

INCH-POUND

MIL-R-10185E(MR)

13 January 1992

SUPERSEDING

MIL-R-10185D(MR)

19 August 1986

MILITARY SPECIFICATION

RINGS, BREECH, STEEL FORGINGS FOR

This specification 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.

1. SCOPE

1.1 Scope. This specification supports the acquisition of medium-high to high tensile strength alloy steel forgings for breech rings. This specification includes the minimum essential Engineering and Packaging Requirements and the necessary Quality Assurance Provisions to determine that these requirements have been met.

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications 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

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Standardization Documents Order Desk, Bldg. 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Director, U.S. Army Laboratory Command, Materials Technology Laboratory, ATTN: SLCMT-MEE, Watertown, MA 02172-0001 by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC No. A6706

AREA FORG

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MIL-R-10185E(MR)

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

DRAWINGS (see 6.10)

US Army Armament Research Development and Engineering Center (ARDEC)

B8769067 - Magnetic Particle Inspection of Cannon and Mount Components

(Copies of drawings, 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 documents form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of the documents which are DoD adopted are those listed in the issue 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 A751 - Chemical Analysis of Steel Products, Standard Methods, Practices, and Definitions for
 ASTM D3951 - Commercial Packaging, Practice for
 ASTM E8 - Tension Testing of Metallic Materials
 ASTM E10 - Method of Test for Brinell Hardness of Metallic Materials
 ASTM E23 - Notched Bar Impact Testing of Metallic Materials
 ASTM E340 - Macroetching Metals and Alloys, Standard Method For
 ASTM E381 - Rating Macroetched Steel, Standard Method For

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

(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. Forgings shall be in accordance with the applicable drawings, this specification, MIL-C-13931, and all referenced documents. Any conflicts are to be resolved by means of the order of precedence (see 2.3).

MIL-R-10185E(MR)

3.2 First article. The contractor shall submit a first article unless it is specifically waived in the contract (see 4.3 and 6.2). No first article requirements shall be waived without review and approval by the procuring contracting officer (see 6.5).

3.2.1 New first article. A new first article shall be submitted when the contractor changes the tooling, reforging stock chemistry or method of manufacture, forging procedure or heat treat procedure.

3.3 Test metal. Integrally-forged test metal (see 6.6.5) and forgings, as required, shall be provided for acceptance tests. The test specimens shall be taken at the location shown on the applicable drawing. All integrally-forged metal whether or not used for mechanical property tests, shall be removed from all forgings by the contractor before shipment of the forgings.

3.4 Chemical composition and heat treatment. Unless a particular composition of steel is specified on the applicable drawing, in the invitation for bids, contract, or purchase order, (see 6.2) the contractor shall select a steel composition which when heat treated shall meet the mechanical properties specified on the applicable drawing or contract. The contractor shall submit his proposed chemistry and the proposed heat treatment process with the bid for forgings. At time of delivery, the contractor shall furnish a certified chemical analysis for each heat of steel used in producing the forgings. The analysis should include percentages of carbon, manganese, silicon, phosphorus, sulfur, aluminum, titanium, and alloying elements. Note: The type lubricants and cleaning process prior to heat treatment is also required with the bid for forgings (see 3.12).

3.5 Orientation of breech ring. When the flowline direction is specified on a drawing, the specified direction shall be predominant.

3.6 Internal soundness. The internal soundness of the forgings shall be equal to or better than macroetch standards C4, S3, and R3 of Plate 1. Photomicrographs of the macroetch standards shall be as specified in ASTM E381.

3.7 Surface soundness. Unless otherwise specified on the applicable drawing, the forging shall comply with the magnetic particle inspection requirements of drawing B8769067, Class IV.

3.8 Mechanical properties.

3.8.1 First article forgings. The mechanical properties of the first article forgings shall be determined by machining test specimens from the test coupon (6.6.4) and the test metal (6.6.5) as shown on the applicable drawing.

3.8.1.1 Yield strength. The yield strength (0.1% offset) of each test specimen shall meet the requirements of the applicable drawing.

3.8.1.2 Reduction of area. The reduction of area for each individual specimen shall be greater than or equal to the minimum reduction of area specified in table I for the corresponding yield strength.

3.8.1.3 Impact resistance. The Charpy V-notch impact resistance at $-40^{\circ}\text{F} \pm 2^{\circ}\text{F}$ for each individual specimen shall be greater than or equal to

MIL-K-10185E(MR)

the minimum Charpy V-notch impact resistance specified in table I for the corresponding average yield strength (0.1% offset).

3.8.1.4 Value difference. For each mechanical property attribute, yield strength (0.1% offset), reduction of area and Charpy V-notch impact resistance, a value difference (6.6.6) shall be calculated. This value difference shall be used to determine acceptability of production forgings for mechanical property requirements.

3.8.2 Production forgings. The mechanical properties of production forgings shall be determined by machining test specimens from the test metal. The mechanical property test results from those test specimens shall be adjusted using the value difference determined by the first article to calculate adjusted yield strength (0.1% offset), adjusted reduction of area, and adjusted Charpy V-notch impact resistance.

3.8.2.1 Adjusted yield strength. The adjusted yield strength (0.1% offset) of each test specimen shall meet the requirements of the applicable drawing.

3.8.2.2 Adjusted reduction of area. The adjusted reduction of area for each individual test specimen shall be equal to or greater than the minimum reduction of area specified in table I for the corresponding adjusted yield strength.

3.8.2.3 Adjusted impact resistance. The adjusted Charpy V-notch impact resistance for each test specimen shall be equal to or greater than the minimum Charpy V-notch impact resistance in table I for the corresponding average adjusted yield strength.

3.8.3 Hardness. In a sampled lot accepted for mechanical properties, each forging not selected for the sample shall have a hardness within 25 Brinell hardness numbers of the average hardness value of the forgings selected for the sample.

TABLE I. Mechanical properties.

Yield strength (0.1% offset) range	Reduction of area		Charpy V-notch impact resistance at $-40^{\circ}\text{F} + 2^{\circ}\text{F}$,	
	Transv.	Long.	Transv.	Long.
psi	%	%	ft-lbs.	ft-lbs
90,000 - 99,999	40	50	40	60
100,000 - 109,999	40	50	35	50
110,000 - 119,000	40	50	35	50
120,000 - 129,000	40	50	35	45
130,000 - 139,999	35	45	30	40
140,000 - 149,999	30	40	25	35
150,000 - 159,999	30	40	20	30
160,000 - 169,999	25	35	15	25
170,000 - 180,000	25	35	15	20

MIL-R-10185E(MR)

3.9 Weld repair of forgings. Each forging not meeting the requirements of 3.7 may be repaired by welding only upon receipt by the contractor of written approval by the procuring contracting officer. Requests for repair welding must be submitted by the contractor in writing to the procuring contracting officer. The request must include a dimensioned sketch illustrating the size and location of the weld repairs to be attempted, the filler material to be used, the weld procedure to be practiced, and the inspection procedure and criterion. Final heat treatment shall be after weld repairing has been completed.

3.10 Dimensions and surface roughness. Dimensions, surface roughness, and dimensional tolerances shall be specified on the applicable drawing.

3.11 Draft angle. The draft angle shall be seven degrees maximum. Dimensions on drawings do not include the draft angle. Any matching draft angle shall be acceptable.

3.12 Identification marking. Each breech ring shall be marked as specified on the applicable drawing and in accordance with MIL-C-13931. Markings on breech rings shall include the contractor's identification number and heat number or heat code. When a heat code is used, a cross-reference to the heat number shall appear on the test report and packing slips.

3.13 Cleaning. The type lubricants and cleaning process prior to heat treatment shall be identified with the bid for forgings.

3.13.1 Cleaning with a silicon based lubricant. When a silicon based lubricant is used in the forging process, these forgings shall be cleaned prior to heat treatment by abrasive blasting or shot blasting.

3.14 Records.

3.14.1 Properties. The contractor shall maintain records of the chemical and mechanical properties of the forgings (see 6.3).

3.14.2 Procedures. The contractor shall maintain detailed forging - heat treatment procedures subject to review by a Government representative. The contractor shall notify the procuring contracting officer of any changes to these procedures.

3.15 Workmanship. The forging shall not contain defects which, due to their nature, degree, or extent, prevent the fulfillment of the requirements of this specification. The existence of defects which cannot be removed by machining the forging to its finished dimensions shall cause the forging to be rejected even if all other requirements of this specification are met.

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 (examinations and tests) 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

MIL-K-10185E(MR)

is approved by the Government. The Government reserves the right to perform any of the inspections set forth in this specification where such inspections are deemed necessary to ensure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items shall meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of manufacturing operations, is an acceptable practice to ascertain conformance to requirements, however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material.

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

- a. First article inspection (see 4.3).
- b. Quality conformance inspection (see 4.4).

4.3 First article inspection. A first article shall be submitted for inspection in accordance with contract requirements. The first article shall be representative of the manufacturing processes to be used during quantity production. The first article shall be subjected to the examinations and tests of 4.3 and 4.4 to determine compliance with all the requirements of the applicable drawings, this specification, and the contract. Production breech ring forgings shall not be produced for acceptance until the first article sample acceptance has been approved by the procuring contracting officer.

4.3.1 Sample size. Unless otherwise specified, the first article sample size shall consist of a minimum of two forgings (see 6.2).

4.3.2 Value difference determination. Mechanical property tests shall be conducted on test specimens removed from the test coupon (see 6.6.4) and from the test metal (see 6.6.5) of the first article forgings to obtain the "value differences" (see 6.6.6). The mechanical property values from all test specimens shall meet the requirements of the applicable drawing and table I. A value difference shall be established for each mechanical property (yield strength, reduction of area and Charpy impact resistance) and shall be added algebraically to the applicable mechanical property measured from test specimens removed from the test metal of production forgings to obtain the adjusted value (see 6.6.8).

4.4 Quality conformance inspection. Quality conformance inspections shall be as specified in table II.

MIL-R-10185E(MR)

TABLE II. Quality conformance inspection.

Characteristic	Requirement Paragraph	Examination or Test Paragraph
Chemical composition	3.4	4.4.6
Dimensions	3.10	4.4.3
Identification marking	3.12	4.4.4
Workmanship	3.15	4.4.5
Packaging	5.0	4.4.8
<u>Material soundness</u>		
Surface (magnetic particle)	3.7	4.4.9.1
Internal (macro-etch)	3.6	4.4.9.2
<u>Mechanical properties</u>		
Hardness	3.8.3	4.4.2.1
Yield strength	3.8.1.1	4.4.2.3
Adjusted yield strength	3.8.2.1	
Reduction of area	3.8.1.2	4.4.2.4
Adjusted reduction of area	3.8.2.2	
Impact resistance	3.8.1.3	4.4.2.5
Adjusted impact resistance	3.8.2.3	

4.4.1 Inspection lot. The formation, size and presentation of lots for inspection shall be in accordance with the contract, purchase order, or item QAP (see 6.6.1).

4.4.2 Mechanical properties. Unless otherwise specified, the number of forgings randomly selected from a mechanical property inspection lot (see 6.6.1.1) for mechanical property tests other than hardness shall be a minimum of twenty percent (20%) of the total number of individual forgings in each inspection lot, but in no instance less than two forgings from each inspection lot. Mechanical properties (yield strength, reduction of area, and Charpy impact resistance) shall be determined from the test metal of each forging in the sample. Adjusted mechanical properties (see 6.6.8) of each forging in the sample shall conform with the applicable drawing and table I. Failure of any forging in the sample to comply with the requirements shall be cause for rejection of the represented lot.

4.4.2.1 Hardness criteria. Brinell hardness shall be determined on each forging in each lot in accordance with ASTM E10. Hardness tests shall be made on the body of the forging and not on its test metal. At least two different locations shall be tested in the regions depicted on the applicable forging drawing. Each individual hardness reading of the forgings not in the sample (which are not tested for mechanical properties) shall be within ± 25 Brinell hardness numbers of the average of the hardness value of the corresponding reading of the forgings in the sample (which are tested for mechanical properties). Each hardness reading shall also meet the requirements specified on the applicable forging drawing. Failure of any forging to meet the requirements shall be cause for rejection.

MIL-R-10185E(MR)

4.4.2.2 Test specimens. The test specimens shall be prepared from test metal as required. Unless otherwise specified on the applicable drawing or in the contract or purchase order (see 6.2), the minimum number of specimens and the test required for each specimen location shall be as shown in table III.

TABLE III. Minimum number of test specimens.

TEST	NUMBER OF SPECIMENS
Macrostructure	1
Tension (YS and RA)	2
Charpy V-notch	2

4.4.2.2.1 Locations. Unless otherwise shown on the applicable drawing, o'clock positions are relative for test metal disks; that is, tension specimens shall be located at the 12 o'clock and 6 o'clock positions; and Charpy V-notch specimens shall be located at 3 o'clock and 9 o'clock positions. Specimens shall be located tangent to a circle midway between the inner bore surface and the outer surface of the test metal. The V-notch of the Charpy specimen shall face, and be parallel to, the flowline direction of the forging. Note: The Charpy specimen is perpendicular to the flowline direction of the forging.

4.4.2.3 Yield strength. The yield strength of the tension specimen shall be determined in accordance with ASTM E8. The rate of stress application when determining the yield strength shall not exceed 100,000 pounds per square inch per minute. Yield strength shall be determined by the offset method which shall be 0.10 percent (0.001 inch per inch of gage length). Tension specimens shall be machined to the form and dimensions of either one of the 0.350 inch or 0.500 inch diameter specimens shown in ASTM E8. The adjusted yield strength (see 6.6.10) shall conform with the values specified on the applicable drawing.

4.4.2.4 Reduction of area. Reduction of area shall be determined in accordance with ASTM E8. The minimum adjusted reduction of area (see 6.6.8) shall conform with the requirements of table I for the corresponding yield strength.

4.4.2.5 Impact resistance. Charpy V-notch impact resistance shall be determined in accordance with ASTM E23. The testing temperature shall be $-40^{\circ} \pm 2^{\circ}\text{F}$. The minimum, adjusted Charpy V-notch impact resistance (see 6.6.8) shall conform with the requirements of table I for the average adjusted yield strength.

4.4.3 Dimensions and surface roughness. In a dimensional inspection lot (see 6.6.1.2) of ten forgings or less, each forging shall be inspected. In a dimensional inspection lot of more than ten forgings, ten forgings plus one forging from each group of ten forgings or fraction thereof, shall be inspected. Dimensions and surface roughness of each forging in the sample shall be measured for conformance with the requirements of 3.10. Failure of any forging in the sample to comply with any of the requirements shall be

MIL-R-10185E(MR)

cause for rejection of the represented lot. A rejected lot shall be screened to remove all forgings failing to comply with the requirements.

4.4.4 Identification marking. Each forging shall be examined to determine compliance with the marking requirements of 3.12. In addition, assurance shall be made that there is positive identification between all test specimens, the respective test metal (or test coupon) and the breech ring being evaluated. Failure to comply shall be cause for rejection.

4.4.5 Workmanship. Each forging shall be visually examined to determine compliance with the workmanship requirements of 3.15. Evidence of poor workmanship shall be cause for rejection.

4.4.6 Chemical composition. A chemical analysis representing each heat shall be conducted in accordance with ASTM A751. A certified test report of the chemical analysis shall be submitted for each forging to the procuring contracting officer.

4.4.7 Weld repair. Weld repair shall be examined by suitable means including visual, magnetic particle, dimensional checks and similar tests. Each forging which has been repaired by welding shall comply with the requirements of 3.9.

4.4.8 Packaging inspection. An examination shall be made to determine compliance with the packaging, packing, and marking requirements of Section 5 of this specification.

4.4.9 Material soundness.

4.4.9.1 Surface soundness. Each forging shall be magnetic particle inspected on all surfaces after heat treatment and cleaning in accordance with B8769067 and shall comply with the requirements of 3.7.

4.4.9.2 Internal soundness. Test metal of each forging, tested for mechanical properties, shall undergo macroetch testing in accordance with ASTM E340, and shall comply with the requirements of 3.6.

4.5 Rejection. Forgings which fail to meet the requirements of this specification when tested in conformance with 4.4 shall be rejected.

4.5.1 Defective machined specimens, faulty test equipment, and faulty testing methods. If a defectively machined test specimen, faulty test equipment or faulty operation of the testing equipment results in the rejection of a forging, the test values obtained from such specimens may be disregarded subject to the approval of the procuring contracting officer and another specimen from the same forging location may be substituted for each such specimen.

4.5.2 Local defects. If rejection of a forging can be traced to the presence of obvious defects (e.g., non-metallics) in the failed test specimen(s), the test values obtained on those specimen(s) shall be disregarded subject to the approval of the procuring contracting officer. Two wake bars may be substituted for each defective specimen. When wake bars have been substituted, failure of the forgings to comply with specification

MIL-R-10185E(MR)

requirements based on test results from the wake bars, shall be cause for rejection of the forgings, whether or not the wake bars also exhibit defects.

4.5.3 Resubmission after re-heat treatment. An inspection lot which fails to meet mechanical property requirements may be reheat treated as a lot. A reheat treated lot shall be retested by taking at least the number of tests required for original testing and only those tests taken after reheat treatment (retempering or re-quench and retemper) shall be used to determine acceptability.

4.6 Check tests. From any lot of forgings found acceptable under prescribed inspection, the Government may designate any forging as a check forging. Such a forging shall be tested at a facility to be designated by the Government, and shall be subjected to any or all tests specified herein. If the forging fails to comply with the requirements of the applicable engineering drawing and table 1, two additional forgings shall be tested. If both forgings comply with all requirements, the lot shall be accepted. If either forging fails to comply with all the requirements, the lot shall be rejected.

4.7 Reporting of tests. The results of all tests and retests, chemical and mechanical, made on each forging or its associated test coupon or test metal or both shall be recorded and maintained (see 6.3). Results shall be provided to the Government procuring activity, the procuring contracting officer or the Government representative, as required by the Contract Data Requirement List, Form DD 1423, or as requested.

5. PACKAGING

5.1 Preservation and packaging. Cleaning, drying, preservation and packaging shall be in accordance with ASTM D3951 to provide adequate protection against corrosion, deterioration, and physical damage during shipment from the contractor to the point of delivery.

5.1.1 Protective coating. All machined surfaces shall be protected with a complete coating of medium preservative oil conforming to MIL-L-3150.

5.2 Packing. All forgings shall be packed for shipment in accordance with ASTM D3951.

5.2.1 Large forgings. Large forgings having projections which may be damaged in handling shall be crated.

5.2.2 Small forgings. Small rough forgings shall be immobilized in adequate containers or shall be shipped in burlap bags.

5.3 Marking for shipment. Marking for shipment shall be in accordance with ASTM D3951 in addition to any special marking required in the contract or purchase order.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

MIL-R-10185E(MR)

6.1 Intended use. The forgings specified herein are intended for use with military cannon.

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 2.1.1).
- c. Applicable drawings or sketches showing the locations of test metal and the appropriate figures of the specification for the location of test coupons and test specimens.
- d. A chemical composition when applicable (see 3.4)
- e. The yield strength range and any other mechanical property attributes and their range of values when applicable (see 3.8).
- f. First article. A first article shall be submitted in accordance with contract requirements.
 - (1) The contract shall designate the examinations and tests to be performed by the contractor and the test data that is required to be delivered to the Government and the examinations and tests to be performed by the Government.
 - (2) The contract shall specify the sample size (i.e., the number of units) of the first article (see 4.3.1)
 - (3) The contract shall designate at whose expense a retest may be performed.
 - (4) The contract shall specify that the acceptable first article will be delivered in accordance with the terms of the contract.
 - (5) The contract shall specify the number of test specimens required for each test if different from that stated in 4.3.2.
 - (6) The contract shall specify the disposition of rejected first article and further action to be taken by contractor, if any.
 - (7) Solicitations should provide that the Government reserves the right to waive any first article requirements subject to the provisions of 3.2.
 - (8) The contract should specify a reasonable time frame wherein the contractor will be notified as to the disposition of residual metal (see 6.4.2).
- g. The serial numbers of the forging(s), if any.
- h. Availability of Government inspection equipment.

MIL-R-10185E(MR)

- i. Extent of contractor's responsibility for Government furnished and contractor-required final inspection equipment.
- j. When applicable, the contract shall specify the corrosion protection material to be applied to the surfaces of the forgings.
- k. The levels of preservation, packaging and packing required if different from the requirements of Section 5.
- l. The number of forgings, if any, that will be placed in strategic storage. The preservative material, sampling plan, rotation procedures, and any other contractual provisions relative to strategic storage.
- m. When warranted, the application of MIL-Q-9858 or MIL-I-45208, as appropriate.

6.3 Consideration of data requirements. The following data requirements should be considered when this specification is applied on a contract. The applicable Data Item Descriptions (DID's) should be reviewed in conjunction with the specific acquisition to ensure that only essential data are requested/provided and that the DID's are tailored to reflect the requirements of the specific acquisition. To ensure correct contractual application of the data requirements, a Contract Data Requirements List (DD Form 1423) must be prepared to obtain the data, except where DOD FAR Supplement 27.475-1 exempts the requirement for a DD Form 1423.

<u>Reference Para.</u>	<u>DID Number</u>	<u>DID Title</u>	<u>Suggested Tailoring</u>
3.9	DI-FORG-81195	Repair Welding Approval Record For Forgings or Castings	---
3.14.1	DI-FORG-81196	Chemical and Physical Properties for Forging or Casting Analysis Report	---

(Copies of data item descriptions related to this specification, and identified in section 6 will be approved and listed as such in DOD 5010.12L, Vol. 11, AMSDL. Copies of data item descriptions required by the contractors in connection with specific acquisition functions should be obtained from the Standardization Documents Order Desk, Bldg. 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094 or as directed by the contracting officer.)

6.4 First article. When first article inspection is required, the procuring contracting officer should provide specific guidance to offerors whether the item(s) should be a preproduction sample, a first article sample, a first production item, a sample selected from the first lot of production items, a standard production item from the contractor's current inventory, and the number of items to be tested as specified in 4.3. The procuring contracting officer should also include specific instructions in acquisition documents regarding arrangements for examinations, approval of first article test results, and disposition of first articles. Invitations for bids should provide that the Government reserves the right to waive the requirement for samples for first article inspection to those bidders offering a product which

MIL-R-10185E(MR)

has been previously acquired or tested by the Government and that bidders offering such products, who wish to rely on such production or test, must furnish evidence with the bid that prior Government approval is presently appropriate for the pending contract. Bidders should not submit alternate bids unless specifically requested to do so in the solicitation.

6.4.1 Prior approval of manufacturing procedure. If the contractor has obtained approval of his manufacturing procedure in accordance with and for a previous acquisition, and his manufacturing procedure has not changed, the procuring contracting officer, with the review by the responsible engineering activity and the approval of the responsible product assurance activity, may waive the requirements for tests of a first article on a procurement of breech ring forgings of similar type and physical properties to those previously procured, provided a period of no more than two years has elapsed from the completion of a previous procurement.

6.4.2 Residual metal. Residual metal from the first article forgings and from any check forgings should be retained by the test facility performing the first article tests until disposition is requested of and directed by the procuring contracting officer (see 6.2.f.(8)).

6.5 Waivers and deviations. The procuring contracting officer shall coordinate all requests for waiver or deviation to this specification with Benet Laboratories and the Product Assurance Directorate at Watervliet Arsenal.

6.6 Definitions.

6.6.1 Inspection lot.

6.6.1.1 Mechanical property inspection lot. A mechanical property inspection lot consists of two or more production forgings made from the same heat of steel and heat treated simultaneously in a batch type furnace heat treat arrangement or consecutively in a continuous heat treat arrangement.

6.6.1.2 Dimensional inspection lot. A dimensional inspection lot consists of two or more production forgings of one part number produced in the same dies and using the same forging process which established the first article and presented for acceptance at one time.

6.6.2 Retest. A retest is defined as any test made after the results of the original test are known.

6.6.3 Section. Same as test coupon (see 6.6.4).

6.6.4 Test coupon. Test coupon is a mass of metal removed from the breech ring part of a forging and includes at least a portion of the critical areas thereof, and is of sufficient size to provide the necessary mechanical property test specimens.

6.6.5 Test metal. Test metal is additional metal which is integrally forged and integrally heat treated material external to the body of the forging. The test metal shall be of sufficient size and volume to provide all necessary test specimens for mechanical property tests as required. The

MIL-R-10185E(MR)

dimensions of the test metal shall not be less than those of the forging at a point coincident with the end of the forging from which it extends.

6.6.6 Value difference. Value difference is that difference between the average value of the test for each mechanical property attribute except hardness of the material test coupon and the average value of the test for the same mechanical property attribute except hardness of the respective test metal. The value difference may be plus or minus. Example: Value difference = (First article test coupon average value) - (First article test metal average value).

6.6.7 Wake bar. A wake bar is a test specimen which is substituted for another specimen which has been discarded because of the presence of local defects caused by, or overlooked, in the preparation of the specimen. The wake bar should be taken as close as possible to the site of the original test specimen.

6.6.8 Adjusted value. An adjusted value is a value calculated by algebraically adding the particular value difference to the particular mechanical property attribute value of the test metal. Example: Adjusted value = (Production forging test metal value) + (value difference).

6.7 Finish-machined contour. The contour of the finish-machined breech ring, including important fillets, should be indicated on the forging drawing, or on a separate drawing, furnished by the procuring contracting officer.

6.8 Metric units. When metric units are required, units for degree Fahrenheit, pounds per square inch, square inch and inch may be converted to the metric equivalent by multiplying them by the following conversion factors:

<u>English</u>	<u>Multiply by</u>	<u>Equals</u>	<u>Metric SI Unit</u>
degree Fahrenheit	(F-32)X5/9	=	degree Celsius (C)
pounds per square inch	6.894	=	Pascal (Pa)
square inch	6.452	=	(Cm) ²
inch	2.54	=	Centimeter (cm)

NOTE: Conversion factors can be associated with ASTM E380 entitled "Metric Practice Guide".

6.9 Subject term (key word) listing.

Cannon, General, Specification for	Chemical composition
Forgings, steel, alloy	Mechanical properties
Rings, breech, steel, forging	Test metal

6.10 Drawings. Drawings listed in Section 2 of this specification under the heading "U.S Army Armament Research, Development and Engineering Center" (ARDEC) may also include drawings prepared by, and identified as Watervliet Arsenal, Ordnance Corps, Weapons Command, or U.S. Army Armament Research and Development Command, U.S. Army Armament, Munitions and Chemical Command, etc. Technical data originally prepared by these activities are now under the cognizance of ARDEC.

MIL-R-10185E(MR)

6.11 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

Custodian:
Army - MR

Preparing activity:
Army - MR

Review activity:
Army - AR

Agent:
Army - AR

Project FORG-A212

(KBWP# ID-0245A/DISK 0080A. FOR MTL USE ONLY)

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

1. DOCUMENT NUMBER

MTL-R-10185E(MR)

2. DOCUMENT TITLE

RINGS, BREECH, STEEL FORGINGS FOR

3a. NAME OF SUBMITTING ORGANIZATION

4. TYPE OF ORGANIZATION (Mark one)

 VENDOR USER MANUFACTURER OTHER (Specify): _____

b. ADDRESS (Street, City, State, ZIP Code)

5. PROBLEM AREAS

a. Paragraph Number and Wording:

b. Recommended Wording:

c. Reason/Rationale for Recommendation:

6. REMARKS

7a. NAME OF SUBMITTER (Last, First, MI) - Optional

b. WORK TELEPHONE NUMBER (Include Area Code) - Optional

c. MAILING ADDRESS (Street, City, State, ZIP Code) - Optional

8. DATE OF SUBMISSION (YYMMDD)