

INCH-POUND

MIL-DTL-7989C  
25 SEPTEMBER 2006  
 SURPERSEDING  
 MIL-C-7989B  
 8 March 1971

## DETAIL SPECIFICATION

 COVERS, LIGHT – TRANSMITTING, FOR AERONAUTICAL  
 LIGHTS, GENERAL SPECIFICATION FOR

Inactive for new design after 11 June 1999

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

## 1. SCOPE

1.1 Scope. This specification covers light-transmitting covers for Aeronautical use.

1.2 Classification. Covers shall be furnished in the following classes, as specified:

- Class A - Annealed Glass (Nonheat Resistant)
- Class B - Heat Resistant Class
- Class C - High-Impact Strength Glass
- Class D - Plastic

## 2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in section 3, 4, or 5 of this standard. This section does not include documents cited in other sections of this standard or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of documents cited in section 3, 4, or 5 of this standard, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specification, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

## DEPARTMENT OF DEFENSE SPECIFICATIONS

(See supplement 1 for a list of Aeronautical and Military Standards)

## DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-130 Identification Markings of U.S. Military Property

(Copies of these documents are available online at <http://assist.daps.dla.mil/quicksearch/> or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

Comments, suggestions, or questions on this document should be addressed to Defense Supply Center Philadelphia (DSCP), ATTN: DSCP-NASA, 700 Robbins Avenue., Philadelphia, PA 19111-5096 or e-mail to [dscpg&inspeccomments@dla.mil](mailto:dscpg&inspeccomments@dla.mil). Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at <http://assist.daps.dla.mil>.

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2.3 Non-Government publications. The following documents form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

#### AMERICAN SOCIETY FOR QUALITY (ASQ)

ASQ Z1.4 Sampling Procedures and Tables for Inspection by Attributes

(Copies of this document are available from [www.asq.org](http://www.asq.org) or American Society for Quality Control, 611 East Wisconsin Avenue, Milwaukee, WI 53202.)

#### SOCIETY OF AUTOMOTIVE ENGINEERS (SAE)

SAE AS25050 Colors, Aeronautical lights and Lighting Equipment, General Requirements for

(Copies of this document are available from [www.sae.org](http://www.sae.org) or the Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096-0001.)

2.4 Order of precedence. In the event of a conflict between the text of this document and the reference cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

### 3. REQUIREMENTS

3.1 Preproduction. This Specification makes provisions for preproduction testing.

3.2 Selection of specifications and standards. Specifications and standards for necessary commodities and services not specified herein shall be selected as provided in 3.2.1 and 3.2.2.

3.2.1 Commercial parts. Commercial parts having suitable properties may be used where, on the date of invitation for bids, there are no suitable standard parts. In any case, commercial utility parts such as screws, bolts, nuts, and cotter pins, having suitable properties may be used provided:

- a. They can be replaced by the standard parts (MS or AN) without alteration.
- b. The corresponding standard part numbers are referenced in the parts list and, if practical, on the contractors drawings.

3.2.2 Standard Parts. With the exception in 3.2.1, MS or AN standard parts shall be used where they suit the purpose. They shall be identified on the drawings by their part numbers.

#### 3.3 Materials.

3.3.1 Fungus-proof materials. Materials that are nutrients for fungi shall not be used where it is practical to avoid them. Where used and not hermetically sealed, they shall be treated with a fungicide agent acceptable to the procuring activity. However, if they will be used in a hermetically sealed enclosure, fungicidal treatment will not be necessary.

3.3.2 Recycled, recovered, or environmentally preferable materials. Recycled, recovered, or environmentally preferable materials should be used to the maximum extent possible, provided that the material meets or exceeds the operational and maintenance requirements, and promotes economically advantageous life cycle costs.

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3.4 Design and construction.

3.4.1 General. Covers shall be free from defects which will prevent meeting candlepower intensity and beam distribution, strength, thermal shock, or other physical requirements. Open blisters or imbedded blisters which may be opened with a pencil point are not acceptable. Polished sheets of filters shall be entirely free from wrinkles and mold marks.

3.4.2 Bubbles. Diffusing covers will not be required to meet any bubble requirements.

3.4.2.1 Bubble obstruction. The distribution of bubbles shall be reasonably uniform throughout the cover. The percentage of useful surface obstructed by bubbles (B) shall not exceed one. This percentage shall be determined by multiplying one hundred times the sum of the squares of the projected effective diameters of the bubbles ( $\sum d^2$ ) divided by the square of the projected effective diameter ( $D^2$ ), or

$$B = \frac{100 \sum d^2}{D^2}$$

B shall not exceed 1

3.4.2.1.1 The effective diameter of a noncircular cover or bubble is one half the sum of the largest and smallest dimensions of the cover or bubble.

3.4.2.1.2 The total number of bubbles shall not exceed the number shown in Table I.

TABLE I. Number of bubbles.

Effective Diameter of Bubble in Inches	Number of Bubbles per Effective Square Inch of Projected Area of Cover
.050 - .060	3
.040 - .050	4
.030 - .040	6
.020 - .030	11
.015 - .020	25
.010 - .015	44
.005 - .010	100

3.4.2.2 Large bubbles. When bubbles larger than .050 inch effective diameter are grouped, nonoverlapping circular or square areas of 1 square inch of projected area be drawn about the projected pattern in such a way that no unit of area has more than 3 bubbles. No more than 5 bubbles greater than .050 inch effective diameter shall be allowed within any 1 square inch of projected area.

3.4.3 Gasket surfaces. The gasket surfaces of all covers shall be either ground or molded to a sufficiently true surface to insure a tight joint.

3.4.4 Colored covers. All colored covers shall be colored material throughout the entire thickness of the portions designed for light transmission. Surface coloring will not be accepted.

3.4.5 Glass. Those portions of colored diffusing glass covers designed to transmit light shall be uniformly coated on the inside surface with an inorganic white, highly diffusing enamel. Covers shall be fired at such a Temperature and for such a period as to insure adhesion of the enamel to the glass.

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3.4.5.1 White diffusing glass covers may be made either from clear glass with a coating of diffusing white enamel, applied as specified in 3.4.5, or from good quality opal glass.

3.4.6 Plastics. Diffusion in plastic covers shall be accomplished by means of a pigment uniformly dispersed throughout the plastic.

3.5 Performance.

3.5.1 Exposure. Covers shall be capable of withstanding exposure to atmospheric conditions of high humidity and bright sunlight for a period of at least 1 year without showing surface roughening or undergoing an appreciable change in color or optical properties.

3.5.2 Heat resistance.

3.5.2.1 Class A, B, and C covers. Class A, B, and C covers shall withstand operation in the lighting fixture for which they are designed for a period of 1 hour followed by immediate chilling to 10° Centigrade (C).

3.5.2.2 Class B and C covers. Class B and C covers shall withstand the sudden temperature shock specified in the applicable detail specification or drawing. If no temperature shock is specified, the covers shall withstand the temperature shock test specified in 4.4.5.2.

3.5.2.3 Class D covers. Class D covers shall withstand a temperature of 60 °C for 6 hours without appreciable change in dimensions or optical properties .

3.5.3 Impact. Class C covers shall withstand impact tests as required by the applicable detail specification.

3.5.4 Water absorption. Class D covers shall show a weight increase of not more than 1.6 percent after immersion in water for 24 hours.

3.5.5 Specific gravity. The specific gravity of class D covers shall not exceed 1.40.

3.5.6 Chromaticity and transmission. Chromaticity and transmission shall be in accordance with SAE-AS25050.

3.5.7 Diffusion. Diffusing covers shall meet the brightness ratio requirements of SAE-AS25050.

3.6 Interchangeability. All parts having the same manufacturer's part number shall be functionally and dimensionally interchangeable.

3.7 Dimensions. The shape and dimensions of covers shall conform to applicable standard or specification.

3.8 Identification of product. Equipment, assemblies, and parts shall be marked for identification in accordance with MIL-STD-130.

3.9 Workmanship. Workmanship shall be in accordance with high-grade aircraft manufacturing practice covering this class of material.

4. VERIFICATION

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

- a. Preproduction inspection (4.2)
- b. Conformance inspection (4.3)

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4.2 Preproduction inspection.

4.2.1 Preproduction inspection samples. The preproduction inspection samples shall consist of 10 covers of each class representative of the production equipment. They shall be tested at a laboratory designated by the procuring activity or, when so stated in the contract, at the contractor's plant under the supervision of the procuring activity.

4.2.2 Preproduction tests. Preproduction tests shall consist of all tests described under 4.4.

4.3 Conformance inspection. Conformance inspection shall consist of the following:

- a. Individual tests.
- b. Sampling plans and tests.

4.3.1 Individual tests. Each sample cover shall be subjected to the following tests as described under 4.4:

- a. Examination of product.
- b. Chromaticity and transmission or brightness ratio.

4.3.2 Sampling plans and tests. Unless otherwise specified, the Acceptable Quality Levels (AQLs) listed in this section shall be used to establish the sample size, however, the acceptance number shall be zero.

4.3.2.1 Lot. The lot definition, formation, and size shall be in accordance with ASQ Z1.4.

4.3.2.2 Sampling plan A. One random sample of covers from each lot shall be selected in accordance with ASQ Z1.4, inspection level II, AQL of 1.0 percent defective. The sample shall be subjected to the following tests as described under 4.4:

- a. Examination of product.
- b. Dimensions.

4.3.2.3 Sampling plan B. A random sample of covers on each lot shall be selected in accordance with ASQ Z1.4, AQL 6.5 percent, inspection level as specified. The sample shall be subjected to the following tests as described under 4.5.

- |                                                         |                      |
|---------------------------------------------------------|----------------------|
| a. Heat resistance                                      | Inspection Level S-4 |
| b. Specific gravity (plastic only)                      | Inspection Level S-4 |
| c. Water absorption (plastic only)                      | Inspection Level S-4 |
| d. Diffusion (glass only)                               | Inspection Level S-4 |
| e. Chromaticity and transmission or<br>brightness ratio | Inspection Level S-1 |
| f. Coloring                                             | Inspection Level S-1 |

4.3.3 Resubmitted inspection lots. ASQ Z1.4 shall apply except that a resubmitted inspection lot shall be inspected by the contractor under the supervision of the inspector using tightened inspection. If the original acceptance was zero, a sample size represented by the next higher sample size code letter shall be chosen with the acceptance number remaining zero.

4.4 Test methods.

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4.4.1 Examination of product. Each cover shall be examined to determine conformance to this specification with respect to material and workmanship. The covers shall be examined for defects and bubbles. A cover conforming to a detailed standard or specification shall be considered acceptable with regard to bubble obstruction (see 3.4.2.1) if it meets the beam candlepower and beam distribution requirements of that detail standard or specification.

4.4.2 Chromaticity and transmission or brightness ratio. Inspection of covers to determine conformance to requirements for chromaticity and transmission or brightness ratio shall be in accordance with SAE-AS25050. For covers which meet candlepower and beam distribution requirements (see 4.4.1) only the chromaticity need be determined.

4.4.3 Coloring. One cover of each class and color may be broken at the discretion of the inspector to determine compliance with the requirements for coloring.

4.4.4 Dimensions. Samples shall be checked for compliance with the applicable drawings or specifications by measurement or by suitable gages or jigs.

4.4.5 Heat resistance.

4.4.5.1 Class A, B, and C cover samples shall be installed in the fixtures for which they are intended. The fixtures shall be equipped with lamps of the maximum wattage to be used under each type of cover. The fixtures shall be operated at the rated voltage of the lamps, in still air at 20° to 25° C for 1 hour, after which the fixtures shall, if practicable, be immediately immersed in water at a temperature of 10° C or if immersion is not practicable, they shall be sprayed with water at a temperature of 10° in a manner simulating rainfall.

4.4.5.2 Temperature shock. Class B or C cover samples shall be heated in an oven to a temperature of 100° ±2° C, for 1 hour. They shall then be immediately immersed in water at a temperature of 0° to 5° C.

4.4.5.3 Class D covers. The samples shall be placed in an oven heated to 60° C. After 6 hours at that temperature, the pieces shall be checked for dimensions, warpage, unmolding of surface, chromaticity, and transmission or brightness ratio. The transmission and brightness ratio tests shall be in accordance with SAE-AS25050.

4.4.6 Specific gravity. The specific gravity shall be checked by any standard method.

4.4.7 Water absorption. The samples shall be carefully weighed and then submerged in water for the specified time at room temperature. Upon removal from water they shall be quickly wiped dry, weighed, and the weight increase recorded.

4.4.8 Diffusion (class). The sample shall be submerged in any commercially available paint and varnish remover for a period of not less than 3 minutes. Evidence of loosening or softening or other dissolution of the enamel shall constitute failure in this case.

## 5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When packaging of materiel is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the military service's system commands. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity."

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## 6. Notes.

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

6.1 Intended use. The light-transmitting covers covered by this specification are intended for use as follows:

- a. Class A covers. In light assemblies where weight and heat resistance are not important factors.
- b. Class B and C covers. In light assemblies where resistance to heat is essential.
- c. Class D covers. In light assemblies where light weight is essential and heat resistance is not an important factor.

6.2 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number, and date of this specification.
- b. Part number of the cover desired.
- c. That ten covers of each class should be furnished as preproduction test samples and the point of preproduction testing (see 4.3.1).
- d. Packaging requirements (see 5.1).

6.3 Subject term (key word) listing.

Annealed glass cover  
Heat-resistant glass cover  
High-impact strength glass cover  
Plastic cover

6.4 Changes from previous issue. Asterisks or vertical lines are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

Custodians:  
Army – AV  
Navy – AS  
Air Force – 99

Preparing activity:  
DLA-IS  
  
(Project No. 6220-2006-005)

Review Activities:  
Army – MI  
Air Force – 71

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at <http://assist.daps.dla.mil>.