

MIL-T-45011A(MU)
 31 May 1968
 SUPERSEDING
 MIL-T-45011(Ord)
 25 November 1957

MILITARY SPECIFICATION

TELESCOPE ELBOW M17C

1 SCOPE

1.1 This specification covers one type of 8 power prismatic elbow telescope which has a 6 degree field of view, color selection filters, and a special patterned reticle. (See 6.1)

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

Military

MIL-O-13830	Optical Components for Fire Control Instruments, General Specification Governing the manufacture, Assembly and Inspection of
MIL-F-1392c	Fire Control Materiel (General Specification Governing the Manufacture and Inspection of
MIL-P-14232	Parts, Equipment and Tools for Army Materiel, Packaging and Packing of
MIL-I-456C	Inspection Equipment, Supply and Maintenance of

STANDARDS

Military

MIL-STD-105	Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-109	Quality Assurance Terms and Definitions

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DRAWINGS

U.S. Army, Frankford Arsenal

F8636070 Telescope, Elbow, M17C

PACKAGING DATA SHEET

8636070 Packaging of Telescope, Elbow M17C

3. REQUIREMENTS

3.1 Fabrication. - The telescope shall be manufactured in accordance with Drawing F8636070 and all drawings pertaining thereto.

3.2 General specification. The contractor shall be responsible for compliance with the following requirements of MIL-F-13926

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

3.3 Environmental.

3.3.1 Extreme storage temperature. - The telescope shall show no evidence of physical failure at the standard ambient temperature of 60° to 90° Fahrenheit (F) after having been exposed and thermally stabilized at -80° and +160°F. The telescope shall subsequently meet all applicable requirements of this specification at the standard ambient temperature.

3.3.2 Extreme operating temperatures. - The telescope shall meet the applicable requirements of 3.7 while exposed and thermally stabilized at -40° and + 150°F.

3.4 Vibration. - The telescope shall meet applicable requirements 3.5 to 3.7.2 inclusive of this specification after having been vibrated at 30 cycles per second at an amplitude of 0.06 inch (0.12 total excursion) for a period of 5 minutes plus or minus 15 seconds.

3.5 Cleanliness. - The telescope shall meet the cleanliness requirements of MIL-O-13830. There shall be no more than 3 particles of dirt visible when viewed through the evepiece. The area of each particle shall not be in excess of the area equivalent to a size 5 dig. This requirement shall be met in all filter positions.

3.6 Accuracy.

3.6.1 Orientation. The telescope, positioned with the mounting surface in a vertical plane and the keyway centerline vertical, shall meet the

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requirements of 3.6.2 to 3.6.7 inclusive. Filter wheel shall be in clear position.

3.6.2 Collimation. - Optical line of sight shall be parallel to the mounting surface and be perpendicular to the keyway centerline within 0.5 mil.

3.6.3 Image tilt. - Image of a vertical target line shall be vertical within one degree of arc.

3.6.4 Parallelism of reticle and image. - Vertical center line of the reticle pattern shall be parallel to the image of a vertical target line within 30 minutes of arc.

3.6.5 Parallax. - Parallax at the center of the field shall not exceed 0.1 mil when viewing a target at 1200 ± 100 meters.

3.6.6 Resolution. - Resolution of the optical axis shall be six seconds of the arc or less. Resolution consists of detectable line structure and proper line count in all four meridians. Focus variation between any two meridians shall not exceed 0.25 diopter at the eyepiece.

3.6.7 Filters. - Collimation and parallelism requirements shall be met with all filters positioned in the optical path.

3.6.8 Eyepiece focus. - Eyepiece focus shall be adjustable over the range of plus 2 diopters to minus 4 diopters as read on the eyepiece scale. The zero diopter setting of the reticle shall indicate zero within ± 0.25 diopter as read on a dioptrimeter.

3.7 Operability.

3.7.1 Diopter adjustment. - Torque required to rotate the diopter adjustment shall not exceed 6 inch-pounds when the telescope is thermally stabilized at standard ambient temperature (60° to 90°F) and shall not exceed 8 inch-pounds when thermally stabilized at the temperatures of 3.3.2.

3.7.2 Filter selector adjustment. - The filter selector knob shall be mechanically operable for positioning each filter in the optical path when the telescope is thermally stabilized at the standard ambient temperature and the temperatures of 3.3.2. The detent shall latch with and hold the filter holder rigidly in position when each filter is positioned in the optical path. Torque required to release the filter from latched position shall not exceed 3 inch-pounds.

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 other facilities suitable for the performance of the inspection requirements specified herein, unless approved by the Government. The Government reserves the right to

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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.

4.1.1 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.

4.2 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 three (3) telescopes manufactured in the same manner using the same materials, equipment, processes, and procedures as used in regular production. All parts and materials, including packaging and packing shall be obtained from the same source of supply as used in regular production.

4.2.1 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 and submit a record of this inspection with the sample, including certificates of conformance for materials.

4.2.2 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.

4.3 Inspection provisions

4.3.1 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.

4.3.2 Examination and tests.

4.3.2.1 Components and subassemblies - All components and subassemblies shall be inspected in accordance with the inspection provisions contained in Supplementary Quality Assurance Provisions (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. 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, II and III 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 Tables I, II and III shall constitute the minimum inspection to be performed by the supplier after first article approval and prior to Government acceptance or rejection by item or lot.

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TABLE I - CLASSIFICATION OF DEFECTS

<u>CLASS</u>	<u>CHARACTERISTIC</u>	<u>REQUIREMENT</u>	<u>TEST PROCEDURE</u>
<u>MAJOR</u>	<u>AOL 0.65 Defective</u>		
101.	Vibration	3.4	4.6.3
102.	Cleanliness	3.5	4.6.4
103.	Resolution	3.6.6	4.6.5
104.	Collimation	3.6.2	4.6.6.1
105.	Parallax	3.6.5	4.6.6.2
106.	Filters	3.6.7	4.6.6.3
107.	Image tilt	3.6.3	4.6.6.4
108.	Parallelism of reticle and image	3.6.4	4.6.6.5
109.	Eye-piece focus	3.6.8	4.6.6.6
110.	Diopter adjustment torque	3.7.1	4.6.7.1
111.	Filter selector adjustment torque	3.7.2	4.6.7.2

MINOR None defined

NOTE: The tests of Table I shall be conducted at a temperature between 60° and 90°F.

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

4.4 Special sampling.

4.4.1 General. - One telescope shall be selected at random as a special sampling from each 100 produced. The sample shall meet the requirements and tests in Table II.

TABLE II

<u>NO.</u>	<u>CHARACTERISTIC</u>	<u>REQUIREMENT</u>	<u>TEST PROCEDURES</u>
301.	Fabrication	3.1	Applicable Drawing-Visual
302.	General specification	3.2	MIL-F-13926 - Visual

4.4.2 Environmental. - Three telescopes shall be selected at random as samples from each 50 produced, or from each months production whichever occurs first. Each sample shall meet the requirements and tests in Table III, and shall then meet the requirements and tests in Table I.

TABLE III

<u>NO.</u>	<u>CHARACTERISTIC</u>	<u>REQUIREMENT</u>	<u>TEST PROCEDURES</u>
303.	Storage temperatures (-80° and +160°F)	3.3.1	4.6.1

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304.	Diopter adjustment, torque	3.3.2, 3.7.1	4 6.2, 4 6.7.1
305.	Filter selector adjustment, torque	3.3.2, 3.7.2	4 6.2, 4.6.7.2

4.4.3 Failure of sample. - Should any one item of a special sampling fail to meet the specified test requirements, acceptance of the represented inspection lot shall be suspended by the Government until necessary corrections have been made by the contractor and the resubmitted items have been approved (see 4.3.3).

4.5 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.

4.5.1 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.

4.5.2 Contractor furnished inspection equipment

4.5.2.1 Government design. - Unless otherwise specified in the contract, all inspection equipment specified by drawing number in specifications or SQAP forming a part of the contract shall be supplied by the contractor in accordance with technical data listed in the technical data package (TDP).

4.5.2.2 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 the 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 5 2.3 Inspection equipment design requirements

4 5 2 3 1 Orientation of telescope (mounting) - The inspection of the telescope for the accuracy requirements will be accomplished by means of special testing equipment as depicted herein

a. Leveling of the special testing equipment - The qualified surface of the testing equipment utilized for securing a target projector collimator, an adjustable holding device and a viewing collimator shall be crossleveled within 10 seconds

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b. Holding device.- The device shall be capable of securing and positioning the telescope with its mounting surface in a vertical plane and the locating keyway centerline vertical on leveled surface of the test equipment within 10 seconds.

c. Target collimator - A target projector collimator having a clear aperture of at least 1-3/4 inches shall be a part of the test equipment. The target projector collimator shall have an appropriate calibrated target reticle pattern for measuring the optical and mechanical accuracies of the telescope. The vertical reticle line of target test reticle pattern shall be adjusted plumb. The optical axis of the target projector collimator shall be aligned coincident to the geometric axis of the telescope under test. Unless otherwise specified, the target projector collimator shall be adjusted for infinity focus. The zero line of sight of the target projector collimator shall be set with the line of sight in the same horizontal level plane (as the nominal line of sight of the telescope) within 5 seconds.

4.5 2.3.2 Torque requirements - A torque wrench type tester with a minimum range from zero to ten inch pounds, the accuracy of which shall be plus or minus one-quarter inch pound throughout the entire zone of excursion, shall be utilized. The testing equipment shall be equipped with suitable adapters to accommodate testing of the diopter adjustment and the filter selector knob.

4.6 Test methods and procedures

4.6 1 Extreme 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 3.3.1. The telescope shall be exposed to each temperature extreme specified in 3.3.1 for a minimum of 5 hours. After each temperature exposure the telescope shall be stabilized in an ambient temperature between 60° and 90° F and subjected to the visual, tactile and audible examination of 4.6 2. The telescope shall then be subjected to the tests in 4.6 2 through 4.6 7.2 inclusive to determine conformance to 3.3.1. The temperature shall be changed at a rate not exceeding 18 F per minute.

4.6 2 Extreme operating 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 3.3.2. The telescope shall be exposed to each temperature extreme specified in 3.3.2 for a period of 5 hours. At the end of each 5 hour period, and while still at the temperature extreme, the telescope shall be subjected to the applicable test of 4.6 7.1 through 4.6 7.2 inclusive. The telescope shall conform to the requirements of 3.3.2. The temperature shall be changed at a rate not exceeding 18 F per minute.

4.6 3 Vibration - Standard vibrating equipment capable of providing the amplitude and frequency specified in 3.4 shall be utilized for the vibration test. Unless otherwise specified the test equipment shall be in conformance with the "Test Facilities" requirements of MIL-F-13926. The telescope shall be mounted on the vibrating table by means of an adapter. This adapter shall position the telescope with its mounting surface and

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keyway in a vertical plane. The telescope shall be vibrated in a vertical plane for a period of 5 minutes \pm 15 seconds. Upon completion of the vibration cycle the telescope shall be subjected to the tests specified in 4.6.3.1.

4.6.3.1 Examination.- Subsequent to vibration the telescope shall be thoroughly examined for physical defects to determine conformance with 3.4, prior to being subjected to the remaining tests specified herein. A visual examination shall be made for missing or damaged parts. A tactile examination shall also be conducted to determine looseness or improper functioning of moving parts such as diopter adjustment, filter selector knob, etc. An audible examination shall be made of the telescope by shaking it and listening for loose internal parts or broken optical components, such as lenses, prism, reticle, etc. Any one of the possible defects defined above shall be cause to consider a telescope defective. Telescopes which have passed the above examinations shall be subjected to the tests specified in 4.6.4 through 4.6.7.2 inclusive.

4.6.4 Cleanliness.- The optical surfaces of the telescope shall be inspected for cleanliness in accordance with MIL-O-13830. The telescope shall conform to the cleanliness requirements of 3.5.

4.6.5 Resolution - Position the telescope on a holding device capable of accepting the locating surface of the telescope assembly. With the filter of the telescope in clear position perform this test utilizing an observation telescope with a magnification of at least 3 power (3X) and a resolving power chart on a wall target. The test methods and procedures shall be in compliance with the "Resolution Test" specified in MIL-O-13830 and the resolving power chart shall contain four line sets as shown in Figure 1 therein. The observation telescope shall be positioned at the eyepiece assembly of the telescope. The focus of the observation telescope and eyepiece shall be established at one best focus setting for viewing of the detectable line structure and proper line count of the resolution target. Resolution of the telescope optical system shall meet the requirements specified in 3.6.6.

4.6.6 Orientation - Perform the following tests with the telescope assembly positioned on special testing equipment conforming to 4.5.2.3.1. The filter wheel shall be in clear position. The clear filter shall be in the field of view of the telescope with no overlap of adjacent filters.

4.6.6.1 Collimation.- Observe through the eyepiece of the telescope. The line of sight through the geometric axis of the telescope reticle pattern shall meet the requirements specified in 3.6.2.

4.6.6.2 Parallax - Perform this test with the diopter knob scale of the telescope set for best focus of the telescope reticle. Parallax requirements shall be met when the target image is adjusted as specified in 3.6.5. Parallax will be recognized by displacement of the telescope center lines with respect to the center target image lines when the observer's head is moved side to side or up and down. Displacement between the telescope reticle and target image shall not exceed the tolerance specified in 3.6.5.

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4.6.6.3 Filters.- Perform this test in sequence with the tests in 4.6.6.1 and 4.6.6.2. Position the filter selector knob adjustment to each filter detent position as specified in 3.6.7 with respect to the telescope assembly filter positions. Introduction of each filter into the optical path of the telescope shall meet the requirements specified in 3.6.2 and 3.6.5 with no overlap of adjacent filters.

4.6.6.4 Image tilt.- Perform this test with the aid of an observation telescope containing a vertical and horizontal reticle line. The vertical "0" reticle line shall be equipped with tolerance marks incorporated on both sides of the "0" vertical reticle line to determine image tilt accuracy. Plumb the vertical line of the observation telescope and position the telescope on the qualified leveled surface of the test equipment at the telescope eyepiece assembly. While viewing through the telescope obtain coincidence of one extremity of the telescope's "0" vertical reticle line with respect to the vertical target image line. The image of the vertical target image line shall be parallel to the telescope vertical reticle line within the tolerance specified in 3.6.5 as measured on the observation telescope reticle.

4.6.6.5 Parallelism of reticle and image - Perform this test while observing through the eyepiece of the telescope with the unaided eye. One extremity of the telescope vertical reticle line shall be coincident to a vertical target image line. The reticle line shall be parallel to the target image line within the tolerance specified in 3.6.4, as measured at the other extremity of the vertical reticle line with respect to the target image.

4.6.6.6 Eyepiece focus - A calibrated dioptometer with a magnification of at least 3 power (X) shall be utilized for measuring the accuracy of the zero diopter setting of the reticle. Set the dioptometer objective scale to zero and adjust the dioptometer objective for best focus of the dioptometer reticle. Set the diopter knob of the telescope eyepiece assembly to indicate zero diopter. Position the dioptometer at the eyepiece of the telescope. Observe through the dioptometer, obtain best focus of the telescope reticle by adjustment of the telescope eyepiece diopter knob. The reticle shall be in best focus within the tolerance specified in 3.6.8, as measured on the diopter knob scale of the telescope. Eyepiece focus shall be adjustable through the range specified in 3.6.8 from the established best focus of the telescope reticle as measured on the diopter knob scale of the telescope.

4.6.7 Operability.- The tests in 4.6.7.1 and 4.6.7.2 shall be performed utilizing standard measuring equipment specified in 4.5.2.5.2.

4.6.7.1 Diopter adjustment.- With the adapter affixed to the diopter adjustment, the diopter adjustment shall be rotated through the range specified in 3.7.1. The running torque shall not exceed the values specified in 3.7.1 at the temperatures indicated.

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4.6.7.2 Filter selector adjustment - The filter selector knob shall be mechanically operable for positioning each filter as specified in 3.7.2 at the temperatures indicated. The running torque required to release the filter from latched position shall not exceed the tolerance specified in 3.7.2.

5. PREPARATION FOR DELIVERY

5.1 Packaging, packing and marking. - Packaging, packing and marking shall be in accordance with Packaging Data Sheet 8636070. The level of protection shall be as specified in the procurement document.

6. NOTES

6.1 Intended use. - Elbow Telescope M17C is primarily intended for use as a component of Rawin Set AN/GMD-1A to align and orient the electrical axis of the antenna with the optical line of sight on a fixed target. Rawin Set AN/GMD-1A, component of a radio-sonde system used to gather and interpret meteorological intelligence, is a transportable ground-based radio direction finder that tracks a balloon-borne radio-sonde transmitter.

6.2 Ordering data - Procurement documents should specify the following:

- (a) Title number and date of this specification
- (b) Selection of applicable levels of preservation, packaging and packing required (see 5.1)

Custodian

Preparing activity

Army - MU

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Project No. 6550-A002

SPECIFICATION ANALYSIS SHEET		Form Approved Budget Bureau No. 22 R255
<p>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 Service amend contractual requirements.</p>		
SPECIFICATION		
ORGANIZATION		
CITY AND STATE	CONTRACT NUMBER	
MATERIAL PROCURED UNDER A <input type="checkbox"/> DIRECT GOVERNMENT CONTRACT <input type="checkbox"/> SUBCONTRACT		
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		
c. IF ANY SPECIFIC WHICH REQUIREMENT CONSIDERED TOO RIGID		
d. IS THE SPECIFICATION RESTRICTIVE? e. If "yes" in what way?		
f. MAKE A COPY OF PORTION WHICH MAY BE OF USE IN IMPROVING THE SPECIFICATION. If there are additional papers make a separate envelope addressed to preparing activity.		
g. PROJECT NAME AND ACTIVITY (Optional)	DATE	

DD FORM 1426

REPLACES EDITION OF 1 OCT 64 WHICH MAY BE USED

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