

MIL-G-25871B

27 November 1978

SUPERSEDING

MIL-G-25817A(ASG)

30 July 1958

MILITARY SPECIFICATION

GLASS, LAMINATED, AIRCRAFT GLAZING

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

1. SCOPE

1.1 Scope. This specification covers laminated glass, ready-cut, with various types of edge attachments, for use in aircraft glazing.

1.2 Classification. Laminated glass shall be furnished in the following types and classes, as specified in the contract or order (see 6.2).

- Type I - Ready-cut, commercial polished plate or float glass.
- Type II - Ready-cut, high-light-transmission polished plate or float glass.
- Type III - Ready-cut, heat-absorbing polished plate or float glass.
- Type IV - Ready-cut, low expansion borosilicate polished plate glass (coefficient of expansion from 45 to 60×10^{-7} per degree Celsius between 25° and 300°C).
- Type V - Chemically strengthen glass.

In any type, glass may be specified as:

- Class A - Flat
- Class B - Curved.

Beneficial comments (recommendation, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: AFML/MXA, WPAFB, O. 45433, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

FSC 9340

MIL-G-25871B

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
PPP-B-585	Box, Wood, Wirebound
PPP-B-591	Box, Fiberboard, Wood-Cleated
PPP-B-601	Box, Wood, Cleated Plywood
PPP-B-621	Box, Wood, Nailed and Lock Corner
PPP-B-636	Box, Shipping, Fiberboard

MILITARY

MIL-P-116	Preservation - Packaging, Methods of
MIL-L-10547	Liner, Case, And Sheet, Overwrap, Water Vaporproof or Waterproof, Flexible
MIL-B-13239	Barrier Material, Waterproofed, Flexible All Temperatures, Heat Sealable
MIL-G-25667	Glass, Monolithic, Aircraft Glazing

STANDARDS

FEDERAL

FED-STD-406	Plastic, Methods of Testing
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MILITARY

MIL-STD-129	Marking for Shipment and Storage
MIL-STD-130	Identification Marking of U.S. Military Property
MIL-STD-1186	Cushioning, Anchoring, Bracing, Blocking, And Waterproofing, With Appropriate Test Methods

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

MIL-G-25871B

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.

CONSOLIDATED CLASSIFICATION COMMITTEE

Consolidated Freight Classification Rules

(Application for copies should be addressed to the Consolidated Classification Committee, 202 Chicago Union Station, Chicago, Illinois 60606.)

3. REQUIREMENTS

3.1 Materials.

3.1.1 Glass. The glass plies used in the construction of laminates of the types specified herein shall conform to the corresponding types of MIL-G-25667, except for identification of product.

3.1.2 Interlayer. The material used for interlayer shall be stable without edge sealing and shall have suitable bonding characteristics. The material shall be polyvinyl or a suitable high-temperature resistant material, as specified (see 6.2). Unless otherwise specified, polyvinyl butyral, when used, shall be plasticized with 21.0 + 2 parts by weight of triethylene glycol di-2-ethyl butyrate per 100 parts resin. Use of either a different plasticizer or amount of plasticizer shall be approved by the procuring activity and specified in applicable drawings, specifications, or in the contract or order.

3.2 Design and construction. The laminated glass shall consist of two or more plies of glass (see 6.1.5) held together by an interlayer or transparent material having suitable bonding characteristics. Laminated units may or may not have extended plastic edges, with or without metal reinforcements, as specified in the applicable drawing, or in the contract or order.

3.2.1 Parting medium. Types I through V glass may have a parting medium used to reduce or prevent bonding of the glass plies to the extended plastic edge only, to a specified portion of the interlayer only, or to both the plastic edge and interlayer, when so specified in applicable drawing or in the contract or order.

MIL-G-25871B

3.2.2 Edge reinforcement. Where edge reinforcement of the inter-layer is employed, that portion underlying the glass shall be held to a minimum consistent with good commercial practice, or as specified in applicable drawings.

3.3 Temper. Temper requirements for the individual glass plies shall be as specified in the contract or order in accordance with MIL-G-25667.

3.4 Dimensions and tolerances. The linear dimensions and nominal thickness of Class A and Class B laminates and the curvature of Class B laminates shall be as specified by applicable drawings or specifications.

3.4.1 Thickness tolerances. Unless otherwise specified in the contract or order, the following thickness tolerances shall be allowed. Thickness tolerance for individual plies shall be as specified in MIL-G-25667. Laminates shall have a thickness tolerance of ± 0.8 mm (0.03 in.) for assemblies of 9.5 mm (0.38 in.) thickness or less, ± 1.6 mm (0.06 in.) for assemblies between 9.5 and 25.4 mm (0.38 and 1 in.) in thickness, and ± 3.2 mm (0.12 in.) for assemblies above 25.4 mm (1 in.) in thickness.

3.4.2 Linear tolerances. Unless otherwise specified, the following linear dimensional tolerances shall be allowed. Annealed glass assemblies 6.4 mm (0.25 in.) or under in thickness shall be allowed a linear dimensional tolerance of ± 0.8 mm (0.03 in.). Annealed glass assemblies over 6.4 mm (0.25 in.) thick shall be allowed a linear dimensional tolerance of ± 1.6 mm (0.06 in.). Tempered glass assemblies regardless of thickness shall be allowed a linear dimensional tolerance of ± 1.6 mm (0.06 in.) and an overall slippage tolerance of 1.6 mm (0.06 in.).

3.4.3 Curvature. Unless otherwise specified in the contract or order, Class B units shall not vary from the specified contour by more than 3.2 mm (0.12 in.) when tested as specified in 4.4.7.

3.5 Resistance to temperature change. When tested as specified in 4.4.2, the laminates shall withstand the temperature change without cracking, clouding, delamination, formation of bubbles, or other evidence of deterioration. For the laminates containing components of dissimilar size, the separation of small flakes or chips beyond the trim line of the smaller glass shall not be considered evidence of deterioration.

MIL-G-25871B

3.6 Nonscatterability. Laminates subjected to the impact test in accordance with 4.4.3 shall show no separation of glass and interlayer other than in a permissible spot 6.4 mm (0.25 in.) diameter at point of impact, and within the area 3.2 mm (0.12 in.) wide along either side of any fracture line propagating from the point of impact. Very small amounts of glass may leave the underside of the assembly because of fracture of the bottom plate.

3.7 Original luminous transmittance. The original luminous transmittance of Types I, II, IV and V laminates shall be equal to or greater than the requirements in Table I when tested in accordance with 4.4.4. The original luminous transmittance of Types I, II, IV and V laminates with a high-temperature resistant interlayer may be 0.032 percent less than the requirements of Table I for each 0.025 mm (0.001 in.) of interlayer thickness. The original luminous transmittance requirement for Type III laminates and laminates with an electrical conductive coating shall be as specified in the contract or order.

Table I. Original luminous transmittance.

Thickness		Type		
		I and V (percent)	II (percent)	IV (percent)
mm	(inches)			
0.03 to 6.35	0.001 to 0.250	84.8	89.0	89.0
6.36 to 12.70	0.251 to 0.500	81.6	87.0	87.0
12.71 to 19.05	0.501 to 0.750	78.4	85.0	86.0
19.06 to 25.40	0.751 to 1.000	75.2	83.0	85.0
25.41 to 31.75	1.001 to 1.250	72.0	81.0	83.0
31.76 to 38.10	1.251 to 1.500	68.8	79.0	81.0
38.11 to 44.45	1.501 to 1.750	65.6	77.0	79.0

3.8 Solar-radiation transmittance. This requirement applies only to Type III laminates. Individual plies of heat-absorbing glass shall comply with the solar-radiation transmittance requirements for Type III glass of MIL-G-25667.

MIL-G-25871B

3.9 Original haze. The percentage of haze for all laminates shall not exceed 2.0 percent for thicknesses up to 15.9 mm (0.62 in.), and 2.5 percent the thicknesses above 15.9 mm (0.62 in.), when tested in accordance with 4.4.4. Original haze of laminates incorporating a high-temperature resistant interlayer may be 0.06 percent greater than the values specified above for each 0.025 mm (0.001 in.) of interlayer thickness.

3.10 Luminous transmittance and haze after exposure. After exposure to the light exposure test specified in 4.4.5, the luminous transmittance and haze shall conform to the requirements of 3.7 and 3.9, as applicable.

3.11 Optical inspection. Relaxed optical requirements shall be permitted only in noncritical vision areas. Unless otherwise specified in the contract or order, noncritical areas shall be as follows:

- a. Flat annealed glass: A border extending 25 mm (1 in.) from the edge of the daylight opening, except where such border allowance conflicts with optical gunsight areas.
- b. Curved annealed glass: A border extending 51 mm (2 in.) from the edge of the daylight opening.
- c. Flat and curved tempered and semitempered glass: A border extending 51 mm (2 in.) from the edge of the daylight opening, and the area within a 51 mm (2 in.) radius around the tong marks.

3.11.1 Minor optical defects. Minor optical defects, as determined by examination in accordance with 4.4.6.1, shall be permitted only to the extent specified in the following subparagraphs. Minor optical defects are defined as inclusions in the glass or interlayer such as:

- a. Seeds, bubbles, small cullet, and dust or dirt particles from 0.8 to 2.4 mm (0.03 to 0.09 in.) in diameter. Maximum dimension of elongated inclusions shall be determined by dividing length plus width by two.
- b. Fine striae, cord, thin traces of crayon and fingerprints.
- c. Light surface scratches and fine lint or hair from 13 to 76 mm (0.5 to 3 in.) in length.
- d. Stones to 0.40 mm (0.016 in.) that do not have associated stress when viewed in crossed-polarizers.

MIL-G-25871B

3.11.1.1 Critical vision area minor optical defects. Minor optical defects shall not be permitted in any critical vision area designated in the contract or order, when:

- a. They are so grouped as to form an objectionable pattern or obscure vision.
- b. Any defect has a maximum dimension exceeding the limits of 3.11.1.
- c. The total number for the applicable sheet size and thickness exceeds the additive total permitted by MIL-G-25667 for the individual glass plies plus the allowable number specified in Table II for each interlayer.

Table II. Allowable minor defects in each interlayer.

Area of daylight opening		Maximum number of minor defects for each interlayer thickness of 3.0 mm (0.12 in.) or fraction thereof
(square metres)	(square feet)	
0.000 through 0.372	0.00 through 4.00	4
0.373 through 0.557	4.01 through 6.00	6
0.558 through 0.743	6.01 through 8.00	9
0.744 through 0.929	8.01 through 10.00	12
0.930 through 1.393	10.01 through 15.00	19
1.394 through 1.858	15.01 through 20.00	26
Over 1.858	Over 20.00	As specified

3.11.1.2 Noncritical vision and other area minor optical defects. Minor optical defects in a noncritical vision area and light surface streaks, light plastic rubs or streaks, and blemishes smaller than the minimum stated dimensions in any area shall be disregarded, provided they neither form an objectionable pattern nor are so grouped as to impair visibility. The presence of vents, stones (greater than 0.40 mm or below 0.40 mm if stress causing), or vee-edge chips in any area shall be cause for rejection. The area of the laminate covered by the mounting frame and extending 6.4 mm (0.25 in.) inboard may include any defect except vents, stones (greater than 0.40 mm or below 0.40 mm if stress causing), vee-edge chips, and blowings exceeding 6.4 mm (0.25 in.) deep and 25.4 mm (1 in.) long. Unless otherwise specified, the noncritical vision area shall be as defined in 3.11.

MIL-G-25871B

3.11.2 Optical deviation. For all types of flat laminates, the optical deviation requirements, except for any gunsight areas, shall be as specified in the contract or order, when tested in accordance with 4.4.6.2. Areas of Class A units which are components of optical gunsights shall have an optical deviation requirement of 31.5 seconds of arc when tested in accordance with 4.4.6.2.2.

3.11.3 Optical distortion. Limits of optical distortion shall be as approved by the procuring activity and specified in applicable drawings, specifications, or in the contract or order. Testing shall be in accordance with 4.4.6.3.

3.12 Identification of product. Each laminated unit shall be marked in accordance with MIL-STD-130 according to the following format. Unless otherwise specified, the marking shall not extend more than 15.9 mm (0.62 in.) from the edge of the daylight opening nor be more than 127 mm (5 in.) in length. The identification marking shall be so located as to be legible when the glass unit is installed. Location of the marking shall be specified in the applicable contract drawing.

Identification Format

Examples

Part Number Date of Manufacture (month and year)	Specification Number Manufacturer's Trademark	Type and Class Serial Number (when specified) <u>1/</u>
167481-23 3-73	25871 XYZ	IB 4107.

1/ When the serial number is included in the marking, the procuring activity will furnish a detailed explanation of code to be used.

3.13 Workmanship. Workmanship shall be in accordance with the best practice for high-grade aircraft glass laminates.

4. QUALITY ASSURANCE PROVISIONS

4.1 General. All tests required herein for the testing of glass laminates are classified as Acceptance Tests, for which necessary sampling techniques and method of testing are specified in this section.

MIL-G-25871B

4.2 Individual tests. Individual tests shall consist of the following tests, as described under 4.4 "Test Methods":

- a. Examination of product (4.4.1)
- b. Optical inspection (4.4.6)
- c. Curvature (4.4.7)

4.3 Sampling plan A and B tests.

4.3.1 Lot. A lot shall consist of all glass assemblies prepared by the same process, of similar nominal thickness (in increments of 6.4 mm (0.25 in.) disregarding over-all rectilinear dimensions), the same type, and laminated within any 30-day period. A limited shipment for preproduction aircraft shall not be considered a lot.

4.3.2 Sampling plan A tests.

4.3.2.1 Procedure. Two glass assemblies from each lot shall be selected at random and subjected to the following tests in the order named:

<u>Sample No. 1</u>	<u>Sample No. 2</u>
a. Original luminous transmittance and haze (4.4.4)	a. Resistance to temperature change (4.4.2)
b. Luminous transmittance and haze after exposure (4.4.5)	
c. Nonscatterability (4.4.3)	

4.3.3 Sampling plan B tests.

4.3.3.1 Procedure - alternate sample (luminous transmittance and haze after exposure). An alternate sample may be used for the light exposure test specified in 4.4.5. The alternate sample shall be approximately 64 by 230 mm (2.5 by 9 in.), and be composed of two glass plies 1.52 to 2.54 mm (0.100 to 0.065 in.) thick laminated together with a 3.18 ± 0.13 mm (0.125 ± 0.005 in.) interlayer of the same material used for the fabrication of the lot of laminates being represented. This alternate sample shall meet the requirements of 3.7, 3.9 and 3.10.

4.3.3.2 Procedure - alternate sample (nonscatterability). This alternate sample shall be approximately 305 mm (12 in.) square and be composed of two 3 mm (0.125 in.) nominal thickness glass plies laminated together with a 3 mm (0.125 in.) nominal thickness interlayer of the same material and by the same process used for fabrication of the lot of assemblies being represented. Alternate samples for nonscatterability tests shall be laminated and tested weekly when aircraft assemblies are being produced.

MIL-G-25871B

4.3.3.3 Production glass assemblies rejected for other reasons may be used for these tests.

4.3.4 Rejection and retest. Failure of any specimen in any requirement for which it represents a lot shall cause rejection of the lot represented. Failure of any assembly in any requirement for which all assemblies are inspected shall cause rejection of the individual assembly. Rejected glass assemblies shall not be resubmitted for test without full particulars concerning previous rejection being given the Inspector.

4.4 Test methods.

4.4.1 Examination or product. Each assembly shall be visually inspected in the equivalent of light from a clear sky without sun (CIE Illuminant C) to determine conformance to the requirements of this specification with respect to tolerances, identification of product, and workmanship. Dimensions shall be measured to the nearest 0.5 mm (0.02 in.).

4.4.2 Resistance to temperature change. Specimens shall be placed in air at a temperature of $-55^{\circ} \pm 5^{\circ}\text{C}$ ($-67^{\circ} \pm 9^{\circ}\text{F}$) for a period of 2 hours or until temperature equilibrium has been attained in the assembly, then placed in still air at a temperature of $25^{\circ} \pm 3^{\circ}\text{C}$ ($77^{\circ} \pm 5.4^{\circ}\text{F}$) 1 hour or until temperature equilibrium has been attained in the specimen. The laminate, except when a high-temperature resistant interlayer is used, shall then be placed in circulating air at $72^{\circ} \pm 2^{\circ}\text{C}$ ($161.6^{\circ} \pm 3.6^{\circ}\text{F}$) for 3 hours. Laminates using high-temperature resistant interlayer shall be placed in circulating air at $150^{\circ} \pm 2^{\circ}\text{C}$ ($302.0^{\circ} \pm 3.6^{\circ}\text{F}$) for a minimum of 12 hours. After removal to still air at $25^{\circ} \pm 3^{\circ}\text{C}$ ($77.0^{\circ} \pm 5.4^{\circ}\text{F}$) and cooling to this temperature, the specimen shall be examined for evidence of deterioration (see 3.5) caused by this test.

4.4.3 Nonscatterability. The test specimens shall be subjected to impact while supported in a horizontal position by a suitable frame. Normally this frame shall support the entire length of each side of the glass along a margin not more than 9.5 mm (0.38 in.) wide. The frame shall rest on a metal plate of sufficient weight and rigidity to prevent distortion. A spherical steel ball dropped from a suitable height shall strike the approximate center of the specimen with a single gravity-accelerated blow. The height from which the ball is dropped shall be sufficient to cause fracture of outer glass plies without developing a hole through the laminate. In case the outer glass plies are not fractured by this impact, the specimen shall be turned upside down and the falling-ball impact repeated. Immediately after the outer glass plies have been fractured, the assembly shall be examined to detect any interlayer surface which is free of glass.

MIL-G-25871B

Such an area is considered evidence of separation of glass and the interlayer. The specimens shall be tested at a temperature of $25^{\circ} \pm 3^{\circ}\text{C}$ ($77.0^{\circ} \pm 5.4^{\circ}\text{F}$).

4.4.4 Original luminous transmittance and haze. The original luminous transmittance and haze of the sample shall be determined in accordance with Method 3022 of FED-STD-406.

4.4.5 Luminous transmittance and haze after exposure. The luminous transmittance and haze of the specimen after exposure shall be determined in the same manner as for original luminous transmittance and haze. The light shall consist of a flaming carbon arc of the Fade-0-Meter type using the equivalent of Atlas No. 20 and No. 70 carbons enclosed in a clear Corex D globe and operated at a current of 13 amperes. As an alternate, a quartz mercury arc possessing controls to provide an intensity equivalent to the flaming carbon arc may be used. The specimen shall be exposed at a distance of 380 mm (15 in.) from the arc with the plane of the glass normal to the direction of the source. The exposure time shall be 100 hours. The specimen temperature shall not exceed 72°C (161.6°F) at any time during the exposure period.

4.4.6 Optical inspection.

4.4.6.1 Minor optical defects. Each laminate shall be visually inspected in the equivalent of light from a clear sky, without sun (CIE Illuminant C). The laminate shall be placed in a position similar to that of the glazed light at a distance of 610 to 914 mm (24 to 36 in.) from the Inspector. Inspection shall be accomplished by looking through the unit against a background, 6 to 9 m (20 to 30 feet) from the laminate, which will enable approximately equal perception of all types of minor optical defects.

4.4.6.2 Optical deviation. The optical deviation of all types of flat glass, except for gunsight areas, shall be determined by examining the image projected on a screen through the specimen during a complete survey of its area as described below, or by the alternative method in 4.4.6.2.1 under the conditions stated. The projection (line) method described below shall be considered the reference method in a case of a disagreement.

A lantern-slide projector shall be used to project the image of a narrow black line focused on a smooth screen. The screen shall be located in a fixed position at a distance of 4.6 to 7.6 m (15 to 25 feet) from the specimen. An opaque shield having a vertical aperture approximately 25 X 250 mm (1 by 10 in.) shall be mounted 914 mm (3 feet) in front of the projector lens. The screen shall contain a

MIL-G-25871B

dashed vertical line and 8 parallel black lines, 4 on either side, corresponding to angular deviations of 2, 3, 4.5, and 7 minutes of arc, respectively, from the centerline. Suitable dimensions for a specimen-to-screen distance of 7.6 m (25 feet) are given in Table III. The screen shall be aligned with the projector to provide superposition of the central dashed line and the projected line before inspection of the glass unit. The specimen shall then be passed through the light beam in its own plane normal to the beam. After the specimen has been moved horizontally until each portion of the area being tested has intercepted the beam, it shall be rotated through 90 degrees in its own plane and the test repeated. In both positions, the deviation on the screen shall be continuously noted.

Any deviation of any part of the projected vertical line from the central dashed line exceeding the amount specified by the procuring activity in the contract or order shall be cause for rejection. Observations may be made by means of a second observer close to the screen or by means of a low-power telescope.

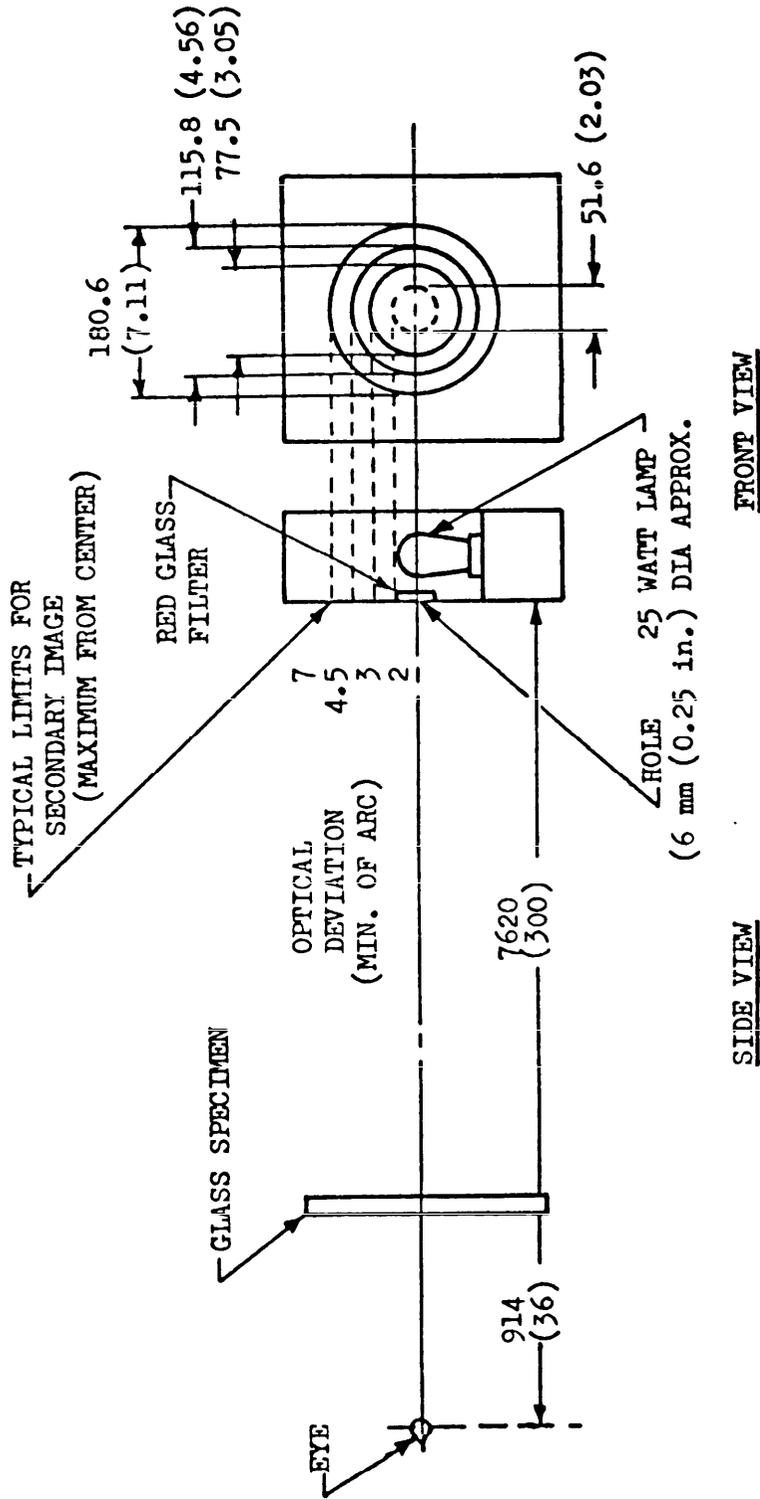
TABLE III. Normal incidence deviation data.

Optical Deviation (minutes of arc)	Projected Image Shift at 7.6 m (25 feet) (Distance from Line to Dashed Line)	
	(mm)	(inches)
2.0	4.6	0.18
3.0	6.8	0.26
4.5	9.9	0.39
7.0	15.5	0.61

4.4.6.2.1 Alternative optical deviation. The optical deviation may be determined by observing the position of the secondary image, caused by lack of parallelism between the two surfaces, relative to the primary image of a small luminous dot. The light box shown in Figure 1 shall be viewed against a black background having a maximum illumination of 86 lm/m² (8 foot-candles). The face of the light box shall be black with the four white or translucent circles and a center aperture covered by a red filter.

The specimen shall be 4.6 to 7.6 m (15 to 25 feet) from the light box and shall be so positioned that the area being examined will be a plane normal to the line of sight between the examiner's eye and the

MIL-G-25871B



FOR SPECIMEN-TO-LIGHT-BOX DISTANCES IN THE RANGE 4.6 TO 7.6 m (15 TO 25 FEET), THE DIMENSIONS OF THE CIRCLES SHOULD BE REDUCED IN PROPORTION.

AREA BEING EXAMINED SHALL BE NORMAL TO LINE OF SIGHT. DIMENSIONS IN mm (INCHES).

FIGURE 1. Alternative optical deviation test (see 4.4.6.2.1)

MIL-G-25871B

light source. The light box circles shall have the dimensions appropriate to the specimen-to-light-box distance used. The examiner's eye shall be within 914 mm (3 feet) of the specimen. The specimen shall be systematically moved across the fixed line of sight in order that the examination includes every portion of the entire area except the specified margin around the edge of the glass. The observer shall use only one eye at a time. The location of the observer's eye shall be on a line normal to the face of the light box passing through the central aperture. The displacement of the secondary image outside the circle of radius corresponding to the specified angular deviation shall be cause for rejection.

4.4.6.2.2 Optical deviation (gunsight area). The optical deviation in the gunsight area shall be determined by examining the reflection of a specially constructed and illuminated screen on the two surfaces of the specimen, or by an equivalent method. The screen shall have 12.7 mm (0.50 in.) diameter holes drilled 38 mm (1.5 in.) between centers and shall have the aft face suitably illuminated so that the holes will appear as illuminated dots on the surfaces of the specimen. The perforated area of the screen shall be large enough to embrace the entire critical area. The specimen shall be placed 14.3 m (47 feet) from the screen as shown in Figure 2. A low-power telescope shall be placed not more than 152 mm (6 in.) from the center of the screen for observing the reflections on the surfaces of the specimen. Separation of the illuminated dots indicates that the optical deviation of the specimen exceeds 31.5 seconds of arc (60 seconds wedge angle). For assemblies containing an electrically conductive coating, the test method for gunsight areas shall be as specified by the procuring activity in the contract or order.

4.4.6.3 Optical distortion. Optical distortion of all types of glass shall be determined by a test based on the principle of viewing a grid through the glass sample and measuring the optical distortion by direct measurement, measurement of a photograph, split-line determination, or by visual comparison with agreed upon referee samples. The detailed test procedure shall be determined by agreement between the procuring activity and the contractor.

4.4.7 Curvature. Unless otherwise specified in the contract or order, Class B units shall not vary from the specified contour by more than 3.2 mm (0.12 in.) when laid on either a male or female peripheral checking fixture and utilize normal clamping pressure.

5. PACKAGING

5.1 Preservation and packaging.

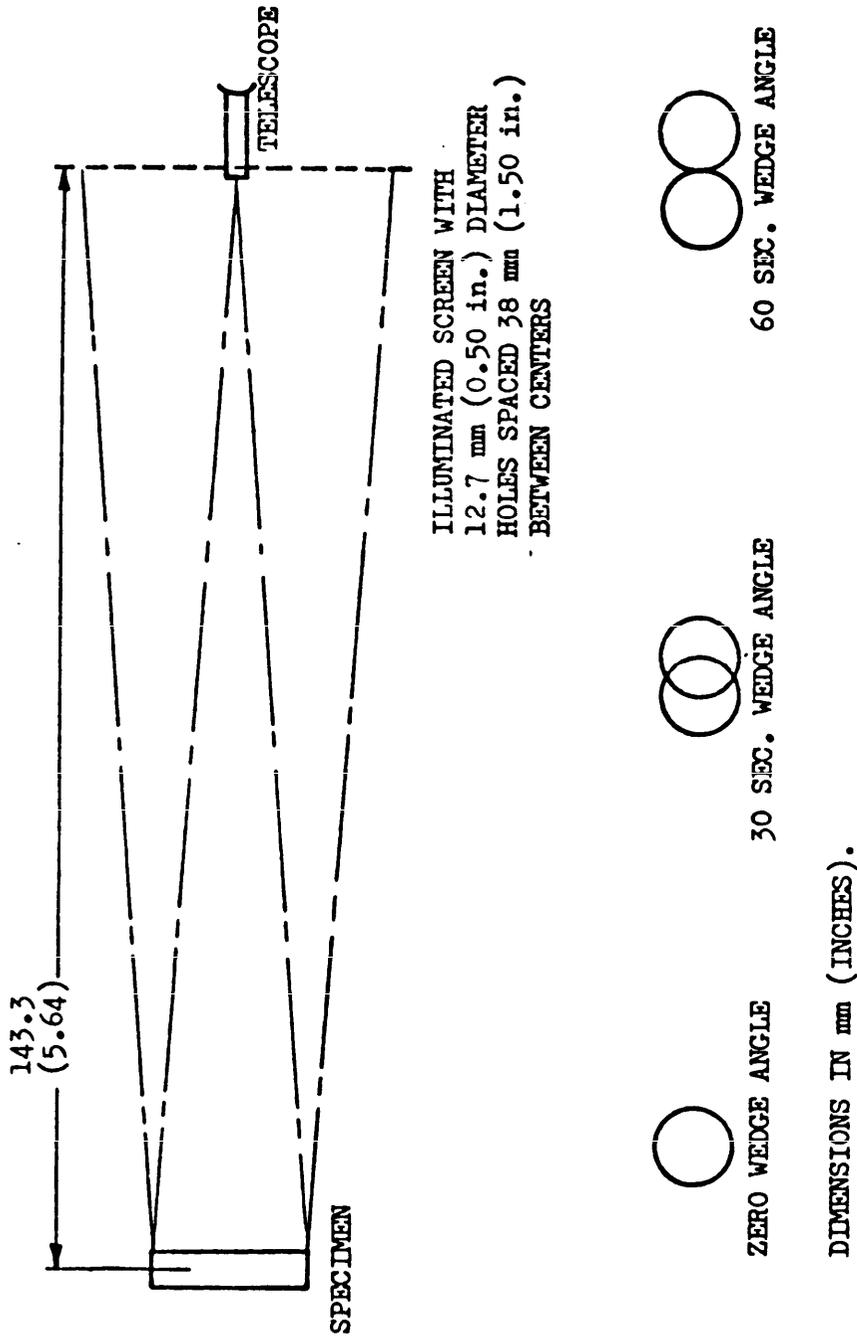


FIGURE 2. Setup for determining optical deviation of gunsight area (see 4.4.6.2.2).

MIL-G-25871B

5.1.1 Level A. Glass laminates shall be preserved in accordance with MIL-P-116, Method III. Laminates shall be interleaved with a suitable paper which shall extend to the edge of the glass in all directions. Unit quantities shall be as specified by the contract or order.

5.1.2 Level C. Glass laminates shall be preserved and packaged in accordance with the manufacturer's commercial practice.

5.2 Packing.

5.2.1 Level A. Glass laminates, packaged as specified in 5.1.1, 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, when used, shall be Type I or II, Class 2 of NN-P-530. Containers conforming to PPP-B-591 and 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 (124 kg). 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 laminates 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 and PPP-B-621 shall be provided with a case liner of barrier material conforming to MIL-B-13239, 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 (91 kg) except when the weight of a single packed laminate exceeds this limitation.

5.2.2 Level B. Glass laminates, packaged as specified in 5.1.1, shall be packed for shipment in domestic type containers conforming to PPP-P-585, PPP-B-591, PPP-B-601, PPP-B-621 (Class 1, Style 2), and PPP-B-636. Containers conforming to PPP-B-591 and 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 (124 kg). 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 laminates 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 (91 kg) except when the weight of a single packed laminate exceeds this limitation.

MIL-G-25871B

5.2.3 Level C. Packages which require overpacking 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 Consolidated Freight Classification Rules or regulations of other common carriers, as applicable to the mode of transportation.

5.3 Physical protection. Cushioning, blocking, bracing and bolting as required shall be in accordance with MIL-STD-1186 except that for domestic shipments, waterproofing requirements for cushioning materials and containers shall be waived. Drop tests of MIL-STD-1186 shall be waived when preservation, packaging, and packing of the item is for immediate use or when drop tests of MIL-P-116 are applicable.

5.4 Marking of shipments. Interior packages and exterior shipping containers shall be marked in accordance with MIL-STD-129.

6. NOTES

6.1 Intended use. All types of laminates are intended for normal glazing installation for a specific part of an aircraft.

6.1.1 Type I. Type I laminates utilize commercial plate or float glass intended for normal use.

6.1.2 Type II. Type II laminates utilize a special high-light-transmission glass intended for use when high light transmission is mandatory.

6.1.3 Type III. Type III laminates utilize a special heat-absorbing glass intended for use when the absorption of radiant energy is of primary importance, and light transmission can be sacrificed.

6.1.4 Type IV. Type IV laminates utilize a special low-expansion glass intended for use when exceptionally high resistance to thermal shock is desired.

6.1.5 Type V. Type V laminates utilize chemically strengthened glass intended for normal use.

6.1.6 Other laminates. In the event laminates of a type not covered herein are desired (for example, a laminate composed of different types of MIL-G-25667 glass plies, such as one ply of Type II color-clear glass and one of Type III heat-absorbing glass, or a laminate composed of one or more plies of a special glass not covered by MIL-G 25667), it is recommended that the laminate be tested for the

MIL-G-25871B

properties covered by this specification using the detailed test methods herein with the specific requirements being approved by the procuring activity and specified in the contract or order.

6.2 Ordering data. Procurement documents (contract or order) should specify the following:

- a. Title, number, and date of this specification.
- b. Type and class of glass. (See 1.2).
- c. Interlayer type. (See 3.1.2).
- d. Special requirements for plasticizer. (See 3.1.2).
- e. Design and construction. (See 3.2 through 3.2.2).
- f. Degree of temper. (See 3.3).
- g. Dimensions and tolerances. (See 3.4 through 3.4.3. and 4.4.7).
- h. Original luminous transmittance for Type III laminates. (See 3.7).
- i. Optical inspection criteria. This should include one or more drawings showing zones of inspection including non-critical and gunsight areas, optical deviation and distortion requirements for various zones, optical distortion test method, angle of installation and point eye-position and allowable minor defects for units larger than 1.858 square metres (20 square feet). (See 3.11 through 3.11.3, and 4.4.6.2).
- j. Location of identification, marking, and serial numbering requirements, as applicable (See 3.12).
- k. Test methods for special laminates. (See 6.1.6).
- l. Levels of packaging and packing. (See 5.1 and 5.2).

6.3 Marginal indicia. No asterisk (*) symbol is used to indicate where technical changes have been made in this specification because of the extensive nature of all changes. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content in relation to the previous issue.

Custodians:
Air Force - 11
Navy - SH

Preparing Activity:
Air Force - 11

Project No. 9340-0044

Review Activity:
DSA-GS

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