

QQ-S-634A
October 29, 1970
SUPERSEDING
Fed. Spec. QQ-S-634
January 6, 1965

FEDERAL SPECIFICATION

STEEL, BAR, CARBON, COLD FINISHED, (STANDARD QUALITY)

This specification was approved by the Commissioner, Federal Supply Service, General Services Administration, for the use of all Federal agencies.

1. SCOPE AND CLASSIFICATION

1.1 Scope. This specification covers standard quality cold finished carbon steel bars for general fabrication purposes (see 6.1).

1.2 Classification.

1.2.1 Descriptive requirement.

1.2.1.1 Chemical composition. Standard quality bars are furnished to chemical composition in accordance with the steel grade numbers and composition of Fed. Std. No. 66 or to minimums, maximums, and ranges in accordance with Fed. Std. No. 66 (see 6.3).

1.2.1.2 Chemical composition and mechanical properties. Standard quality bars are furnished to chemical composition and to mechanical property requirements. Mechanical properties are specified to minimum or maximum properties rather than ranges. The mechanical properties should be compatible with the chemical composition. Hardness is specified to minimum, maximum, or to ranges in accordance with the thermal treatment received (see 3.4.1).

1.2.2 Additional descriptive requirement.

Austenite grain size (see 3.3).

1.2.3 Condition. Standard quality bars are furnished in the cold finished condition, either as cold drawn (CD) or cold finished (CF) or in the following additional thermal or mechanical treatments:

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Annealed and cold³ drawn (ACD) (see 6.2.1)
Normalized and cold drawn (NCD) (see 6.2.1)
Normalized, cold drawn, and stress relieved (NCDSR)
Normalized, tempered, and cold drawn (NTCD)
Drawn at elevated temperature (DET)
Turned and polished (TP) (see 6.6)
Turned, ground, and polished (TGP) (see 6.6)
Annealed, cold drawn, and stress relieved (ACDSR)
Quenched and tempered and cold drawn (QTC D)
Quenched and tempered, cold drawn and stress relieved (QTCDSR)
Cold drawn and stress relieved (CDSR)
Drawn at elevated temperature and stress relieved (DETSR)
Cold drawn, ground, and polished (CDGP)

1.2.4 Forms. Standard quality bars are furnished in the following forms, as specified (see 6.2).

Rounds
Squares
Hexagons
Flats
Special bar sections

1.2.5 Size. Standard quality bars are furnished in the following size ranges, as specified (see 6.2).

Rounds, up to 9 inches, inclusive
Squares, up to 4 inches, inclusive
Hexagons, up to 3-1/8 inches, inclusive
Flats, 1/8 inch and over in specified thickness, and up to
12 inches in specified width
Special bar sizes - Consult producer

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:

Federal specification:

H-B-621 - Brush, Stencil

Federal standards:

Fed. Std. No. 48 - Tolerances for Steel and Iron Wrought Products
Fed. Std. No. 66 - Steel: Chemical Composition and Hardenability
Fed. Std. No. 123 - Marking for Domestic Shipment (Civilian Agencies)
Fed. Test Method Std. No. 151 - Metals; Test Methods

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(Activities outside the Federal Government may obtain copies of Federal Specifications, Standards, and Handbooks as outlined under General Information in the Index of Federal Specifications and Standards and at the prices indicated in the Index. The Index, which includes cumulative monthly supplements as issued, is for sale on a subscription basis by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

(Single copies of this specification and other Federal Specifications required by activities outside the Federal Government for bidding purposes are available without charge from Business Service Centers at the General Services Administration Regional Offices in Boston, New York, Washington, D. C., Atlanta, Chicago, Kansas City, Mo., Fort Worth, Denver, San Francisco, Los Angeles and Seattle, Washington.

(Federal Government activities may obtain copies of Federal Specifications, Standards, and Handbooks and the Index of Federal Specifications and Standards from the established distribution points in their agencies.)

Military Standards:

MIL-STD-129 - Marking for Shipment and Storage.

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

(Copies of Military Specifications and Standards required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

2.2 Other publication. The following documents form a part of this specification to the extent specified herein. Unless a specific issue is identified, the issue in effect on date of invitation for bids or request for proposal shall apply.

American Society for Testing and Materials (ASTM) Standards:

E8 - Tension Testing of Metallic Materials.

E10 - Brinell Hardness of Metallic Materials.

E18 - Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials.

E112 - Estimating Average Grain Size of Metals.

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

National Motor Freight Traffic Association, Inc., Agent:

National Motor Freight Classification.

(Application for copies shall be addressed to the National Motor Freight Traffic Association, Inc., Agent, 1616 P Street, N.W., Washington, D.C. 20036.)

Uniform Classification Committee, Agent:

Uniform Freight Classification.

(Application for copies should be addressed to the Uniform Classification Committee, Tariff Publishing Officer, Room 202 Union Station, 516 W. Jackson Blvd., Chicago, Illinois 60606.)

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(Technical society and technical association specifications and standards are generally available for reference from libraries. They are also distributed among groups and using Federal agencies.)

3. REQUIREMENTS

3.1 Chemical composition.

3.1.1 When standard quality bars are ordered to chemical composition only, the bars may be ordered to identification grade numbers (see 6.3) or applicable ranges or maximum or minimum limits (see 6.3). A ladle analysis of each heat of steel shall be furnished by the supplier.

3.1.2 When standard quality bars are ordered to chemical composition and mechanical properties, chemical composition shall be specified as in 3.1.1 and the supplier shall furnish a ladle analysis of each heat.

3.1.3 Check analysis. The chemical composition, as determined by check analysis, shall meet the requirements for the specified composition provided that in a heat of steel the individual tolerances do not vary both above and below the ranges shown for check analysis tolerances in Fed. Std. No. 66.

3.2 Mechanical properties. When standard quality bars are specified to chemical composition and mechanical properties, the mechanical properties of the test specimens representing the steel shall meet the requirements as shown on the drawing or in the contract or order.

3.3 Austenite grain size. When specified in the contract or order, standard quality bars may be specified to coarse (1-5, inclusive) or fine (5-8, inclusive) grain size. Unless otherwise specified, at least 70 percent of the grains shall comply with the ordered size.

3.4 Condition. Unless otherwise specified in the contract or order, standard quality bars shall be furnished in the cold finished condition (CF) either as cold rolled (CR) or (CD) cold drawn (see 1.2).

3.4.1 Additional thermal treatments. When specified in the contract or order, standard quality bars may be specified to the following thermal treatments to meet requirements for hardness or mechanical properties (see 3.2 and 6.2).

(a) Annealed. Bars may be specified to a maximum hardness after the annealing treatment. Maximum hardness is dependent on end use and shall be as specified on the drawings or in the contract or order, or as agreed between the supplier and procuring activity.

(b) Normalized. Bars may be specified to a maximum hardness after the normalizing treatment. Maximum hardness shall be as specified on the drawing or in the contract or order, or as agreed between the supplier and procuring activity.

(c) Quenched and tempered. Bars may be specified to a hardness range or to mechanical properties. The hardness range shall be as specified on the drawing or in the contract or order, or as agreed between the supplier and procuring agency. Mechanical properties for the test specimen representing the steel shall be as specified on the drawing or in the contract or order, or as agreed between the supplier and the procuring activity.

(d) Stress relieved. Bars may be specified to a maximum or minimum hardness. The maximum or minimum hardness shall be as specified on the drawing or in the contract or order, or as agreed between the supplier and procuring activity.

3.5 Finish. Bars shall be furnished as cold finished with a surface coating of oil or other rust inhibiting material.

3.6 Dimensions. Dimensions shall be as specified in the contract or order, or on the applicable drawing (see 1.2.5 and 6.2). Dimensional tolerances from specified size shall be in accordance with Fed. Std. No. 48 as shown in table I.

Table I. Tolerance references

Tolerance	Fed. Std. 48 reference
Size - rounds cold drawn or turned and polished rounds, turned and polished hexagons, cold drawn squares - cold drawn flats - cold finished	2a1
Size - rounds turned, ground and polished, or cold drawn, ground and polished	2a2
Random lengths	2a3
Specific lengths	2a4
Straightness	2a5

3.7 Identification marking. Bars shall be marked for identification as specified in the contract or order. For Defense Supply Agency procurement, bars will be continuously marked as follows:

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(a) All bars 1/2 inch or more in width of flat or diameter shall be marked at intervals not greater than 3 feet throughout length of bar with specification number, grade, heat number, and contractor's name or trademark. The surface to be marked shall be clean, dry, and entirely free of oil, grease, and other substances that may adversely affect the adhesive quality of the marking inks. After marking, sufficient drying time shall be allowed to prevent smearing. The marking shall not rub off or be smeared by contact incident to normal handling during shipment or storage.

(b) Bars smaller than 1/2 inch in width of flat or diameter shall be bundled and tagged with the specification number, grade, heat number, and contractor's name or trademark at each end with an extra tag included in the bundle.

3.8 Workmanship. Bars shall be clean and free from pipe, segregation, surface defects, and other defects which may affect detrimentally the suitability of the bars for their intended use.

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 utilize 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 Lot. Unless otherwise specified in the contract or order, a lot shall consist of all bars submitted for inspection at the same time of the same heat (of the same batch for thermally treated bars which are batch treated), and of the same size, thickness, or shape.

4.3 Sampling.

4.3.1 For chemical analysis. At least one sample shall be taken from each lot for check analysis.

4.3.2 For mechanical properties. At least two samples for tension testing shall be taken from each lot, except that when the finished material from a lot is less than 30 tons one test sample shall be taken.

4.3.3 For hardness tests. At least two samples for hardness tests shall be taken from each lot.

4.3.4 Austenite grain size. At least one sample from each lot shall be taken for checking austenite grain size.

4.4 Examination.

4.4.1 Visual. Unless otherwise specified in the contract or order, all bars in each lot shall be examined for compliance with the requirements for finish (see 3.5), identification marking (see 3.7), and workmanship (see 3.8).

4.4.2 Dimensions. Unless otherwise specified in the contract or order, all bars in each lot shall be measured to determine compliance with the dimensional requirements (see 3.6).

4.4.3 Preparation for delivery. Prior to shipment, examination shall be made to determine compliance with the requirements of section 5.

4.5 Test.

4.5.1 Chemical composition. Samples for check analysis shall be prepared and tested in accordance with method 111 or method 112 of Fed. Test Method Std. No. 151. In case of dispute, analysis by method 111 shall be the basis for acceptance or rejection.

4.5.2 Tension tests. Specimens for tensile testing shall be prepared and tested in accordance with ASTM E 8.

4.5.3 Hardness tests. Specimens for hardness testing shall be prepared and tested in accordance with ASTM E 10 or E 18, as applicable.

4.5.4 Austenite grain size. Specimens for austenite grain size testing shall be prepared and tested in accordance with ASTM E 112.

4.6 Marking adhesion. A clean, dry brush (conforming to H-B-621, type L) shall be applied (10 strokes) across the markings, using sufficient pressure to bend the bristles 15 to 20 degrees in order to determine proper adherence of marking inks required in 3.7.

4.7 Rejection and retest. Unless otherwise specified in the contract or order, rejection and retest shall be conducted in accordance with the general section of Fed. Test Method Std. No. 151.

5. PREPARATION FOR DELIVERY

5.1 Preservation and packaging. Preservation and packaging shall be level A or C as specified (see 6.2).

5.1.1 Level A. Preservation and packaging shall be in accordance with the applicable requirements of MIL-STD-163.

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5.1.2 Level C. Unless otherwise specified, cleaning, drying, preservation, and packaging shall be in accordance with the manufacturer's standard practice, providing it insures protection for the product during shipment and safe delivery to its destination.

5.2 Packing. Bars shall be packed for shipment in accordance with levels A or C as specified (see 6.2).

5.2.1 Level A. Bars shall be packed in accordance with the applicable requirements of MIL-STD-163.

5.2.2 Level C. Packing shall be in accordance with commercial practice adequate to ensure acceptance and delivery by the carrier for the mode of transportation employed. Containers shall comply with the requirements of the Uniform Freight Classification or National Motor Freight Classification, as applicable to the mode of transportation.

5.3 Marking.

5.3.1 Civil agencies. In addition to any special marking specified in the contract or order, marking for shipment shall be in accordance with Fed. Std. No. 123.

5.3.2 Military activities. In addition to any special marking specified in the contract or order, marking for shipment shall be in accordance with MIL-STD-129.

6. NOTES

6.1 Intended use. Standard quality cold finished carbon steel bars are produced from special quality hot rolled bars for the purpose of improving surface finish, dimensional accuracy, and machinability. They are used in applications involving forging, heat treating, machining, etc. For cold drawn or cold rolled cold finished bars, the tensile and yield strength are increased and the machinability is improved. Standard quality bars may be specified with restrictive requirements, special processing requirements, or for identified applications. When critical methods of fabrication, machining, heat treating, and end use requirements are required, standard quality steel plus one or more of these requirements, if technically compatible may result in an overall savings in the production of parts or items from the steel bars. The following comprise the special requirements:

Restrictive requirements

Special discard
Special heat treating requirements

Testing requirements

Macroetch test
Fracture test
Nonmetallic inclusion test

Special surface**Restricted requirements**

Restricted mechanical properties
Restricted chemical composition
Restricted size tolerance
Restricted length tolerance

Special processing requirements

Special straightness
Special recutting of bar ends
Special chamfering of bar ends
Special surface coating

Identified applications

Cold heading and cold forging quality
Cold extrusion quality

6.2 Ordering data. Purchasers should select the preferred options permitted herein, and include the following information in procurement documents:

- (a) Title, number and date of this specification.
- (b) Chemical composition or chemical composition and mechanical property requirements (see 1.2.1, 3.1, and 3.2)
- (c) Condition, if other than cold finished (see 1.2.3 and 3.4)
- (d) Austenite grain size, coarse or fine, if required (see 1.2.2 and 3.3)
- (e) Maximum hardness of mechanical properties if condition other than as cold finished is required (see 3.4)
- (f) Form and size (see 1.2.4, 1.2.5, and 3.6)
- (g) Identification marking (see 3.7)
- (h) Level of preservation and level of packing required (see section 5)

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6.2.1 Cold finished bars. In the procurement of cold finished bars under 0.55 percent carbon the CD condition will meet most requirements and is generally best suited for further machining without assessment of extras for thermal treatment as represented by the ACF and NCF conditions. It is suggested that if thermal treatment to relieve stresses before subsequent use or working is required the cold finished stress relieved (CDSR) be procured.

6.3 Selection of chemical composition.

6.3.1 Steel grade designation. Designations covering chemical composition commonly produced to this specification are as follows:

1010	1020	1040	1049
1015	1022	1042	1050
1016	1025	1045	
1018	1026	1046	
1019	1035	1048	

6.3.2 Minimum and maximum limits and ranges. Although standard quality bars are usually ordered to grade designations, the compositions may be prepared using the ladle ranges and limits shown in table II. For steel manufactured by any process, the elements comprising the desired chemical compositions are specified in one of three ways:

- (a) By a maximum limit.
- (b) By a minimum limit.
- (c) By minimum and maximum limits, termed the range; by common usage, the range is the arithmetical difference between the two limits (e.g. 0.60 to 0.72 is a 0.12 range).

Table II. Cold finished carbon steels other than standard grades

Ladle chemical ranges and limits			
Element	Chemical ranges and limits, percent		
	When maximum of specified element is:	Range	Lowest max.
Carbon See note 1	To 0.12 incl.	--	0.06
	Over 0.12 to 0.25 incl.	0.05	
	Over 0.25 to 0.40 incl.	0.06	
	Over 0.40 to 0.55 incl.	0.07	
	Over 0.55 to 0.80 incl.	0.10	
	Over 0.80	0.13	
Manganese	To 0.40 incl.	0.15	0.35
	Over 0.40 to 0.50 incl.	0.20	
	Over 0.50 to 1.65 incl.	0.30	
Phosphorus	Basic steels: To 0.040 incl.		0.040
	Over 0.040 to 0.08 incl.	0.03	
	Over 0.08 to 0.13 incl.	0.05	
Sulfur	Basic Steels: To 0.050 incl.		0.050
	Basic steels: Over 0.050 to 0.09 incl.	0.03	
	Over 0.09 to 0.15 incl.	0.05	
	Over 0.15 to 0.23 incl.	0.07	
	Over 0.23 to 0.35 incl.	0.09	
Silicon	To 0.10 incl.	--	0.10
	Over 0.10 to 0.15 incl.	0.08	
	Over 0.15 to 0.20 incl.	0.10	
	Over 0.20 to 0.30 incl.	0.15	
	Over 0.30 to 0.60 incl.	0.20	
Copper	When copper is required, 0.20 minimum is generally used		

NOTE 1: Carbon: The carbon ranges shown in the column headed "Range" apply when the specified maximum limit for manganese does not exceed 1.10 percent. When the maximum manganese limit exceeds 1.10 percent, add 0.01 to the carbon ranges shown above.

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6.4 Supersession data. QQ-S-634 superseded that part of QQ-S-633 covering cold finished steel bars. Merchant quality hot rolled steel bars are covered in QQ-S-630 and special quality hot rolled bars in QQ-S-631. Free machining cold finished steel bars are covered in QQ-S-637.

6.5 Relationship to commercial standards. Standard quality cold finished carbon steel bars specified to chemistry only are similarly covered in ASTM A 108.

6.6 Mechanical properties of turned, ground, and polished cold finished bars. Cold finished bars produced by machining operations such as turning, polishing, and grinding are essentially the same as the hot rolled bars from which they are produced.

6.7 International standardization agreement. Cold-finished carbon steel bar classes 1010, 1012, 1015, 1018, 1020, 1025, and 1095 are the subject of international standardization agreement (ABC-Navy-STD-41, "Interchangeability/Equivalency of Carbon and Alloy Steels in Bar Form for General Dockyard Repairs").

MILITARY CUSTODIANS:

Army - MR
Navy - AS
Air Force - 11

Preparing activity:

Army - MR

CIVIL AGENCIES INTEREST:

AGR
COM
DC
GSA
HEW
INT
JUS
PO

Review activities:

Army - AT, MR, MU, WC
Navy - AS
Air Force - 11
DSA - IS

User activities:

Army - MI, ME
Navy - SH
Air Force -

Orders for this publication are to be placed with General Services Administration, acting as an agent for the Superintendent of Documents. See Section 2 of this specification to obtain copies and other documents referenced herein. Price 15 cents each.

SPECIFICATION ANALYSIS SHEET		Form Approved Budget Bureau No. 119-R004
INSTRUCTIONS		
This sheet is to be filled out by personnel either Government or contractor, involved in the use of the specification in procurement of products for ultimate use by the Department of Defense. This sheet is provided for obtaining information on the use of this specification which will insure that suitable products can be procured with a minimum amount of delay and at the least cost. Comments and the return of this form will be appreciated. Fold on lines on reverse side, staple in corner, and send to preparing activity.		
SPECIFICATION		
QQ-S-634A, Steel, Bar, Carbon, Cold Finished, (Standard Quality)		
ORGANIZATION		CITY AND STATE
CONTRACT NO.	QUANTITY OF ITEMS PROCURED	DOLLAR AMOUNT
		\$
MATERIAL PROCURED UNDER A		
<input type="checkbox"/> DIRECT GOVERNMENT CONTRACT <input type="checkbox"/> SUBCONTRACT		
1. HAS ANY PART OF THE SPECIFICATION CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE? A. GIVE PARAGRAPH NUMBER AND WORDING		
B. RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES		
2. COMMENTS ON ANY SPECIFICATION REQUIREMENT CONSIDERED TOO RIGID		
3. IS THE SPECIFICATION RESTRICTIVE? <input type="checkbox"/> YES <input type="checkbox"/> NO IF "YES", IN WHAT WAY?		
4. REMARKS (Attach any pertinent data which may be of use in improving this specification. If there are additional papers, attach to form and place both in an envelope addressed to preparing activity)		
SUBMITTED BY (Printed or typed name and activity)		DATE