MIL-S-3289B
25 September 1984
SUPERSEDES
MIL-S-3289A
23 April 1965

MILITARY SPECIFICATION

STEEL, PLATE AND DISK, CARBON, FORGING QUALITY

This specification is approved for use by the Army Materials and Mechanics Research Center, 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 covers one composition of forging quality carbon steel plate and disks, for steel cartridge cases for 20MM and larger ammunition.

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications, standards, and handbooks. Unless otherwise specified, the following specifications, standards, and handbooks 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: Director, US Army Materials and Mechanics Research Center, ATTN: AMXMR-SMS, Watertown, MA 02172 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

STANDARDS

FEDERAL

Fed. Std. No. 66 - Steel; Chemical Composition and Hardenability
Fed. Test Method Std. No. 151 - Metals; Test Methods

MILITARY

MIL-STD-163 - Steel Mill Products Preparation for Shipment and Storage

(Copies of specifications, standards 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 document(s) form a part of this specification to the extent specified herein. The issues of the documents which are indicated as DoD adopted shall be the issue listed in the current DoDISS and the supplement thereto, if applicable.

American society for Testing and Materials (ASTM) Standards
E10 - Brinell Hardness of Metallic Materials
E18 - Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials
E112 - Determining Average Grain Size

(Application for copies of ASTM publications should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphis, 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).

2.3 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein, the text of this specification shall take precedence.

3. REQUIREMENTS

3.1 Material. The steel plate and disks shall be produced from aluminum-killed fine grain steel.

3.2 Chemical Composition.

3.2.1 Heat analysis. The chemical composition of the steel shall conform to the requirements of Table I. A chemical analysis of each heat of steel shall be submitted to the procuring activity by the contractor.

Table I - Chemical requirements, heat analysis

Element	Percent
Carbon	0.26-0.33
Manganese	0.60-0.90
Phosphorus (max.)	0.035
Sulphur (max.)	0.040
Silicon (max.)	0.10

3.2.2 Product analysis. The chemical composition, as determined by product analysis, shall meet the requirements of Table I, subject to the tolerances for product analysis as given in FED STD No. 66.

3.3 Hardness. The maximum hardness of the plate or disks shall be as specified by the procuring activity or as agreed upon between the procuring activity and the supplier (see 6.2).

3.4 Austenite grain size. The steel shall have a grain size of 5 or finer.

3.5 Spheroidization requirement. The plate or disks shall be furnished in either the spheroidized or non spheroidized condition as specified by the procuring activity (see 6.2). When specified (see 6.2) the microstructure shall conform to standards furnished or approved by the procuring activity.

3.6 Decarburization. The standards (see 6.2) for the depth and extent of decarburization shall be furnished or approved by the procuring activity (see 6.2). The supplier is not responsible for conducting decarburization examination on plates procured in the as-rolled condition.

3.7 Internal soundness. The standard for soundness shall be as specified by the procuring activity (see 6.2).

3.8 Surface condition. Unless otherwise specified in the invitation for bids, request for proposal, contract or order, plate and disks shall be furnished pickled and oiled, or pickled and limed (see 6.2).

3.9 Dimensions. Dimensions of plate and disks shall be as specified in the contract or order (see 6.2).

3.9.1 Tolerances

3.9.1.1 Thickness. Unless otherwise specified, (see 6.2), the plate and disk thickness measured at any point, shall not exceed the specified thickness. Minus tolerance on specified thickness shall be as shown in Table II.

Table II - Permissible variation in thickness of plates and disks

Specified thickness inch		Permissible variations in thickness, inch, minus only
Over	To and including	
----	0.420	0.020
0.420	0.560	.025
0.560	----	.030

3.9.1.2 Major diameter of disks. Unless otherwise specified (see 6.2), the major diameter (dimension A, figure 1) of disks shall not exceed the specified diameter. Minus tolerances on specified thickness shall be as shown in table III.

Table III - Permissible variations in major diameters of disks (dimension A, figure 1)

Specified diameter inch		Permissible variations, inch, minus only
Over	To and including	
----	3.375	0.010
3.375	6.000	.015
6.000	----	.020

3.9.1.3 Disk configuration. Unless otherwise specified in the contract or purchase order disks shall be supplied in the configuration shown in Figure 1. Dimensions and tolerances shall be as specified by the procuring activity (see 6.2).

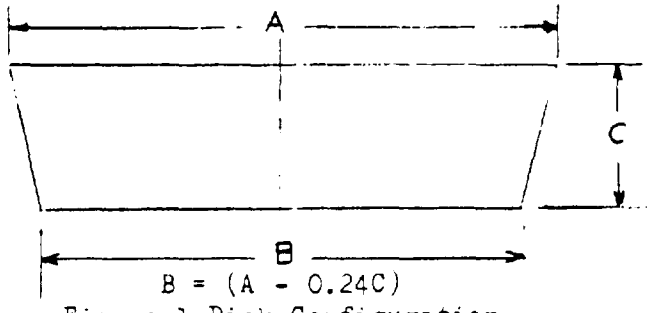

Figure 1 Disk Configuration

3.9.1.4 Dishing of disks. The permissible amount of dishing shall be as specified by the procuring activity (see 6.2).

3.10 Identification marking. Plate and disks shall be marked for identification as specified in the contract or order (see 6.2).

3.11 Workmanship. Plate and disks shall be free from laminations, seams, scabs, scratches and other defects consistent with forging quality steel and the intended use in cartridge cases.

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 that supplies and services conform to prescribed requirements.

4.2 Classification of inspection. The inspection requirements specified herein are classified as quality conformance inspection.

4.2.1 Inspection conditions. Unless otherwise specified, all inspections shall be performed in accordance with the test conditions specified in the applicable test method document or applicable paragraph(s) in the specification.

4.3 Sampling.

4.3.1 Lot description.

4.3.1.1 Plates. Unless otherwise specified, (see 6.2), a lot shall consist of all plates of the same thickness, produced from the same heat in accordance with the requirement of 3.5 and subject to inspection at the same time.

4.3.1.2 Disks. Unless otherwise specified, (see 6.2), a lot shall consist of all disks of the same diameter and thickness, produced from the same heat in accordance with the requirements of 3.5 and subject to inspection at the same time.

4.3.1.3 Chemical composition and austenite grain size. A lot for purposes of determining chemical composition and austenite grain shall size be one heat.

4.3.2 Sampling for quality conformance inspection.

4.3.2.1 Sampling for visual and dimensional examination. Sampling of plates and disks for surface condition, dimensional examination, identification marking and workmanship shall be conducted as specified by the procuring activity (see 6.2).

4.3.2.2 Sampling for packaging, packing and marking. Sampling of shipping containers shall be conducted as specified by the procuring activity (see 6.2).

4.3.2.3 Sampling for tests.

4.3.2.3.1 Chemical analysis. When specified one or more samples shall be taken from each lot for product analysis (see 4.3.1.3 and 6.2). Samples shall be taken in accordance with method 111 or 112 of Fed Test Method Std. No. 151.

4.3.2.3.2 Hardness. Sampling of each lot (see 4.3.1.1, 4.3.1.2 and 6.2) for hardness shall be as specified by the procuring activity (see 6.2).

4.3.2.3.3 Austenite grain size. At least one sample shall be taken to represent each lot (see 4.2.3). Samples shall be selected as agreed upon by the supplier and the procuring activity (see 6.2).

4.3.2.3.4 Spheroidization. Samples for determining spheroidization shall be selected as specified by the procuring activity (see 6.2).

4.3.2.3.5 Decarburization. At least one sample for determination of decarburization shall be taken from each lot (see 4.3.1.1, 4.3.1.2 and 6.2). Samples shall be selected as specified by the procuring activity (see 6.2).

4.3.2.3.6 Internal soundness. Sampling shall be as conducted as specified by the procuring activity. (see 6.2)

4.4 Quality conformance inspection.

4.4.1 Visual and dimensional. Sample plates or disks selected in accordance with 4.3.2.1 shall be inspected for compliance with the requirements for surface condition (3.8), dimensions (3.9), identification marking (3.10), and workmanship (3.11).

4.4.2 Soundness. Sample plates or disks selected in accordance with 4.3.2.3.6 shall be inspected for soundness as specified by the procuring activity (see 6.2).

4.4.3 Preservation, packaging, packing and marking. The inspection shall ascertain that preservation, packaging and packing of disks and plates and marking of containers, is in accordance with the requirements of this specification and the contract or order.

4.4.4 Tests.

4.4.4.1 Test specimens.

4.4.4.1.1 Chemical analysis. Test specimens shall be prepared in accordance with method 111 or 112 of Fed. Test Method Std. No. 151.

4.4.4.1.2 Hardness Samples for hardness shall be prepared in accordance with ASTM E 10 or ASTM E 18, as applicable.

4.4.4.1.3 Austenite grain size. Unless otherwise specified samples shall be prepared in accordance with ASTM E 112 (see 6.2).

4.4.4.1.4 Spheroidization. Specimen size, location and preparation shall be as specified by the procuring activity (see 6.2).

4.4.4.1.5 Decarburization. Specimen size and location shall be as specified by the procuring activity (see 6.2).

4.4.4.2 Test methods.

4.4.4.2.1 Chemical analysis. Chemical analysis shall be conducted in accordance with method 111 or 112 of Fed. Test Method Std. No. 151.

4.4.4.2.2 Hardness. Hardness tests shall be conducted in accordance with ASTM E 10 or ASTM E 18 as applicable.

4.4.4.2.3 Austenite grain size. Austenite grain size shall be determined in accordance with an applicable method of ASTM E 112 as agreed upon by the producer and procuring activity (see 6.2).

4.4.4.2.4 Spheroidization. Microexamination for spheroidization shall be conducted at a magnification of 100 X, unless otherwise agreed upon by the supplier and the procuring activity (see 6.2).

4.4.4.2.5 Decarburization. One of the following methods may be used at the option of the supplier, except that in the event of a dispute, the results of the referee method shall govern.

4.4.4.2.5.1 Carbon determination. The surface of the specimen shall be machined to the depth of permissible decarburization specified. The exposed surface shall be further machined with a cut approximately 0.005 inches deep. Milling chips from this cut shall be retained for chemical analysis. Chemical analysis shall be conducted in accordance with method 111 of Fed. Test Method Std. No. 151.

4.4.4.2.5.2 Microscopic method. The polished specimens shall be etched with a suitable etchant such as 5 percent picral and examined at 100 X magnification, or as otherwise agreed upon by the procuring activity and the supplier. The depth of decarburization shall not be greater than the standards specified by the procuring activity (see 6.2).

4.4.4.2.5.3 Referee method. The specimen shall be electroplated, heated to proper hardening temperature, brine quenched and tempered at 350 to 400 degrees F. Examination of decarburization will be the same as the microscopic method.

4.5 Rejection.

4.5.1 Examination. If the representative sampling for visual, dimensional, soundness or preparation for delivery fails to meet the requirements of this specification when examined in accordance with 4.4, the lot shall be rejected.

4.5.2 Tests. A lot shall be rejected for failure to comply with any of the specified test requirements when tested in accordance with 4.4.4.

4.5.3 Retests. Retests shall be permitted in accordance with Fed. Test Method Std. No. 151.

5. PACKAGING

5.1 Packaging and packing. Packaging and packing shall be level A or industrial as specified.(see 6.2)

5.1.1 Level A. Materials shall be packaged and packed in accordance with MIL-STD-163

5.1.2 Industrial. Materials shall be preserved and packed in accordance with the manufacturer's standard practice into containers of the type and size commonly used for the purpose and in such a manner as to ensure acceptance by the carrier for transportation at the lowest rate applicable and to afford maximum protection from normal hazards of transportation.

5.2 Marking for shipment. In addition to any marking specified in the contract or order, marking for shipment shall be in accordance with MIL-STD-163.

6. NOTES

6.1 Intended use. The forging quality steel covered in this specification is intended for use in ammunition cases.

6.2 Ordering data. Acquisition documents should specify the following:

(a) Title, number and date of this specification.

(b) Maximum hardness (see 3.3 and 4.3.2.3.2).

(c) Condition, if other than spheroidized annealed (see 3.5).

(d) Standards for spheroidized condition, sampling, test methods (see 3.5, 4.3.2.3.4, 4.4.4.1.4 and 4.4.4.2.4).

(e) Standards for decarburization, sampling, and test methods (see 3.6 and 4.3.2.3.5, 4.4.4.1.5 and 4.4.4.2.5.2).

(f) Standards for internal soundness, sampling, test methods (see 3.7, 4.3.2.3.6 and 4.4.2).

(g) Surface condition, if other than pickled and oiled or pickled and limed (see 3.8, and 4.3.2.1).

(h) Dimensions and tolerances (see 3.9, 3.9.1, 3.9.1.1, 3.9.1.2, and 3.9.1.3).

(i) Permissible amount of dishing (see 3.9.1.4).

(j) Identification marking (see 3.10 and 4.3.2.1).

(k) Lot size, if other than as specified (see 4.3.1.1 and 4.3.1.2).

(l) Sampling for workmanship (see 4.3.2.1).

(m) Sampling for product analysis (see 4.3.2.3.1).

(n) Sampling, test method for austenite grain size (see 4.3.2.3.3, 4.4.4.1.3 and 4.4.4.2.3).

(n) Level of packaging (see 5.1).

6.3 Chemical composition. When cartridge cases requiring high pressures are manufactured, the chemical composition for carbon should be adjusted to the high side of the range of chemistry shown in Table I.

Custodian:

Army - MR
Navy - OS

Review activities:

Army - AR, EA

DLA - IS

Preparing activity:

Army - MR

Project No. 9515-0451

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STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions – Reverse Side)

1. DOCUMENT NUMBER	2. DOCUMENT TITLE

3a. NAME OF SUBMITTING ORGANIZATION	4. TYPE OF ORGANIZATION *(Mark one)*
	☐ VENDOR
b. ADDRESS *(Street, City, State, ZIP Code)*	☐ USER
	☐ MANUFACTURER
	☐ OTHER *(Specify)*: _____

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)*

DD FORM 1426

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