MIL-L-0050064F(EA)
1 November 1977
SUPERSEDING
MIL-L-0050064E(MU)
29 January 1973
USED IN LIEU OF
MIL-L-50064C
30 September 1964
(See 6.5)

MILITARY SPECIFICATION

LENSES, OPHTHALMIC, SIMPLE

This limited coordination Military specification has been prepared by US Army Armament Research and Development Command (DRDAR-TSC-S) based upon currently available technical information, but it has not been approved for promulgation as a coordinated revision of Military Specification MIL-L-50064C. It is subject to modification. However, pending its promulgation as a coordinated Military specification, it may be used in procurement.

1. SCOPE

1.1 Scope. This specification covers three types of cast, cylindrical, plastic lenses.

1.2 Classification. Lenses shall be of the following types, as specified (see 6.2):

Type I - Drawing C5-2-951.
Type II - Drawing C5-2-1000.
Type III - Drawing C5-2-1594.

2. APPLICABLE DOCUMENTS

2.1 Government 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:

FSC 4240

: Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, US Army Armament Research and Development Command, Attn: DRDAR-TSC-S, Aberdeen Proving Ground, MD 21010 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

SPECIFICATIONS

MILITARY

MIL-C-10758 - Chemical Agent, GB.
MIL-C-12051 - Chemical Agent, Mustard, Distilled (HD).

STANDARDS

FEDERAL

FED-STD-123 - Marking for Shipment (Civil Agencies).

MILITARY

MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.

DRAWINGS

US ARMY ARMAMENT RESEARCH AND DEVELOPMENT COMMAND

EDGEWOOD ARSENAL

C5-2-951 - Lens, Chemical-Biological Mask, C5.
C5-2-1000 - Lens, Outsert.
C5-2-1594 - Lens.
DLB136-19-6-1 - Tester, Impact, Lens, Q39.
D6540-A50-0089 - Lensometer, Q44.

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

PUBLICATIONS

EDGEWOOD ARSENAL INSTRUCTION MANUAL

136-300-118 - Instruction Manual for the Operation and Maintenance of Shadowgraph, Lens, Ophthalmic, Simple.

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.

AMERICAN SOCIETY FOR TESTING AND MATERIALS

ASTM Standards

D673 - Test for Mar Resistance of Plastics.
D1003 - Test for Haze and Luminous Transmittance of Transparent Plastics.

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pennsylvania 19103.)

3. REQUIREMENTS

3.1 Material. The lens shall be fabricated of cast, thermosetting plastic material using allyl diglycol carbonate as the basic monomer in the formulation (see 6.4).

3.2 Manufacture. The lens shall be manufactured in accordance with Drawing C5-2-951, C5-2-1000, or C5-2-1594 as applicable (see 6.1).

3.3 Light transmission. The lens shall transmit a minimum of 89 percent of the incident visible light when tested as specified in 4.4.4.1.1.

3.4 Haze. Haze shall be no more than 4.0 percent when tested as specified in 4.4.4.1.1.

3.5 Prismatic effect. The prismatic effect of the lens shall not exceed one-eighth diopter in the vertical meridian nor more than three-eighths diopter in the horizontal meridian when tested as specified in 4.4.4.1.2.

3.6 Refractive power. The refractive power of the lens shall not exceed plus or minus one-eighth diopter when tested as specified in 4.4.4.1.3.

3.7 Local distortion. The lens shall exhibit no regions wherein the difference in prismatic effect or refractive power exceeds one-eighth diopter in any meridian when tested as specified in 4.4.4.1.4.

3.8 Local defects (see figure 1). When tested as specified in 4.4.4.1.5, any local defects present in the lens shall satisfy the following requirements:

3.8.1 Magnitude. The lens shall exhibit no local defect whose magnitude or intensity exceeds the allowable maximum for the applicable zone.

3.8.2 Number. The total number of detectable local defects in the lens shall not exceed two in zone A or five in zone B.

3.8.3 Proximity. In zones A and B there shall be no two detectable local defects separated by less than 1/4 inch; in zone C there shall be no two detectable local defects separated by less than 1/8 inch.

3.9 Durability.

3.9.1 Boiling. The lens shall show no discoloration or evidence of fracture and its radius of curvature shall not change by more than ± 10 percent when tested as specified in 4.4.4.2.1.

3.9.2 Thermal shock. The lens shall show no discoloration or evidence of fracture and its radius of curvature shall not change by more than ± 10 percent when tested as specified in 4.4.4.2.2.

3.9.3 Room temperature impact. The lens shall neither fracture nor chip when tested as specified in 4.4.4.2.3.

3.9.4 Low temperature impact. The lens shall neither fracture nor chip when tested as specified in 4.4.4.2.4.

3.9.5 Mar resistance. Haze shall be no more than 5.0 percent when tested as specified in 4.4.4.2.5.

3.9.6 Chemical resistance. The lens shall show no discoloration or crazing when tested as specified in 4.4.4.2.6.

3.9.7 Discoloration. The lens shall show no discoloration and shall transmit no less than 89 percent of the incident visible light when tested as specified in 4.4.4.2.7.

3.10 Preproduction sample. Prior to the start of regular production, a preproduction sample of lenses shall be produced in accordance with this specification for examination and tests (see 4.3).

3.11 Workmanship. The lens shall be colorless, smooth, and free from blemishes (internal and external), striae, waves, and damage such as cracks, splits, and other visible defects as revealed in shadowgraph examination (see 4.4.4.1.5), which will impair its appearance or cause distortion of vision. In addition, the lens shall be free from foreign matter. Workmanship and local defects of a magnitude greater than the referee standards established by the Government for major and minor defects (see 6.6) shall be categorized under the appropriate defect class.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection.

4.1.1 Contractor's responsibility. Unless otherwise specified in the contract, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by 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 specified requirements.

4.1.2 Government responsibility. Unless otherwise specified, the Government will be responsible for the performance of tests specified in 4.4.4.2.6. Samples shall be forwarded to the laboratory designated by the contracting officer.

4.1.3 Objective evidence. The supplier shall provide objective evidence acceptable to the contracting officer that the requirements of 3.1 and section 5 for which specific inspection has not been provided in this specification have been satisfied.

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

(a) Preproduction inspection (see 4.3).
(b) Quality conformance inspection (see 4.4).

4.3 Preproduction inspection.

4.3.1 Sample. A preproduction sample of 35 lenses shall be produced using the same methods, materials, and equipment as will be used during regular production.

4.3.2 Inspection procedure.

4.3.2.1 For examination. The preproduction sample shall be examined for all the requirements of the drawings and of this specification.

4.3.2.2 For tests. Five lenses shall be taken at random from the preproduction sample for each of the tests specified in 4.4.4.2.

4.3.3 Tests. Tests shall be conducted as specified in 4.4.4.

4.3.4 Acceptance/rejection criteria. The preproduction sample shall meet the examination and tests as specified in 4.3.2 to be acceptable. The supplier shall obtain written approval from the contracting officer before proceeding with regular production.

4.4 Quality conformance inspection.

4.4.1 Lotting. A lot shall consist of the lenses of one type produced from one batch (see 6.3) of lens-casting compound cured under the same conditions (time, temperature, and mold conditions). Any materials, equipment, or procedure used in regular production which differs from that used in the preproduction sample shall be approved by the contracting officer prior to its institution. A new preproduction sample may be required.

4.4.2 Sampling.

4.4.2.1 For examination and nondestructive tests. Sampling shall be conducted in accordance with MIL-STD-105.

4.4.2.2 For destructive tests. Sampling shall be conducted in accordance with MIL-STD-105, level S-3.

4.4.3 Inspection procedure.

4.4.3.1 For examination and nondestructive tests. Sample lenses shall be examined and tested in accordance with the classification of defects and with MIL-STD-105.

4.4.3.2 For destructive tests. Sample lenses shall be tested in accordance with 4.4.4.1.1, 4.4.4.2.1, 4.4.4.2.5, and 4.4.4.2.7 and MIL-STD-105 using an AQL of 0.65 percent defective for acceptance except as specified in 4.4.3.3.

4.4.3.3 Classification of defects.

(a) Lens (see applicable drawing).

Categories	Defects	Acceptance standards
Critical:	None defined	
Major:	AQL 0.25 percent defective	
101	Cracks or splits	

AQL 0.65 percent defective

102	Prismatic effect excessive	4.4.4.1.2
103	Refractive power out of limit	4.4.4.1.3
104	Distortion (zone A)	4.4.4.1.4
105	Defects, over limits (zone A)	4.4.4.1.5
*106	Room temperature impact (type I and III only)	4.4.4.2.3

AQL 1.0 percent defective

107	Cylindrical radius of curvature	
108	Profile incorrect or irregular	
109	Centerline mark located incorrectly	
110	Spotty discolorations (zone A)	
111	Sharp edges	
112	Scratches (zone C)	
113	Bulge	
114	Workmanship (3.11)	
*115	Room temperature impact (type II only)	4.4.4.2.3

*Perform this test prior to other examinations and tests.

Minor: AQL 2.5 percent defective

201	Distortion (zone B)	4.4.4.1.4
202	Defects (over limits zone B)	4.4.4.1.5
203	Spotty discoloration (zone B)	
204	Thickness incorrect	

4.4.4 Tests.

4.4.4.1 Nondestructive.

4.4.4.1.1 Light transmission and haze. The light transmission and haze shall be determined using ASTM D1003. Samples taken for mar resistance test (see 4.4.4.2.5) shall be tested for compliance with 3.4 prior to testing for compliance with 3.9.5.

4.4.4.1.2 Prismatic effect. The prismatic effect of the lens shall be determined using the Q44 Lensometer (D6540-A50-0089).

4.4.4.1.3 Refractive power. The refractive power of the lens shall be determined using the Q44 Lensometer (D6540-A50-0089).

4.4.4.1.4 Local distortion (see Figure 1). Any region within zones A or B, which in the course of visual inspection or examination shows evidence of distortion due to irregularity of either surface, inhomogeneity of plastic materials, surface or internal defects, shall be examined in the following manner: Measure the apparent prismatic effect and refractive power (4.4.4.1.2 and 4.4.4.1.3) of the affected region, and then the prismatic effect and refractive power of the region adjacent to the affected region, and check for compliance with 3.7.

4.4.4.1.5 Local defects. The lens shall be examined for compliance with 3.8 by comparative shadowgraph reviewing with the referee standards in accordance with Instruction Manual 136-300-118.

4.4.4.2 Destructive tests.

4.4.4.2.1 Boiling. The lens shall be placed in boiling water for a period of at least two hours. Allow the lens to cool to room temperature. In regular production the lenses tested for mar resistance may also be used for the boiling test.

4.4.4.2.2 Thermal shock. The lens shall be placed in a boiling water bath for at least 10 minutes and shall then be transferred quickly to a crushed-ice bath containing enough water to cover the ice. The ice bath shall be stirred continually for a period of at least 10 minutes, and the lens shall then be removed and allowed to stand at room temperatures for 24 hours, whereupon it shall be examined for compliance with 3.9.2.

4.4.4.2.3 Room temperature impact. Room temperature impact shall be determined using the Q39 Lens Impact Tester (DLB136-19-6-1). This test is nondestructive when lens is properly cured.

4.4.4.2.4 Low temperature impact. The lens shall be tested using the Q39 Lens Impact Tester (DLB136-19-6-1), except that the temperature shall be minus 40° ± 3° F.

4.4.4.2.5 Mar resistance. The lens shall be abraded in accordance with ASTM D673, using at least 400 grams of abrasive. The lens shall be placed in the abrader with its convex surface up and with the normal to its surface, at the point on the axis of the abrader tube, inclined at an angle of 45 degrees to the axis of the abrader tube. After abrasion, the lens shall be dipped in water and carefully wiped dry with a lint-free cloth or tissue to remove excess abrasive. The lens shall be tested as specified in 4.4.4.1.1 for compliance with 3.9.5.

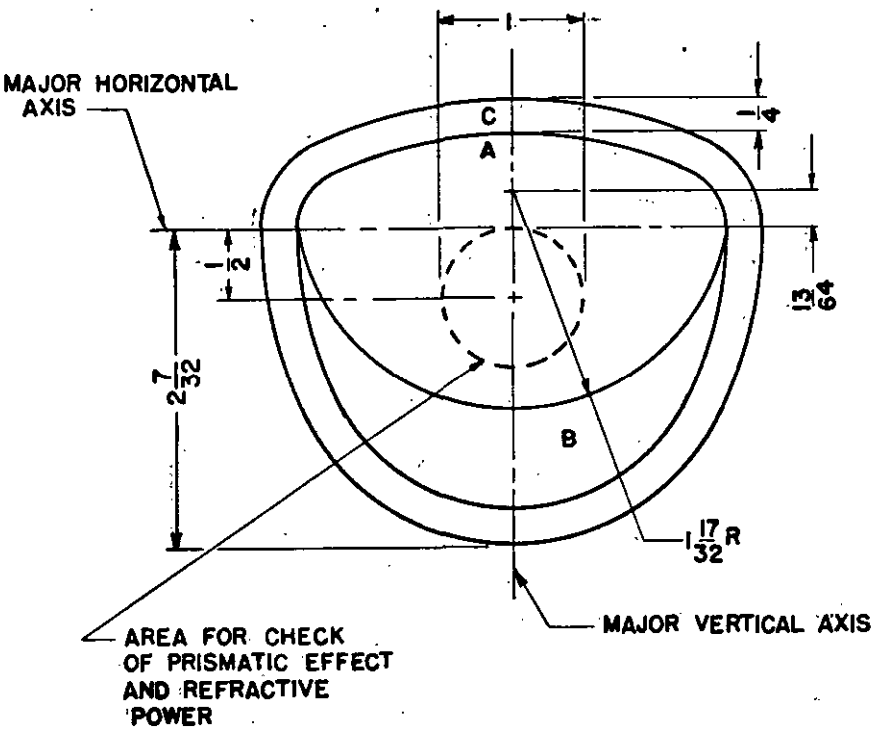

Figure 1- Lens, Cylindrical, Plastic

4.4.4.2.6 Chemical resistance. Drops of liquid agents GB (MIL-C-10758) and HD (MIL-C-12051) shall be applied to the surface of the lens and allowed to stand for a period of at least 24 hours. The lens shall be decontaminated prior to examination.

4.4.4.2.7 Discoloration. The lens, after determining light transmission in accordance with 4.4.4.1.1, shall be aged in an air circulating oven at a temperature of 155° ± 3° F for 24 continuous hours. The lens shall be removed and allowed to stand at room temperature for four hours whereupon it shall be tested as specified in 4.4.4.1.1 and examined for compliance with 3.9.7.

5. PREPARATION FOR DELIVERY

5.1 Packaging, packing, and marking, interplant shipments (see 6.7). The lenses shall be packaged and packed to provide adequate protection from physical damage from the supply source to the first receiving activity for immediate use or further processing. Shipping containers shall be in compliance with rules and regulations applicable to the mode of transportation. Marking shall be in conformance with Fed. Std. No. 123.

5.2 Repair part. When lenses are procured for storage and issue as a repair part, preservation, packaging, packing, and marking shall be as specified on the repair part packaging data sheet which is identified by the National Stock Number.

6. NOTES

6.1 Intended use. The lenses covered by this specification are intended for use as follows: Type I (M17 and M17A1 Masks), Type II (M1 Outsert), and Type III (M9 Facepiece).

6.2 Ordering data. Procurement documents should specify:

(a) The title, number, and date of this specification.
(b) Type of lens required.
(c) Preproduction.

(1) Time allowed for supplier submission of sample for Government test and evaluation after award of contract.
(2) Name and address of test facility and shipping instructions when testing is performed by the Government.
(3) Time required for the Government to notify the supplier whether or not to proceed with production.

6.3 Batch. A batch is defined as that quantity of material which has been subjected to some unit chemical or physical mixing process intended to make the final product substantially uniform.

6.4 Plastic. A copolymer with CR39 (Columbia Chemical Division, Pittsburgh Plate Glass Company) has been found to be satisfactory in manufacturing the lenses.

6.5 Supersession data. This specification includes the requirements of MIL-L-51076(CmlC), dated 29 December 1961.

6.6 Referee standards. The Government will furnish referee standards to define the type and category (major and minor) of each defect. These referee standards are based upon the defect magnitude and the potential deleterious effect on the wearer.

6.7 Interplant shipments. Packaging for supplies and materials which will not enter the military supply system. Typical interplant shipments are shipments from a vendor to a subcontractor or a prime contractor, or from a subcontractor to a prime contractor, or from a vendor or contractor to a military arsenal or plant.

Custodians:

Army - EA

Preparing activity:

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Project No. 4240-A705

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Commander
US Army Armament Research and Development Command
Attn: DRDAR-TSC-S
Aberdeen Proving Ground, MD 21010

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SPECIFICATION ANALYSIS SHEET

Form Approved
Budget Bureau No. 22-R255

INSTRUCTIONS: This sheet is to be filled out by personnel, either Government or contractor, involved in the use of the specification in procurement of products for ultimate use by the Department of Defense. This sheet is provided for obtaining information on the use of this specification which will insure that suitable products can be procured with a minimum amount of delay and at the least cost. Comments and the return of this form will be appreciated. Fold on lines on reverse side, staple in corner, and send to preparing activity. Comments and suggestions submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or serve to amend contractual requirements.

SPECIFICATION

ORGANIZATION

CITY AND STATE

CONTRACT NUMBER

MATERIAL PROCURED UNDER A

☐ DIRECT GOVERNMENT CONTRACT ☐ SUBCONTRACT

1. HAS ANY PART OF THE SPECIFICATION CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE?

A. GIVE PARAGRAPH NUMBER AND WORDING.

B. RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES

2. COMMENTS ON ANY SPECIFICATION REQUIREMENT CONSIDERED TOO RIGID

3. IS THE SPECIFICATION RESTRICTIVE?

☐ YES ☐ NO *(If "yes", in what way?)*

4. REMARKS *(Attach any pertinent data which may be of use in improving this specification. If there are additional papers, attach to form and place both in an envelope addressed to preparing activity)*

SUBMITTED BY *(Printed or typed name and activity - Optional)*

DATE

DD FORM 1 JAN 66 1426

REPLACES EDITION OF 1 OCT 64 WHICH MAY BE USED.