MIL-P-46329A(MU)
3 March 1972
SUPERSEDING
MIL-P-46329 (ORD)
30 JANUARY 1962

MILITARY SPECIFICATION

PERISCOPE , TANK: M13, M14A1, M17, M17C, M26, M27, M37 & M45

1. SCOPE

1.1 This specification covers 8 configurations of plastic periscopes known As periscope, Tank: M13, M14A1, M17, M17C, M26, M27, M37, and M45- MS. These periscopes Are used as vision devices in combat type vehicles.

2. APPLICABLE DOCuMENTS

2.1 The following documents, of the issure in effect on date of lnvitation for bids or request for proposal, form a part of this specification to the extent specified herein.

SPECIFICATIONS

Military

MIL-F-13926	Fire Control Material: General Specification Governing the Manufacture and Inspection of
MIL-O-13830	Optical Components for Fire control Instruments, General Specification Governing the Manufacture, Assembly and Inspection of
MIL-I-45607	Inspection Equipment, Acquisition, Disposition and Maintenance of

STANDARDS

Military

MIL-STD-105	Sampling Procedures lnd Tables for Inspection by Attributes
MIL-STD-109	Quality Assurance Terms lnd Definitions
MIL-STD-130	Identification Marking of U.S. Military Property
MIL-STD-810	Environmental Test Methods

DRAWINGS

U.S. Army, Frankford Arsenal

D7578357	Periscope, Tank: M13
D7694072	Periscope, Tank: M14A1
D7043549	Periscope, Tank: M17

F7595727	Periscope, Tank: M17C
D7688875	Periscope, Tank: M26
F7633132	Periscope, Tank: M27
F8635100	Periscope, Tank: M37
F8213430	Periscope, Tank: M45

(Copies of specifications, standards, drawings and packaging data sheets 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 Qualification. - Periscopes furnished under this specification shall be products which have been tested, and passed the qualification tests. listed herein, and have been listed on or approved for listing the applicable qualified products list.

3.2 Fabrication. - The periscope shall be manufactured in accordance with the drawing applicable to the type periscope specified in the contract and all drawings pertaining thereto.

3.3 General specification. - The contractor shall be responsible for adherence to, and compliance with, the following requirement. of Specifications MIL-F-13926 and MIL-O-13830.

3.3.1 MIL-O-13830.

(a) Cleanliness

3.3.2 MIL-F-13926.

(a) Order of precedence.
(b) Inorganic protective surface finishes.
(c) Dimensions and tolerances.
(d) Part identification and marking.
(e) Workmanship.

3.4 Environmental.

3.4.1 Weathering and shelf life (Qualification only). After meeting all other requirements of this specification, the periscope shall be capable of meeting the requirements of 3.4.1.1, 3.4.1.2 and 3.4.1.3, and shall be otherwise functional subsequent to unprotected outdoor exposure at a north latitude of 40° ± 5° for a period of 9 months, including initial testing, and shall be equally functional and capable of meeting these requirements subsequent to indoor storage at 60°F to 90°F for the same period.

3.4.1.1 Resolution. - Follpwing weathering and shelf life exposure (see 4.11.2) the periscope shall meet the requirement of 3.5.1 except that resolution shall be within 75 seconds of arc.

3.4.1.2 Spherical power.- Following was the ring and shelf life exposure the periscope shall meet the requirement of 3.5.2 except that spherical power shall be within the range of minus 0.60 to plus 0.30 diopter.

3.4.1.3 Astigmatism and light transmission.- Following weathering and shelf life exposure the periscope shall meet the requirements of 3.503 and 3.5.4 except that astigmatism and light transmission shall not degrade in excess of 20 percent of the value recorded prior to was the ring and shelf life tests.

3.4.2 Shock. - The periscope shall not be damaged after being subjected to the test specified in Specification MIL-O-13830, after which it shall meet all requirements of this specification.

3.4.3 Temperature
failure and shall meet the requirementst of this Specification at room temperature (60 to 90 degrees Fahrenheit) after being exposed to ambient temperatures of plus 160 and minus 65 degrees Fahrenheit.

3.4.4 Mirror and window laminations. - Mirror and window laminations shall not be damaged when sub jetted to the temperatures specified in 3.4.3. The appearance of bubbles, blisters or other indications of cement separa - tion shall be considered evidence of bond failure.

3.5 Optical characteristics.

3.5.1 Resolution. - The periscope shall permit resolution of a test pattern subtending 1 minute of arc within the resolving area as outlined on the applicable drawing specified in 2.1.

3.5.2 Spherical power. - Spherical power shall be within the range of minus 0.50 to plus 0.25 diopter.

3.5.3 Astigmatism.- Astigmatism shall mot exceed 0.25 diopter.

3 .5.4 Light transmission. - Light transmission shall not be less than 50 percent.

3.6 Bubbles and inclusions. - Bubbles and inclusions (excepting lint) shall not exceed 0.040 inch in maximum diameter and the total projected area (perpendicular to the light path) of all bubbles and inclusions shall not exceed 0.05 percent of the cross-sectional area of the plastic body perpendicular to the light path. Maximun permissible inclusions are listed below (excepting lint):

TABLE I

	Diameter (inch)				
Periscope	**.040**	**.030**	**.020**	**.010**	**.005**
M13	2	4	8	32	128
M14A1, M17	3	10	12	48	92
M17C, M26, M27, M37, M45	5	10	21	83	332

The combination of bubbles and inclusions shall not be permitted because a lesser musher than permissible is found in one area.

3.6.1 Lint.- No lint particles shall exceed 0.25 Inch in projected length (perpendicular to the light path). Not more than one such lint particle shall be permitted. No additional lint particles shall exceed 0.125 inch in projected length. The cross-sectional area of all lint particles shall be computed on the basis of 0.003 inch width and included in the computation of total projected area. The total projected length (inches) of all lint particles shall not exceed the following:

M13, M14A1, M17 - 0.75 inch
M26, M27, M37, M45 and M17C - 1.35 inch

The maximum combination of lint with bubbles and inclusions shall not be permitted because a lesser mmber than permissible is found.

3.7 Identification marking.- Identification marking, unless otherwise specified, shall be in accordance with Standard MIL-STD-130.

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 in the contract or order, the supplier 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 necessary to assure supplies and services conform to prescribed requirements.

4.1.1 General Provisions.- The component and subassembly inspection requirements of MIL-F-13926 form a part of the, Quality Assurance Provisions of this specification. Definitions of inspection terms shall be as listed in MIL-STD-109.

4.1.2 Classification of Tests.- The inspection requirements specified herein are classified as follows:

a. Qualification tests (See 4.2).
b. First Article tests (See 4.3).
c. Quality Conformance Inspection (See 4.4).

4.2 Qualification tests.- Qualification tests shall consist of tests for all the requirements of this specification. Six (6) periscopes and 6 plastic bodies as delineated in 4.3 shall be submitted to the designated Government laboratory for testing by the Government. The Items shall be accompanied by:

a. A certification that the construction, materials and workmanship used in fabrication of the items are representative of the items to be offered under contract.

b. A list of all test equipment utilized to perform required tests.

c. A written description of the Quality Assurance system used in the manufacturer's normal operations.

d. A summary of operations and tests performed on sub-contract, and identification of the sub-contractor.

4.2.1 Qualification approval.- Potential suppliers who have submitted the required items for qualification testing will be placed on the Qualified Products List (QPL) for this specification at such time as the specimens have successfully passed all the required tests in a Government Laboratory. Failure to meet All of these requirements will result in failure.to obtain qualification approval. Qualification items will be accepted for retest upon presentation of satisfactory evidence that deficiencies have been corrected. The Government reserves the right to conduct such on-cite inspections on the potential suppliers premises as may be deemed necessary to insure that the manufacturing processes and quality control measures used in fabrication of the specimens are indicative of the quality of the item expected in production.

4.2.2 Retention of (Qualification.- TWO (2) years from the date of last notification of qualification approval, unless otherwise directed by the qualifying activity, suppliers shall submit six (6) representative samples (see 4.2 herein) for requalification. Failure of the samples to meet all the required tests shall be cause for removal from the Qualified Products List (QPL).

4.3 First Article (Initial Production) approval.- The requirements for First Article approval and the responsibility (Government or Contractor) for First Article Testing, shall be as specified in the contract. The sample for First Article approval tests shall consist of 6 periscopes, 6 each of all items covered by SQAP plus 6 plastic bodies applicable to the periscope under test. The plastic body part numbers are listed below with their respective periscope. The sample shall be manufactured in the same manner, using the same materials, equipment, processes and procedures intended for production. To the maximum extent possible, all parts and materials, including packaging and packing to be used in production, shall be obtained from the same source of supply as used in the First Article.

PERISCOPE	PLASTIC BODY
M13	D7669322
M14A1	D7676876
M17	D7674952
M17C	F7595729
M426	D7688880
M27	F7633133
M37	F8635077
M45	F8213427

4.3.1 Government testing.- When the Government is responsible for conducting First Article approval tests, the contractor, prior to submitting

the sample to the Government, shall inspect the sample to insure that it conforms. to all the requirements of the contract except for the "Sunshine" test in 4.7.1.3 herein. The contractor shall submit a record of this inspection with the sample, including certificates of conformace for materials.

4.3.2 Contractor testing.- When the contractor is responsible for conducting First Article approval tests, the sample shall be inspected by the contractor for all the requirements of the contract. The sample and a record of this inspection, including certificates of conformance for materials, shall be submitted to the Government for approval. The Government reserves the right to witness the contractor's inspection.

4.4 Impaction provisions.

4.4.1 Submission of product.- Unless otherwise specified by the contracting officer, inspection lot size, lot formation and presentation of lots shall be In accordance with Submission of Product" provisions of MIL-STD-105.

4.4.2 Examination and tests.

4.4.2.1 Components and subassemblies.- All Componcnts and subassemblies shall be inspected in accordance with the inspection provisions contained in Supplementary Quality Assurance Revisions (SQAP) listed in the technical data package (TDP). In the absence of SQAP's, the applicable Quality Assurance Provisions of MIL-F-13926 shall apply, except that MIL-STD-105 sampling plans shall be utillzed. Examination, and tests related to Section 3 herein shall be performed on a single defect (individual characteristic) basis in accordance with MIL-STD-105 and the sampling plans specified in Tables I, and II herein. Examination and tests for packaging, packing, and marking shall be in accordance with MIL-P-14232 and section 5 herein. The tabulated classification of defects in Table I and II shall constitute the minimnm inspection to be performed by the supplier after First Article approval and prior to Government acceptance or rejection by item or lot.

4.4.2.2 First Article.- First Article testing shall be conducted In accordame with Tables I and II and shall then meet the sunshine test in 4.7.1.3 in lieu of the weathering and shelf life test (qualification only) in 4.11.2.

TABLE I - CLASSIFICATION OF DEFECTS

CLASS CRITICAL; NONE MAJOR;AQL 0.65%		R E Q U I R E M E N T	
101.	Shock	3.4.2	4.7.1.1
102.	Temperature	3.4.3	4.7.1.2
103 l	Resolution	3.5.1	4.7.2.1.1
104,	Spherical power	3.5.2	4.7.2.1.2
105 l	Light transmission	3.5.4	4.7.2.2
106.	Astigmatism	3.5.3	4.7.2.1.3
107.	Mirror and window laminations	3.4.4	4.0

MINOR; AQL 2.5%	REQUIREMENT	TEST PROCEDURE
201. Bubbles and Inclusions	3.6	4.9
202. Lint	3.6.1	4.10

4.4.3 Acceptance and rejection. - Rejected lots shall be screened for all defective characteristics. Remmoval or correction of defective unit. and resubmittance of rejected lots shall be in accordance with "Acceptance and Rejection" as specified in MIL-STD-105.

4.5 Special Sampling.

4.5.1 General.- Three periscopes shall be selected at random by a Government representative as a special sample from each 100 produced. The sample sample shall meet the requirements and test procedures in Table II and shall then meet the requirements end tests in Table I.

TABLE II

CHARACTERISTICS	REQUIREMENTS	TEST PROCEDURES
301. Fabrication	3.2	Applicable drawings - visual
302. General specification	3.3	MIL-F-13926; visual

4.5.2 Failure of sample.- Should any one item of a special sampling fail to meet the specified test requirements, acceptance of the product shall be suspended by the Government until necessary corrections have been made by the contractor and resubmitted samples have been approved (see 4.4.3).

4.6 Inspection equipment.- Except as otherwise provided for by the contract, the contractor shall supply and maintain inspection equipment in accordance with the applicable requirements of MIL-I-45607.

4.6.1 Government furnished inspection equipment.- Where the contract provides for Government furnished test equipment, supply and maintenance of test equipment shall be in accordance with applicable requirements specified in MIL-I-45607.

4.6.2 Contract furnished inspection equipment.

4.6.2.1 Government design.- All Inspection equipment specified by drawing number in specifications or SQAP's forming a part of the contract shall be supplied by the contractor in accordance with technical data included in the technical data package.

4.6.2.2 Contractor design.- The contractor shall design and supply inspection equipment compatible with the "Test Methods and Procedures" specified in 4.6 of this specification and with the component inspection procedures specified in "Examination" and "Test Facilities" requirements of MIL-F-13926. Since tolerance of test equipment is normally considered to be within 10 of the product tolerance for which it Is intended, this inherent error in thc test equipment design must be considered as part of the prescribed product tolerance limit. Thus, concept, construction, materials, dimensions and tolerances used in the design of test equipment shall be so selected and

controlled as to insure that the test equipment will reliably indicate acceptability of a product which does not exceed 90% of the prescribed tolerance limit, and permit positive rejection when non-conforming. Construction shall be such as to facilitate routine calibration of test equipment.

4.7 Test methods and procedures.

4.7.1 Environmental.

4.7.1.1 Shock.- A shock testing machine, capable of producing the magnitude and duration of shock specified in 3.4.2, shall be used. The peak amplitude of each shock shall be 150 G's, the time duration between 01.7 and 2.0 milliseconds. Subsequent to the 6 Impulses, the periscope shall show no evidence of physical damage and shall then meet the test in 4.7.1.2.

4.7.1.2 Storage temperature.- The testing equipment utilized in this test shall be in accordance with the "Test Facilities" requirements of MIL-F-13926 and the conditions of 3.4.3. The periscope shall be installed in the chamber and the internal chamber temperature lowered at a rate not to exceed 40°F/Hr until the internal chamber temperature is stabilized at -65°F. This temperature shall be maintained for at least 6 hours. At the end of this period, the temperature shall be raised at a rate not to exceed 40° F/Hr until the internal chamber temperature is stabilized at +160°F. Subsequently the periscope shall show no evidence of physical failure and shall be tested for conformance with 3.4.4 and 3.5.1 through 3.5.4, inclusive.

4.7.1.3 Sunshine.- This test is to be conducted on the First Article sample only. Upon completion of all other acceptance tests listed in this specification, the periscope shall be subjected to Procedure 1, Method 505 "Sunshine" of MIL-STD-810 for a period of 10 days. The periscope shall show no evidence of physical failure and shall meet the requirements of 3.4.4 and 3.5.1 through 3.5.4 Inclusive except that the required values of optical performance shall be as specified in 3.4.1.1 through 3.4.1.3 inclusive.

4.7.2 Performance.

4.7.2.1 General.- The test to determine compliance with the resolution spherical power, and astigmatism requirements of Section 3 (para 3.5.1, 3.5.2 and 3.5.3, respectively) shall be performed utilizing a holding medium to support the periscope during the test, a dioptometer with a magnification of at least three power (3X) and a resolving power wall chart. The resolving power chart shall represent the angular subtense for the seconds of arc specified in 3.5.1, and shall contain four line sets as shown in Figure 1 of MIL-0-13830. The dioptometer's eyepiece shall be focused to its reticle to accommodate the individual inspectors eye. Using the dioptometer, the target shall be resolved in each of the four meridans and the diopter reading for each meridan shall be recorded. This operation shall be repeated in nine regions of the clear aperature, three approximately 1 1/2 inch from each end and three in the center.

4.7.2.1.1 Resolution.- The total spread of the four readings obtained in each of the nine areas, as outlined in 4.7.2.1, cannot exceed 0.25 diopter

for compliance with the resolution requirement of 3.5.1.

4.7.2 .1.2 Spherical power.- The average of the horizontal and vertical target focus readings obtained in each of the nine areaa, as outlined in 4.7.2.1, shall be between - 0.5 to +0.25 diopters for comPliance with the spherical power requirement of 3.5.2.

4.7.2.1.3 Astigmatism.- The algebraic difference in focus between the horizontal and vertical target focus readings obtained in each of the mine areas, as outlined in 4.7.2.1, shall not exceed .25 diopter for compliance with the astigmatism requirement of 3.5.3.

4.7.2.2 Light transmission.- Light transmission of the periscope shall be determined by means of a photometer. Prior to testing for light transmission, full intensity of the light source must be determined. The actual test is made by inserting the periscope between the light source and the means provided for picking up the exit ray of the periscope. The actual light transmitted through the periscope shall be measured by the means provided. The percent of light transmitted shall conform to the limits specified in 3.5.4.

4.8 Mirror and window laminations.- The laminations of the mirrors and windows shall be visually examined for compliance with 3.4.4. The appearance of any bubbles, blisters, cracks or separations shall be considered evidence of bond failure.

4.9 Bubbles and inclusions,- The samples of plastic material for the body shall be inspected for bubbles and inclusions under brilliant illumination such as is provided with a standard 500 watt lantern slide projector, or equivalent. The viewing shall be through one of the faces of the blank, to which a heavy coat of mineral oil has been applied to produce a transparent surface. The blank shall be backed by a dull background such as black felt or black masking paper during this inspection. The distribution and size of bubbles and inclusions shall conform to 3.6 and Table I, Section 3.

3.10 Lint.- The test for lint shall be performed on the samples of plastic material at the same time that the test for bubbles and inclusions, 4.9, is being perfomed. The length of the lint particles shall conform to the requirements of 3.6.1. The total projected area of any lint particles shall be computed as stated in 3.6.1 and added to the total area found in 4.9 for conformance with 3.6.1

4.11 Qualification tests.

4.11.1 Qualification tests shall consist of all tests specified herein using the six items submitted in accordance with 4.2. These tests shall be performed at Frankford Arsenal, Philadelphia, Pa., unless otherwise specified by the contracting officer. Upon successful completion of all tests in Tables I and II, the periscopes shall be subjected to the tests in 4.11.2 for compliance with 3.4.1.

4.11.2 Weathering and shelf life tests.

4.11.2.1 Weathering.- Three of the six items submitted for qualification testing shall be placed outdoors, unprotected from sunlight, rain, wind or temperature fluctuations for the period of time required in 3.4.1.

4.11.2.2 Shelf life.- Three of the six items submitted for qualification testing shall be packaged in accordance with the applicable packaging data and placed indoors under standard ambient conditions as described in Section 3.1 of MIL-STD-810. The items shall be stored for the period of time required in 3.4.1.

4.11.3 Acceptance or rejection.- Upon completion of the required exposure, the periscope shall be tested for compliance with 3.4.4 and 3.4.1.1 through 3.4.1.3 inclusive. Any failure shall result in failure to obtain qualification. (see 4.2.1).

5. PREPARATIOIN FOR DELIVERY

5.1 Packaging, Packing and marking.- Packing and marking shall be In accordance with the applicable packaging data sheet for the model periscope designated in the contract or purchase order.

MODEL PERISCOPE	APPLICABLE PACKAGING
M13	Packaging Data Sheet - 7570357
M14Al	Packaging Data Sheet - 7694072
M17	Packaging Data Sheet - 7043549
M17C	Packaging Data Sheet - 7595727
M26	Packaging Data Sheet - 7688875
M27	Packaging Data Sheet - 7633132
M37	Packaging Data Sheet - 8635100
M45	Packaging Data Sheet - 8213430

The level of protection shall be as specified in the procurement documents.

6. NOTES

6.1 Intended Use.- Periscopes covered by this specification are intended for use as vision devices in combat type vehicles.

6.2 Ordering data .- Procurement documents should specify the following:

a. Title, number and date of this specification.
b. The model periscope being procured (see 1.1).
c. Applicable stock number.
d. Applicable packaging data sheet (see 5.1).
e. Selection of applicable level of preservation packaging and packing.
F. Submittal of periscopes for First Article testing (see 4.3) shall be shipped to:

Commanding Officer
Frankford Arsenal
ATTN: SMUFA-Q5200
Philadelphia, Pa. 19137

6.3 Qualification.- With respect to products requiring qualification, awards will be made only for products which are at the time set for opening of bids, qualified for inclusion in the applicable Qualified Product Lists whether or not such products have actually been so listed by that date. Requalification shall also be considered in accordance with 4.2.2. The attention of suppliers is called to this requirement, and manufacturers are urged to arrange to have the products they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. The activity responsible for the Qualified Products List is the U.S. Army, Frankford Arsenal, Philadelphia, Pa. 19137 - ATTN: SMUFA-J4000, and information pertaining to qualification of products may be obtained from that activity.

6.3.1.- The 6 periscopes submitted in accordance with 3.1 and 4.2 shall be of a model specified herein and shall be considered as qualified for all model periscopes specified upon successful completion of qualification testing.

Custodian:

Army-MU

Preparing activity:

Army-MU

Project No. 6650-A057

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions – Reverse Side)

1. DOCUMENT NUMBER	2. DOCUMENT TITLE

3a. NAME OF SUBMITTING ORGANIZATION	4. TYPE OF ORGANIZATION *(Mark one)*
	☐ VENDOR
	☐ USER
b. ADDRESS *(Street, City, State, ZIP Code)*	☐ MANUFACTURER
	☐ OTHER *(Specify)*: _____

5. PROBLEM AREAS

a. Paragraph Number and Wording:

b. Recommended Wording:

c. Reason/Rationale for Recommendation:

6. REMARKS

7a. NAME OF SUBMITTER *(Last, First, MI)* – Optional	b. WORK TELEPHONE NUMBER *(Include Area Code)* – Optional
c. MAILING ADDRESS *(Street, City, State, ZIP Code)* – Optional	8. DATE OF SUBMISSION *(YYMMDD)*

DD FORM 82 MAR 1426

PREVIOUS EDITION IS OBSOLETE.