

MIL-M-13508A

16 APRIL 1963

SUPERSEDING

MIL-M-13508 (ORD)

24 JUNE 1954

MILITARY SPECIFICATION

**MIRRORS, GLASS, FRONT SURFACED
ALUMINIZED, FOR OPTICAL ELEMENTS**

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

1. SCOPE

1.1 Scope. This specification covers mirrors used in optical fire control equipment and projection systems for wavelengths of light within the visible spectrum of 400 millimicrons to 700 millimicrons. These mirrors consist of optical blanks with a deposit of aluminum reflecting coating overlaid with a protective film on the front surface of each blank.

2. APPLICABLE DOCUMENTS

2.1 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

UU-T-101 Tape, Gummed, Mending and Reinforcing Paper and Cloth
CCC-C-271 Cheesecloth, Bleached and Unbleached

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MIL-O-13830 Optical Components for Fire-Control Instruments General Specification Governing the Manufacture Assembly and Inspection of

MIL-P-16898 Preservation and Packaging of Lenses, Prisms Reticles and Mirrors Associated with Navigational and Projection Equipment.

MIL-I-45208 Inspection Requirements, General Specification for

STANDARDS

MILITARY

MIL-STD-105 Sampling Procedures and Tables For Inspection by Attributes
MIL-STD-202 Test Methods for Electronic and Electrical Component Parts

DRAWINGS

U.S. ARMY MUNITIONS COMMAND

C7641866 Scratch and Dig Standard
D7680600 Optical Coating Standard

(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.)

3. REQUIREMENTS

3.1 General. General requirements and associated tests common to all fire control instruments as contained in MIL-O-13830 shall be mandatory. For purposes of this

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specification pinholes shall be referred to as digs.

3.2 Film and coating processes. The coating and film processes producing a finished minor shall cause no impairment to the optical surface which would cause rejection of the optical blank under MIL-O-13830. No optical blank which has met the requirements of MIL-O-13830 shall be rejected because of fine hair lines, scratches, digs or stains which are made more visible by the mirroring process.

3.3 Protective film. The protective film shall be magnesium fluoride or any oxide of silicon unless otherwise specified by the drawing.

3.3.1 Film thickness. The optical thickness of the film which protects the aluminum coating shall be one-half wavelength for 550 millimicrons unless otherwise specified by the drawing.

3.4 Reflectivity. The finished mirrors shall not have less than 86 percent reflectivity for white light and shall be measured as specified in 4.8.

3.5 Surface quality. The surface quality of the mirror shall be as specified on the drawing when inspected in accordance with 4.9.

3.6 Hardness. There shall be no deterioration of the finished mirror such as streaks or hairline scratches when tested in accordance with 4.10.

3.7 Adherence. No part of the aluminum coating shall be removed when tested in accordance with 4.11.

3.8 Temperature exposure. The finished mirror shall show no evidence of damage after being subjected to the test specified in 4.12.

3.9 Humidity and salt spray. When specifically required by the procuring agency (see 6.2) the finished mirror shall be subjected to the humidity and salt spray tests specified in 4.13. At the completion of these tests the mirror shall show no evidence of corrosion or pitting.

3.10 Workmanship. Workmanship shall be in accordance with 4.14.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified, the supplier may utilize his own facilities or any commercial laboratory acceptable to 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 General requirements. Except where otherwise specified herein, the contractor's inspection system shall be in accordance with MIL-I-45208.

4.3 Lot formation. When inspection lot sizes and lot formations are applicable, they shall be in accordance with MIL-STD-105 and shall also be defined in the contractor's inspection system.

4.4 Inspection of components. All positional and functional characteristics shown on drawings, or contained in notes on the drawings or referenced specifications, which indicate precision requirements and have a bearing on the functional accuracy and performance of a specific system shall be inspected in accordance with the written inspection system required by MIL-I-45208.

4.5 Component sampling inspection. Where quality control has been established on in-process manufacture, sampling inspection of components may be used in lieu of 100 percent inspection and shall be in accordance with the following sampling plan:

Lot size inclusive	Sample size	Accept lot	Reject lot
0— 25	Use 100% Inspection		
26— 35	20	0	1
36— 50	25	0	1
51—150	30	0	1
151—300	30	1	2
301—over	60	2	3

4.6 Film and coating processes. A visual inspection shall be performed upon completion of each film and coating process. Using the scratch and dig Standard C7641866 there shall not be more than the allowable scratches or digs in the useable aperture, and they shall not exceed the size designated in surface quality requirements on the element drawings. Both processes must be in accordance with 3.2.

4.7 Film thickness. A visual comparison inspection shall be made of the protective film overlay. Using the optical coating comparison standard D7680600 and a fluorescent lamp positioned so that both the sample and standard are reflecting the image of the lamp, a comparison of color at the desired range can be made. In the absence of a standard a spectrophotometer can be employed to measure the film thickness as required in 3.3.1.

4.8 Reflectivity. This inspection shall be conducted with the aid of a spectrophotometer to determine the percentage of reflectance when the mirror is positioned at a 45° angle (Fig. 1). The mirror shall reflect no less than the minimum percent required by 3.4.

4.9 Surface quality. A visual inspection for surface quality shall be made of the polished optical blank and it shall be in accordance with the applicable test procedures for lenses specified in MIL-O-13830. This inspection shall be performed prior to the application of the aluminum coating and protective overlay film. The surface quality inspection for the coating and film shall be performed after each process has been completed as specified in 4.6 and 4.7 for conformance with 3.5.

4.10 Hardness. This test shall be performed using a pad of clean dry laundered cheesecloth, conforming to Spec. CCC-C-271, approximately 3/8 inch in diameter and approximately 1/2 inch thick. Bearing with a minimum force of one pound on the protected clean surface of the mirror, rub a minimum of 50 strokes across the surface in straight lines or circular motions. Subsequent to this

procedure the protective coating must meet the requirements of 3.6.

4.11 Adherence. The inspector shall place the sticky surface of cellulose tape, conforming to Specification UU-T-101, over a portion of the coated surface. Rub the tape firmly against the coated surface. Pull the tape down over the edges of the mirror and then slowly remove the tape. A visual inspection shall be made of the tested area to assure that the coating and protective film have not been removed from the reflecting surface to determine compliance with 3.7. Edges not forming a part of the reflecting surface shall not be considered when inspection is being performed.

4.12 Temperature exposure. The mirror shall be exposed to ambient temperatures of minus 80 and plus 160 degrees Fahrenheit for a period of 5 hours at each specified temperature. A visual inspection shall be made at these temperatures for separation or lifting of the film and coating from the glass. The same inspection shall be made after the mirror is returned to standard ambient temperature (plus 60° to 90° Fahrenheit).

4.13 Humidity and salt spray.

4.13.1 Humidity exposure. The inspection shall place several sample mirrors selected at random from a normal production run in a thermostatically controlled humidity cabinet, with an atmosphere of at least 95 percent relative humidity at a temperature of 120° plus or minus 4° Fahrenheit for a continuous period of 24 hours. The relative humidity shall be determined by wet and dry bulb thermometers. After this exposure has been completed the samples shall be cleansed and the test in 4.10 shall be performed on the samples to insure compliance with the requirements of 3.6 and 3.7 as specified by 3.9.

4.13.2 Salt spray exposure. This inspection test shall be conducted in accordance with test procedure of MIL-STD-202. After this exposure has been completed the samples shall be cleansed and shall be subjected to the tests specified in 4.10 and 4.11 for assurance

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that the requirements of 3.6 and 3.7 have been met.

4.14 Workmanship. All mirrors shall meet the test methods and procedures specified herein to determine compliance with 3.10 as well as visual examination to be made subsequent to all testing to determine compliance with workmanship as specified.

5. PREPARATION FOR DELIVERY

5.1 Packaging, packing and marking. Packaging, packing and marking shall be in accordance with MIL-P-16898.

6. NOTES

6.1 Intended use. Mirrors covered by this specification are intended for use in optical fire control equipment and projection systems to form images by reflecting light rays without appreciable diffusion by the application of metallic coating or backing to one side of a shaped piece of polished glass.

Custodians:

Army—Munitions Command
Navy—Bu Ships
Air Force—Middletown AMA

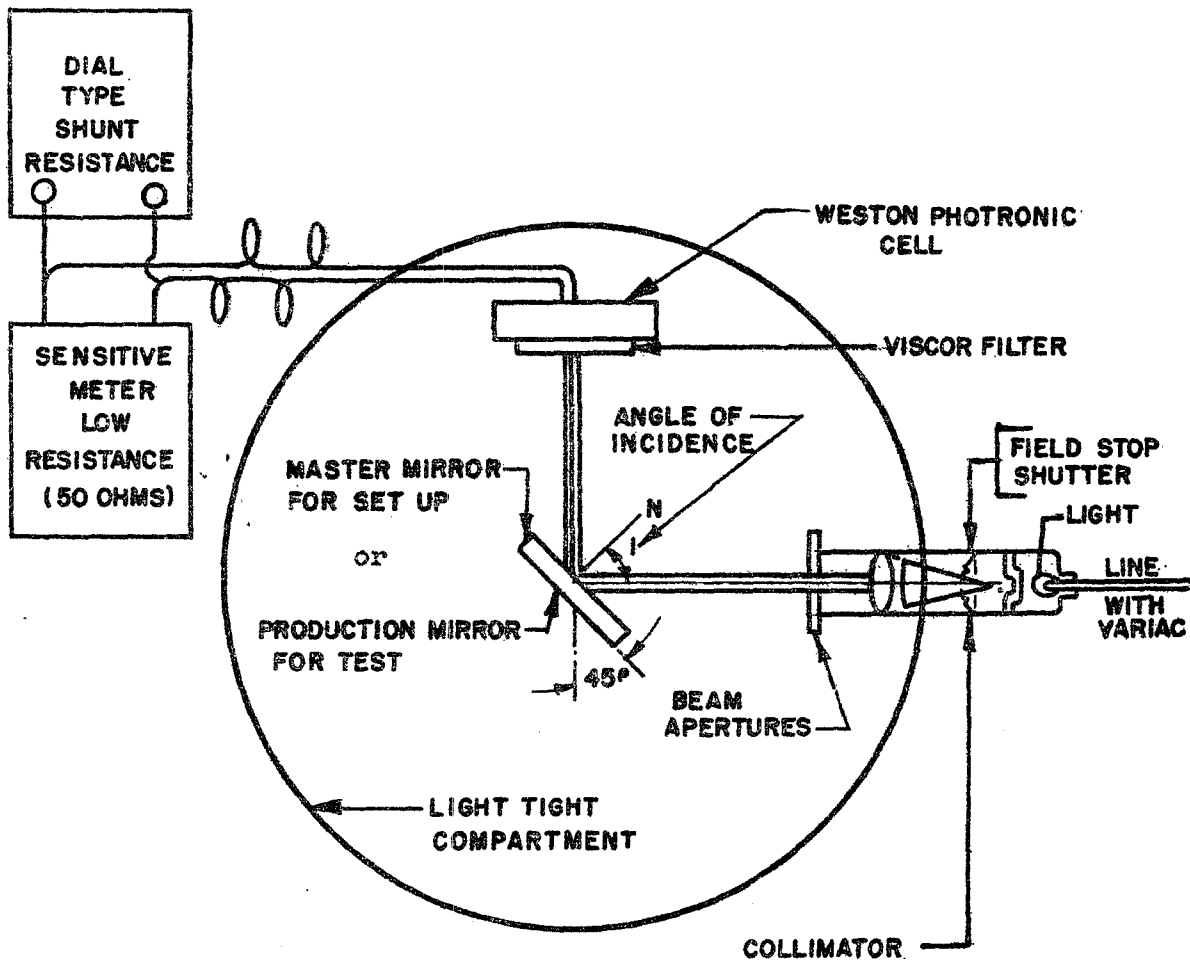
6.2 Ordering data. Procurement documents should specify the following:

- (a) Title, number and date of this specification.
- (b) Quantity of mirrors.
- (c) Type of protective film.
- (d) Whether humidity or salt spray tests are required.
- (e) Selection of applicable levels of packaging and packing.

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 of conveying any rights or permission to manufacture, use or sell any patented invention that may in any way be related thereto.

Preparing activity:

Army—Munitions Command
Project No. 6650-0103



THE LOAD RESISTANCE OF THE PHOTOCCELL IS REDUCED BY METER ADJUSTMENT SHUNT

FIGURE 1