in 4.6.11 the plastic material shall conform to the after weathering requirements for dimensional stability (Table III), luminous transmittance and haze (Table II) and crack propagation resistance (Table III).

3.10 Identification of product (see 6.2j).

3.10.1 Marking of individual sheets. Each stretched sheet shall be identified by using procedures and materials not detrimental to the physical strength or optical requirements of this plastic and that will ensure legibility during the life of the sheet under all environmental conditions. The location of the identification marking on the sheet shall be as specified by the acquisition activity. Unless otherwise specified, identification marking shall consist of the following:

ABC-XXXX-1234-05-6-7-25690B

where:

- ABC = Processor's initial
- XXXX = Processor's Cage No.
- 1234 = Processor's serial number under which complete records of the item are kept
- 05-6-7 = Month, day, and year of stretching
- 25690B = Specification number

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TABLE III. Physical properties.

Characteristic	Requirement		Test para
	Individual Value	Average Value	
Resistance to crack propagation, Pounds per inch ^{3/2} , min, K value			4.6.6
Received @ std conditions	2300	2700	
As received @ -17.8°C (0°F)	1150	1250	
After weathering @ std conditions	2100	2300	
Thermal relaxation, shrinkback @ 110°C (230°F), %, max	10.0		4.6.7
@ 145°C (293°F), %, min	37.5		
Tensile strength, psi, min		11000	4.6.8
Shear strength, psi, min		3000	4.6.9
Dimensional stability, after natural weathering, %, max.	0.2		4.6.11.2

3.10.2 Marking of fabricated assemblies. When no marking is specified, each fabricated assembly shall be permanently marked with the following information so as to be legible for the anticipated life of the part. The acquisition activity shall specify location and method of marking to ensure visibility after installation. The marking shall be not longer than 2 inches when 2 lines are used, and no longer than 4 inches when single or staggered lines are used. Such as:

40-9677-3	25690B	24674
05-92	XXXX	XXXXX

where:

- 40-9677-3 = The acquisition activity assembly number
- 25690B = Specification number
- 05-92 = Month and year of final fabrication assembly
- XXXX = The manufacturer's trade mark or initial
- 24674 = The manufacturer's serial number (example)
- XXXXX = The manufacturer's Cage No.

3.10.3 Marking letter size limitations. Unless otherwise specified (see 6.2j), maximum marking letter height shall be 0.125 inch. Spacing between lines of letters shall not be greater than 0.0625 inch, and the methods used for marking shall not cause distortion of the plastic surface beyond 0.125 inches from the edges of the markings.

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3.11 Instruction sheet for flat sheet material. For flat sheet material, the manufacturer shall submit two copies of a dated and coded instruction sheet to the activity responsible for qualification for approval. The approved instruction sheet shall be made available by the manufacturer to fabricators and authorized Government inspectors for use at contractor's plants. The instruction sheet shall contain specific information or references as to the limitations for the material and any precautions necessary in handling, storing, cutting, drilling, machining, forming, cementing, abrading, polishing, and cleaning. The description of all compounds, materials, and equipment mentioned therein shall be given in sufficient detail to permit nonproprietary procurement. Government specifications shall be used when available. Proprietary fabrication techniques shall not be included in the instruction sheets.

3.12 Workmanship. The workmanship shall be in accordance with high-grade commercial practice for high quality sheets and formed parts.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements (examinations and tests) as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by 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 ensure supplies and services conform to prescribed requirements.

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

4.2 Classification of inspections. The inspection requirements specified herein are classified as follows:

- a. Qualification inspection sheets (see 4.3).
- b. Qualification retention (see 4.3.4).
- c. First article inspection formed parts (see 4.3.5).
- d. Quality conformance inspection (see 4.4).

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4.3 Qualification. Qualification inspection shall be performed on flat sheets. Unless otherwise specified, specific formed part configurations manufactured from qualified sheets shall be examined as a first article (see 4.3.5). The qualification inspection shall consist of all the tests specified in table IV. To obtain qualification approval for all sheet thicknesses, the manufacturer shall submit samples of the following thicknesses: 0.080, 0.400, 0.700 and 1.000 inch. Qualification of two consecutive ranges will automatically extend qualification to any size within the two ranges. Individual thicknesses may also be tested and approved. The thickness range granted for individual qualifications shall be ± 0.100 inch.

TABLE IV. Qualification tests and inspections.

Characteristic	Requirement paragraph	Test paragraph
Dimensions	3.3	4.6.1
Color	3.4	4.6.1
Minor optical defects	3.5.1	4.6.1
Angular deviation	3.5.2	4.6.2
Optical distortion	3.5.3	4.6.3
Luminous transmittance and haze	3.5.4	4.6.4
Long term water absorption	3.6	4.6.5
Resistance to crack propagation	Table III	4.6.6
Thermal relaxation	Table III	4.6.7
Tensile strength	Table III	4.6.8
Shear strength	Table III	4.6.9
Craze resistance	3.7	4.6.10
Natural weathering	3.9	4.6.11
Dimensional stability	Table III	4.6.11.2
Identification of product	3.10	4.6.1
Instruction sheet	3.11	4.6.1
Workmanship	3.12	4.6.1

4.3.1 Qualification test sample. Manufacturers shall submit flat sheets. Manufacturers employing a one-step process (hot-stretching and part forming in one operation) shall submit sheets utilizing the same procedures employed in the part forming operation. The manufacturer shall submit one 36 by 36 inch flat stretched sheet for each thickness range (see 4.3) or individual thickness for which qualification is desired.

4.3.1.1 Qualification approval. Qualification approval of flat sheets shall be granted by class (see 1.2.1) for the identified MIL-P-8184 material. A change from one approved MIL-P-8184 material to another may be cause for requalification of the stretching process. It is the obligation of the manufacturer to inform the Qualifying activity when the MIL-P-8184 material has been changed. When requalification of a different MIL-P-8184 material is required, the manufacturer shall submit test data and test samples as directed by the Qualifying Activity.

4.3.1.2 Test specimen samples. A portion of the flat sheet sample (4.3.1) shall be used by the manufacturer to prepare sufficient test specimens to complete the tests specified for long term water absorption (4.6.5), resistance to crack propagation (4.6.6), thermal relaxation (4.6.7), tensile properties (4.6.8), shear strength (4.6.9) and craze resistance (4.6.10). Preparation of these specimens may require the sample to be machined and polished to specific thicknesses required by the applicable test.

4.3.2 Forwarding of qualification samples. The qualification samples (4.3.1.1 and 4.3.1.2) and the instruction sheet (3.11) shall be forwarded to the Commanding Officer, Naval Air Warfare Center Aircraft Division Warminster, Attention: ACSTD (Code 6061), Warminster, PA 18974-5000. The samples shall be segregated by thickness (machined samples shall be identified as to original thickness). The samples shall be plainly and durably marked with the following information:

Sample for qualification
PLASTIC, SHEETS AND FORMED PARTS, MODIFIED ACRYLIC BASE,
MONOLITHIC, CRACK PROPAGATION RESISTANT
Name of manufacturer
Plant address (where manufactured)
Submitted by (name) (date) for qualification testing in
accordance with the requirements of MIL-P-25690B under
(reference authorizing letter) (see 6.3).

4.3.3 Manufacturer's data. Two copies of the manufacturer's test report and instruction sheet shall be submitted with the samples of 4.3.1. The report shall contain numerical test data, where applicable, showing that the material submitted for the qualification inspection conforms to the requirements of this specification. In addition, manufacturer's substantiating data for materials (see 3.2) shall be requested at this time.

4.3.4 Retention of qualification. In order to retain qualification of the product approved for listing on the Qualified Products List (QPL), the manufacturer shall verify by certification to the qualifying activity that the manufacturer's 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 certification and shall be initiated by the Government. The Government reserves the right to re-examine

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the qualified product whenever deemed necessary to determine that the product continues to meet any or all of the specification requirements.

4.3.5 First article inspection (formed parts). Unless otherwise specified, first article inspection shall be performed on parts formed from sheets produced by the the stretching operation. The first part produced to a specific configuration against a contract or order shall be subjected to the tests specified in table V and table VI. When the acquisition activity has not specified test specimen locations, the selection of test specimen locations within the part shall be based upon the manufacturer's best knowledge of maximum stress and points of minimum toughness. At least two specimens, one with its long dimension oriented parallel to the longitudinal dimension of the part and one with its long dimension oriented normal to this shall be taken for each 2 square feet of area. Testing of formed parts for sampling may be made before trimming, application of edge attachments, and finishing operations. Approval of the first article of a specific configuration shall remain in effect for all subsequent contracts until a production formed part of the same configuration fails the quality conformance tests (see 4.4.2).

4.4 Quality conformance.

4.4.1 Sampling and inspection. Sampling and inspection points shall be identified as Inspection No. 1 thru 5 in figure 1. The data gathered shall be cumulative. A description of each quality conformance point follows.

4.4.1.1 Inspection No. 1. The starting sheet shall be approved MIL-P-8184 (class 1 or class 2) material.

4.4.1.2 Inspection No. 2. Every stretched sheet shall be examined for appearance, minor optical defects (3.5.1) and thickness. A sample shall be taken from the first, and then every fifth stretched sheet produced per stretching machine in operation. The sample shall be large enough to complete the tests in table VI, except for craze resistance. Craze resistance shall be determined once per week, with the sample being taken from the first weekly product sample of each stretching machine.

4.4.1.3 Inspection No. 3. Inspection No. 3 shall be conducted after the stretched sheet is cut to sized flat sheets for direct delivery to the Government, or cut into blanks for forming into parts. Blanks are not inspected until after the forming process. Every sized flat sheet shall be visually examined to table V.

4.4.1.4 Inspection No. 4. When the part being formed from a blank is a new configuration, is processed using a new fixture or is processed using new forming conditions, the first part shall be subjected to the first article inspection of 4.3.5. After successful completion of the first article process, every part produced shall be inspected to table V. Every seventh production part shall be inspected to table VI, except craze resistance (Craze resistance shall be performed as specified in 4.4.1.2). The part being inspected shall not be destroyed; however, test specimens may be obtained from edge trim, cut-cuts, or other trim areas of the part. When specimen preparation from the part is impractical, specimens shall be prepared from a flat formed (see 6.4.2) section (cut from the same sheet) which has been processed under the same conditions as the part.

4.4.1.5 Inspection No. 5. A quantity of shipping containers fully prepared for shipment, just prior to closure, shall be selected in accordance with MIL-STD-105 Inspection Level I and Acceptable Quality Level 2.5 percent defective. The lot size, for purposes of this inspection, shall be the total number of shipping containers. The sample unit shall be one shipping container. Inspection shall be in accordance with Table VII and section 5 of this specification.

TABLE V. Visual inspection for quality conformance.

Examine	Defect
Appearance	Any visible haze, imbedded dirt, foreign material Color - not free of dye or pigments
Workmanship	See 3.12
Optical uniformity	Defects such as striae, bubbles, blisters and other blemishes, except as described as minor defects (see 3.5.1)
Dimensions	Not as specified on applicable drawings or specifications Tolerances vary more than those herein or by the contract
Identification	Not in accordance with 3.10

TABLE VI. Physical and mechanical inspection. 1/

Characteristic	Paragraph	
	Requirement	Test
Angular deviation	3.5.2	4.6.2
Luminous transmittance as received only	3.5.4	4.6.4
Haze, as received only	3.5.4	4.6.4
Craze resistance 2/	3.7	4.6.10
Resistance to crack propagation, std conditions	Table III	4.6.6
Thermal relaxation	Table III	4.6.7

- 1/ Two specimens per characteristic, except as noted. Conditioning of specimens for quality conformance shall be not less than 48 hours.
 2/ Five specimens each, toluene/isobutyl acetate, wet, only.

4.4.2 Inspection criteria. Unless otherwise specified (see 6.2k), any sized sheet not in conformance with Table V requirements shall be discarded and not included in the lot offered to the Government. Failure of any specimen (sheet or formed part) to conform to any requirement specified in Table VI shall fail the sheet or part and will necessitate testing the sheet or part immediately before and after the failed item. Additionally, failure of a formed part requires first article testing (see 4.3.5) of the next part of the same configuration.

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TABLE VII. Quality conformance packaging inspection.

Examine	Defect
Packaging	Individual sheets or parts not packaged as specified.
Packing	Packing material not as specified. Not in accordance with contract requirements. Container not as specified, closure not accomplished by specified or required methods or materials Inadequate application of components, such as incomplete closures of case liners, container flaps, loose or inadequate strappings, bulged or distorted containers.
Instruction sheet	Missing or not as specified (see 3.11).
Count	Less than specified or indicated quantity.
Weight	Gross or net weight exceeds specified requirements.
Markings	Interior or exterior markings (as applicable) omitted, illegible, incorrect, incomplete, or not in accordance with contract requirements (see 5.3).

4.5 Test conditions.

4.5.1 Standard conditions. Standard conditions shall be $25^{\circ} \pm 5^{\circ}\text{C}$ ($77^{\circ} \pm 10^{\circ}\text{F}$) and a relative humidity of 50 ± 5 percent. Unless otherwise specified herein, all tests shall be conducted at standard conditions.

4.5.2 Specimen conditioning. Unless otherwise specified in the test method or procedure, all specimens undergoing qualification testing shall be conditioned a minimum of 96 hours at standard conditions. Quality conformance specimen conditioning shall be not less than 48 hours.

4.6 Test methods.

4.6.1 Examination of product. Each sheet or part shall be examined for minor optical defects, dimensional tolerances (where applicable), color (when specified), workmanship, and identification of product to determine conformance with the requirements of this specification.

4.6.2 Angular deviation. Angular deviation (angular displacement) shall be determined on stretched sheet specimens only, in accordance with ASTM D637. Each sheet shall be examined, then rotated 90° and re-examined for conformance to 3.5.2.

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4.6.3 Optical distortion. The optical distortion shall be determined by a method based upon the principle of observing a grid through the transparency and determining the rate of change of deviation by direct vision or measurement of a photograph. The detailed test procedure shall be subject to the approval of or be as specified by the qualifying activity. Conformance to 3.5.3 shall be noted.

4.6.4 Luminous transmittance and haze. The luminous transmittance and haze of each specimen shall be determined in accordance with ASTM D 1003, Procedure A. Testing shall be performed on specimens prior to flattening or other operations which may alter their surface or color, except for natural weathering specimens. Specimens which have undergone natural weathering shall be examined as specified in 4.6.11.3. All values shall be in conformance with 3.5.4.

4.6.5 Long term water absorption. Three 1 by 2 by 0.125 inch thick specimens shall be vacuum dried at $70^{\circ} \pm 1^{\circ}\text{C}$ ($158^{\circ} \pm 2^{\circ}\text{F}$) for 72 ± 1 hours. The dry weight (W_1) shall be determined to the nearest 0.001 gram followed by immediate immersion in water at $60^{\circ} \pm 1^{\circ}\text{C}$ ($140^{\circ} \pm 2^{\circ}\text{F}$) for a period of 25 days + 1, - 0 hours. The specimens shall be removed from the water, immediately surface dried using a soft cloth and reweighed (W_2). Long term absorption shall be determined as follows:

$$\% \text{ Long term absorption} = \frac{W_2 - W_1}{W_1} \times 100$$

4.6.6 Resistance to crack propagation.

4.6.6.1 Test specimens. Test specimens shall conform to figure 2. The specimen's width and thickness at the center shall be measured to the nearest 0.01 and 0.001 inch, respectively. Five specimens shall be cut from each sample. The direction from which these samples are taken from the sheet is arbitrary. Curved specimens shall be flattened as much as possible, using an appropriate heat and pressure process that preserves specimen thickness.

4.6.6.2 Procedure.

4.6.6.2.1 Crack initiation. Cracks shall be initiated on opposite sides of the centrally located hole in the specimen so as to be oriented in the width direction. The distance between the heads of the initial cracks shall be between 0.50 and 0.75 inch so that the crack-length at the point of instability will be between 25 and 50 percent of the specimen width. In initiating the cracks, the following procedure is recommended: A fine saw cut, approximately 0.030 inch deep is made with a jeweler's saw. The driving yoke and blade shown in figure 3 are employed in initiating the cracks. With the specimen held firmly in a vertical position with its length horizontal, the blade is inserted through the central hole and seated in the saw cut. The yoke straddles the specimen and engages the blade in the squared notches. A light hammer tapping of the yoke is used to initiate the crack. The specimen is then rotated 180 degrees and the crack initiating procedure repeated. Thicker specimens (0.700 and over) may require an alternate method of crack initiation. However, crack length dimensions shall be consistent regardless of the initiation method. After crack initiation, the specimens shall be conditioned a minimum of 96 hours at standard conditions (see 4.5.1).

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4.6.6.2.2 Gripping and loading. The specimen shall be gripped to approximately 1 inch from each end by Templin type grips of sufficient width. Care shall be taken to ensure uniform gripping and proper alignment of the specimen. The specimen shall be loaded at a constant rate that will cause failure in 3 to 5 minutes (a rate of 600 ± 100 pounds per minute should be suitable for most thicknesses). Low temperature testing shall be carried out at $-17.8^\circ \pm 1.1^\circ\text{C}$ ($0^\circ \pm 2^\circ\text{F}$) after not less than 1 hour conditioning at that temperature.

4.6.6.2.3 Crack length. The failing load, crack length at onset of fast fracture, and test temperature shall be recorded. The crack length at onset of fast fracture may be determined by closely following the progress of the crack front during slow fracture and examination of the failure cross section upon completion of test. The average crack length shall be reported to the nearest 0.01 inch. Figure 4 is a sketch (not to scale), after failure, of the cross section of the broken specimen taken at the centerline of the hole.

4.6.6.2.4 Toughness factor. Toughness factors, K, for specimens shall be computed from the following equation:

$$K = \frac{P}{t} \sqrt{\frac{\pi Z}{B}}$$

where:

- P = failure load in pounds
- t = thickness of the specimen in inches
- B = specimen width in inches
- $\pi = 3.14$

$$Z = \frac{Y (2+Y^4)}{(2-Y^2 - Y^4)^2}$$

$$Y = \frac{X}{B}$$

X = average crack length at onset of fast fracture. Table VIII contains Z values corresponding to varying Y values.

4.6.7 Thermal relaxation.

4.6.7.1 Test specimens. Three test specimens shall be prepared to the dimensions given on figure 5. Each specimen shall be scribed with a circle 2.0 ± 0.1 inches in diameter and perpendicular straight lines intersecting at the center of circle and intersecting its perimeter as shown on figure 4. The scribed lines shall not be greater than 0.004 inch in width. The scribed lines shall be oriented in the direction of maximum stretch and its normal. The scribed lines shall be designated A and B, respectively, for the purpose of recording. Diameters A and B shall be measured to the nearest 0.01 inch, using an appropriate optical measuring device. Each specimen shall be conditioned for not less than 48 hours at 70° to 82°C (160° to 180°F).

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TABLE VIII. Values of Z.

Example: When $Y = \frac{X}{B} = 0.146$; $Z = 0.0746$										
Y	0	1	2	3	4	5	6	7	8	9
0.070	0.0352	0.0357	0.0362	0.0367	0.0372	0.0377	0.0382	0.0387	0.0392	0.0398
.080	.0403	.0408	.0413	.0418	.0423	.0428	.0433	.0438	.0443	.0449
.090	.0454	.0459	.0464	.0469	.0474	.0479	.0485	.0490	.0495	.0500
.100	.0505	.0510	.0515	.0521	.0526	.0531	.0536	.0541	.0546	.0552
.110	.0557	.0562	.0567	.0572	.0578	.0583	.0588	.0593	.0598	.0604
.120	.0609	.0614	.0619	.0625	.0630	.0635	.0640	.0646	.0651	.0656
.130	.0661	.0667	.0672	.0677	.0683	.0688	.0693	.0698	.0704	.0709
.140	.0714	.0720	.0725	.0730	.0736	.0741	.0746	.0752	.0757	.0762
.150	.0768	.0773	.0778	.0784	.0789	.0795	.0800	.0805	.0811	.0816
.160	.0822	.0827	.0833	.0838	.0843	.0849	.0854	.0860	.0865	.0871
.170	.0876	.0882	.0887	.0893	.0898	.0904	.0909	.0915	.0920	.0926
.180	.0931	.0937	.0942	.0948	.0953	.0959	.0965	.0970	.0976	.0982
.190	.0987	.0993	.0998	.1004	.1010	.1015	.1021	.1027	.1032	.1038
.200	.1044	.1049	.1055	.1061	.1067	.1072	.1078	.1084	.1090	.1095
.210	.1101	.1107	.1113	.1119	.1124	.1130	.1136	.1142	.1148	.1154
.220	.1159	.1165	.1171	.1177	.1183	.1189	.1195	.1201	.1207	.1213
.230	.1219	.1225	.1231	.1237	.1243	.1249	.1255	.1261	.1267	.1273
.240	.1279	.1285	.1291	.1297	.1303	.1309	.1315	.1321	.1328	.1334
.250	.1340	.1346	.1352	.1359	.1365	.1371	.1377	.1384	.1390	.1396
.260	.1402	.1409	.1415	.1421	.1428	.1434	.1440	.1447	.1453	.1460
.270	.1466	.1472	.1479	.1485	.1492	.1498	.1505	.1511	.1518	.1524
.280	.1531	.1538	.1544	.1551	.1557	.1564	.1571	.1577	.1584	.1591
.290	.1597	.1604	.1611	.1617	.1623	.1630	.1637	.1644	.1651	.1658
.300	.1665	.1672	.1679	.1686	.1693	.1700	.1707	.1714	.1721	.1728
.310	.1735	.1742	.1749	.1756	.1763	.1771	.1778	.1785	.1792	.1799
.320	.1807	.1814	.1821	.1828	.1836	.1843	.1850	.1858	.1865	.1873
.330	.1880	.1887	.1895	.1902	.1910	.1917	.1925	.1933	.1940	.1948
.340	.1955	.1963	.1971	.1979	.1986	.1994	.2002	.2010	.2017	.2025
.350	.2033	.2041	.2049	.2057	.2065	.2073	.2081	.2089	.2097	.2105
.360	.2113	.2121	.2129	.2138	.2146	.2154	.2162	.2171	.2179	.2187
.370	.2196	.2204	.2213	.2221	.2230	.2238	.2247	.2255	.2264	.2273
.380	.2281	.2290	.2299	.2307	.2316	.2325	.2334	.2343	.2352	.2361
.390	.2370	.2379	.2388	.2397	.2406	.2415	.2424	.2433	.2443	.2452

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4.6.7.2 Procedure. After conditioning, each specimen shall be consecutively subjected to the following conditions in an air-circulating oven. Care should be taken to avoid warpage and hot spots:

- a. 24 hours at $110.0^{\circ} \pm 1.1^{\circ}\text{C}$ ($230^{\circ} \pm 2^{\circ}\text{F}$)
- b. 24 hours at $145.0^{\circ} \pm 2.2^{\circ}\text{C}$ ($293^{\circ} \pm 4^{\circ}\text{F}$)

After each 24-hour exposure, the specimens shall be cooled to room temperature for at least 3 hours and A and B (see figure 5) measured to the nearest 0.01 inch. The specimen shall then be reheated at the next higher temperature. Total dimensional change after each temperature shall be calculated as follows:

$$\text{Percent Dimensional change} = \frac{\text{initial length} - \text{final length}}{\text{initial length}} \times 100$$

4.6.8 Tensile strength. Five specimens from each flat sheet shall be tested in accordance with ASTM D638 using a speed of 0.05 inch per minute. All values shall be reported, along with the average value.

4.6.9 Shear strength parallel to surface. Five specimens from each flat sheet shall be tested. Specimens shall be prepared as shown on figure 6. Surfaces A and B shall be loaded by means of a compression shear fixture having self-aligning loading faces. A cross-head rate of 0.020 inch per minute shall be used. The average shear strength for each sheet tested shall be reported. All values shall be recorded.

4.6.10 Crazing.

4.6.10.1 Specimen conditioning. Twenty specimens 1 inch wide by thickness from 0.250 up to and including 0.500 inch with a length equivalent to that specified on figure 7, shall be conditioned for 4 hours at 70° to 80°C (160° to 180°F). Thicknesses greater than 0.500 inch shall be machined to 0.5 inch. Immediately following the conditioning procedure, ten specimens (these are dry specimens) shall be conditioned 48 hours at standard conditions (see 4.5.1). The remaining ten specimens shall be cooled in air for 1 hour, immersed in water at $49^{\circ} \pm 1^{\circ}\text{C}$ ($120^{\circ} \pm 2^{\circ}\text{F}$) for 24 hours, followed by immersion in water maintained at $23^{\circ} \pm 1^{\circ}\text{C}$ ($73^{\circ} \pm 2^{\circ}\text{F}$) for 2 to 3 hours (These are wet specimens). Throughout all immersion times, the specimens shall not be in contact with one another. Water immersed (wet) specimens shall be tested within 15 minutes of removal from water. Other (dry) specimens shall be tested as soon as possible after completion of the conditioning period. The test fluids shall be applied against the unmachined side of the specimen.

4.6.10.2 Procedure. Each specimen shall be measured, taped with a 0.125 inch wide black matte tape (Chartpak or equivalent), (see figure 7), then set up as a cantilever beam under the load derived from the equation on figure 7. The specimens shall be placed under the load for 10 minutes before adding the fluids. Ten specimens (5 wet and 5 dry) shall be tested with isopropyl alcohol (TT-I-735) and ten specimens (5 wet and 5 dry) tested with a 1 to 2 by weight mixture of toluene (TT-T-548) to isobutyl acetate (ASTM D1718). The fluids shall be applied to a filter paper, which in turn is applied in the manner shown on figure 7. The filter paper shall remain wet during the entire exposure period by adding more test fluid with an eyedropper, when necessary.

As crazing progresses toward the load, move the filter paper or wrap down the specimen. Exposure time to each fluid shall be 30 +1, -0 minutes. At this time, mark the distance from the last craze point to the load point using a combination square, modified with a plumb line and leveling bob. Stress to craze values shall be calculated as follows:

$$\text{Stress to craze, psi} = \frac{6 LW}{wt^2}$$

Where

L = Length from last craze to load point

W = Applied load in pounds

w = specimen width

t = specimen thickness

4.6.11 Natural weathering.

4.6.11.1 Procedure. Two flat sections, each, 1 foot square in area, shall be marked as specified in 4.6.11.2, then exposed to outdoor weathering in southern Florida for a period of 6 months. Each panel shall be exposed in an unrestrained condition, supported only by the edges and not backed. They shall be mounted at a 45-degree angle to the horizontal and faced south.

4.6.11.2 Dimensional stability. Prior to exposure to natural weathering, two distances, perpendicular to one another and not less than 10 inches long, shall be scribed on each panel within 1 inch of adjacent edges. Before and after exposure, the distances shall be measured to the nearest 0.01 inch and employed in calculating the percentage dimensional change, using the equation specified in 4.6.7.2.

4.6.11.3 Luminous transmittance and haze. Weathered panels shall be immersed in distilled water and the loose surface dirt carefully removed. The surface moisture shall then be removed. Luminous transmittance and haze shall be determined as specified in 4.6.4. Determinations shall be made at four points on the surface of the specimen which are free from scratches and similar defects obviously resulting from transporting and handling. When testing curved panels, the light path of the instrument shall be normal to the surface at all times.

4.6.11.4 Resistance to crack propagation. At least six specimens from each weathered panel shall be prepared as shown on figure 2 and tested as specified in 4.6.6. One-half of the specimens shall be cut so as to have their longitudinal axes parallel. The other one-half of the specimens shall be oriented perpendicular to the first half. The average value for each weathered sheet shall be reported. All values shall be recorded.

5. PACKAGING

5.1 Preservation. Preservation shall consist of a protective covering on both sides of the plastic sheet. Parts shall be preserved in accordance with MIL-P-116 and protectively covered. The protective covering shall be an adhered paper or film that can be readily removed without injury or damage to the plastic surface. The covering shall protect the surfaces from scratches or damage during shipment.

5.2 Packing. Packing shall be level A, B or Commercial, as specified (see 6.2.f). Containers shall be maintain the plastic sheet or part in its original condition. All internal loads shall be supported to avoid damage to surfaces by cleats. An instruction sheet shall be included in each individual exterior container (see 3.11). All plastic sheets shall be packed as far as practicable by size and thickness.

5.2.1 Level A.

5.2.1.1 Sheets. Plastic sheets, packaged in accordance with 5.1, shall be packed for shipment in overseas type containers conforming to PPP-B-585 (class 3), PPP-B-591, PPP-B-601 or PPP-B-621 (class 2, style 2). Plywood shall be in accordance with type A of A-A-55057. Plywood shall be treated in accordance with TT-W-572. Containers conforming to PPP-B-591 or PPP-B-601 shall be modified to the extent that solid wood ends and sides, in lieu of the cleated type, shall be used. Wirebound boxes conforming to PPP-B-585 shall be provided with fiberboard liners having a minimum Mullen test of not less than 275 pounds. All cleats shall be flush and containers shall be designed in a manner which will ensure even weight distribution over the entire bearing surface when the sheets are stored. Containers shall be closed and strapped in accordance with the applicable container specification and appendix thereto. Containers conforming to PPP-B-585, PPP-B-591 or PPP-B-621 shall be provided with a case liner fabricated and sealed in accordance with MIL-L-10547. The gross weight of the shipping container, when packed for shipment, shall not exceed approximately 200 pounds, except when the weight of a single packed sheet exceeds this limitation.

5.2.1.2 Parts. Unless otherwise specified by the acquisition activity, plastic parts of one size, shape, and design, preserved and packaged as specified in 5.1, shall be packed in V-board containers conforming to type I or II, class 2, grade 3, V3, of PPP-B-636 or containers of equivalent protective value. Tape conforming to PPP-T-97 may be used in lieu of round or flat steel bandings for fiberboard containers.

5.2.2 Level B.

5.2.2.1 Sheets. Plastic sheets, packaged as specified in 5.1, shall be packed for shipment in domestic type containers conforming to PPP-B-585, PPP-B-591, PPP-B-601 or PPP-B-621 (class 1, style 2). Containers conforming to PPP-B-591 or PPP-B-601 shall be modified to the extent that solid wood ends and sides in lieu of cleated type shall be used. Wirebound boxes conforming to PPP-B-585 shall be provided with fiberboard liners having a minimum Mullen test of not less than 275 pounds. All cleats shall be flush and containers shall be designed in a manner which will ensure even weight distribution over the entire bearing surface when the sheets are stored. Containers shall be closed and strapped in accordance with the applicable container specification

and appendix thereto. The gross weight of the shipping container, when packed for shipment, shall not exceed 200 pounds, except when the weight of a single packed sheet exceeds this limitation.

5.2.2.2 Parts. Unless otherwise specified by the acquisition activity, plastic parts of one size, shape, and design, preserved and packaged as specified in 5.1, shall be packed in domestic type shipping containers conforming to PPP-B-636. Unless otherwise specified by the procuring activity, the quantity per container shall be limited by the gross weight of the parts and container. The gross weight shall not exceed 70 pounds, unless the weight of an individual part exceeds this limitation. Unless otherwise directed by the acquisition activity, the quantity of like parts, per container, shall remain the same as in any one contract. Container closure and strapping shall be in accordance with the appendix of PPP-B-636.

5.2.3 Commercial. Packages which require over-packing for acceptance by the carrier shall be packed in exterior type shipping containers in a manner that will ensure safe transportation at the lowest rate to the point of delivery. Containers shall meet Uniform Classification Rules or regulations of other common carriers as applicable to the mode of transportation.

5.3 Marking of shipments. Marking of interior protective coverings and exterior shipping containers shall be in accordance with MIL-STD-129 and shall contain the following information:

5.3.1 Interior packages.

5.3.1.1 Sheets. The markings on the protective covering of each plastic sheet shall include the information required in 3.10.1 and the Federal Stock Number of the sheet.

5.3.1.2 Fabricated parts. The markings on the protective covering of each fabricated part shall include the information in 3.10.2 and, if applicable, the Federal Stock Number and drawing number of the part.

5.3.2 Exterior shipping containers. Exterior shipping containers shall include the following information:

PLASTIC, SHEETS AND PARTS, MODIFIED
ACRYLIC BASE, CRACK PROPAGATION RESISTANT
MIL-P-25690B
DO NOT STACK

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. The material covered by this specification is intended for use primarily in aircraft glazing applications where superior crack propagation resistance (shatter resistance, craze resistance, fatigue resistance) is required in addition to normal optical, mechanical strength, and heat resistance properties. It is the intent of this specification to ensure, by flat stretching the material, that adequate crack propagation resistance has been introduced into the material and that it has been retained to a satisfactory degree throughout the process.

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6.1.1 Special information.

6.1.1.1 Additional requirements. Agencies purchasing sheets or panels of the material for specific purposes may specify additional requirements or provide for those contained herein to be more rigid, or both, as required. If material conforming to this specification is used in applications requiring specialized optical properties, more rigid optical requirements may be specified in the detailed product specification/drawing. In that event, the more rigid requirements of the detailed specification must take precedence.

6.1.1.2 Part drawings. Reference to this specification may be made on drawings or in product specifications in order to indicate that the part in question should be prepared in such manner and from such "as-cast" materials as to possess in its final form the properties required by this specification.

6.1.1.3 Variation of physical properties with temperature. Many physical properties of this material vary with temperature/humidity. This fact should be considered by designers, engineers, draftsmen, and prospective users of the material.

6.2 Acquisition requirements. Acquisition documents must specify the following:

- a. Title, number, and date of this specification.
- b. Quantity.
- c. Dimensions, tolerances, thickness for sized flat sheets (see 3.3).
- d. Product specification/drawing for formed parts (see 3.2.2).
- e. Color, when required (Include optical properties)(see 3.4).
- f. Levels of packing (see Section 5).
- g. No. of sheets or formed parts per container (see 5.2).
- h. Issue of DODISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.1.1 and 2.2).
- i. Optical uniformity requirements, when other than in 3.5.1, 3.5.2 or 3.5.3.
- j. Permanent markings, if other than 3.10.
- k. Inspection criteria, if other than 4.4.2.

6.3 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time set for award of contract, qualified for inclusion in Qualified Products List QPL No. 25690 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

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may be eligible to be awarded contracts or purchase orders for products covered by this specification. The activity responsible for the Qualified Products List is the Commander, Naval Air Systems Command, Attention: AIR-5304, Washington, DC 20361-5110; however, information pertaining to qualification of products and letter of authorization for submittal of sample may be obtained from the Commanding Officer, Naval Air Warfare Center Aircraft Division Warminster, ACSTD (Code 6061), Warminster, PA 18974-5000.

6.3.1 Qualification approval. Qualification approval of a supplier's flat sheets under this specification will qualify him to prepare production parts having configurations other than those tested during qualification, provided that the supplier certifies that the heat treatment (temperature and time at temperature) used in forming production specimens is within the specified time and temperature limitation used in the preparation of the qualification specimens. The first part formed under a contract or order may be subject to the first article requirements of 4.3.5.

6.4 Definition.

6.4.1 Flat formed section. Flat formed section shall be defined as a portion of the sheet used to form the part that is subjected to the identical heat and as close to the pressure cycles as possible, used to produce the part while preserving the original sheet thickness as much as possible.

6.4.2 Stretching. In this specification the term "stretched material" refers to material that has been subjected to a processing technique having the following general steps: The "as-cast" sheet is brought to a rubbery state by properly heating the sheet to a higher temperature than its forming temperature. The sheet is then mechanically stretched or compressed, i.e., elongated parallel to its surfaces so as to increase its area approximately 3 to 4 times with a resultant decrease in its thickness. The sheet is then cooled to a rigid condition essentially "freezing in" the elongation and accompanying molecular orientation in the sheet. Stretching is, therefore, not to be considered synonymous with forming.

6.5 Consideration of data requirements. The following data requirements should be considered when this specification is applied on a contract. The applicable Data Item Descriptions (DID's) should be reviewed in conjunction with the specific acquisition to ensure that only essential data are requested/provided and that the DID's are tailored to reflect the requirements of the specific acquisition. To ensure correct contractual application of the data requirements, a Contract Data Requirements List (DD Form 1423) must be prepared to obtain the data, except where DOD FAR Supplement 27.475-1 exempts the requirement for a DD Form 1423.

<u>Reference Paragraph</u>	<u>DID Number</u>	<u>DID Title</u>	<u>Suggested Tailoring</u>
4.3.5	DI-NDTI-80809A	Test/Inspection Report	

The above DID's were those cleared as of the date of this specification. The current issue of DOD 5010.12-L, Acquisition Management Systems and Data requirements Control List (AMSDL), must be researched to ensure that only current, cleared DID's are cited on the DD Form 1423.

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6.6 Conversion factors. Conversion factors needed for this specification are as follows:

Inch-pound units	multiply by	to get	Metric units
Inches	2.54		centimeters
Sq inches	6.45		Sq centimeters
Pounds force	4.45		Newtons
PSI	0.0069		Mpa

6.7 Subject term (key word) listing.

- Aircraft glazing
- First article
- Flat sheets
- Formed parts
- Methyl Methacrylate
- Qualification
- Stretch process

6.8 Changes from previous issue. Asterisks were not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

Custodians:
 Army - ME
 Navy - AS
 Air Force - 11

Preparing Activity
 Navy - AS
 (Project No. 9330-1191)

Review activity:
 Army - AV
 DLA - GS

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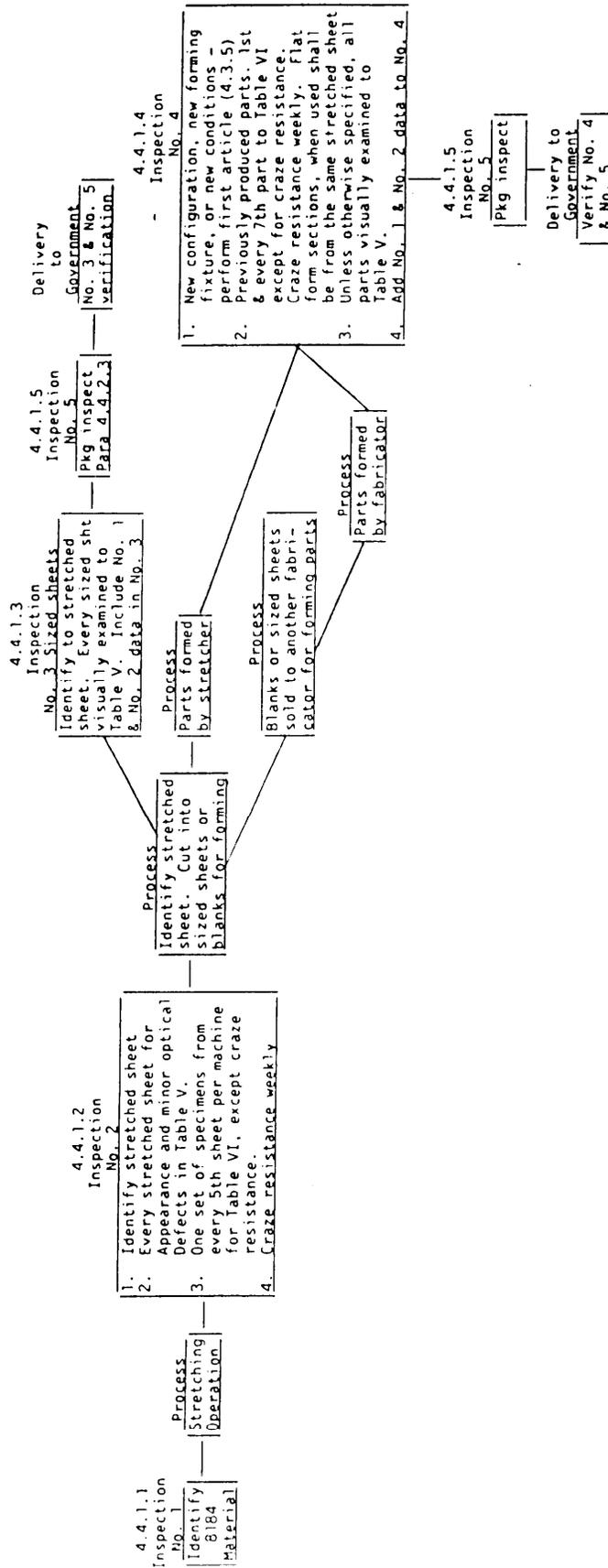
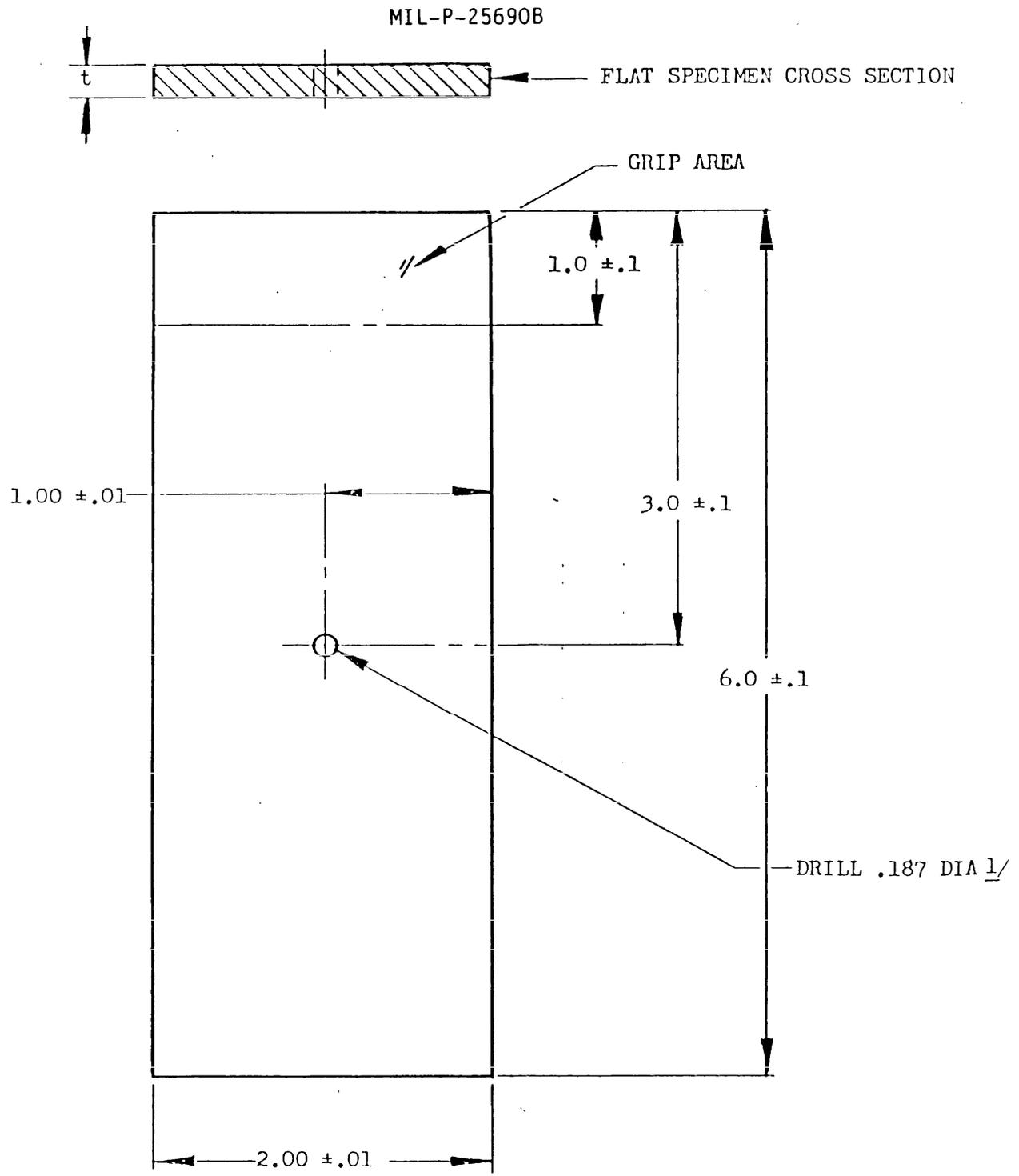


Figure 1. Quality conformance plan.



DIMENSIONS IN INCHES.

1/ For thicknesses over 0.700 inch, a 0.250 to 0.310 inch diameter may be used.

FIGURE 2. Toughness specimen

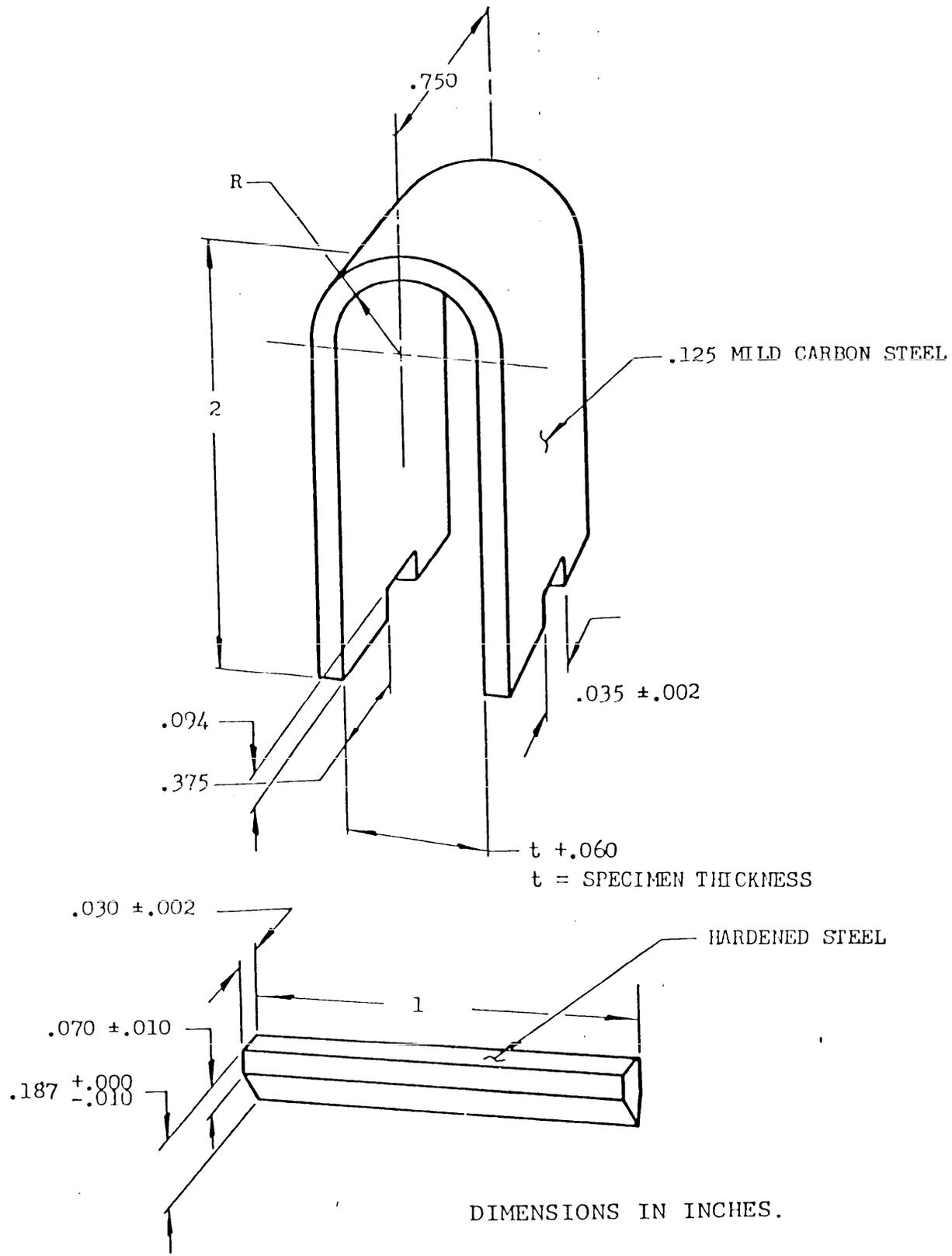


FIGURE 3. Driving wedge and blade for initiating cracks in toughness specimens

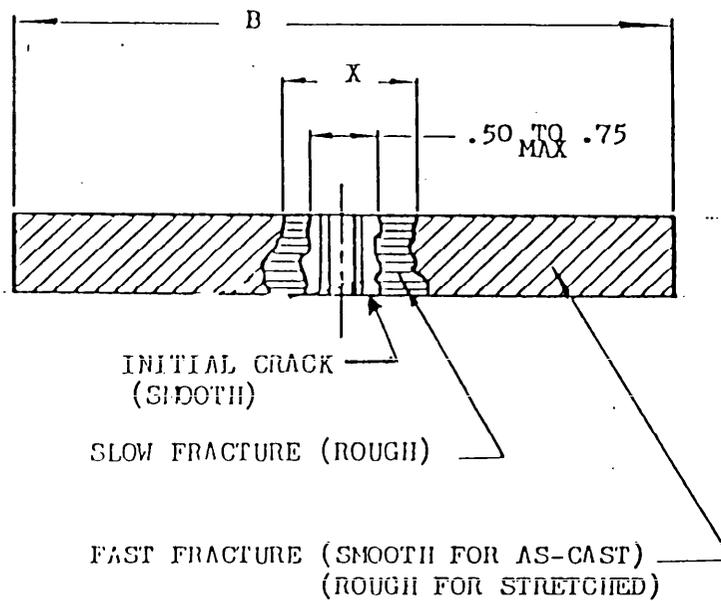
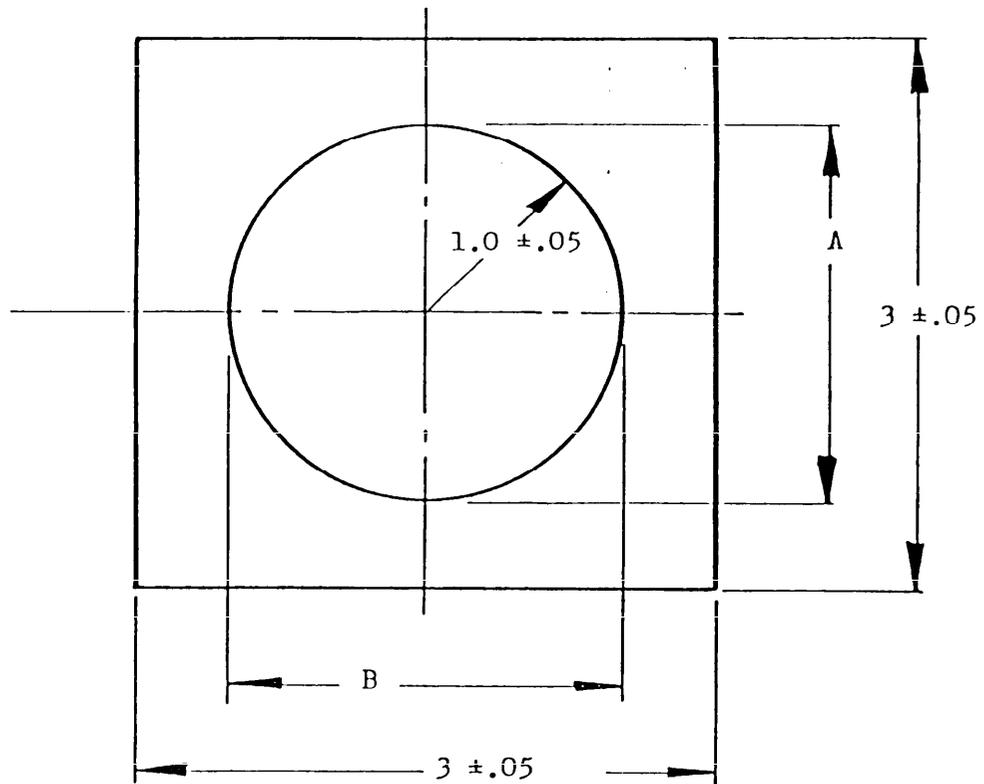
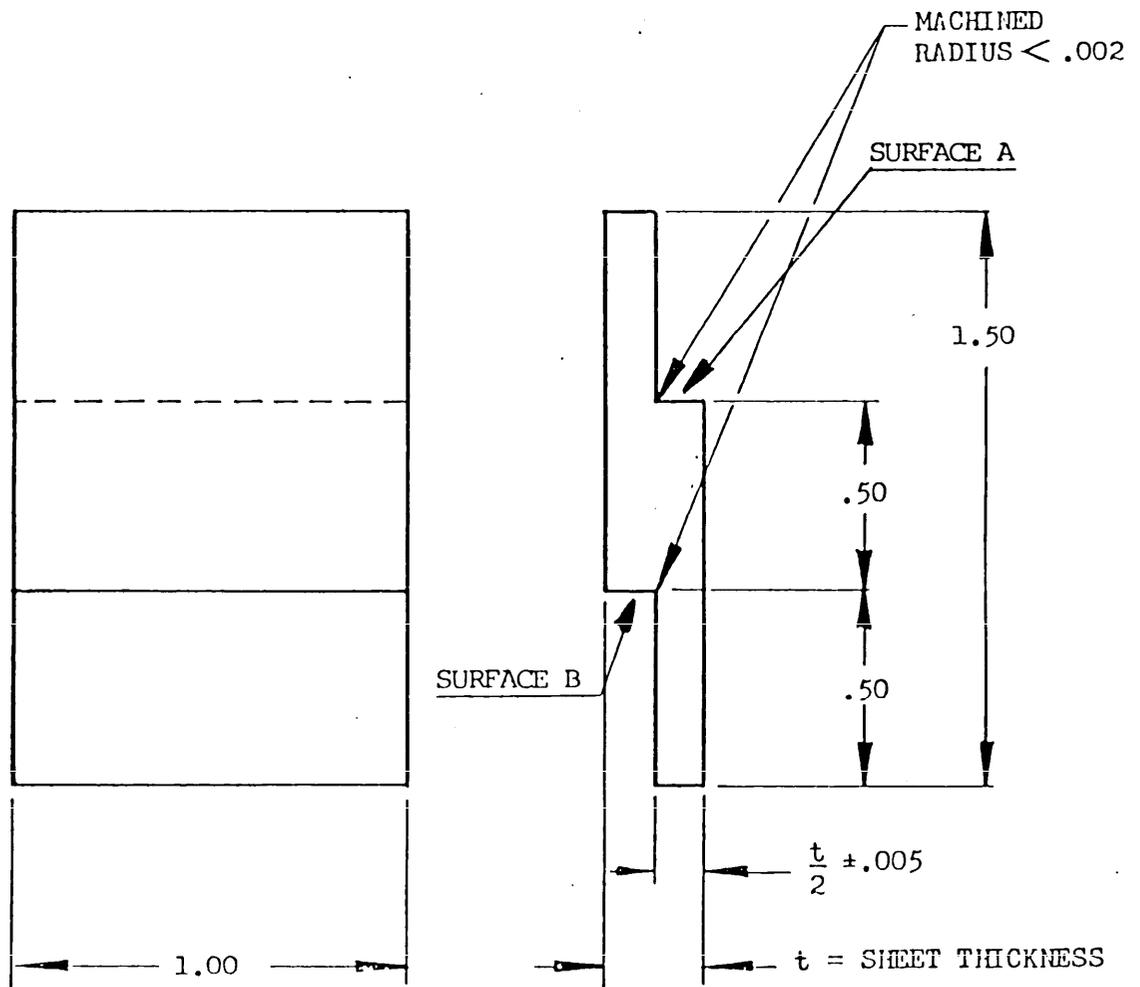


FIGURE 4. Cross section, after failure, of broken specimen taken at the centerline of the hole



DIMENSIONS IN INCHES.

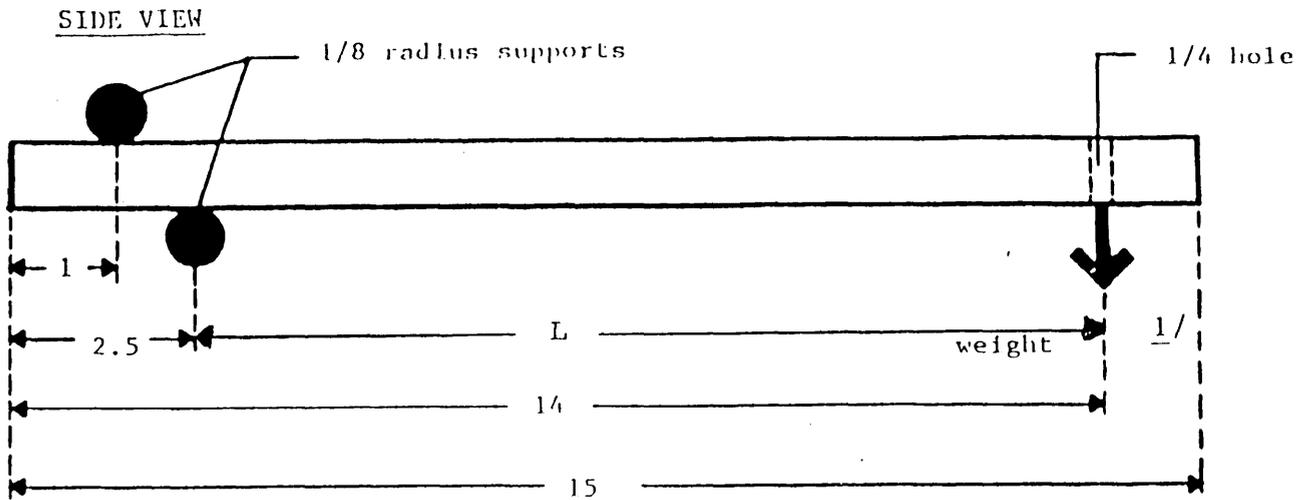
FIGURE 5. Thermal relaxation specimen



DIMENSIONS IN INCHES. TOLERANCE = $\pm .01$

FIGURE 6. Shear strength specimen

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1/ Applied weight as follows:

$$W = \frac{w t^2 \sigma}{6 L}$$

Where:

- W = applied weight (pounds)
- w = specimen width (1 inch)
- t = specimen thickness (inch)
- σ = outer fiber stress (4000 psi)

L = distance from fulcrum to load point
 (11.5 inch)

Dimensions w and t are measured to the nearest 0.001 inch.

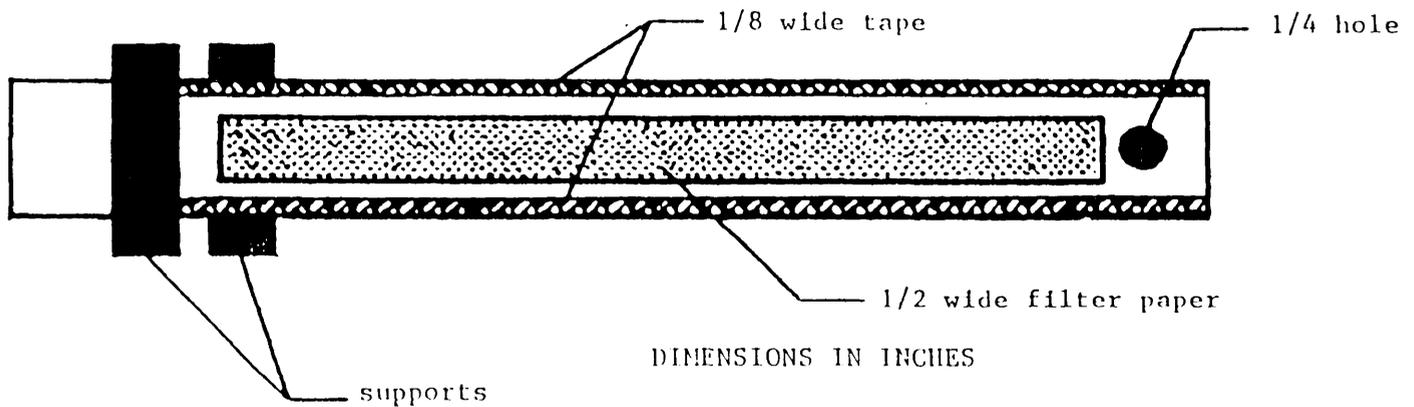


FIGURE 7. Crazing apparatus configuration

Commanding Officer
Naval Air Warfare Center Aircraft Division Lakehurst
Systems Requirements Department (Code SR3)
Lakehurst, NJ 08733-5100

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.
2. The submitter of this form must complete blocks 4, 5, 6, and 7.
3. The preparing activity must provide a reply within 30 days from receipt of the form.

NOTE: This form may not be used to request copies of documents, nor to request waivers, or clarification of requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

I RECOMMEND A CHANGE:		1. DOCUMENT NUMBER MIL-P-25690B	2. DOCUMENT DATE (YYMMDD) 93/01/29
3. DOCUMENT TITLE PLASTIC, SHEETS AND FORMED PARTS, MODIFIED ACRYLIC BASE, MONOLITHIC, CRACK PROPAGATION RESISTANT			
4. NATURE OF CHANGE (Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)			
5. REASON FOR RECOMMENDATION			
6. SUBMITTER			
a. NAME (Last, First, Middle Initial)		b. ORGANIZATION	
c. ADDRESS (Include Zip Code)		d. TELEPHONE (Include Area Code) (1) Commercial (2) AUTOVON (if applicable)	7. DATE SUBMITTED (YYMMDD)
8. PREPARING ACTIVITY			
a. NAME COMMANDING OFFICER, NAVAL AIR WARFARE CENTER AIRCRAFT DIVISION LAKEHURST SYSTEMS REQUIREMENTS DEPARTMENT		b. TELEPHONE (Include Area Code) (1) Commercial (908) 323-7488	(2) AUTOVON 624-7488
c. ADDRESS (Include Zip Code) CODE SR3 LAKEHURST, NJ 08733-5100		IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT: Defense Quality and Standardization Office 5203 Leesburg Pike, Suite 1403, Falls Church, VA 22041-3466 Telephone (703) 756-2340 AUTOVON 289-2340	