

INCH-POUND

MIL-PRF-13455D

22 July 1996

SUPERSEDING

MIL-F-13455C(AT)

17 February 1988

PERFORMANCE SPECIFICATION

FILTER, LIGHT (FOR BLACKOUT SECURE)

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

1 SCOPE

1.1 Scope This specification covers one type of non-fluorescent, optical isotropic blue light filter for use in military vehicle interiors (see 6.1)

2 APPLICABLE DOCUMENTS

2.1 General The documents listed in this section are specified in sections 3 and 4 of this specification. This section does not include documents cited in other sections of this specification 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 documents cited in sections 3 and 4 of this specification, whether or not they are listed.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to U S Army Tank-automotive and Armaments Command, ATTN AMSTA-TR-E/BLUE, Warren, MI 48397-5000, by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document, or by letter

AMSC N/A

FSC 6220

DISTRIBUTION STATEMENT A Approved for public release, distribution is unlimited

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2.2 Government documents

2.2.1 Other Government documents, drawings, and publications The following other Government documents, drawings, and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues are those cited in the solicitation (see 6.2)

DRAWINGS

DEPARTMENT OF DEFENSE

12314082 - Lens, Blue

(Copies of this drawing are available from the U.S. Army Tank-automotive and Armaments Command, AMSTA-TR-E/BLUE, Warren, MI 48397-5000)

2.3 Non-Government publications The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DoD adopted are those listed in the issue of the Department of Defense Index of Specification and Standards (DoDISS) cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DoDISS are the issues of the documents cited in the solicitation (see 6.2)

AMERICAN NATIONAL STANDARD INSTITUTE (ANSI)

ANSI/ASQC Z1.4 - Sampling Procedures and Tables for Inspection by Attributes (DoD Adopted)

(Application for copies should be addressed to American National Standard Institute, 11 West 42nd Street, New York, NY 10036)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D1003 - Standard Test Method for Haze and Luminous Transmittance of Transparent Plastics
ASTM D1435 - Standard Practice for Outdoor Weathering of Plastics

(Application for copies should be addressed to the American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959)

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2.4 Order of precedence In the event of a conflict between the text of this document and the references 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 First article When specified (see 6.2), a first article sample shall be subjected to first article inspection (see 4.3).

3.2 Materials Materials used shall be in accordance with the manufacturer's materials specifications for the light filter. The materials shall be capable of meeting all of the operational and environmental requirements specified herein.

3.2.1 Corrosion control When applicable, the light filter shall be fabricated from compatible metals or materials that are inherently corrosion resistant or are permanently treated to prevent forms of corrosion and deterioration which affect system performance (see 4.5.1).

3.3 Design and construction The design and construction of the light filter shall be fabricated and assembled to the form and dimensions shown on Drawing 12314082 and as specified herein (see 4.3 and 4.5.1).

3.3.1 Mounting equipment Filters shall be furnished with mounting equipment. The mounting equipment shall conform to applicable drawings or specified requirements and shall be free from defects affecting the appearance or serviceability of the installed filters (see 4.3 and 4.5.1).

3.4 Performance

3.4.1 Optical characteristics

3.4.1.1 Spectral transmission The emission transmitted by the light filter, of any vehicle interior or exterior light source, which may be illuminated (including warning lights) in the blackout mode, shall be limited to the visible spectrum (380 to 700 millimicrons) as shown in figure 1. No energy shall be emitted in the 700 to 1200 millimicron portion of the electromagnetic spectrum (see 4.5.3).

3.4.1.1.1 Selectivity Light filters shall have the following transmission characteristics (see 4.5.2.1).

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- a 50 percent (%) transmission at some point within the range of 620 to 640 millimicrons inclusive
- b Less than 1% transmission at all points within the range of 360 to 580 millimicrons inclusive

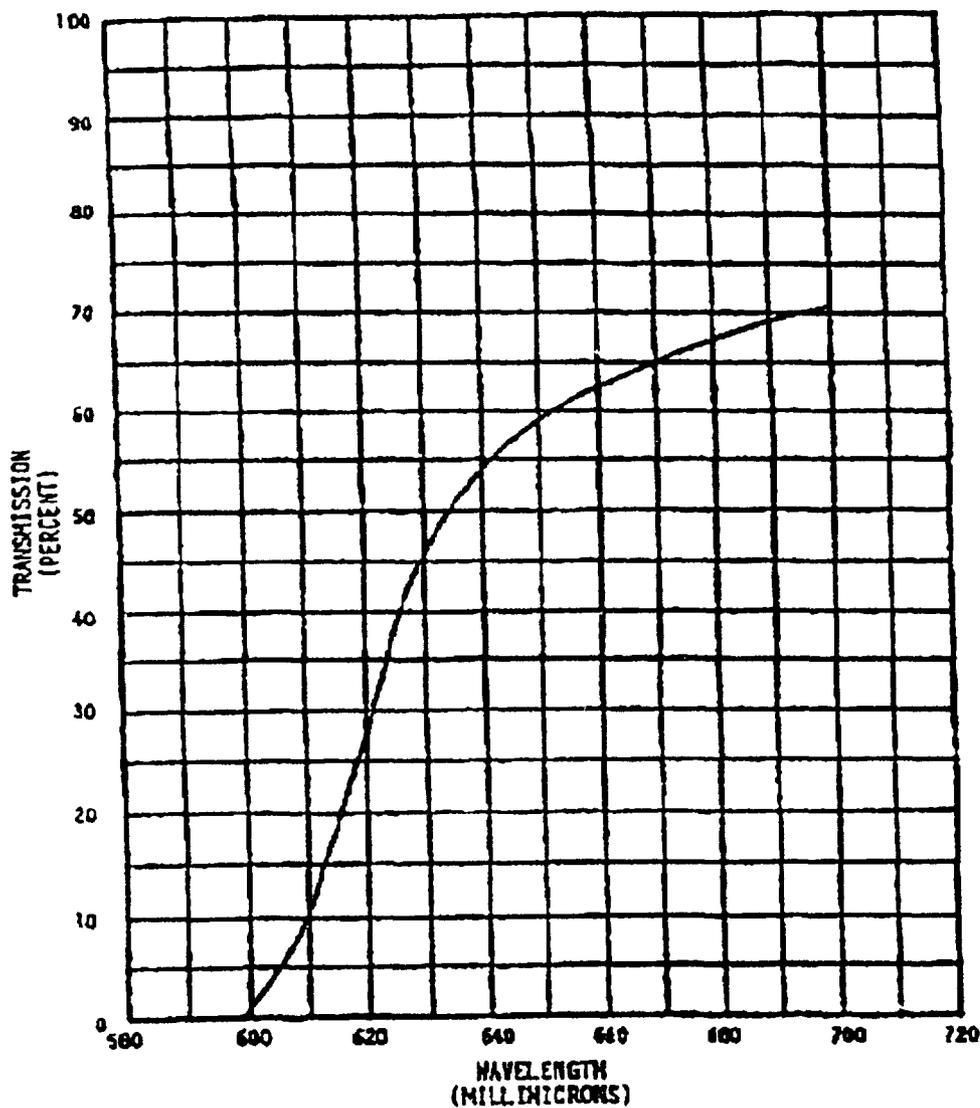


FIGURE 1 Transmission characteristics for light filter

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3 4 1 1 2 Transmission analysis The sums obtained using rod visibility factors and cone visibility factors respectively (see table I), shall be in accordance with the following (see 4 5 3)

| | |
|---------------------------|---------------------|
| <u>Visibility factors</u> | <u>Sum obtained</u> |
| Rod factors | 11 maximum |
| Cone factors | 90 minimum |

TABLE I Transmission results

| Wavelength, millimicrons | Rod visibility factor, R | Cone visibility factor, C | Transmission T% | R x T | C x T |
|-----------------------------|--------------------------------|---------------------------------|--------------------|-------|-------|
| 360 | 1 000 | 1 000 | - | - | - |
| 370 | 1 000 | 1 000 | - | - | - |
| 380 | 1 000 | 1 000 | - | - | - |
| 390 | 1 000 | 1 000 | - | - | - |
| 400 | 1 000 | 1 000 | - | - | - |
| 410 | 1 000 | 1 000 | - | - | - |
| 420 | 1 000 | 1 000 | - | - | - |
| 430 | 1 000 | 1 000 | - | - | - |
| 440 | 1 000 | 1.000 | - | - | - |
| 450 | 1 000 | 1 000 | - | - | - |
| 460 | 1 000 | 1 000 | - | - | - |
| 470 | 1 000 | 1 000 | - | - | - |
| 480 | 1 000 | 1 000 | - | - | - |
| 490 | 1 000 | 1 000 | - | - | - |
| 500 | 1 000 | 1 000 | - | - | - |
| 510 | 1 000 | 1 000 | - | - | - |
| 520 | 1 000 | 1 000 | - | - | - |
| 530 | 1 000 | 1 000 | - | - | - |
| 520 | 1 000 | 1 000 | - | - | - |
| 540 | 1 000 | 1 000 | - | - | - |
| 550 | 1 000 | 1 000 | - | - | - |
| 560 | 1 000 | 1 000 | - | - | - |
| 570 | 1 000 | 1 000 | - | - | - |
| 580 | 3475 | 9293 | - | - | - |
| 590 | 2147 | 8684 | - | - | - |
| 600 | 1288 | 7718 | - | - | - |
| 610 | 0736 | 6550 | - | - | - |
| 620 | 0429 | 5262 | - | - | - |
| 630 | 0261 | 3871 | - | - | - |

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TABLE I Transmission results - Continued

| Wavelength, millimicrons | Rod visibility factor, R | Cone visibility factor, C | Transmission T% | R x T | C x T |
|-----------------------------|--------------------------------|---------------------------------|--------------------|--------|--------|
| 640 | 0159 | 2695 | - | - | - |
| 650 | 0100 | 1732 | - | - | - |
| 660 | 0067 | 1036 | - | - | - |
| 670 | 0044 | 0568 | - | - | - |
| 680 | 0028 | 0315 | - | - | - |
| 690 | 0018 | 0158 | - | - | - |
| 700 | 0011 | 0082 | - | - | - |
| 710 | 0007 | 0044 | - | - | - |
| 720 | 0005 | 0023 | - | - | - |
| 730 | - | 0012 | - | - | - |
| 740 | - | 0006 | - | - | - |
| 750 | - | 0003 | - | - | - |
| 760 | - | 0001 | - | - | - |
| | | | Total | 11 Max | 90 Min |

3.4.2 **Reflection** The light filter shall reflect not more than 15% of the light directed to it when placed in light conforming to standard illuminant C (see 4.5.3.4)

3.4.3 **Weathering** The light filter shall meet the requirements of 3.4.1.1 after being subjected to accelerated weathering (see 4.5.3.5)

3.5 **Identification marking** Identification marking shall include, as a minimum, the following information permanently marked on the exterior of the light filter (see 4.3)

- a Manufacturer's identification including the commercial and Government entity (cage)
- b National stock number

3.6 **Workmanship** Light filters shall be free from scratches, sharp edges, or cracks and any defects which may affect their optical characteristics or appearance. Dimensions shall be within specified limits shown on applicable drawings, and surfaces shall be of specified finish and without blemish (see 4.3)

4 VERIFICATION

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

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- a First article inspection (see 4 3)
- b Conformance inspection (see 4 4)
 - 1 Examination
 - 2 Tests

4 2 Inspection conditions Unless otherwise specified (see 6 2), all inspections shall be conducted under the following conditions

- a Air temperature 55 to 91°F (13 to 33°C)
- b Barometric pressure 28 5 (+2 0, -3 0) inches of Hg (97 (+6 8, -10 kPa))
- c Relative humidity 50 ±30%

4 3 First article inspection Unless otherwise specified (see 6 2), first article inspection shall be performed on four light filters when a first article sample is required This inspection shall include the examinations of 4 4 1 (see table III) and the tests of table II

TABLE II Classification of inspections

| Title | Requirement | Inspection | First article | Conformance | |
|-----------------------|----------------|------------|---------------|-------------|-------|
| | | | | Examination | Tests |
| Materials | 3 2 thru 3 3 1 | 4 5 1 | X | | |
| Selectivity | 3 4 1 1 1 | 4 5 2 1 | X | | X |
| Transmission analysis | 3 4 1 1 2 | 4 5 3 | X | | X |
| Reflection | 3 4 2 | 4 5 3 4 | X | | |
| Weathering | 3 4 3 | 4 5 3 5 | X | | |

TABLE III Classification of defects.

| Category | Defects | Method of examination |
|---------------|---|-----------------------|
| Critical | None | |
| <u>Major.</u> | | |
| 101 | Assembly incomplete (see 3 3) | Visual |
| 102 | Dimensions affecting interchangeability, out of tolerance (see 3 3) | SIE 1/ |
| 103 | Improper marking (see 3 5) | Visual |
| 104 | Faulty workmanship affecting performance (see 3 7) | Visual |

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TABLE III Classification of defects

| Category | Defects | Method of examination |
|--------------|---|-----------------------|
| <u>Minor</u> | | |
| 201 | Dimensions not affecting interchangeability, out of tolerance (see 3 3) | SIE |
| 202 | Improper marking (see 3 5) | Visual |
| 203 | Faulty workmanship affecting appearance (see 3 7) | Visual |

1/ SIE = Standard Inspection Equipment

4 3 1 First article inspection failure Deficiencies found during, or as a result of, first article inspection shall be cause for rejection of the first article sample until evidence has been provided by the contractor that corrective action has been taken to eliminate the deficiency. Any deficiency found during, or as a result of, first article inspection shall be evidence that all items already produced prior to completion of the first article inspection are similarly deficient unless contrary evidence satisfactory to the contracting officer is furnished by the contractor. Such deficiencies on all items shall be corrected by the contractor. The Government will not accept products until first article inspection is completed to the satisfaction of the Government.

4 4 Conformance inspection Conformance inspection shall include the examinations of 4 4 1 and the tests of 4 5 2 and 4 5 3

4 4 1 Examination

4 4 1 1 Sampling Samples from an inspection lot for conformance inspection shall be selected in accordance with ANSI/ASQC Z1 4. Each sample selected shall be inspected as specified herein for the defects listed in table III. Conformance to a lot shall be accepted when zero (0) defects are found and rejected when one (1) or more defects are found.

4 4 1 2 Classification of defects For examination purposes, defects shall be classified as listed in table III.

4 4 2 Acceptance tests Each light filter or core selected in accordance with 4 4 1.1 shall be subjected to the tests specified in table II. Failure of any test shall be cause for rejection.

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4 5 Methods of inspection

4 5 1 Materials and construction Conformance to 3 2 thru 3 3 1 shall be determined by inspection of contractor records providing proof or certification that design, construction, processing, and materials conform to requirements. Applicable records shall include drawings, specifications, design data, receiving inspection records, processing and quality control standards, vendor catalogs and certifications, industry standards, test reports, and rating data.

4 5 2 Performance tests

4 5 2 1 Selectivity This test shall be conducted in conjunction with the test specified in 4 5 3. If a continuous-recording instrument is used, the entire transmission curve shall be examined for conformance to the curve shown in figure 1 and to the requirements of 3 4 1 1 1. If readings have been taken at 10 millimicrons intervals only, the values shall be compared with the values shown on figure 1 for each corresponding wavelength. A value of 50% or less for the 620 millimicrons reading and a value of 50% or more for the 640 millimicrons reading shall constitute conformance to requirement of 3 4 1 1 a.

4 5 3 Transmission analysis test

4 5 3 1 Apparatus The instrument used for this test shall be a spectrophotometer capable of isolating a spectral band in the order of magnitude of 1 millimicron or less in width and employing photometric means for measuring the percentage of the incident light transmitted.

4 5 3.2 Procedure Light of the wavelength range 360 to 760 millimicrons inclusive shall be directed at the surface of incidence of the light filter, from a direction normal to it, and the percent of transmission measured at the wavelength values specified in table I.

4 5 3.3 Transmission evaluation The product of the spectral transmission in % (T) and the rod visibility factor (R) shall be determined for each wavelength listed in table I. The product of T and the cone visibility factor (C) shall be determined for each wavelength listed in table I. When both products have been obtained for each specified step, the sum of all the products of R times T and the sum all the products of C times T shall be in accordance with 3 4 1 1 2.

T = Spectral transmission, %

R = Rod visibility factor

C = Cone visibility factor

4 5 3 4 Reflection To determine conformance to 3 4 2, the light filter shall be conditioned for not less than 2 hours at $77 \pm 5^\circ\text{F}$, and while at that temperature, shall be placed in light conforming to standard illuminant C in accordance with procedure A of ASTM D1003. The percentage of reflection shall be measured with photometric equipment. The filter shall be placed

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in the light path at any angle above the critical angle of refraction, and adjusted to achieve maximum reflection from the outer (normally exposed) surface

4.5.3.5 Weathering test Light filters shall be subjected to accelerated weathering in accordance with ASTM D1435. Filters shall be attached to panels of a size and shape to permit their installation on the apparatus turntable. Filters shall be located on the panels in such manner that, when the panels are mounted on the turntable, the area to be tested for light transmission shall be 4.50 ± 0.25 in from the center of turntable rotation. Filters shall be mounted with the outer side exposed. At the completion of the weathering procedure, filters shall be subjected to the test specified to determine conformance to 3.4.3.

5 PACKAGING

5.1 Packaging For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When actual packaging of materiel is to be performed by DoD personnel, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activity within the Military Department or Defense Agency, or within the Military Department's System Command. 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.

6 NOTES

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

6.1 Intended use Filters covered by this specification are intended for interior use in combat vehicles, trailers, and similar applications for maintaining blackout security by providing a blue light which will permit performance of the tasks required of dark-adapted vehicle personnel while preserving the maximum practicable degree of dark adaptation and which will be visible for the minimum possible distance.

6.2 Acquisition requirements Acquisition documents must specify the following:

- a Title, number, and date of the specification
- b Issue of DoDISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.2.1 and 2.3)
- c When first article is required (see 3.1)
- d Inspection conditions if other than as specified (see 4.2)
- e If first article sample should be other than as specified (see 4.3)
- f Packaging requirements (see 5.1)

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6.3 Subject term (key word) listings

Blue light
Combat vehicles
Dark adaptations

6.4 Changes from previous issue Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extent of the changes

Custodian
Army - AT

Preparing Activity
Army - AT

Review Activities
Army - ME, EA, MI
DLA - GS

(Project 6220-1086)

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

- 1 The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision number should be given.
- 2 The submitter of this form must complete blocks 4, 5, 6, and 7.
- 3 The preparing activity must provide a reply within 30 days from receipt of the form.

NOTE: This form may not be used to request copies of documents, nor to request waivers, or clarification of requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

| | | | |
|--|--|--|------------------------------------|
| 1 RECOMMEND A CHANGE: | | 1 DOCUMENT NUMBER MIL-PRF-13455D | 2 DOCUMENT DATE (YYMMDD) 960722 |
| 3. DOCUMENT TITLE Filter, Light (For Blackout Secure) | | | |
| 4 NATURE OF CHANGE (Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed) | | | |
| 5 REASON FOR RECOMMENDATION | | | |
| 6. SUBMITTER | | | |
| a NAME (Last, First, Middle Initial) | | b. ORGANIZATION | |
| c. ADDRESS (Include Zip Code) | | d TELEPHONE (Include Area Code) (1) Commercial D. AUTOVON (if applicable) | 7. DATE SUBMITTED (YYMMDD) |
| 8. PREPARING ACTIVITY | | | |
| a NAME | | b TELEPHONE (Include Area Code) (1) Commercial (810) 574-8745 (2) AUTOVON 786-8745 | |
| c ADDRESS (Include Zip Code) Commander U.S. Army Tank-automotive and Armaments Command, ATTN: AMSTA-TR-E/BLUE, Warren, MI 48397-5000 | | IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT Defense Quality and Standardization Office 5203 Leesburg Pike Suite 1403, Falls Church, VA 22041-3466 Telephone (703) 756-2340 AUTOVON 289-2340 | |