

# MIL-R-6771B

## 20 SEPTEMBER 1954

Superseding  
MIL-R-006771A(USAF)  
15 December 1953  
MIL-R-6771  
22 June 1950

### MILITARY SPECIFICATION

#### REFLECTOR; GUNSIGHT GLASS

This specification has been approved by the Department of Defense for use of the Departments of the Army, the Navy, and the Air Force.

#### 1. SCOPE

1.1 This specification covers glass in the form of plates to be used for the fabrication of reflector glass.

#### 2. APPLICABLE DOCUMENTS

2.1 The following specifications and standards, of the issue in effect on date of invitation for bids, form a part of this specification to the extent specified herein:

#### SPECIFICATIONS

##### Federal

DD-G-451	Glass, Flat and Corrugated, for Glazing, Mirrors, and Other Uses
NN-P-515	Plywood, Container Grade
PPP-B-601	Boxes, Wood, Cleated-Plywood

##### Military

MIL-P-116	Preservation, Methods of
JAN-G-174	Glass, Optical
JAN-P-106	Packaging and Packing for Overseas Shipment - Boxes; Wood, Nailed
JAN-P-108	Packaging and Packing for Overseas Shipment - Boxes, Fiberboard (V-Board and W-Board), Exterior and Interior

#### STANDARDS

MIL-STD-129	Marking for Shipment and Storage
MIL-STD-130	Identification Marking of U. S. Military Property

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(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.)

### 3. REQUIREMENTS

3.1 General.- The requirements of Specifications DD-G-451 and JAN-G-174 are applicable as requirements of this specification.

3.1.1 Where the requirements of this specification conflict with either of the above general specifications, this specification shall govern.

3.2 Component parts.- The gunsight reflector shall consist of a single plate glass from which surface irregularities have been removed by precision grinding to produce surfaces that are plane and parallel, in order to meet the optical requirements.

3.3 Materials.- The materials used shall be such as to produce glass having the characteristics specified herein.

3.4 Design.- The glass as required herein is designed as the transparent reflector-screen item in gunsight optical systems. Gun alignment between the target and sight becomes more effective with this addition.

3.4.1 Surface and color tint.- Glass shall be ground and polished on both surfaces. It may show a slight greenish tint after this operation.

3.4.2 Light transmission.- Visible light transmission through a 0.250-inch glass path shall be not lower than 88 percent of the incident light, unless otherwise specified.

#### 3.4.3 Optics.-

3.4.3.1 Reflection.- To insure that a double image will not be produced by the two surfaces of the reflector plate, the wedge angle between the two surfaces in any part of the critical area shall not exceed a value "W," depending upon the angle of incidence of the optical axis of the reflector plate measured in the plane containing the optical axis and perpendicular to the reflector plate. This value may be determined from figure 1, unless otherwise specified.

3.4.3.2 Flatness.- The reflector plate shall be such that the curvature radius for each of the surfaces in the critical area shall be not less than 360 feet for glass less than 1/4 inch thick, and 500 feet for glass 1/4 inch thick or more.

#### 3.5 Construction.-

3.5.1 Defects in critical area.- The area of the glass used for reflection (critical area) shall contain not more than three scattered seeds. Seeds shall not exceed 1/64 inch in diameter.

3.5.1.1 The area between the concealed portion and the critical area may contain scattered seeds not to exceed 1/64 inch.

3.5.1.2 No surface breaks, such as scratches, digs, cuts, and rubs shall exist in any part of the exposed area of the plate when a crystalline edge caused by these defects is apparent to the unaided eye.

3.5.1.3 There shall not be any striae, ream, or chord in the exposed area of the plate.

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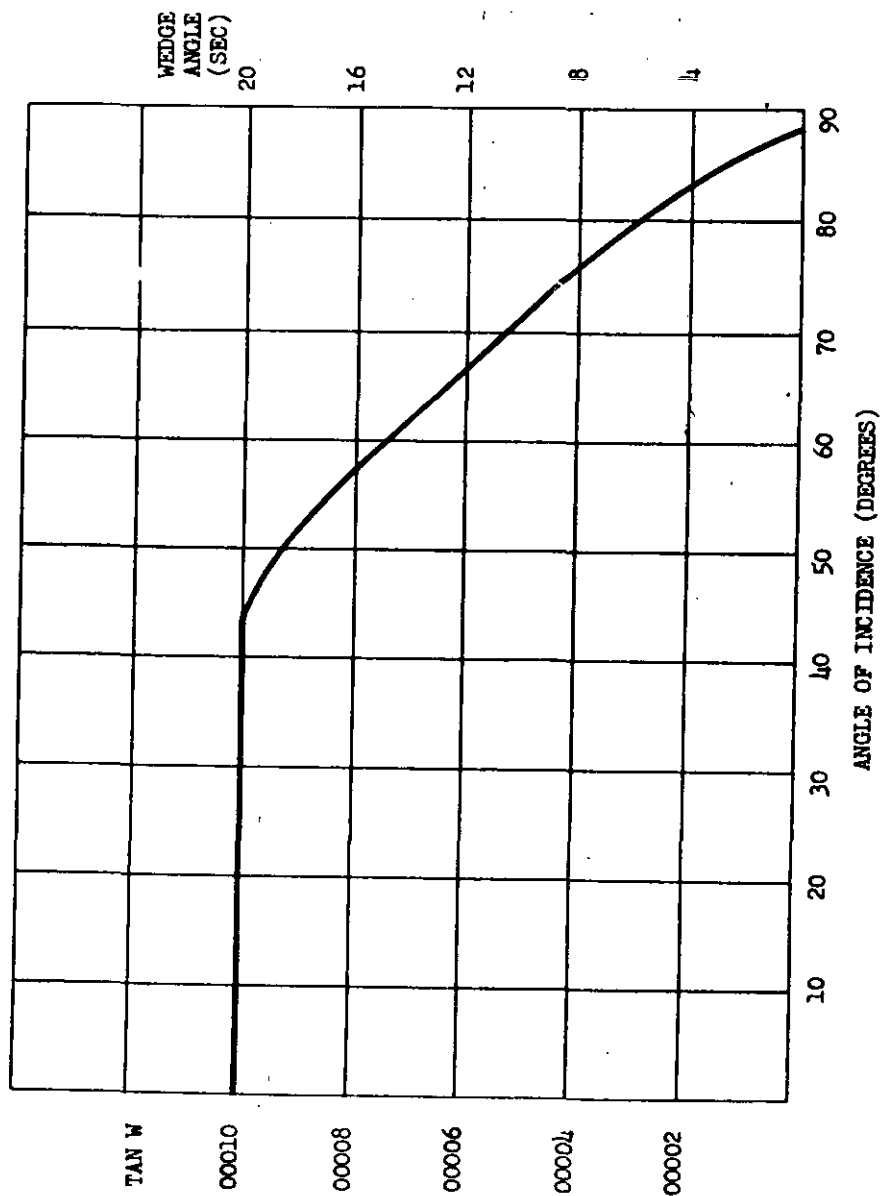


FIGURE 1. Determination of "W"

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### 3.5.2 Edges.-

3.5.2.1 The entire periphery of the edges and the surfaces of the bevel shall be gray-ground to reduce objectionable highlights.

3.5.2.2 The area concealed under the holding fixture may contain edge defects if no vent or crack will result. Small chips, not to exceed 1/64 inch, will be permitted on exposed edges of the plate, and the seam may be extended to 1/16 inch to minimize such chips.

3.6 Tolerances.- Dimensional tolerances shall be in accordance with the following, unless otherwise specified.

- (a) A tolerance  $\pm 1/32$  inch will be permissible in the length or width.
- (b) A tolerance  $\pm 5$  degrees will be permissible on bevels.
- (c) For shapes other than square or rectangular, the allowable tolerance shall be doubled.
- (d) Thickness of reflector plates shall be as specified on the applicable drawing. When no tolerance is given on the drawing, it shall be  $+0.020$  and  $-0.010$  inch.

3.7 Weight.- The weight of the finished glass shall not exceed 12 pounds per square foot per inch thickness.

3.8 Size.- Glass shall be furnished, cut to exact sizes and shapes, as specified in the order or contract.

3.9 Performance.- The reflector shall satisfy its required functions and meet the test requirements of Section 4.

3.9.1 Temperature change.- The glass shall be capable of withstanding changes in temperature from  $-65^{\circ}$  to  $+160^{\circ}$ F without cracking, clouding, or other evidence of deterioration.

3.10 Identification of product.- Each finished plate shall be permanently marked on one corner without extending more than 1/2 inch from the edge. No ink shall be used. Marking shall be in accordance with Standard MIL-STD-130 and also as follows:

Manufacturer's name or trade-mark  
Drawing Part No. \*  
Specification MIL-R-6771B

\*Applicable data to be entered by the contractor.

3.11 Workmanship.- Workmanship shall be free from defects which will affect the appearance of the reflector glass or which may affect its serviceability.

## 4. QUALITY ASSURANCE PROVISIONS

4.1 Classification of tests.- The inspection and testing of reflector glass shall be classified as follows:

- (a) Preproduction tests: Preproduction tests are those tests performed on samples representative of the production of the item after the award of contract, to determine that the production meets the requirements of this specification.

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- (b) Acceptance tests: Acceptance tests are those tests performed on individual lots which have been submitted for acceptance.

4.2 Test conditions.-- Unless otherwise specified, the reflector plate shall be tested at temperatures between 68° and 86°F under prevailing atmospheric conditions.

4.3 Preproduction tests.--

4.3.1 Sampling instructions.-- One or more reflector glasses as specified in the contract will be tested for design approval by the procuring activity or, when so specified in the contract, at the contractor's plant under the supervision of the procuring activity.

4.3.2 Tests.-- The Preproduction tests of reflectors shall consist of all the tests specified under Acceptance tests.

4.4 Acceptance tests.-- The Acceptance tests shall consist of the Individual tests and Sampling tests.

4.4.1 Individual tests.-- Each reflector plate shall be subjected to the following tests.

4.4.1.1 Examination of product.-- Each reflector plate shall be checked for compliance with this specification with respect to material, dimensions, finish, defects, and marking during the following test.

4.4.1.1.1 Each reflector plate shall be checked for striae and other defects in a dark room by the following method (or any other method approved by the procuring activity):

- (a) A diffusing screen shall be placed 80 inches from a source of light approximately 1/16 inch in diameter, normal to the light path. The reflector shall be held at the same angle to the light path as in use, at a point midway between the light source and screen. Any defects or striae will be indicated by shadows or lines of unequal illumination on the screen. The exposed area of the reflector shall be free from striae and other defects visible to the unaided eye.
- (b) The surfaces shall be inspected in a dark room by viewing each surface in a beam of light reflected obliquely at various angles off that surface. Surface breaks, scratches, digs, cuts, and the like shall not be discernible to the unaided eye when viewed in this manner.

4.4.2 Sampling tests.-- Ten percent of the reflector plates shall be selected at random from each lot or fraction thereof on the order and subjected to the Sampling tests. These tests (Parallelism, Visual light transmission, and Radius of curvature) shall be in addition to the Individual tests specified above.

4.4.2.1 Radius of curvature.-- The reflector plate shall be tested to determine whether the curvature radius of each surface of the critical area is in accordance with the limits specified in paragraph 3.4.3.2. Any suitable method approved by the procuring activity may be used. One suggested method is to make use of the interference fringes produced in the following manner and as shown on figure 2 in which:

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- S - monochromatic source of light.
- T - thin transparent plate of glass.
- O - optical flat.
- R - reflector plate under test.
- M - microscope of low-magnifying power.

4.4.2.1.1 Light from S shall be so reflected downward by T that it falls on R and O. The observer looking through M will then see the interference fringes formed by the air film between R and O. If the lower surface of R is plane, then straight parallel fringes equally spaced will result. If this surface is cylindrical, then straight parallel fringes not equally spaced, or curved fringes, will result. If unequally spaced straight fringes are seen, then the plate shall be moved until curved fringes are visible. If the surface R is curved in any other manner, curved fringes will be visible.

4.4.2.1.2 A straight edge shall be placed over the portion of the critical area which reveals the most highly curved fringes. The straight edge shall be placed tangent to the most highly curved fringe at its peak, and a count shall be made of the number of fringes that it crosses from the point of tangency. N shall equal the number of fringes crossed. The values B equal to  $N L/2$  is then computed where L is the wavelength of the light used. Therefore, when sodium light is used, if the straight edge crosses more than 7 fringes per inch, the radius of curvature is less than 500 feet. Similarly, if the straight edge crosses more than 10 fringes per inch, the radius is less than 360 feet.

4.4.2.1.3 If sodium light of wavelength 5895.9 angstroms is used, the maximum allowable value of N may be computed as follows for a distance of 1 inch from the point of tangency; i.e., H - 1 inch:

$$S = H^2/12,000 = 1/12,000 \text{ inch} = 0.000083$$

$$B = 0.0000116 N \text{ inch}$$

In order that B does not exceed S, then N may not be greater than 7. Therefore, when sodium light is used, if the straight edge crosses more than 7 fringes per inch, the plate shall be rejected.

#### 4.4.2.2 Parallelism.-

4.4.2.2.1 The reflector plate shall be tested for wedge angle between the two surfaces of the reflector plate. This test may be conducted with a good micrometer of sufficient accuracy, but any other method acceptable to the procuring activity may be used. The difference in the thickness of the plate shall be measured at the center of the critical area and at each end of the major and minor axes of this area.

4.4.2.2.2 The difference in thickness between any 2 points shall not exceed a value T equal to D tangent W where "D" is the distance between the 2 points and "W" is the angle determined from figure 1. Tangent W can also be obtained from figure 1. If "W" equals 20 seconds, that is, angle of incidence of the optical axis on the reflector is 45 degrees or less, then tangent W is 0.001. Thus, if the measurements are taken at 2 points 1 inch apart, the differences in thickness between the 2 points shall be not greater than 0.001 inch.

4.4.2.2.3 An optional method of making this test is to use a calibrated collimator capable of measuring the double-image angle. If this method is used, the double-image angle shall be not greater than 1 minute 20 seconds.

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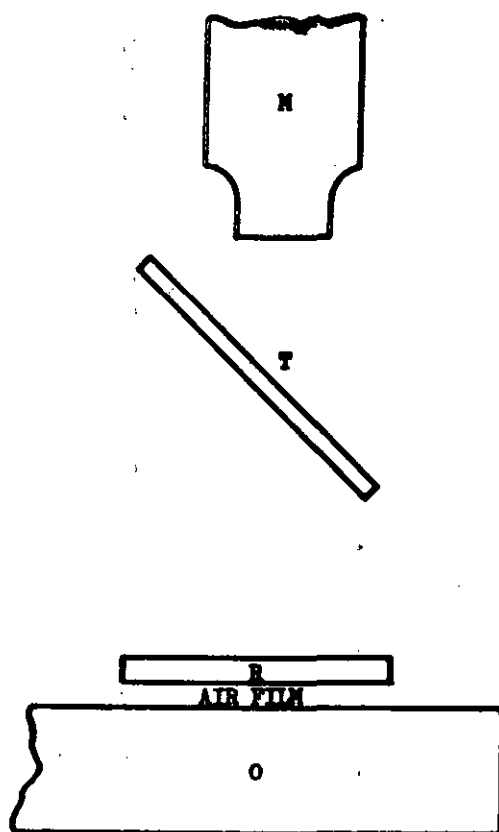


FIGURE 2. Setup for determining flatness

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4.4.2.3 Visual light transmission.- The visual light transmission shall be conducted with a Western Model 603 Foot-candle meter, or equal, equipped with a Visor filter, or equivalent, having similar spectral sensitivity and equivalent accuracy. Then, with the position of the light source and photronic cell fixed, the reflector plate shall be placed in front of the cell and the transmitted light measured. Light shall be not less than 88 percent of the incident light.

4.4.3 Rejection and retest.-

4.4.3.1 Failure of any sample to conform to any one of the requirements specified herein shall be cause for rejection of the lot represented. Rejected glass shall not be resubmitted for test without particulars covering previous rejection being furnished the procuring activity. Glass rejected after retest shall not be resubmitted without the specific approval of the procuring activity.

4.4.3.2 When tests are specified on a quantity of reflector plates that are selected as representative of a certain lot, and one or more of this number fails to meet the requirements, additional plates of the lot represented shall be tested immediately to determine the cause of failure. Individual performance tests shall not be interrupted, unless the defect is of such a nature that it will seriously affect the performance or safe use of the reflector.

## 5. PREPARATION FOR DELIVERY

5.1 Application.- The requirements of Section 5 apply only to direct purchases by or direct shipments to the Government.

5.2 Packaging.- Each reflector glass shall be packaged in accordance with Specification MIL-P-116, method 1A, without the addition of a contact preservative.

5.2.1 Unit packages.- Unit packages shall be in accordance with Specification JAN-P-108.

5.3 Packing.- Shipping containers, insofar as possible, shall contain an identical number of parts, shall be uniform in size, and shall be designed to enclose the contents in a snug, tight-fitting manner. The gross weight of the shipping container, when packed for shipment, shall not exceed approximately 200 pounds.

5.3.1 Domestic shipment.- When domestic shipment is specified, interior packages shall be packed in substantial commercial shipping containers so constructed as to insure acceptance by common or other carrier for safe transportation at the lowest rate to the point of delivery. The use of corrugated and solid fiberboard having a minimum Mullen test of less than 275 pounds is prohibited.

5.3.2 Overseas shipment.- For overseas shipment, the interior packages shall be packed in shipping containers in accordance with Specification PPP-B-601 or JAN-P-106. Plywood, if used, shall be in accordance with Specification NN-P-515, type II, class 2.

5.4 Marking of shipments.- Interior packages and exterior shipping containers shall be marked in accordance with Standard MIL-STD-129. The nomenclature shall be as follows: Reflector, Gunsight Glass, Size \*, Specification MIL-R-6771B, Drawing Part No. \*, Federal Stock No. \*, (if no FSN available, leave space therefor).

\*Applicable data to be entered by the contractor.



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## 6. NOTES

6.1 Intended use.- The reflector glass specified is intended for use on all collimating-type gunsights utilizing a separate reflector glass.

6.2 Superseding data.- This specification supersedes Specification MIL-R-6771, which specification incorporated the requirements of U. S. Army Specification 93-24794, and Specification MIL-R-006771A(USAF).

6.3 Ordering data.- Requisitions, contracts, and orders should specify part numbers, quantities, and whether overseas shipment is required. Drawings should specify the kind of glass and show the critical, central, and border areas, where applicable.

6.3.1 Approval of Preproduction test sample.- It is expected that the contract or purchase order will specify that one or more reflector glasses of each drawing Part number will be required as First Articles and that these First Articles will be subjected to the Preproduction tests to determine compliance with the requirements of this specification. The invitation for bids and the contract should specify the point of inspection for these tests.

6.4 Definitions.- Definitions of the defect terms used herein may be obtained from Specifications DD-G-451 and JAN-G-174.

PATENT NOTICE: When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

## Custodians:

Army - Ordnance Corps  
Navy - Bureau of Ordnance  
Air Force