Designation: A 499 – 89 (Reapproved 2008)

Standard Specification for Steel Bars and Shapes, Carbon Rolled from "T" Rails[1]

This standard is issued under the fixed designation A 499; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope

1.1 This specification covers carbon steel bars and shapes produced from standard rail steel. These bars are furnished in the as-wrought condition intended for structural use, or bar and shape uses, where high tensile properties are applicable. These materials are available in two strength levels as Grades 50 and 60.

1.2 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

2. Referenced Documents

2.1 *ASTM Standards:* [2]

A 1 Specification for Carbon Steel Tee Rails

A 29/A 29M Specification for Steel Bars, Carbon and Alloy, Hot-Wrought, General Requirements for

A 370 Test Methods and Definitions for Mechanical Testing of Steel Products

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 Rail steel bars and bar size shapes are available in the following sections and nominal sizes:

3.1.1.1 *Rounds, Squares, and Round Corner Squares* in sizes ranging from ⅜ to 1¼ in. (9.5 to 32 mm).

3.1.1.2 *Square and Round Edge Flats*, ⅝ to 5 in. (15.9 to 127 mm), inclusive, in width and thickness from 7⁄64 to 1 in. (2.8 to 25 mm), inclusive, within 6 lb/ft (8.8 kg/m) limit.

3.1.1.3 *Hexagons and Octagons*, in sizes ½ to 1 in. (12.7 to 25 mm) in 1⁄16-in. (1.6-mm) increments.

3.1.1.4 *Bar Size Shapes:*

(1) Equal and Unequal Angles, ¾ to 3 in. (19.0 to 76 mm) length of legs and thickness ranging from 7⁄64 to ⅜ in. (2.8 to 9.5 mm), inclusive.

(2) Tees, 1¼ , 1⅜ , 1½ by ⅛ and 3⁄16 in. thickness (32, 35, 38 mm by 3.2 and 4.8 mm thickness).

(3) Channels, 1 to 2½ in. (25 to 64 mm), inclusive, in depth and ⅜ to 1 in. (9.5 to 25 mm), inclusive, in width of flange.

3.1.1.5 *Special Bar Sections:*

(1) Ovals, from ⅝ to ⅞ in. (15.9 to 22.2 mm) in longest dimension by 5⁄16 to 7⁄16 in. (7.9 to 11.1 mm), inclusive, in the small dimension.

(2) Diamonds, ⅞ and 13⁄16 in. (22.2 and 20.6 mm) in the longest dimension by ⅝ to ¾ in. (15.9 to 19.0 mm), inclusive, in the smallest dimension.

(3) I-Beams, 1½ and 2⅛ in. (35 and 54 mm) in width and ⅛ to ¼ in. (3.2 to 6.4 mm), inclusive, in thickness.

(4) U-Bars, 1¼ and 1 5⁄16 in. (32 and 33 mm) in width and 5⁄32 to 5⁄16 in. (4.0 to 7.9 mm) in thickness.

(5) Channeled Flats, 1¼ to 2 in. (32 to 51 mm), inclusive, in depth, and 3⁄16 to ⅜ in. (4.8 to 9.5 mm), inclusive, in thickness.

4. Ordering Information

4.1 Orders for material under this specification should include the following information:

4.1.1 Quantity (weight or number of pieces),

4.1.2 Name of material (rail steel carbon bars),

4.1.3 Grade of steel (Grade 50 and Grade 60),

4.1.4 Dimensions (diameter, thickness, width, etc. and length),

4.1.5 Cross section (rounds, square, hexagon, etc.) (3.1),

4.1.6 ASTM designation and date of issue,

4.1.7 Certification, if required (Section 11), and

4.1.8 End use.

[1] This specification is under the jurisdiction of ASTM Committee A01 on Steel, Stainless Steel and Related Alloys, and is the direct responsibility of A01.15 on Bars.

Current edition approved March 1, 2008. Published April 2008. Originally approved in 1964. Last previous edition approved in 2002 as A 499 – 89 (2002).

[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

Copyright © ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959, United States.

Copyright ASTM International
Provided by IHS under license with ASTM
No reproduction or networking permitted without license from IHS
Not for Resale

NOTE 1—A typical ordering description is as follows: 10 000 lb, rail steel carbon bars, 1.000 in. diameter by 10 ft, round, ASTM A 499 dated _____.

5. General Requirements

5.1 Material furnished under this specification shall conform to the applicable requirements of the current edition of Specification A 29/A 29M, unless otherwise provided herein.

6. Materials and Manufacture

6.1 *Material*—The material shall be hot wrought from standard section "T" rails. No other materials, such as those known by the terms "rerolled," "rail steel equivalent," or "rail steel quality," shall be substituted.

6.2 *Hot Forming*—The material shall be produced by hot forming slit railroad rail parts to yield straight lengths in the sections and nominal sizes specified in 3.1.1.

6.3 *Condition*:

6.3.1 The material shall be furnished hot wrought, as wrought.

6.3.2 The material shall be furnished in cut lengths or ranges of random lengths, as specified by the purchaser.

7. Chemical Composition

7.1 The chemical composition of rails does not change during use in track, reheating, slitting or rolling; consequently, the composition of rail steel products will fall within the limits specified in Specification A 1 for standard section "T" rails of open-hearth, basic-oxygen, electric-furnace, and Bessemer process.

7.2 Rail steel products are not supplied to definite composition limits. By mutual agreement with the manufacturer, material may be supplied from rails with a desired range of carbon and manganese when such rails are available.

8. Mechanical Properties

8.1 *Requirements*—The material as represented by the test specimens shall conform to the tensile or hardness requirements specified in Table 1.

8.2 *Test Specimens*—Test specimens may be taken from a full section or a machined section.

TABLE 1 Mechanical Requirements

	Grade 50	Grade 60
Tensile strength, min, ksi (MPa)	80 (550)	90 (620)
Yield point, min, ksi (MPa)	50 (345)	60 (415)
Elongation in 8 in. or 200 mm, min, %	5	5
Elongation in 2 in. or 50 mm, min, %	7	7
Brinell hardness, min[A]	159	190
Rockwell B hardness, min[A]	83	91

[A] Hardness tests are an acceptable alternative for tension tests where the bar size precludes a tension test specimen in accordance with Test Methods and Definitions A 370.

8.3 *Number of Tests*—One tension test or one hardness test, at the manufacturer's option, shall be made from each lot. A lot shall consist of one section of the same size produced in one continuous shift (turn) of operation (normally an 8-h period).

9. Dimensions and Permissible Variations

9.1 *Dimensions*—The permissible variations in dimensions shall be in accordance with the requirements specified in Tables 2-7. Due to differences in mill facilities, tolerances of special bar sections vary among the manufacturers and such tolerances are subject to agreement between manufacturer and purchaser.

9.2 *Length*—The permissible variations for length shall be in accordance with the requirements specified in Table 8.

9.3 *Straightness*—Variations in straightness shall not exceed ¼ in. (6.4 mm) in any 5 ft (1.52 m); or ¼ in. × number of feet of length divided by 5 (6.4 mm × number of metres of length divided by 1.52).

10. Workmanship, Finish, and Appearance

10.1 *Descaling*—The bars shall be furnished "not descaled."

11. Certification and Report of Testing

11.1 Upon request of the purchaser in the contract or order, a manufacturer's certification that the material was manufactured and tested in accordance with this specification together with a report of the test results shall be furnished at the time of shipment.

12. Keywords

12.1 carbon steel bars; carbon steel shapes

Copyright ASTM International
Provided by IHS under license with ASTM
No reproduction or networking permitted without license from IHS
Not for Resale

TABLE 2 Permissible Variations in Thickness and Length of Leg for Angles

Specified Length of Leg, in. (mm)[A]	Permissible Variations in Thickness, for Thickness Given, Over and Under, in. (mm)			Permissible Variations in Length of Leg, for Thickness Given, Over and Under, in. (mm)		
	To 3/16 (4.8), incl	Over 3/16 to 3/8 (4.8 to 9.5), incl	Over 3/8 (9.5)	To 3/16 (4.8), incl	Over 3/16 to 1/4 (4.8 to 6.4), incl	Over 1/4 (6.4)
To 1 (25), incl	0.008 (0.203)	0.010 (0.255)	. . .	1/32 (0.8)	3/64 (1.2)	[B]
Over 1 to 2 (25 to 51), incl	0.010 (0.255)	0.010 (0.255)	0.012 (0.305)	3/64 (1.2)	1/16 (1.6)	[B]
Over 2 to 3 (51 to 76), incl	0.012 (0.305)	0.015 (0.380)	0.015 (0.380)	1/16 (1.6)	1/16 (1.6)	[B]

[A] The longer leg of an unequal angle determines the size for tolerance. The out-of-square tolerance in either direction is 1½ deg (0.03 rad).
[B] Due to differences in mill facilities and rolling techniques, these are subject to agreement between manufacturer and purchaser.

TABLE 3 Permissible Variations in Thickness and Width for Square and Round Edge Flats

Specified Width, in. (mm)	Permissible Variations in Thickness for Thickness Given, Over and Under, in. (mm)		Permissible Variations in Width, in. (mm)	
	To ½ (12.7), incl	Over ½ to 1 (12.7 to 25), incl	Over	Under
To 1 (25), incl	0.008 (0.203)	0.010 (0.255)	1/32 (0.8)	1/32 (0.8)
Over 1 to 2 (25 to 51), incl	0.012 (0.305)	0.015 (0.380)	1/32 (0.8)	1/32 (0.8)
Over 2 to 4 (51 to 102), incl	0.015 (0.380)	0.020 (0.510)	1/16 (1.6)	1/32 (0.8)
Over 4 to 6 (102 to 152), incl	0.015 (0.380)	0.020 (0.510)	3/32 (2.4)	1/16 (1.6)

TABLE 4 Permissible Variations in Cross Section for Rounds, Squares, and Round-Cornered Squares

Specified Size, in. (mm)	Permissible Variation from Specified Size, in. (mm)		Out-of-Round or Out-of-Square, in. (mm)[A]
	Over	Under	
Over 5/16 to 7/16 (7.9 to 11.1), incl	0.012 (0.305)	0.012 (0.305)	0.018 (0.455)
Over 7/16 to 1 (11.1 to 25), incl	0.015 (0.380)	0.015 (0.380)	0.022 (0.600)
Over 1 to 1¼ (25 to 32), incl	0.020 (0.510)	0.020 (0.510)	0.030 (0.760)

[A] Out-of-round is the difference between the maximum and minimum diameters of the bar, measured at the same cross section. Out-of-square is the difference in the two dimensions at the same cross section of a square between opposite faces.

TABLE 5 Permissible Variations for Octagons and Hexagons

Specified Size Between Opposite Faces, in. (mm)	Permissible Variations from Specified Size, in. (mm)		Out-of-Hexagon or Out-of-Octagon, in. (mm)[A]
	Over	Under	
To ½ (12.7), incl	0.010 (0.255)	0.007 (0.178)	0.015 (0.380)
Over ½ to 1 (12.7 to 25), incl	0.015 (0.380)	0.015 (0.380)	0.020 (0.510)

[A] Out-of-hexagon and out-of-octagon is the greatest difference between any two dimensions at the same cross section between opposite faces.

TABLE 6 Permissible Variations in Dimensions for Channels

Specified Size of Channel, in. (mm)	Permissible Variations in Size, Over and Under, in. (mm)				Out-of-Square of Either Flange, in./in. (mm/mm) of Flange Width
	Depth of Section[A]	Width of Flanges[A]	Thickness of Web for Thickness Given		
			To 3/16 (4.8), incl	Over 3/16 (4.8)	
To 1½ (38), incl	1/32 (0.8)	1/32 (0.8)	0.010 (0.255)	0.015 (0.380)	3/64 (1.2)
Over 1½ to 3 (38 to 76), incl	1/16 (1.6)	1/16 (1.6)	0.015 (0.380)	0.020 (0.510)	3/64 (1.2)

[A] Measurements for depth of section and width of flanges are over-all. This table does not include special channel sections.

Copyright ASTM International
Provided by IHS under license with ASTM
No reproduction or networking permitted without license from IHS
Not for Resale

TABLE 7 Permissible Variations in Dimensions for Tees

Specified Size of Tee, in. (mm)[A]	Permissible Variations in Size, in. (mm)				Thickness of Stem		Stem Out-of-Square[B]
	Width or Depth[C]		Thickness of Flange				
	Over	Under	Over	Under	Over	Under	
To 1¼ (32), incl	3/64 (1.2)	3/64 (1.2)	0.010 (0.255)	0.010 (0.255)	0.005 (0.127)	0.020 (0.510)	1/32 (0.8)
Over 1¼ to 2 (32 to 51), incl	1/16 (1.6)	1/16 (1.6)	0.012 (0.305)	0.012 (0.305)	0.010 (0.255)	0.020 (0.510)	1/16 (1.6)

[A] The longer member of the unequal tee determines the size for tolerances.
[B] Stem out-of-square is the variation from its true position of the center line of the stem measured at the point.
[C] Measurements for both width and depth are overall.

TABLE 8 Permissible Variations in Length

Specified Size of Rounds, Squares, Hexagons, and Octagons	Specified Size of Flats, in. (mm)		Permissible Variations Over Specified Length, in. (mm)[A,B]				
	Thickness	Width	To 5 ft (1.52 m), incl	Over 5 to 10 ft (1.52 to 3.05 m), incl	Over 10 to 20 ft (3.05 to 6.10 m), incl	Over 20 to 30 ft (6.10 to 9.14 m), incl	30 to 40 ft (9.14 to 12.19 m)
			Mill Shearing				
To 1 (25), incl	To 1 (25), incl	To 3 (76), incl	3/8 (9.5)	1/2 (12.7)	5/8 (15.9)	3/4 (19.0)	1¼ (32)
Over 1 to 2 (25 to 51), incl	To 1 (25), incl	Over 3 to 6 (76 to 152), incl	1/2 (12.7)	5/8 (15.9)	3/4 (19.0)	1 (25)	1½ (38)
Other Sections Classified as Bar Size, Shapes, and Angles			1/2 (12.7)	5/8 (15.9)	3/4 (19.0)	1 (25)	1½ (38)

[A] No permissible variations under.
[B] Where a plus and minus tolerance from specified length is desired and the order so specifies, half of these tolerances may be taken over and half under.

ASTM International takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.

This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, at the address shown below.

This standard is copyrighted by ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959, United States. Individual reprints (single or multiple copies) of this standard may be obtained by contacting ASTM at the above address or at 610-832-9585 (phone), 610-832-9555 (fax), or service@astm.org (e-mail); or through the ASTM website (www.astm.org).

Copyright ASTM International
Provided by IHS under license with ASTM
No reproduction or networking permitted without license from IHS
Not for Resale