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24 SEPTEMBER 1984

SUPERSEDING
MIL-M-10008E
25 June 1975

MILITARY SPECIFICATION

MORTAR, 81MM: M29A1

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

Note: This weapon is a security item and is subject to security control during manufacture per AR 190-11, DoD Directive 5100.76 and WVAR 735-20.

1. SCOPE

1.1 This specification covers one type of lightweight, smooth bore mortar consisting of cannon assembly M29A1, Bipod Assembly M23A1, and Baseplate Assembly M3.

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications and standards. Unless otherwise specified, the following specifications and standards of the issue listed in that issue of the Department of Defense Index of Specifications and Standards (DoDISS) specified in the solicitation form a part of this specification to the extent specified herein.

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, Munitions and Chemical Command, ATTN: SMCAR-LCB-SAS, Watervliet, N.Y. 12189, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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SPECIFICATIONS

Federal

O-I-490 - Inhibitor, Corrosion, Liquid Cooling System

Military

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

MIL-C-13931 - Cannon, General Specification for

MIL-P-14232 - Parts, Equipment and Tools for Army Materiel, Packaging and Packing of

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

STANDARDS

Military

MIL-STD-109 - Quality Assurance Terms and Definitions

MIL-STD-129 - Marking for Shipment and Storage

MIL-STD-1189 - Standard Symbology for Marking Unit Packs, Outer Containers and Selected Documents

MIL-STD-1235 - Single and Multi-Level Continuous Sampling Procedures and Tables for Inspection by Attributes

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.

DOCUMENTS

W-81M-1 - Proving Ground Acceptance Test Procedure Supplement

DRAWINGS

U.S. Army Armament, Munitions and Chemical Command

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QAP-APPENDIX-WVA - General Quality Assurance Provisions

F11578364 - Mortar, 81MM: M29A1

P11578364 - Packaging Data Sheet, Mortar, 81MM: M29A1

Master LQAP 7309128 - Master Index of Quality Assurance Provisions, Baseplate Assembly, M3

Master LQAP 8766507 - Master Index of Quality Assurance Provisions, Cannon Assembly, M29A1

Master LQAP 11578362 - Master Index of Quality Assurance Provisions, Bipod Assembly, M23A1

PUBLICATIONS

DA Form 2408-4 - Weapon Record Data

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

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. The issue of the documents which are indicated as DoD adopted shall be the issue listed in the current DoDISS and the supplement thereto, if applicable.

ASTM

ASTM D3951 - Standard Practice for Commercial Packaging

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

2.3 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein, drawing requirements shall have first order of precedence,

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followed by the text of this specification, then the other referenced specifications and standards.

3. REQUIREMENTS

3.1 First article. The contractor shall submit a first article unless it is specifically waived in the contract (see 6.2.1). No first article requirements shall be waived without review by the responsible engineering activity and approval by the responsible product assurance activity.

3.2 General requirements. The mortar assembly and components shall conform to the general drawing F11578364, to the requirements of this specification, and to MIL-C-13931.

3.2.1 Marking. When specified, marking shall be in accordance with the requirement specified in MIL-C-13931.

3.2.2 Lubrication. Subassemblies and parts shall be lubricated as specified on applicable drawings using MIL-L-3150.

3.3 Cannon assembly.

3.3.1 Brazing. Brazing of the plug to the tube and seating of the firing pin shall be in accordance with the applicable drawings and specifications.

3.3.2 Leakage and distortion. When the barrel is subjected to 10,400 plus or minus 400 pounds per square inch hydrostatic pressure for the lower 29 1/2 inches of the tube, there shall be no leakage and no permanent distortion of the cannon tube in excess of drawing dimensions and the requirements of 3.5.2 and 3.5.3.

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3.3.3 Surface finish of cannon tube bore. The surface finish of the bore of the cannon tube shall be as specified on the applicable drawing prior to testing and upon completion of testing. No scratches, gouges or imperfections shall be present in the cannon tube bore surface prior to testing or upon completion of testing.

3.4 Functional characteristics. Each mortar assembly shall perform the firing, pressure sustaining, and projectile launching functions of its type 81MM mortar system without interference, erratic movement, or malfunction.

3.4.1 Mechanism, elevating assembly. When assembled, the mechanism, elevating assembly shall function smoothly through the entire range of travel. Backlash shall not exceed 1/8 turn. The amount of backlash is a function of the clearance between the spindle, tube, and bevel gears.

3.4.2 Mechanism, traversing assembly. The expanding bearing on the shouldered end of the traversing screw nut shall be adjusted to obtain a close, smoothly-sliding fit inside the traversing tube. The assembly shall function smoothly through the entire range of travel. Backlash shall not exceed 1/8 turn. The amount of backlash is a function of the clearance between the traversing screw and the nut.

3.4.3 Leveling-mechanism. The mechanism for leveling the mortar shall provide a smooth positive adjustment throughout its range of movement. The coil spring and the washers in the sleeve

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assembly shall operate to increase the firmness of the joint and the stability of adjustment during firing. The sliding-bracket and the locking-sleeve shall move easily on the sliding-sleeve for preliminary leveling and shall grip the sliding-sleeve securely when the locking-sleeve is tightened manually. The sliding-sleeve shall travel smoothly on the leg-body.

3.4.3.1 Leveling-mechanism adjustment. The adjusting-nut-locking ring shall connect the adjusting-nut and the sliding-sleeve on the left-leg-body. The locking-ring shall be screwed onto the adjusting-nut until the end of the nut is seated on the end of the sliding-sleeve. The locking-ring shall then be unscrewed the minimum distance necessary to permit manual rotation of the nut while the sliding-sleeve is locked against rotation. Following this adjustment, the locking-ring and adjusting-nut shall be drilled and tapped to receive the adjusting-nut-locking-ring-screw.

3.4.4 Baseplate. The rotating cap in the baseplate shall move freely and smoothly throughout 360 degrees rotation.

3.4.5 Firing pin protrusion. Protrusion of the firing pin from the face of the plug shall be 0.090 to 0.096 inch.

3.5 Performance.

3.5.1 Pressure resistance. Each barrel shall be capable of withstanding an internal pressure of 10,400 plus or minus 400 pounds per square inch at a temperature of 70 degrees F for the lower 29 1/2 inches of the tube. The entire length of the tube

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shall be capable of withstanding a pressure of 4,310 plus or minus 180 pounds per square inch at a temperature of 70 degrees F.

3.5.2 Material soundness. Both prior to and after testing, all parts of the assembled mortar shall comply with the soundness requirements specified on the applicable drawings.

3.5.3 Enlargement of the cannon tube bore. The cannon tube bore diameter when measured after testing shall not exceed the actual bore diameter measured prior to the start of testing by more than 0.002 inch. There shall be no indication of abnormal wear, damage, or deformation of the bore surface.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or purchase order, 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 prescribed requirements.

4.1.1 The inspections set forth in the specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in

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the specification shall not relieve the contractor of his responsibility for assuring that all supplies submitted to the Government for acceptance conform to all requirements of the contract.

4.2 Quality assurance terms and definitions. Quality Assurance terms and definitions used in this specification are in accordance with MIL-STD-109.

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

a. First article inspection (see 4.5).

b. Quality conformance inspection (see 4.6).

4.4 Inspection conditions. Unless otherwise specified, all inspections shall be performed in accordance with test conditions specified on the drawings, and in applicable paragraphs of the specification and test method document.

4.5 First article inspection. Unless otherwise specified in the contract (see 6.2.1), production items identified as first article items by the applicable item Quality Assurance Provisions (QAP) shall be submitted for inspection in accordance with the contract. Each first article sample size shall be as specified in the applicable item QAP. First article items shall be representative of the production processes to be used during quantity production.

4.5.1 Inspection provisions. Each first article item shall be subjected to the following inspections:

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a. All dimensions and physical characteristics specified on applicable engineering drawings.

b. First article requirements specified in applicable article QAP's listed in Master LQAP 8766507, LQAP 7309128, and Master LQAP 11578362.

c. Additional requirements as specified in the contract (see 6.2.1).

4.6 Quality conformance inspection. Quality conformance shall be as specified in TABLE I.

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TABLE I. Quality conformance inspection.

Examination	Requirement Paragraph	Inspection Paragraph
Firing pin protrusion	3.4.5	4.6.5.1
Material soundness		
Cannon barrel	3.5.2	4.6.5.2.1
Baseplate	3.5.2	4.6.5.2.2
Packaging	5.	4.6.5.3
Functional inspection		
Bipod mechanisms	3.4.1, 3.4.2 3.4.3, 3.4.3.1	4.6.6.1
Mortar assembly	3.4	4.6.6.2
Baseplate	3.4.4	4.6.6.3
Tests		
Brazed joint leakage	3.3.2, 3.3.3, 3.5.3	4.6.7.1
Proof acceptance	3.5.1, 3.5.2, 3.5.3	4.6.7.2
Proof firing test method	3.5	4.7.1
Pressure simulation test method	3.5	4.7.2, 4.7.2.1

4.6.1 Inspection provisions. Mortars, subassemblies, components, and parts thereof shall be inspected in accordance with this specification, MIL-C-13931, QAP's listed in: Master LQAP 8766507, Master LQAP 7309128, Master LQAP 11578362, and QAP-APENDIX-WVA; and any additional requirements listed in the contract (see 6.2.1).

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

4.6.3 Inspection equipment. Special inspection equipment used in the inspection of parts, components, subassemblies, and assemblies are prescribed in applicable item QAP's.

4.6.3.1 Acquisition, maintenance, and disposition. Unless otherwise specified (see 6.2.1), responsibility for acquisition, maintenance, and disposition of inspection equipment shall be in accordance with MIL-I-45607.

4.6.3.2 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.

4.6.3.3 Usage of Inspection Equipment. Usage of inspection equipment shall be such as not to degrade the as-manufactured quality of parts, components, subassemblies and assemblies.

4.6.4 Hydrostatic pressure testing equipment.

a. The design of the test equipment shall be such as not to damage the bore of the tube.

b. The test equipment shall be capable of subjecting the cannon barrel (tube and plug) to an internal hydrostatic pressure of 10,400 psi plus or minus 400 psi, applied to the lower 29 1/2 inches of the barrel measured from the plug end of the tube. Total cycle time from the commencement of pressuriza-

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tion to the attainment of test pressure and immediate release shall not exceed 120 seconds.

c. The test equipment shall also be capable of subjecting the entire length of the barrel (tube and plug) to an internal hydrostatic pressure of 4,310 psi plus or minus 180 psi. Total cycle time from the commencement of pressurization to the attainment of test pressure and immediate release shall not exceed 120 seconds.

d. Test fluid shall be water with a corrosion inhibitor added (O-I-490 or approved equal) or oil having a kinematic viscosity not exceeding 25.2 centistokes at 130 degrees F.

e. The barrel shall be supported in such a manner that it is free to expand longitudinally and radially; and shall be enclosed in a container of such construction that should the barrel rupture, the pressure release shall be entirely contained, preventing possible injury to personnel. Shielding of the high pressure pump, conduits, pressure gages, etc., shall be provided.

f. Provisions to purge the system of air shall be provided. The operation of the test equipment shall be such that air entrapment is eliminated.

g. Provisions to drain the test fluid shall be provided.

4.6.5 Examination.

4.6.5.1 Firing pin protrusion. The protrusion of the firing pin from the face of the plug shall be inspected on each mortar cannon with inspection equipment prescribed in the applicable item

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QAP or approved equivalent. Firing pins failing to comply with the requirements of 3.4.5 shall be subject to rejection.

4.6.5.2 Material soundness.

4.6.5.2.1 Cannon. After proof firing or proof simulation, the cannon bore shall be examined by means of a borescope. The cannon barrel shall be subjected to magnetic particle inspection in accordance with applicable drawings and specifications. Barrels failing to comply with the requirements of 3.5.2 shall be subject to rejection.

4.6.5.2.2 Aluminum baseplate, M3. Each aluminum baseplate, M3 shall be subjected to liquid penetrant inspection in accordance with applicable drawings and specifications. Any baseplate failing to comply with the requirements of applicable drawings and specifications shall be subject to rejection.

4.6.5.3 Packaging inspection. Packaging inspection for the level designated in the contract shall be performed in accordance with the applicable packaging data sheets and MIL-P-14232. Packages failing to comply with the packaging requirements shall be subject to rejection.

4.6.6 Functional inspection.

4.6.6.1 Bipod mechanisms. The elevating, traversing, and leveling mechanisms of each mortar bipod shall be manually operated a minimum of two cycles of operation. Backlash of the elevating and traversing mechanisms shall comply with 3.4.1 and 3.4.2, respectively. The leveling mechanism and leveling mecha-

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nism adjustment shall comply with 3.4.3 and 3.4.3.1, respectively. Any bipod mechanism failing to comply with these requirements shall be subject to rejection.

4.6.6.2 Mortar assembly. Each mortar assembly and its component mechanisms shall be free of interference, erratic movement, and malfunction. Any mortar assembly failing to comply with these requirements shall be subject to rejection.

4.6.6.3 Baseplate. The rotating cap of each baseplate shall be manually rotated through 360 degrees. Any baseplate failing to comply with 3.4.4 shall be subject to rejection.

4.6.7 Tests.

4.6.7.1 Brazed joint leakage. Each cannon barrel shall be subjected to the high pressure simulation test method of 4.7.2 except 4.7.2.b. After test, inspect the following:

a. Leakage. The tube-plug joint and adjacent surfaces of the plug and tube shall be inspected. Any evidence of leakage shall be cause for rejection.

b. Distortion. The bore diameter shall be measured with an air gage, or other Government approved gage. Any barrel having bore enlargements exceeding the limit specified in 3.5.3 in the pressurized portion of the barrel, or any barrel exhibiting bulging in the vicinity of the joint shall be subject to rejection.

c. Bore surface condition. The bore of the cannon barrel shall be examined by means of a borescope. Any barrel failing to

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meet the requirements of 3.3.3 shall be subject to rejection.

4.6.7.2 Proof acceptance. Mortars shall be proof accepted through proof firing, simulation tests or both. Mortars and spare barrels to be proof fired shall be tested using the method of 4.7.1. Each tube failing to comply with any of the requirements 3.5.1, 3.5.2 and 3.5.3 shall be subject to rejection. Barrels selected for simulated proof firing shall be tested using the method of 4.7.2. Barrels failing to comply with the requirements of 3.5.1, 3.5.2 and 3.5.3 shall be subject to rejection. Proof firing shall be done on a sampling basis and shall be conducted as follows:

a. Using plan CSP-1 of MIL-STD-1235 and an AQL of 1.0, the Product Assurance Directorate at Watervliet Arsenal shall designate the appropriate initial quantity (i) and sample frequency (f) [see 6.2.1 (j)], in the contract.

b. The first "i" quantity of mortars or barrels produced in a particular buy shall be proof fired. When the "i" quantity has been satisfied, sampling shall be put into effect using the "f" sampling frequency. All mortars not proof fired shall be simulated proof fired.

c. A new "i" qualifying quantity shall be required when any of the following conditions occurs:

(1) a 30 day lapse in production, or more.

(2) a new contractor.

(3) a change in process, material, or source of supply

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deemed significant by the product assurance element of the procuring activity.

(4) failure of a component part during proof firing that is attributed to noncompliance with the requirements of the engineering drawings.

d. Proof fired mortars and replacement barrels shall be furnished with applicable data on DA Form 2408-4 (Weapon Record Data) as specified by Product Assurance Directorate at Watervliet Arsenal.

e. Mortars found to be defective at the proving ground, as a result of a critical failure, shall be reported to the Product Assurance Directorate, Watervliet Arsenal, Watervliet, NY 12189 and Benet Weapons Lab, Watervliet Arsenal, Watervliet, NY 12189 within 12 hours by telecon. The test facility shall forward an Equipment Performance Report(EPR), incident to the deficiency within three working days.

4.7 Test methods.

4.7.1 Proof firing. Proof firing shall be conducted by the Government at a proving ground specified by the Government. Firing shall be conducted in accordance with Proving Ground Acceptance Test Procedure Supplement W-81M-1.

4.7.2 Pressure simulation test method. The high pressure simulation test shall utilize equipment designed in accordance with 4.6.4. The test procedures are as follows:

a. The cannon barrel (tube and plug) shall be subjected to

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an internal hydrostatic pressure of 10,400 psi plus or minus 400 psi, applied to the lower 29 1/2 inches of the barrel measured from the plug end of the tube. Total cycle time from the commencement of pressurization to the attainment of test pressure and immediate release shall not exceed 120 seconds.

b. The entire length of the barrel (tube and plug) shall be subjected to an internal hydrostatic pressure of 4,310 psi plus or minus 180 psi. Total cycle time from the commencement of pressurization to the attainment of test pressure and immediate release shall not exceed 120 seconds.

c. Test fluid shall conform to 4.6.4.d.

d. Barrel support shall conform to 4.6.4.e.

e. Safety features and procedures shall conform to 4.6.4.f and 4.6.4.g.

4.7.2.1 Acceptance inspection. When the high pressure simulation test method of 4.7.2 is used, the following inspections shall be performed on the cannon barrel:

a. Leakage. The tube-plug joint and adjacent surfaces of each cannon barrel shall be examined. Any evidence of leakage of the joint or bulging in the vicinity of the joint shall be subject to rejection.

b. Material soundness. Each mortar barrel shall be examined for material soundness in accordance with 4.6.5.2.1. Failure to meet soundness requirements; and scratches, gouges, or imperfections in the bore surface shall be subject to rejection.

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c. Bore enlargement. The bore diameters of each cannon barrel shall be measured with an air gage, electronic gage, or other Government approved gage. Any barrel having bore enlargements exceeding the limit specified in 3.5.3, and any indication of abnormal wear, damage, or deformation of the bore surface shall be subject to rejection.

5. PACKAGING

5.1 Mortar System - Levels A, B, and C. Preservation, packaging and packing of the mortar system shall be in accordance with Packaging Data Sheet P11578364 for the level of protection specified in the contract (see 6.2).

5.2 Repair parts.

5.2.1 Levels A, B and C. Repair parts preservation, packaging and packing shall be in accordance with the applicable packaging data sheet for the level of protection specified in the contract (see 6.2).

5.2.2 Level X-industrial packaging. Repair parts preservation, packaging, packing and marking shall be in accordance with ASTM D3951 when Level X protection is specified in the contract (see 6.2).

5.3 Marking.

5.3.1 Level A,B and C. Marking of unit packages and exterior shipping containers shall be in accordance with Packaging Data Sheet P11578364.

5.3.2 Level X - Industrial. Marking shall be in accordance with

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ASTM D3951.

5.3.3 Special marking. Concealed identification marking of the mortar system shall be in accordance with MIL-STD-129.

5.3.4 Bar Code Marking. When specified (see 6.2.1.n), bar code marking shall be in accordance with MIL-STD-129 and MIL-STD 1189.

6. NOTES

6.1 Intended use. The 81MM mortar is intended for use with a ground mount by infantry troops. It may also be mounted on armor vehicles.

6.2 Ordering data. Procurement documents should specify the following:

6.2.1 Acquisition requirements.

a. Title, number and date of this specification.

b. Requirements for and the number of mortars, components thereof, or both, to be submitted for first article by the contractor (see 3.1).

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

d. All inspection and test data that is required.

e. At whose expense a retest may be performed.

f. Serial numbers for the mortars and repair tube assemblies.

g. Inspection equipment, responsibility for acquisition, maintenance, and disposition thereof, if other than as specified (see 4.6.3).

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h. Availability of inspection equipment from the Government.

i. Extent of supplier's responsibility for Government-furnished and for supplier-required final inspection equipment

j. Applicable acceptance test procedures, initial consecutive quantity (i), and sampling frequency (f) (see 4.6.7.2.a).

k. Under what conditions simulated firing may be performed, the test equipment available, and the procedures to be followed.

l. When applicable, the sampling plan for the actual firing of repair tubes.

m. The levels of preservation, packaging, and packing required for mortar assemblies (see 5.1) and repair parts (see 5.2).

n. When applicable, bar code marking requirements (see 5.3.3).

6.2.2 Contract data requirements. Monthly reports of the results of final examination and performance testing shall be as specified for delivery on DD Form 1423 in the contract.

6.2.2.1 When this specification is used in an acquisition which incorporates a DD Form 1423, Contract Data Requirements List (CDRL), the data requirements identified below shall be developed as specified by an approved Data Item Description (DD Form 1664) and delivered in accordance with the approved CDRL incorporated into the contract. When the provisions of DoD FAR Supplement 52.227-7031 are invoked and the DD Form 1423 is not used, the

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data specified below shall be delivered by the contractor in accordance with the contract or purchase order requirements. Deliverable data required by this specification is cited in the following paragraphs.

Paragraph No.	Data Requirement Title	Applicable DID No.
3.1	First Article Inspection Report	DI-T-4902

(Data item descriptions related to this specification, and identified in Section 6 will be approved and listed as such in DoD 5000.19L., Volume II, AMSDL. Copies of data item descriptions required by the contractors in connection with specific acquisition functions should be obtained from the Naval Publications and Forms Center or as directed by the Contracting Officer).

6.3 When warranted, the contract should specify the application of MIL-Q-9858 or MIL-I-45208, as appropriate.

6.4 Unless otherwise specified, the contract should specify the application of MIL-I-45607 and MIL-STD-45662.

6.5 Certain provisions of this specification are the subject of international standardization agreements, QSTAG-59 and QSTAG-152. When amendment, revision, or cancellation of this specification is proposed which will modify the international agreement concerned, the preparing activity will take appropriate action through international standardization channels including departmental standardization offices to change the agreement or make other appropriate accommodations.

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User interest

NAVY-MC

Preparing activity:

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Project No. 1015-A302