

MIL-C-46540B
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SUPERSEDING
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MILITARY SPECIFICATION

CASE, CARTRIDGE: 20MM, M103

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

1. SCOPE

1.1 This specification covers the M103 cartridge case for use in the assembly of 20mm cartridges. (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-A-2550 - Ammunition, General Specification for

STANDARDS

MILITARY

MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-109 - Quality Assurance Terms and Definitions
MIL-STD-651 - Visual Inspection Standards for 20mm Ammunition and Components
MIL-STD-1168 - Ammunition Lot Numbering
MIL-STD-1169 - Packaging, Packing and Marking for Shipment of Inert Ammunition Components
MIL-STD-1235 - Single and Multilevel Continuous Sampling Procedures and Tables for Inspection by Attributes

FSC 1305

MIL-C-46540B

DRAWINGS

ARMAMENT COMMAND

D7553815 - Case, Cartridge, 20MM, M103
 C7258801 - Classification of Defects for Case, Cartridge,
 20MM, M103 and M103B1
 D7258817 - Cartridge, 20MM, Target Practice, M55A2
 D7258856 - Carton, Interplant Shipment for 20MM, Cartridge
 Cases, Empty, Unprimed
 LI 8656290 - Index of Inspection Equipment Lists for:
 Case, Cartridge, 20MM, M103

PUBLICATIONS

U. S. ARMY MATERIEL COMMAND

AMCR 715-505 - Ammunition Ballistic Acceptance Test Methods,
 Volume 8, Test Procedures for 20MM Cartridges

(Copies of specifications, standards, drawings, and publications required by suppliers in connection with specific procurement functions should be obtained from the procuring 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. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

American Society for Testing and Materials (ASTM)
 ASTM E18-67 -- Rockwell Hardness and Rockwell Superficial Hardness of
 Metallic Materials

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

Technical Society and Technical Association specifications and standards are generally available for reference from libraries. They are also distributed among technical groups and using federal agencies.

3. REQUIREMENTS

3.1 General. - The cartridge case shall comply with Drawing (Dwg) D7553815, referenced specifications, and other requirements specified herein.

3.2 Manufacturing process. - The cartridge case shall be manufactured by a process approved by the contracting officer and no deviation from that process shall be made without his prior approval. (see 6.3)

3.3 First article sample. - Unless otherwise directed by the contracting officer, a first article sample shall be required.

3.4 Head rim thickness, maximum.-The maximum head rim thickness of each cartridge case shall be in accordance with Dwg. D7553815.

3.5 Hardness.-The cartridge case shall comply with the hardness requirements of Dwg. D7553815.

3.6 Residual stresses.-The cartridge case shall be free of residual stresses to the degree detectible by the mercurous nitrate test.

3.7 Cleaning.-Sodium dichromate, or similar solutions commonly used to obtain a bright finish on brass products, is prohibited from use in the cleaning process for the cartridge cases.

3.8 Neutrality.-The cartridge case surfaces shall be free of acids and alkalis.

3.9 Function and casualty.-The cartridge case shall function without casualty.

3.10 Workmanship.-The requirements for workmanship are as specified on the applicable drawings, referenced specifications and the following:

3.10.1 Metal processing and handling defects.-The cartridge case shall be free of defects such as metal flaws, folds, wrinkles, splits, cracks, dents, and perforations.

3.10.2 Cleanliness.-The cartridge case shall be free of foreign matter such as corrosion, corrosive residue, stains, dirt, grease, oil, lint, chips, slivers, shavings, and trim sections.

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 deemed necessary to assure supplies and services conform to prescribed requirements.

4.1.1 Quality assurance terms and definitions.-Reference shall be made to MIL-STD-109 to define quality assurance terms.

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

1. First article inspection (see 4.3).
2. Quality conformance inspection (see 4.4).

MIL-C-46540B

4.3 First article inspection.

4.3.1 First article sample.-The sample shall be delivered for inspection in accordance with first article approval provisions of the contract and MIL-A-2550, and shall consist of:

a. Inspection and nonfiring tests:

125 cartridge cases

b. Firing test:

4,000 cartridge cases

The projectile assemblies shall be identified in accordance with MIL-STD-1168.

4.3.1.1 Inspection.-After inspection by the contractor and provisional acceptance by the Government activity, the sample will be inspected in accordance with the provisions of MIL-A-2550. Failure of the original first article sample to be in accordance with the applicable drawings and the requirements of Para. 3, as specified herein, will result in sample disapproval. (see 6.5)

4.4 Quality conformance inspection.

4.4.1 Submission of product.-The product shall be submitted in accordance with MIL-STD-105 or MIL-STD-1235, as applicable.

4.4.1.1 Lot.-A lot shall consist of cartridge cases produced by one manufacturer in one unchanged process, in accordance with the same drawings and drawing revisions, and same specification and specification revision.

4.4.1.2 Lot identification.-Each cartridge case and each packed cartridge case lot shall be identified in accordance with applicable drawings and MIL-STD-1168.

4.4.2 Examination.-Each cartridge case shall be examined for head rim thickness, maximum, requirement of 3.4 in accordance with the method as specified in 4.5.1. Examination for major and minor defects shall be performed as specified herein. Each cartridge case found to be defective shall be rejected.

4.4.2.1 Sampling and acceptance criteria.-The sampling plans and procedures shall be in accordance with MIL-STD-105 or MIL-STD-1235. To determine product acceptability, major or minor defects as listed herein may be considered collectively on a class basis or they may be considered individually. However, where major defects are considered collectively on a class basis, the acceptance number for any individual defect of the class shall be limited by the assigned Acceptable Quality Level (AQL) for individual defect associated with the class. (see 4.4.2.2.c) In addition, where MIL-STD-1235 is used, sampling plans applicable to a class shall not be used for major defects. (see 6.4)

MIL-C-46540B

4.4.2.2 AQL's. -The following AQL's are assigned to major and minor defects:

a. Individual:

Major	-----	0.25%
Minor	-----	0.40%

b. Class basis:

Major	-----	1.50%
Minor	-----	2.50%

c. Individual defects associated with the class basis:

Major	-----	0.40%
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4.4.3 Classification of defects 1/. -The classification of defects shall be as follows:

4.4.3.1 Case, Cartridge (see Dwg. D7553815) 1/.

Categories and Defects

Method of Inspection

Critical: None defined.

Major:

101.	Metal defective -----	Visual
102.	Flash hole missing or obstructed -----	Visual
103.	Corrosion -----	Visual
104.	Oil or grease -----	Visual
105.	Head configuration -----	Visual
106.	Thickness, head rim, min -----	Gage
107.	Perpendicularity case head with datum surface -----	Gage
108.	Chamfer, head rim, missing -----	Visual
109.	Length of flat on head rim, min -----	Gage
110.	Diameter of head, min -----	Gage
111.	Diameter, primer pocket -----	Gage
112.	Depth, primer pocket -----	Gage
113.	Runout, primer pocket with datum surface -----	Gage
114.	Diameter, extractor groove, max -----	Gage
115.	Width, extractor groove, min -----	Gage
116.	Wall thickness, first location from inside head surface -----	Gage
117.	Wall thickness, second location from inside head surface -----	Gage
118.	Inside diameter, mouth, min -----	Gage
119.	Profile and alignment, max -----	Gage
120.	Length to .942 basic diameter, min -----	Gage
121.	Total length, max -----	Gage
122.	Diameter, top of body taper, min -----	Gage
123.	Diameter, body taper at 1.7500 location, min -----	Gage

MIL-C-46540B

4.4.3.1 (Cont)

<u>Categories and Defects</u>		<u>Method of Inspection</u>
<u>Minor:</u>		
201.	Foreign matter other than oil, grease or corrosion ---	Visual
202.	Scratch (other than draw scratch) -----	Visual
203.	Fold or wrinkle -----	Visual
204.	Radius at mouth of primer pocket missing or not tangent to pocket side wall -----	Visual
205.	Wall thickness at mouth -----	Gage
206.	Total length, min -----	Gage
207.	Diameter, extractor groove, min -----	Gage
208.	Width, extractor groove, max -----	Gage
209.	Web thickness -----	Gage
210.	Diameter, flash hole -----	Gage
211.	Diameter, head, max -----	Gage
212.	Inside diameter, mouth, max -----	Gage
213.	Weight -----	Balance
214.	Length to .942 basic diameter, max -----	Gage
215.	Marking incorrect, incomplete or unidentifiable -----	Visual
216.	Dent -----	Visual

1/ MIL-STD-651 shall apply in defining and evaluating visual defects.

4.4.4 Tests.—The tests listed in Table I shall be performed on each cartridge case lot in accordance with the test methods prescribed in 4.5. Sample size and acceptance criteria for each test shall be as specified. Only cartridge cases having met the visual and dimensional requirements and having been selected in such a manner that the sample is representative of the entire lot shall be used in the tests. The selected cartridge cases shall be thoroughly mixed before being divided into samples for the various tests.

TABLE I

<u>Test</u>	<u>Sample Size</u>	<u>Requirement Paragraph</u>
Hardness	1/ 5	3.5
Residual stress	2/ 25	3.6
Neutrality	3/ 10	3.8
Function and casualty	4/ 400	3.9

1/ Failure of two or more of the sample cartridge cases to comply with the hardness requirements shall cause rejection of the lot. If one of the samples fails to comply, a second sample of 10 cartridge cases shall be randomly selected from the lot and tested. The lot shall be rejected if a total of two or more cartridge cases of the combined first and second samples fail to comply with the applicable hardness requirement. Failure is defined as any individual hardness number obtained that does not comply with the drawing hardness pattern position requirements.

4.4.4 (Cont)

2/ The lot shall be rejected if one or more cartridge cases of the sample split.

3/ The lot shall be rejected if one or more cartridge cases of the sample show evidence of acidity or alkalinity.

4/ The lot shall be rejected if any malfunction or casualty of Table II occurs in number(s) equal to or greater than the applicable "Rej" number. If malfunctions or casualties occur in excess of the applicable "Acc" number, but less than the applicable "Rej" number, a second sample of 800 cartridge cases randomly selected from the lot, shall be tested. The lot shall be rejected if in the combined samples malfunctions or casualties occur in number(s) equal to or greater than the applicable "Rej" number.

4.4.4.1 Firing defects. - Firing defects and associated criteria shall be as specified in Table II. For defect definitions, see AMCR 715-505, Volume 8.

Table II

<u>Firing Casualties</u>		<u>Acc</u>	<u>Rej</u>
Failure to chamber	<u>1/</u>	0	1
Failure to extract	<u>2/</u>	0	1
Blown primer	<u>3/</u>	0	1
Splits and ruptures	<u>4/</u>		
Splits:			
I or S		6	17
J		2	12
K, L, or M		0	1
Rupture, partial			
S, J, or K		1	6
L		0	1
Circumferential rupture, complete		0	1
Detached metal	<u>5/</u>	0	1

1/ The case lot will not be penalized if malfunction cannot be shown to have resulted from a defective case.

2/ A fired sample cartridge case remaining in the chamber after the normal extraction cycle will be classed defective, unless it can be shown that the malfunction was caused by a defective weapon.

3/ The sample cartridge case shall be classed defective only if it is evident by visual inspection that both the primer pocket and case head are enlarged and deformed.

MIL-C-46540B

4.4.4.1 (Cont)

4/ Refer to Dwg. C7258801 and AMCR 715-505, Vol. 8 for classifying splits and ruptures resulting from the function and casualty test. If a split or partial rupture extends into two or more defined areas, only the most severe defect criterion of Table II for the areas involved shall be used.

5/ The case lot will not be penalized if malfunction cannot be shown to have resulted from a defective case. There must be evidence of detached metal from fired case exterior. The lot will not be penalized for the detachment of metal shavings from the projectile crimped area of the case interior.

4.4.4.2 Unlisted firing defects.-The lot shall be suspended and referred to the contracting officer for disposition, if a malfunction or casualty not covered by this specification, occurs in any firing test.

4.4.5 Packaging and marking inspection.-Inspection for packing and marking shall be in accordance with MIL-STD-1169.

4.4.6 Inspection equipment.-Index of Inspection Equipment List (LI) 8656290 identifies the applicable Inspection Equipment Lists (IEL) required to perform examination and tests as specified herein. Equipment design(s) shall be in accordance with the applicable IEL code designations. The code designations are defined on Dwg. B11075228, a detail of LI 8656290. The provisions of MIL-A-2550 shall apply.

4.5 Test methods and procedures.

4.5.1 Head rim thickness, maximum.-The method of examination for head rim thickness, maximum, shall be approved by the contracting officer. The equipment design shall provide control(s) that will assure rejection of defective cartridge cases.

4.5.2 Hardness.-The cases of the test sample(s) will be sectioned as shown on Dwg. D7553815. The head sections will have approximately parallel surfaces finished to 63 microinches or finer, care being taken not to change the hardness in obtaining this finish. Four determinations each will be made at the indicated body and neck positions for each sample case, two on each half on the interior as shown. Two determinations each will be made at the indicated head position as shown for each sample case. The method of test shall be in accordance with ASTM E18-67, Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials.

4.5.3 Residual stresses.-The method of test shall be as specified in AMCR 715-505, Volume 8, for case mercurous nitrate test.

4.5.4 Neutrality.—The method of testing cartridge cases for acidity and alkalinity will be as follows using red and blue sensitive litmus paper. Neutral distilled water will be used to moisten the paper and the case to provide adhesion. The litmus paper will be handled with forceps to prevent contamination from fingers. Smoking should not be permitted in the vicinity of test since tobacco smoke will turn red litmus blue. Pieces of red and blue sensitive litmus paper will be placed in several locations both on the interior and exterior of the case. A definite color change is defined as the color produced when blue litmus is immersed for thirty seconds in one thousandth normal (.001N) hydrochloric or sulfuric acid, or when red litmus is immersed for thirty seconds in one thousandth normal (.001N) sodium hydroxide. Litmus paper is considered of sufficient sensitivity if it shows change in color when immersed for 45 seconds, with stirring, in five ten thousandths normal (.0005N) solutions of the corresponding acid or alkali mentioned.

4.5.5 Function and casualty.—The method of test shall be as specified in AMCR 715-505, Volume 8. The four hundred (400) test sample cases will be assembled as cartridge, 20mm, target practice, M55A2, conforming to Dwg. D7258817. Two hundred (200) cartridges will be fired in bursts of 50 rounds in the M39 Gun and two hundred (200) cartridges will be fired in bursts of 50 rounds in the M61 type gun. The gun barrel(s) will be at ambient temperature at the beginning of the test and will be cooled to ambient temperature after each 100 rounds. This test will be conducted at a facility designated by the procuring activity.

5. PREPARATION FOR DELIVERY

5.1 Packing, Level C.—Cartridge cases shall be packed in accordance with Dwg. D7258856.

5.2 Marking.—Marking on each shipping container shall be in accordance with Dwg. D7258856.

6. NOTES

6.1 Intended use.—These cartridge cases are intended for ammunition to be used in 20mm automatic gun systems that have been designed for firing cartridges having the M103 type case configuration.

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

6.2.1 Title, number and date of this specification.

6.2.2 Place of inspection, if not at place of manufacture.

6.2.3 Packing and marking instructions (see 5.1 and 5.2)

6.2.4 Provision for the submission and approval of the manufacturing process. (see 3.2)

MIL-C-46540B

6.2.5 Provision for the shipment of the first article sample quantities to the facility conducting the examination and nonfiring tests.

6.2.6 Provisions for shipment of first article and production lot samples for firing tests.

6.2.7 Provisions for the inclusion of MIL-STD-1167, Ammunition Data Cards on DD form 1423, Contract Data Requirements List.

6.2.8 Provision for the supply, maintenance and disposition of Government furnished test equipment for acceptance test purposes.

6.3 Process deviation. - A process deviation is defined as a change in the approved basic method of manufacture or an operational change which may alter the metallurgical or physical properties of the item.

6.4 AQL's. - The optional use of AQL values for either individual defects or classes of defects, with individual major defect limitation, is intended to minimize inspection agency administrative burden which might result from an exclusive assignment of individual defect AQL's. The option also permits flexibility where sampling inspection for acceptance is integrated into the manufacturing process.

6.5 First article sample. - In order to minimize inspection costs, the firing tests of 4.3 will be performed after the sample has been provisionally accepted by the Government for all other requirements. Additional cartridge cases may be required by the testing facility.

Custodians:

Army - MU
Air Force - 70

Preparing Activity:

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Reviewer:

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