INCH-POUND

MIL-M-63221A(AR)
AMENDMENT 1
28 September 1998

DETAIL SPECIFICATION
MORTAR, 60MM: M224 (Without M64 Sight Unit)

Inactive for new design after 29 November 1995

This amendment forms a part of MIL-M-63221A(AR) , dated 22 July 1992 , and is approved for use by the Department of the Army and is available for use by all Departments and Agencies of the Department of Defense.

PAGE 19

6.2q: Delete entire paragraph.

6.2r, line 2: Delete ″MIL-STD-45662″ and substitute ″ISO 10012-1 and NCSL Z540-1″.

PAGE 22

20.1.1, line 11: Delete ″MIL-STD-721 - Definitions of Effectiveness Terms for Reliability, Maintainability, Human Factors and Safety ″

PAGE 24

30.2.5.1: Delete entire paragraph.

The attached insertable replacement pages listed below are replacements for stipulated pages. When the new pages have been entered in the document, insert the amendment as the cover sheet to the specification.

Replacement page	Page replaced
2	2

AMSC N/A FSC 1010
DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

Replacement page (Continued)	Page replaced
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Custodian:

Army - AR
Air Force - 99

Preparing activity:

Army - AR
(Project 1010-A143)

Review activity:

Air Force – 84
DLA - CS

of these documents are those listed in the issue of the Department of Defense Index of Specification and Standards (DODISS) and supplement thereto, cited in the solicitation (see 6.2).

SPECIFICATIONS

MILITARY

MIL-L-3150 - Lubricating Oil, Preservative, Medium

MIL-C-13931 - Cannon, General Specification for

MIL-L-14107 - Lubricating Oil, Weapons, Low Temperature

MIL-I-45607 - Inspection Equipment, Acquisition, Maintenance and Disposition of

MIL-G-81322 - Grease, Aircraft, General Purpose, Wide Temperature Range

STANDARDS

MILITARY

MIL-STD-129 - Marking for Shipment and Storage

MIL-STD-2073-1 - DoD Material Procedures for Development and Application of Packaging Requirements

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Defense Automated Printing Service, Bldg 4D (DPM-DODSSP), 700 Robbins Avenue, Philadelphia, PA 19120-5099.)

2.1.2 Other Government documents, drawings, and publications.

The following other Government documents, drawings, and publications form a part of this specification to the extent specified herein. Unless otherwise specified, the issues are those cited in the solicitation.

DOCUMENT

United States Army

AR 385-11 - Ionizing Radiation Protection (Licensing, Control, Transportation, Disposal, and Radiation Safety)

DRAWINGS (see 6.5)

U.S. Army Armament Research, Development and Engineering Center (ARDEC)

11578990	-	Baseplate, 60MM Mortar: M8
11579070	-	Baseplate, 60MM Mortar: M7
11579080	-	Cannon, 60MM Mortar: M225
11579090	-	Bipod, 60MM Mortar: M170
SPI AM11579000	-	Special Packaging Instruction; 60MM Mortar: M224

PUBLICATIONS

MLQAP 11579000	-	Master Index of Quality Assurance Provisions (QAPs) for Mortar, 60MM : M224
QAP-Appendix-WVA	-	General Quality Assurance Provisions

(Copies of drawings, publication, and other Government documents required by contractors in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the Procuring Contracting Officer.)

2.2 Non-Government Publications. The following document(s) 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 issues of the 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 Society for Testing and Materials (ASTM)

ASTM D 3951 - Commercial Packaging, Practice for

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pennsylvania 19103-1137.)

Automatic Identification Manufacturers (AIM)

AIM BC1 - Uniform Symbology Specification 39

(Application for copies should be addressed to the Automatic Identification Manufacturers, 634 Alpha Drive, Pittsburgh, PA 15238-2802)

(Non-Government standards and other publications are normally available from the organizations that prepare or distribute the documents. These documents also may be available in or through libraries or other informational services.)

2.3 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 General requirements. The mortar and its components shall conform to the applicable drawings listed in Engineering Parts list 11579080 (Cannon, 60MM Mortar: M225); 11579090 (Bipod, 60MM Mortar: M170); 11579070 (Baseplate, 60MM Mortar: M7); and 11578990 (Baseplate, 60MM Mortar: M8), the requirements of this military specification, the applicable paragraphs of MIL-C-13931 as incorporated in this specification and all referenced documents (see 6.7). Any conflicts are to be resolved by means of the order of precedence (see 2.3).

3.1.1 Weight. The combined weight of the M225 Cannon, the M170 Bipod, and the M7 Baseplate shall not exceed 45.5 pounds. The weight of the M8 Baseplate shall not exceed 3.8 pounds.

3.2 First article. The contractor shall submit a first article unless it is specifically waived in the contract (see 4.4 and 6.2). No first article requirements shall be waived without review and approval by the Procuring Contracting Officer (see 6.4).

3.3 Reliability and maintainability. The requirements for reliability and maintainability are found in APPENDIX.

3.4 Performance characteristics. The mortar shall perform the functions of firing the primer, sustaining pressure of the propellant charge, and launching the projectile in the required direction. All moving parts shall function smoothly without interference, erratic movement or malfunction.

3.4.1 Bipod: M170.

3.4.1.1 Elevating mechanism. The elevating mechanism shall function throughout the entire range of the adjusting screw. With the mortar set up in the firing position, backlash at the crankhandle shall not exceed 1/16 turn in any position of elevation or traverse. The device for locking the elevating mechanism into the traversing mechanism shall provide positive clamping action.

3.4.1.2 Traversing mechanism. The traversing mechanism shall function throughout the entire range of the adjusting screw. With the mortar set up in the firing position, backlash of the traversing wheel assembly shall not exceed 1/12 turn in any position of traverse or elevation. The flat spring in the traverse handwheel shall provide a positive latch of the crank in both the open and folded positions.

3.4.1.3 Cross-leveling mechanism. The cross-leveling mechanism, incorporated in the left leg assembly, shall provide a smooth leveling adjustment throughout the adjusting range, and also a means for collapsing the bipod. The sliding bracket, used for setting up or collapsing the bipod, shall grip the sliding sleeve securely when the locking nut is tightened manually. The sleeve shall move smoothly on the leg-body when the adjusting grip is turned throughout its range of adjustment. Backlash of the cross-level grip shall not exceed 1/16 turn. When the locking nut is loosened, the bracket shall slide smoothly on the sleeve.

3.4.1.4 Shock absorber assembly. The shock absorbers shall extend 6 inches when the yoke is held stationary and a force of

(1) Tritium contamination. There shall be no radiation contamination in excess of the limits specified in AR 385-11.
(2) Illumination check. The range indicator in the M225 Cannon shall be visually checked to ensure that the radioactive light sources are illuminating prior to final preservation and packaging.

3.4.3 Cannon - bipod assembly. The cannon shall be clamped firmly to the collar assembly at the top of the bipod assembly when the knob on the collar assembly is hand tight.

3.4.3.1 Elevating and traversing adjustment torques. The torques required to adjust the elevating and traversing mechanisms of the mortar, set up at any elevation and with the bipod assembly clamped in either the forward or rearward position, shall be as follows:

		Adjustment torque (pound-inches)
Elevating screw	- Elevate:	3.0 ± 2.0
Elevating screw	- Depress:	2.25 ± 1.75
Traversing screw	- Traverse right:	5.0 ± 3.0
Traversing screw	- Traverse left:	3.5 ± 2.5

3.4.4 M7 baseplate assembly. The rotating cap in the baseplate shall move freely and smoothly throughout ± 360° rotation.

3.4.5 M8 auxiliary baseplate assembly. The baseplate latch assembly shall rotate freely about its pivot and shall securely lock the cannon to the baseplate when the baseplate latch assembly is closed and latched. The ball plungers shall fasten the baseplate securely in the folded position when the protrusion on the cannon basecap is inserted between the ball plungers.

3.5 Lubrication. All bearing and mating surfaces inside the elevating and traversing mechanisms shall be coated with a thin film of grease conforming to MIL-G-81322. The firing mechanism shall be lubricated with oil conforming to MIL-L-14107, and the internal surfaces of the two shock absorber assemblies shall have oil applied conforming to MIL-L-3150.

3.6 Performance.

3.6.1 High pressure resistance. The complete mortar (cannon,

4.5.1 Reliability and maintainability testing. The requirements, tests, and test methods for reliability and maintainability are contained in the APPENDIX.

4.6 Quality conformance inspection. Quality conformance inspections are tabulated in TABLE I.

TABLE I. Quality conformance inspection.

	Requirement	Examination and tests and test methods
Bipod mechanism	3.4.1.1, 3.4.1.2, 3.4.1.3	4.6.3.1
Crank Torque	3.4.3.1	4.6.3.1.1
Shock absorber	3.4.1.4	4.6.3.2
Firing mechanism		
Functioning	3.4.2.1.1	4.6.3.3.1
Trigger force	3.4.2.1.1	4.6.3.3.2
Firing pin protrusion	3.4.2.1.2	4.6.3.3.3
Range indicator	3.4.2.1.3	4.6.3.4
Tritium contamination	3.4.2.1.3(1)	4.6.3.4.1
Illumination	3.4.2.1.3(2)	4.6.3.4.2
Cannon-bipod assembly	3.4.3	4.6.3.5
M7 baseplate	3.4.4	4.6.3.6
M8 baseplate	3.4.5	4.6.3.7
High Pressure Resistance	3.6.1	4.7.1, 4.7.2
After proof firing		
Functioning	3.6.2	4.6.4.2
Bore enlargement	3.6.3	4.6.4.3
Bore condition	3.6.3	4.6.4.4
Material soundness	3.6.4	4.6.4.5

4.6.1 Inspection provisions. Mortar assemblies, subassemblies, components and parts thereof shall be inspected to determine compliance with this specification, MIL-C-13931, QAPS listed in Master in box of Quality Assurance Provisions (QAPs) MIQAP 11579000, QAP APPENDIX-WVA, and any additional requirements specified in the contract (see 6.2).

4.6.1.1 Lubrication. The Government representative shall witness assembly of the elevating, traversing and firing mechanisms and shock absorber assemblies to the extent necessary to assure compliance with the lubrication requirements of 3.5 (see 6.2).

4.6.1.2 Inspection approval stamp. The application of the inspection approval stamp shall be as specified in MIL-C-13931.

4.6.2 Special Inspection equipment (SIE). SIE used in the inspection of parts, components, sub-assemblies, and assemblies are listed on the item Quality Assurance Provisions.

4.6.2.1 Acquisition, maintenance, and disposition. Unless otherwise specified (see 6.2), responsibility for acquisition, maintenance, and disposition of inspection equipment shall be in accordance with MIL-I-45607.

4.6.2.2 Accuracy of standard measuring equipment. When commercial or modified commercial inspection equipment is used, it shall be capable of repetitive measurements to an accuracy of 10 percent of the total tolerance of the characteristic being inspected.

4.6.3 Examinations and tests.

4.6.3.1 Bipod mechanisms functional test. Each of the elevating, traversing, and cross-leveling mechanisms of each assembled mortar tested shall be manually operated a minimum of two complete cycles of operation to assure that the requirements of 3.4.1.1, 3.4.1.2, and 3.4.1.3 are complied with. Failure to comply with the requirements (i.e. any evidence of binding, scraping, rubbing, or interference, excessive play or backlash, erratic movement, and other malfunctions) shall be cause for rejection of the bipod assembly.

4.6.3.1.1 Crank torque test. The torques applied to the cranks of the elevating and traversing mechanisms of each assembled mortar to elevate and depress and to traverse right and left shall be measured continuously during the operating cycles. Measurements shall be taken for a minimum of two cycles of operation for each mechanism. Torque measurement equipment shall be subject to approval by the Government representative. Maximum and minimum torques at any position in any cycle to elevate and depress and to traverse the cannon right and left conform with the requirements of 3.4.3.1. Failure of any mechanism to comply shall be cause for rejection of the bipod assembly.

light sources are illuminating. Failure to comply with 3.4.2.1.3 (2) shall be cause for rejection.

4.6.3.5 Cannon bipod assembly. Each cannon bipod assembly shall be inspected under the conditions specified in 3.4.3 to determine compliance with the requirements of 3.4.3. Failure to comply shall be cause for rejection.

4.6.3.6 M7 baseplate assembly. Each M7 baseplate assembly shall be examined to determine compliance with the requirements of 3.4.4. Failure to comply shall be cause for rejection.

4.6.3.7 M8 Auxiliary baseplate assembly. Each M8 baseplate assembly shall be examined to determine compliance with the requirements of 3.4.5. Failure to comply shall be cause for rejection.

4.6.4 Proof Acceptance. All mortars shall be proof accepted either by proof firing of mortars or cannons and, or by simulated proof firing of cannon barrels. Mortars to be proof fired, shall be tested by using the method of 4.7.1. Failure to comply with the requirements of 3.6 shall be cause for rejection. Cannon barrels to be simulated proof fired shall be tested by using the method of 4.7.2. Failure to comply with the applicable requirements of 3.6 shall be cause for rejection.

4.6.4.1 Proof sampling. Proof sampling of mortars shall be conducted as follows:

a. The Product Assurance Directorate, Watervliet Arsenal will designate the qualifying quantity (i) and sample frequency (f) in the contract (see 6.2)

b. The first “i” quantity of mortars produced in the particular contract shall be proof fired at a proving ground. When the “i” quantity has been satisfied, sampling shall be put into effect using the sampling rate. All cannon barrels not proof fired shall be simulated proof fired.

c. Successive production buys require a new “i” qualifying quantity when there is more than a 30 day lapse in production. When a new cannon or tube contractor is utilized or a change in process, material, or source of supply is made that would affect product uniformity, a new “i” quantity shall be fired.

4.6.4.2 Functioning. After proof firing, the elevating, traversing, and cross-leveling mechanisms, the shock absorbers, the firing mechanism, and the range indicator shall be inspected for proper functioning. Failure to comply with 3.6.2 shall be cause for rejection.

4.6.4.3 Bore enlargement. After proof firing no more than 8 rounds, the barrel bore diameters shall be measured with an air gage or other approved gage. Enlargement exceeding the limit specified in 3.6.3 shall be cause for rejection.

4.6.4.4 Bore condition. After proof firing, tube bore surfaces shall be examined with a borescope to determine the condition of the bore surface. Failure to comply with the requirements of 3.6.3 shall be cause for rejection.

4.6.4.5 Material soundness. After completion of proof firing or simulated proof firing, the cannon barrel assembly (tube and basecap) shall be magnetic particle tested in accordance with applicable drawings and specifications. After completion of proof firing, the aluminum baseplates shall be subjected to liquid penetrant inspection in accordance with applicable drawings and specifications. Failure of the material to comply with the requirements of 3.6.4 shall be cause for rejection.

4.6.5 Packaging inspection. Packaging inspection for the level designated in the contract, shall be performed in accordance with the applicable special package instructions. Failure to comply with the packaging requirements shall be cause for rejection.

4.7 Methods of examination and tests.

4.7.1 Proof firing.

4.7.1.1 Physical measurement and inspection requirements.

a. Bore diameter measurement and a borescope inspection shall be performed:

(1) Before firing, on the first ten barrels of any new contract; thereafter, one in 25.

(2) After firing, on all barrels.

b. Magnetic particle inspection shall be performed:

(1) Before firing, on the first ten barrels (tube and basecap) of any new contract; thereafter, one in 25.

4.7.2 Simulated proof firing procedure.

a. The cannon barrel (11579093) with clamp (11579040) and clamp ring (11579039) assembled shall be hydrostatic pressure tested to 9100 ± 300 psi at 70°F for the first 12 inches of the tube measured from the basecap end of the tube and the pressure shall be immediately released as soon as it is attained.

b. The cannon barrel with the clamp and clamp ring assembled shall be hydrostatic pressure tested to 8200 ± 300 psi at 70°F for the entire length of the tube and the pressure shall be immediately released as soon as it is attained.

c. After hydrostatic testing, physical measurement and inspection shall be performed in accordance with the following:

(1) Bore diameter measurements and visual borescope inspection shall be performed on all barrels (tube with basecap attached).

(2) Magnetic particle inspection shall be performed on:

(a) all barrels (tube with basecap attached) with clamp rings (11579039) and clamps (11579040) removed.

(b) all clamp rings (11579039).

(c) all clamps (11579040).

5. PACKAGING

5.1 Cannon - Levels A, B and C. Cleaning, drying, preservation, unit packaging and packing of cannon shall be in accordance with the requirements of Special Packaging Instruction (SPI) AM11579000 and MIL-STD-2073-1, for the level of protection specified in the contract (see 6.2).

5.2 Repair parts, tools and equipment - Level A, B, and C. Cleaning, drying, preservation, unit packaging and packing of repair parts, tools and equipment shall be in accordance with the applicable repair part/tool and equipment SPI and MIL-STD-2073-1 for the level of protection specified in the contract (see 6.2).

5.2.1 Level X - Industrial packaging. Cleaning, drying, preservation, unit packaging and

packing of repair parts, tools and equipment shall be in accordance with ASTM D3951 when industrial packaging is specified in the contract (see 6.2).

5.2.1.1 Quantity in Unit Package (QUP). When Level C packaging in accordance with industrial packaging of repair parts is specified in the contract, the QUP shall be the same as specified in the contract (see 6.2).

5.3 Marking of packages.

5.3.1 Levels A, B and C. Marking of the unit package, intermediate packages, and exterior shipping containers shall be in accordance with MIL-STD-129. When specified (see 6.2), bar code marking shall be in accordance with MIL-STD-129 and AIM BC1.

5.3.2 Level X - industrial. Marking of the unit package, intermediate packages, and exterior shipping containers shall be in accordance with ASTM D3951. When specified (see 6.2), bar code marking shall be in accordance with MIL-STD-129 and AIM BC1.

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 60MM Mortar M224 specified herein is intended for use as a lightweight company mortar for close combat support.

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 2.1 and 2.2).

c. Requirements for and the number of cannon, components thereof, or both to be submitted for first article by the contractor (see 3.2).

d. The examinations and tests to be performed by the contractor and the examinations and tests to be performed by the Government.