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MILITARY SPECIFICATION

PLASTIC SHEET, ACRYLIC, HEAT 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 transparent, heat-resistant cast acrylic sheet plastic materials.

1.2 Classification. Acrylic sheet shall be of the following finishes, as specified (see 6.2):

Finish A - Full finish transparent
Finish B - Rib stock

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.

SPECIFICATIONS

Federal

NN-P-530	Plywood, Flat Panel
TT-W-572	Wood Preservative; Water-Repellent

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

FSC 9330

SPECIFICATIONS

Federal (cont'd)

PPP-B-585	Boxes, Wood, Wirebound
PPP-B-591	Boxes, Fiberboard, Wood-Cleated
PPP-B-601	Boxes, Wood, Cleated-Plywood
PPP-B-621	Boxes, Wood, Nailed and Lock-Corner
PPP-B-636	Box, Fiberboard
PPP-B-640	Boxes, Fiberboard, Corrugated, Triple-Wall

STANDARDS

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 procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

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

American Society for Testing and Materials (ASTM)

ASTM D 542	-	Index of Refraction of Transparent Organic Plastics
ASTM D 570	-	Water Absorption of Plastics
ASTM D 635	-	Rate of Burning and/or Extent of Time of Burning of Self-Supporting Plastics in a Horizontal Position
ASTM D 637	-	Surface Irregularities of Flat Transparent Plastic Sheets
ASTM D 638	-	Tensile Properties of Plastics
ASTM D 648	-	Deflection Temperature of Plastics Under Flexural Load

ASTM D 696	-	Coefficient of Linear Thermal Expansion of Plastics
ASTM D 792	-	Specific Gravity and Density of Plastics by Displacement
ASTM D 1003	-	Haze and Luminous Transmittance of Transparent Plastics
ASTM D 1501	-	Exposure of Plastics to Fluorescent Sunlamp

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

Uniform Classification Committee, Agent

Uniform Freight Classification

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

3. REQUIREMENTS

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

3.2 Materials. The plastic sheet shall be an acrylic type. The manufacturer is given a wide range in the selection of materials and manufacturing processes provided the furnished product is a transparent acrylic conforming to all the requirements of this specification and is suitable for the intended use (6.1).

3.2.1 Color. Unless otherwise specified by the procuring activity the material shall be colorless.

3.3 Dimensions. Dimensions of sheets shall be as specified by applicable drawings or specifications. Unless otherwise specified on the contract or order, a tolerance of ±0.063 inch (1.6 mm) will be allowed on length and width dimensions at 23±1°C (73.5±2°F).

3.4 Thickness. The actual thickness of the sheet at any point shall be within the tolerance specified in Table I. Thickness variations of sheets not included in table I shall not exceed the tolerances for the next greater thickness listed in table I.

3.5 Specific gravity. The specific gravity of the conditioned material shall be 1.19±0.01 when determined as specified in 4.6.1.

3.6 Water absorption. When determined in accordance with 4.6.1, the water absorption of the conditioned material shall not exceed the values given in table I.

3.7 Rate of burning. When tested as specified in 4.6.1, the rate of burning for a 0.500 inch (12.7 mm) width of material shall not exceed the values given in table I.

3.8 Thermal expansion. The coefficent of thermal expansion shall not exceed 0.00010 per degree centigrade (0.000055 per degree Fahrenheit) when tested in accordance with 4.6.2.

3.9 Formability. Formability shall be determined as specified in 4.6.3.

3.9.1 Materials 0.500 inch (12.7 mm) and less in thickness. After heating in accordance with the manufacturer's suggested procedures, the material shall be suitable for forming into hemispheric shapes with the outside diameter of 10 inches (25.4 cm) and a draw of at least 4.5 inches (11.5 cm).

3.9.2 Materials over 0.500 inch (12.7 mm) in thickness. When heated in accordance with the instructions furnished by the manufacturer, the sheets shall be suitable for bending into cylindrical forms of the radius given in table I without the appearance of crazing or other surface irregularities after accelerated weathering.

3.10 Internal strain. The dimensional change after testing in 4.6.4 shall not exceed 1 percent. Large values of dimensional change indicate the relief of high internal stress.

3.11 Workability. When processed according to the manufacturer's instructions, the material shall not fail mechanically nor develop surface or internal defects.

3.12 Flexural deformation temperature. The flexural deformation temperature of the material shall be within the range of 85° to 115°C (185° to 239°F) for material 0.500 inch (12.7 mm) and under, and shall be within the range of 90° to 117°C (194° to 242°F) for material over 0.500 inch (12.7 mm) in thickness.

3.13 Mechanical properties

3.13.1 Tensile strength. The tensile strength of materials as received and after natural weathering, shall be not less than 8,000 psi (55.2 MPa) when tested in accordance with 4.6.6.1. (See 4.6.6 for specimen preparation.)

TABLE I - Thickness, Tolerances and Requirements varying with thickness

Thickness tolerances for lengths and widths				Water absorption	Formability radius (heated)	Warpage after accelerated weathering	Rate of burning
Nominal thickness	See 1/	See 2/	See 3/				
Inch (mm)	Inch (mm)	Inch (mm)	Inch (mm)	Percent (max)	Inches (cm)	Inch (mm) (max)	Inches (cm) per min (max)
0.060 (1.52)	±0.012 (0.30)	--	--	1.00	--	0.030 (0.76)	2.5 (6.35)
0.080 (2.03)	±0.012 (0.30)	±0.020 (0.51)	--	0.80	--	0.020 (0.51)	2.25 (5.72)
0.100 (2.54)	±0.012 (0.30)	±0.020 (0.51)	--	0.70	--	0.020 (0.51)	2.00 (5.08)
0.125 (3.18)	±0.015 (0.38)	±0.020 (0.51)	±0.030 (0.76)	0.65	--	0.015 (0.38)	1.80 (4.57)
0.150 (3.81)	±0.017 (0.43)	±0.020 (0.51)	±0.030 (0.76)	0.60	--	0.015 (0.38)	1.70 (4.32)
0.187 (4.75)	±0.020 (0.51)	±0.023 (0.58)	±0.030 (0.76)	0.50	--	0.015 (0.38)	1.60 (4.06)
0.220 (5.59)	±0.023 (0.58)	±0.025 (0.63)	±0.030 (0.76)	0.45	--	0.015 (0.38)	1.50 (3.81)
0.250 (6.35)	±0.025 (0.63)	±0.030 (0.76)	±0.035 (0.89)	0.40	--	0.015 (0.38)	1.50 (3.81)
0.312 (7.92)	±0.030 (0.76)	±0.035 (0.89)	±0.040 (1.02)	0.36	--	0.015 (0.38)	1.50 (3.81)
0.375 (9.53)	±0.035 (0.89)	±0.040 (1.02)	±0.045 (1.14)	0.30	--	0.015 (0.38)	1.50 (3.81)
0.417 (10.6)	±0.040 (1.02)	±0.045 (1.14)	±0.045 (1.14)	0.28	--	0.015 (0.38)	1.50 (3.81)
0.500 (12.7)	±0.040 (1.02)	±0.045 (1.14)	±0.050 (1.27)	0.25	--	0.015 (0.38)	1.50 (3.81)
0.625 (15.9)	±0.050 (1.27)	±0.050 (1.27)	±0.060 (1.52)	0.25	16.0 (40.6)	0.015 (0.38)	1.50 (3.81)
0.750 (19.0)	±0.050 (1.27)	±0.050 (1.27)	±0.065 (1.65)	0.21	19.0 (48.3)	0.015 (0.38)	1.50 (3.81)
0.875 (22.2)	±0.050 (1.27)	±0.050 (1.27)	±0.070 (1.78)	0.21	22.0 (55.9)	0.015 (0.38)	1.50 (3.81)
1.000 (25.4)	±0.050 (1.27)	±0.050 (1.27)	±0.075 (1.91)	0.20	25.0 (63.5)	0.015 (0.38)	1.50 (3.81)

1/ Sheets up to and including 36 by 60 and 40 by 50 inches (91 by 152 and 101 by 127 cm)
2/ Sheets larger than 1/ up to and including 53 by 80 and 60 by 72 inches (134 by 203 and 152 by 183 cm)
3/ Sheets larger than 2/ up to and including 72 by 90 and 67 by 102 inches (183 by 228 and 170 by 259 cm)

3.13.2 Elongation. The mean elongation immediately before fracture shall not be less than 2 percent as determined in 4.6.6.2.

3.13.3 Warpage after accelerated weathering. The warpage of the plastic after accelerated weathering shall not exceed the value given in table I when determined in 4.6.13.1.1.

3.14 Instruction sheet. On direct purchases by the Government, an instruction sheet shall be furnished on each shipping container, as specified in 5.3. Specific information or reference shall be made to the limitations of the material and the necessary precautions to be observed in handling, storing, cutting, drilling, machining, forming, bending, 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, using Government specifications when available. Instruction sheets shall be approved by the procuring activity. (See 4.3.2.)

3.15 Additional requirements applicable to finish A only

3.15.1 Materials as received and after exposure to natural weathering and to accelerated weathering shall conform to the requirements of table II.

TABLE II

Physical properties (finish A materials only)

Characteristics	Condition of specimen			Test Para
	As received	Natural weathering	Accelerated weathering	
Index of refraction, colorless sheet	1.49±0.01	-	-	4.6.8
Luminous transmittance of colorless sheet, percent, minimum:				
Thickness inch (mm) 0.060 through 0.187 (1.52 through 4.75)	91	90	90	4.6.11
Over 0.187 through 0.312 (4.75 through 7.92)	90	89	89	
Over 0.312 through 0.417 (7.92 through 10.6)	89	87	87	
Over 0.417 through 1.000 (10.6 through 25.4)	89	86	86	
Colorless sheet Haze, percent, maximum	3	4	3	4.6.11

3.15.2 Resistance to weathering. After exposure to natural weathering or accelerated weathering at the conditions specified in 4.6.13, specimens shall show no evidence of cracking, crazing, or other indications of surface instability that could affect visability; or, in the case of natural weathering, minor optical defects as defined in 3.15.3.1 which are not present in the test panel prior to exposure, except that scratches incident to exposure may be disregarded.

3.15.3 Optical uniformity

3.15.3.1 Minor optical defects. The total number of minor defects in the material shall not exceed a limit determined by dividing by 4 the area of the sheet in square feet. 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 (50 cm) on the screen when tested in accordance with 4.6.12.1. It is not required that the entire sheet be quantitatively surveyed for such variation in deviation but, that localized imperfections which are suspected of being detrimental may be evaluated by means of this test. Blemishes which do not individually reduce visability through the plastic shall be disregarded unless they are grouped in an objectionable pattern. Minor defects within 1 inch (25.4 mm) from the edge shall be disregarded.

3.15.3.2 Angular deviation. The material shall contain no major defect. Major defects are defined as any variations in the material which cause angular deviations either side of the undeviated position in excess of the limits specified in table III.

TABLE III. Angular deviation requirement

Sheet thickness	Limits of permissible deviation 1/
0.060 in. through 0.220 in. (1.52 mm through 5.59 mm)	7 minutes at any location more than 1 inch (25.4 mm) from the edge of the sheet
Over 0.220 in. through 0.250 in. (5.59 mm through 6.35 mm)	7 minutes at any location more than 3 in. (76.2 mm) from the edge of the sheet and 9 minutes between 3 in. (76.2 mm) and 1 in. (25.4 mm) of the edge
Over 0.250 in. through 0.375 in. (6.35 mm through 9.53 mm)	7 minutes at any location more than 3 in. (76.2 mm) from the edge and 12 minutes between 3 in. (76.2 mm) and 1 in. (25.4 mm) of the edge

TABLE III. Angular deviation requirement (cont'd)

Sheet thickness	Limits of permissable deviation 1/
Over 0.375 in. through 0.500 in. (9.53 mm through 12.7 mm)	7 minutes at any location more than 3 in. (76.2 mm) from the edge and 14 minutes between 3 in. (76.2 mm) and 1 in. (25.4 mm) of the edge
Over 0.500 in. through 1.000 in. (12.7 mm through 25.4 mm)	12 minutes at any location more than 3 in. (76.2 mm) from the edge and 20 minutes between 3 in. (76.2 mm) and 1 in. (25.4 mm) of the edge

1/ Major defects within 1 inch from the edge shall be disregarded.

3.15.4 Ultraviolet transmittance. The spectral transmittance at any wavelength in the 290 - 330 millimicron wavelength band shall not exceed 5 per cent when tested with 0.250 - inch (6.35 mm) thick acrylic sheet when tested in 4.6.7.

3.15.5 Thermal stability. When subjected to the Thermal Stability test, the material shall show no evidence of blistering.

3.15.6 Properties of colored materials. When colored material is furnished, the color characteristics and limits of haze and luminous transmittance shall be as specified by the procuring activity.

3.16 Workmanship for finish A. Workmanship shall be in accordance with high-grade practice for this type of product. The finished sheet shall be free from such bubbles, striae, and other defects as would render the material unfit for the purpose of viewing objects through it. Since this specification does not apply to formed, molded, or fabricated parts, workmanship beyond the production of polished plane sheet materials is not included.

4. QUALITY ASSURANCE PROVISIONS

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

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

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

4.3 Qualification inspection. Qualification inspection shall consist of all the tests specified in 4.6. Approval of Finish A materials will automatically approve Finish B materials.

4.3.1 Qualification test sample. The qualification sample for each thickness shall consist of at least 20 square feet (1.9 square meters) of finish A, transparent plastic, including sufficient prepared tensile specimens (see 4.6.6 for tensile specimen preparation) to determine all tensile and elongation properties required. Individual sheets shall be at least 12 by 36 inch (30 by 90 cm). To qualify for all thicknesses, suppliers shall submit qualification samples for 0.060, 0.125, 0.250, 0.500, 0.750, and 1 inch (1.5, 6.4, 12.7, 19.0 and 25.4 mm) thicknesses. Qualification for specific thicknesses may also be submitted. The qualification sample shall be forwarded to the Commander, Naval Air Development Center, Warminster, PA 18974, Attention: ACSTD (Code 60631). The samples shall be durably and plainly marked with the following information:

Sample for Qualification test
PLASTIC SHEET, ACRYLIC, HEAT RESISTANT
Name of manufacturer
Address of plant where sample is manufactured
Submitted by (name)(date) for Qualification test in accordance with the requirements of Specification MIL-P-5425D under authorization (reference authorizing letter)

NOTE: Qualification test samples shall be taken from production quantities of material submitted.

4.3.2 Manufacturer's data. Two copies of the manufacturer's test report 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, two copies of the manufacturer's instruction sheet (3.14) shall be furnished at this time.

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(s) comply with the requirements of this specification. Unless otherwise specified by the qualifying activity, the time of periodic verification by certification shall be in two-year intervals from the date of the original qualification.

4.4 Quality conformance

4.4.1 Lot formation. Unless otherwise specified, a lot shall consist of the total number of plastic sheets of the same class and thickness, forming part of one contract, submitted for inspection at one time.

4.4.2 Sampling

4.4.2.1 Visual inspection sampling. Samples for inspections of 4.4.3.1 and 4.4.3.2 shall be a quantity of plastic sheets randomly selected from each lot in accordance with the procedures of MIL-STD-105 and table IV. The sample unit shall be one plastic sheet.

4.4.2.2 Packaging inspection sampling. A quantity of shipping containers fully prepared for delivery just prior to closure shall be selected in accordance with the procedures of MIL-STD-105 and Table IV. The lot size for purposes of this inspection shall be the total number of shipping containers. The sample unit shall be one container. Inspection shall be as specified in 4.4.3.3.

TABLE IV Inspection levels and Acceptable Quality Levels

Inspection paragraph	Inspection Level	AQL 1/
4.4.3.1	S-3	2.5
4.4.3.2 2/	I	1.5
4.4.3.3	S-2	4.0

1/ AQL expressed as defects per 100 units
2/ Sample units required may be randomly selected from those used in 4.4.3.1.

4.4.2.3 Sampling for physical and mechanical testing

4.4.2.3.1 Direct government purchases. Three sample units shall be selected from each lot and tested to the requirements specified in 4.4.3.4. Each sample unit shall contain sufficient material to prepare the number of specimens required in Table VIII.

4.4.2.3.2 Indirect government purchases. For those purchases which are not direct government purchase, the sample size shall be ten sheets (sample units) randomly selected from each lot at the rate of one or two sheets per production day. When production levels are less than 1,000 sheets weekly, one sample unit shall be selected from each 100 sheets produced that week. Samples selected may be from stock material which is cut at the time of manufacture. Each sample unit shall be of sufficient size to prepare the specimens required in Table VIII. Testing of the sample shall be in accordance with 4.4.3.4.

4.4.3 Inspections

4.4.3.1 Dimensional inspection. Each sample unit selected in accordance with 4.4.2.1 shall be inspected for dimensional defects in accordance with Table V.

TABLE V. Quality conformance dimensional inspection

EXAMINE	DEFECT
Sheets	
Length & Width	Varies by more than ±1/16 inch (1.6 mm) from length or width specified (unless greater tolerance permitted by contract or order).
Thickness	Varies by more than ± the applicable tolerance specified in Table I (for thickness variations of sheets not listed in Table I, the tolerances for the next greater thickness of sheet listed shall apply).

4.4.3.2 Appearance and color inspection. Each sample unit selected in accordance with 4.4.2.1 shall be examined to the characteristics in Table VI. Minor optical imperfections and blemishes shall be evaluated as specified in 3.15.3.1 prior to being scored as defects.

TABLE VI. Quality conformance appearance inspections

EXAMINE	DEFECT
Appearance & Workmanship	Bubbles, striae, chipped, scratches.
	Waves, distortion, irregularities, or other defects which would render the material unfit for the purpose of viewing objects through it.
	Surfaces not made to a smooth or polished finish.
	Imbedded particles, such as grit or other foreign matter.
	Ragged or rough edges or sides.
Color	Not colorless, or not color specified.

4.4.3.3 Packaging inspection. Samples selected as specified in 4.4.2.2 shall be examined for conformance to Table VII and Section 5 of this specification. In addition shipping containers fully prepared for delivery shall be examined for closure defects.

TABLE VII. Quality conformance packaging inspection

EXAMINE	DEFECT
Packaging	Individual sheets 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 3.14)
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 nor in accordance with contract requirements (see 5.3).

4.4.3.4 Physical and mechanical inspection. Samples selected as specified in 4.4.2.3.1 or 4.4.2.3.2 shall be tested to the requirements of Table VIII. The number of specimens for each sample unit and reporting of results shall be as specified therein. Failure of any requirement specified in Table VIII shall be cause to reject the lot represented by the sample.

TABLE VIII. Quality conformance - Physical and mechanical inspection

Characteristic	Rqmt	Test Para.	No. of Determinations per Sample unit	Results reported as	
				Pass Fail	Average numerically to the nearest 2/
Flexual deformation temperature	3.12	4.6.9	2	-	0.1°C
Thermal stability	3.15.5	4.6.10	1	X	-
Original luminous transmission	Table II	4.6.11	2	-	0.1 percent
Original haze	Table II	4.6.11	2	-	0.1 percent
Localized optical defects	3.15.3.1	4.6.12.1	2	X	-
Angular deviation	3.15.3.2	4.6.12.2	2	-	1 minute

1/ When failure occurs, a description of failure and numerical point of failure, as applicable, shall be reported.

2/ Test reports shall include all values upon which the average is determined.

4.5 Test conditions

4.5.1 Standard conditions. Standard conditions shall be 25±1°C (77±2°F) and a relative humidity of 50±5 percent. Unless otherwise specified, all tests and examinations shall be conducted at standard conditions.

4.5.1.1 Reporting of test results. Unless otherwise specified in the applicable test method all results shall be reported as the average of the number of specimens being tested. Each individual value shall also be reported.

4.6 Test methods.

4.6.1 ASTM methods. Those requirements tested solely to ASTM methods are identified in Table IX. All other ASTM methods herein are

TABLE IX. ASTM METHODS

Property	Rqmt	ASTM Method
Specific gravity	3.5	D792
Water absorption	3.6	D570
Rate of burning	3.7	D635

4.6.2 Thermal expansion. Two specimens shall be tested in accordance with ASTM D 696. If the results obtained on the two specimens agree within 10 percent of the larger value, the mean of the two values shall be reported. If not, the test shall be repeated until a given pair of specimens yield two values which are within the 10 percent tolerance, and the mean of these two values shall be reported.

4.6.3 Formability

4.6.3.1 Materials 0.500 inch (12.7 mm) and under in thickness. The specimens, 14 inches in diameter, shall be formed by free blowing or drawing into hemispheres with an outside diameter of 10 inches (25.4 cm) and a draw of at least 4.5 inches (11.5 cm). Heating temperature and pressure to be used shall be in accordance with the manufacturer's instructions.

4.6.3.2 Materials over 0.500 inch (12.7 mm) in thickness. Two specimens 4 by 36 inches (10 by 91 cm) shall be formed to a cylindrical shape of outside radius equal to the formability radius specified in table I for the particular thickness. Heating methods, temperatures, rate of forming, and procedures shall be in accordance with the manufacturer's instructions. Forming shall be done over wooden molds covered with a soft lintless cloth. After the formed specimens have cooled, a section 1.5 inches (3.8 cm) along the circumference and 4 inches (10 cm) long shall be cut from one of the formed specimens. This specimen shall be subjected to the test for accelerated weathering and then visually examined for crazing or other defects.

4.6.4 Internal strain. Two conditioned 12-by-18 inch (30 by 45 cm) sheets shall be tested. Each sheet shall be considered as a 12-by-12 inch (30 by 30 cm) specimen supported by the remainder of the sheet. Two fine lines shall be scribed at right angles crossing the center of the 12-by-12 (30 by 30) area. Finely scribed gage marks shall then be placed 2 inches (5 cm) from the edge of the 12-by-12 inch (30 by 30 cm) area on each of these lines. The distance between each pair of gage marks shall be measured to the nearest 0.01 inch (0.025 cm) and the data recorded. Each sheet shall be hung by one short edge in a circulating air oven at 160°±10°C (320°±18°F) for the times indicated below:

Nominal thickness inch (mm)	Minimum heating time (minutes)
0.250 (6.4) and less	16
0.375 (9.5)	25
0.500 (12.7)	33
0.750 (19.0)	55
1.000 (25.4)	79

After removal from the oven, the specimens shall be permitted to cool to standard testing conditions while hanging vertically. The distance between each pair of gage marks shall be remeasured. The dimensional change shall then be computed as the percent change in distance between the gage marks based on the first measurement. The mean of the four values shall be reported.

4.6.5 Workability. The processing procedures described in the manufacturer's instructions (3.14) shall be performed. The specimen shall be examined for defects in accordance with 3.11.

4.6.6 Tensile properties. Tensile and elongation specimens shall be prepared from as received thicknesses up to and including 0.500 inch (12.7 mm). All other thicknesses shall be machined to 0.500 inch (12.7 mm).

4.6.6.1 Tensile strength. Five specimens shall be tested in accordance with ASTM D 638.

4.6.6.2 Elongation. Elongation shall be determined just before break. Procedures shall be in accordance with ASTM D 638.

4.6.7 Ultraviolet transmittance. The spectral transmittance shall be determined using a monochromator having a band width of 10 millimicrons or less, and a photometer having a reproducibility of ±1 percent.

4.6.8 Index of refraction. Three specimens shall be tested in accordance with the refractometer procedure of ASTM D 542. Requirements are for clear, colorless material.

4.6.9 Flexural deformation temperature. Two specimens shall be tested in accordance with ASTM D 648 except as follows: The thickness of the sample being tested shall become the width of the specimen. Those thicknesses not in the range specified in ASTM D 648 shall be plied or machined. The unmachined surface shall be on a side. The load shall be calculated to give a maximum fiber stress of 264 psi (1820 kPa). Each value shall be reported.

4.6.10 Thermal stability. Two conditioned 12-by-18 inch (30 by 45 cm) sheets shall be tested. Each sheet shall be hung in a circulating air oven, at 180°±5°C (356°±9°F) for 2 hours. After removal from the oven, the specimens shall be permitted to cool to standard conditions while hanging vertically, then visually examined for conformance to 3.15.5.

4.6.11 Luminous transmittance and haze. Three specimens shall be examined as specified in ASTM D 1003 procedure A or B for light transmission and haze. Specimens subjected to weathering in 4.6.15 shall be immersed in distilled water for not longer than ten seconds and surface moisture removed by blotting prior to examination.

4.6.12 Optical uniformity and distortion

4.6.12.1 Localized imperfections. Local areas which, upon visual examination, are suspected to containing localized optical imperfections exceeding the limits of 3.15.3.1 shall be tested in accordance with ASTM D637.

4.6.12.2 Angular deviation. The angular deviation shall be determined in accordance with ASTM D637. Each sheet shall be examined then rotated 90° and re-examined.

4.6.13 Weathering properties

4.6.13.1 Accelerated weathering. Accelerated weathering shall be conducted in accordance with procedure C of ASTM D 1501, except that duration of test shall be 120 hours. Each test specimen shall be visually examined for conformance to 3.15.2, then subjected to examinations for luminous transmittance and haze in 4.6.11. Separate specimens shall be subjected to the warpage examination below.

4.6.13.1.1 Warpage after accelerated weathering. The accelerated weathering specimens shall be conditioned on a plane surface. After conditioning, the specimen shall be measured for warpage by determining the greatest distance from a straight edge connecting diagonally opposite corners to the near surface of the plastic. This distance may be measured by means of dial micrometer, thickness gage, or any other device having an accuracy of 0.001 inch (0.025 mm). The warpage reported shall be the maximum value, not an average.

4.6.13.2 Natural weathering. Test specimens 12-by-18 inches (30 by 45 cm) shall be exposed outdoors in southern Florida for a period of six months. Each specimen shall be supported at the edges only and shall be mounted at an angle of 45° from the horizontal, facing south. Both surfaces of the specimen shall be exposed to the conditions. After exposure, the specimen shall be visually examined for conformance to 3.15.2, subjected to luminous transmission and haze examination of 4.6.11, then tested for tensile strength as specified in 4.6.6.1.

4.6.14 Thickness. The thickness shall be measured by means of a dial micrometer, thickness gage, or any other device having an accuracy of 0.001 inch (0.025 mm) and shall meet the requirement of 3.4.

5. PACKAGING

5.1 Preservation - packaging. Preservation packaging shall consist of a protective covering on both sides of the plastic sheet. The protective covering shall be a suitably adhered paper or film that can be readily removed without injury or damage to the plastic surface. The covering shall adequately protect the surfaces from scratches or damage during shipment.

5.2 Packing. Packing shall be level A, B or C as specified (see 6.2). Containers shall be suitable for maintaining the plastic in its original condition. All internal loads shall be supported to avoid damage to surfaces by cleats, etc. An instruction sheet shall be included in each individual exterior container. (See 3.14.) All plastic sheets shall be packed as far as practicable by size and thickness.

5.2.1 Level A. Sheets shall be packed in exterior shipping containers conforming to style A or B, overseas type of PPP-B-601; Class 2 of PPP-B-621; or Class 2 of PPP-B-640. Plywood shall conform to NN-P-530, Type I or II, Grade 4 of Group A. Plywood shall be surface treated in accordance with TT-W-572. The weight of the contents shall not exceed the weight for the type of container selected.

5.2.2 Level B. Sheets packaged as specified in 5.1 shall be packed in domestic exterior shipping containers conforming to PPP-B-585, PPP-B-591, PPP-B-636 or PPP-B-640. When fiberboard containers conforming to PPP-B-636 are used, the special requirements section of Table II therein shall apply. The weight of contents for other containers shall not exceed the weight limitations of the applicable container specification.

5.2.3 Level C. Sheets packaged as specified in 5.1 shall be packed in a manner to insure carrier acceptance and safe delivery at destination. Containers shall be in accordance with Uniform Freight Classification Rules or regulations of other carriers applicable to the mode of transportation.

5.3 Marking of shipment.

5.3.1 Marking of individual sheets. The protective covering of each plastic sheet shall be distinctly marked, at intervals of 1 foot (30 cm), with the following:

(a) Specification number and finish

(b) Nominal thickness

(c) Manufacturer's designation or code for the product

In addition, the National Stock Number (NSN) shall be marked a minimum of one time on each protective covering.

5.3.2 Shipping containers. Each shipping container shall be marked to indicate method of packing and, in addition, shall be marked in accordance with the requirements applicable to the individual Services, as specified in Standard MIL-STD-129. The identification shall be composed of the following information listed in the order shown:

Stock number or other identification number as specified in the purchase order or contract.
Plastic, Sheet Acrylic, Heat Resistant
Specification MIL-P-5425D
Quantity
Finish
Size and thickness
Color of plastic sheet (when required)
Date of manufacture (month and year)
Stored items shall be issued by their date of manufacture (i.e., older items shall be issued first)
Contract or Order No.
Name of manufacturer
Name of contractor (if different from manufacturer)

NOTE: The contractor shall enter the NSN specified in the purchase document or as furnished by the procuring activity. When the NSN is not provided or available from the procuring activity, leave space therefor and enter the number or other identification as provided by the procuring activity.

5.3.3 Additional marking. In addition to all other required markings, the top of each shipping container shall be marked with the following:

SHIP AND STORE - TOP UP

6. NOTES

6.1 Intended use

6.1.1 Finish A. Finish A material is primarily intended for transparent areas on aircraft where a material with good optical, formability, outdoor weathering, and heat-resistance properties is required.

6.1.2 Finish B. Finish B material is intended primarily for use in reinforcing ribs, moldings, etc., of transparent acrylic assemblies.

6.1.3 When material conforming to this specification is used for specialized optical purposes, more rigid optical requirements may be specified in the detail product specification. In this event, the requirements of the detail specification will prevail.

6.1.4 Reference to this specification on drawings or in product specifications may be made in order to specify the flat material to be used in the fabrication of a part. It should be clearly understood that the requirements apply to the flat material prior to forming or fabrication and not to the material in its final form.

6.2 Ordering data

6.2.1 Procurement requirements. Procurement documents should specify the following:

(a) Quantity
(b) Size of sheets
(c) Thickness of sheets (see table I)
(d) Finish (see 1.2)
(e) State whether uncolored or colored sheet is desired. When colored sheet is ordered, appropriate limits for haze and luminous transmittance should be specified.
(f) Level of packing required (see 5.2).

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 been so listed by that date. The attention of suppliers is called to this requirement 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. The activity responsible for the Qualified Products List is the Naval Air Systems Command, Washington, DC 20361; however, information pertaining to qualification of products may be obtained from the Commander, Naval Air Development Center, Warminster, PA 18974, Attn: ACSTD (Code 60631).

6.4 Special sheet size. Sheets 100 by 120 inches (254 by 305 cm) are available in limited quantities in thicknesses of 0.187 to 0.500 inch (4.75 by 12.7 mm), having thickness tolerances conforming to the requirements of table I, column 2, under "Thickness tolerances". The size 100 by 120 inches (254 by 305 cm) should generally be ordered only to meet size requirements because of its limited availability.

d date of this specification (a) The title, number, or

6.5 Variation of physical properties with temperature. Many physical properties of this material vary with temperature. This fact shou;d be considered by designers, engineers, draftsmen, and prospective users of the material.

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

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

Review activities:
Army - AV, EA, ME
Navy - OS
DLA - GS

User activities:
Navy - SH

Preparing activity:
Navy - AS
Project No. 9330-0835