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SUPERSEDING
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January 13, 1954

FEDERAL STANDARD

TOLERANCES FOR STEEL WROUGHT PRODUCTS,
AND FOR CENTRIFUGALLY CAST STEEL

Authority. This standard is issued pursuant to the Federal and Administrative Services Act of 1949, as amended, and its application to the purchase of commodities referred to herein will be mandatory on all Federal agencies.

S1. Scope. This standard covers dimensional and weight tolerances for steel, semifinished and finished bulk items (see sec. S6.1 for exclusions).

S2. Purpose. The purpose of this standard is to provide where possible a list of industry standards of common requirements that may be omitted from the detail specifications for applicable metal products.

S3. Industry standard identification.

S3.1 Revision of industry standards. Revision of industry standards will be coordinated and when accepted by the Government, a change notice to this standard will be issued.

S3.1.1 Referencing of industry standards. The issue in effect of industry standards accepted in this standard should be referenced directly to the requirement in the detail specification and not by cross-reference to this standard.

S4. Changes. When a Federal agency considers that this standard does not provide for its essential needs, written request for changing or adding to the standard, supported by adequate justification, shall be sent to the Administration. This justification shall explain wherein the standard does not provide for essential needs. The request shall be sent in duplicate to the General Services Administration, Federal Supply Service, Standardization Division, Washington, D.C. 20406. The Administration will determine the appropriate action to be taken and will notify the agency.

S5. Conflict with referenced specifications. Where the requirements stated in this standard conflict with any requirement in a referenced specification, the requirements of the standard shall apply. Nature of conflict between the standard and the referenced specification shall be submitted in duplicate to the General Services Administration, Federal Supply Service, Standardization Division, Washington, D.C. 20406.

S6. NOTES.

S6.1 Exclusions. Tolerances for steel forgings, and tool steels are excluded from this standard. Tolerances for steel castings that are statically cast, or cast by methods other than centrifugally cast about a horizontal axis are also excluded from this standard.

S6.2 Nomenclature. Nomenclature of items used in Federal documents shall conform to the Federal Catalog System as given and defined in Cataloging Handbook H6-1. A colloquial name is used in this document where a single approved name is not sufficient.

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57. Tables. A list of tables in this standard is as follows:

- I - Bars.
- II - Bars and wire, concrete reinforcement.
- III - Plate.
- IV - Floor plate.
- V - Floor plate.
- VI - Floor plate.
- VII - Terne sheet.
- VIII - Tin mill products.
- IX - Billets, blooms and slabs.
- X - Structural shapes.
- XI - Sheet and pipe piling.
- XII - Sheet.
- XIII - Strip.
- XIV - Pipe.
- XV - Tubes.
- XVI - Mechanical tubes, carbon and alloy steel.
- XVII - Mechanical tubes, corrosion-resisting steel.
- XVIII - Wire.
- XIX - Wire, coiled coarse zinc-coated.
- XX - Wire, tinmed, and zinc-coated.

58. Industry standards.

American Society for Testing and Materials (ASTM) Standards:

- A6 - General Requirements for Delivery of Rolled Steel Plates, Shapes, Sheet Piling, and Bars for Structural Use.
- A20 - General Requirements for Delivery of Steel Plates for Pressure Vessels.
- A29 - General Requirements for Hot-Rolled and Cold-Finished Carbon and Alloy Steel Bars.
- A53 - Welded and Seamless Steel Pipe.
- A82 - Cold-Drawn Steel Wire for Concrete Reinforcement.
- A109 - Cold-Rolled Carbon Steel Strip.
- A112 - Zinc-Coated (Galvanized) Steel Tie Wires.
- A116 - Zinc-Coated (Galvanized) Iron or Steel Farm-Field and Railroad Right-of-way Wire Fencing.
- A120 - Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Ordinary Uses.
- A121 - Zinc-Coated (Galvanized) Steel Barbed Wire.
- A134 - Electric-Fusion (Arc) - Welded Steel Plate Pipe (Sizes 16 inches and Over).
- A135 - Electric-Resistance-Welded Steel Pipe.
- A139 - Electric-Fusion (Arc)-Welded Steel Pipe (Sizes 4 inches and over).
- A185 - Welded Steel Wire Fabric for Concrete Reinforcement.
- A211 - Spiral-Welded Steel or Iron Pipe.
- A227 - Hard-Drawn Steel Mechanical Spring Wire.
- A228 - Music Steel Spring Wire.
- A229 - Oil-Tempered Steel Spring Wire.
- A230 - Carbon Steel Valve Spring Quality Wire.
- A231 - Chromium-Vanadium Alloy Steel Spring Wire.
- A232 - Chromium-Vanadium Steel Valve Spring Quality Wire.
- A245 - Flat-Rolled Carbon Steel Sheets of Structural Quality.
- A252 - Welded and Seamless Steel Pipe Piles.
- A263 - Corrosion-Resisting Chromium Steel Clad Plate, Sheet and Strip.
- A264 - Stainless Chromium-Nickel Steel Clad Plate, Sheet and Strip.
- A265 - Nickel and Nickel-Base Alloy Clad Steel Plate.
- A273 - Carbon-Steel Blooms, Billets and Slabs for Forging.
- A274 - Alloy-Steel Blooms, Billets and Slabs for Forging.
- A308 - Long Terne Iron or Steel Sheets, Coils, and Cut Lengths.
- A326 - Zinc-Coated (Galvanized) High Tensile Steel Telephone and Telegraph Line Wire.
- A362 - Iron-Chromium and Iron-Chromium-Nickel Alloy Tubular Centrifugal Castings for General Applications.
- A363 - Zinc-Coated Steel Overhead Ground Wire Strand.
- A374 - High-Strength Low-Alloy Cold-Rolled Steel Sheets and Strip.
- A375 - High-Strength Low-Alloy Hot-Rolled Steel Sheets and Strip.
- A401 - Chromium-Silicon Alloy Steel Spring Wire.
- A407 - Upholstery Spring Wire for Coiled Type Springs.
- A411 - Zinc-Coated (Galvanized) Low-Carbon Steel Armor Wire.
- A419 - Upholstery Spring Wire for Zig-Zag Square Formed, and No-Sag Type Spring Units.
- A424 - Steel Sheets for Porcelain Enameling.

American Society for Testing and Materials (ASTM) Standards (con.):

- A425 - Hot-Rolled Carbon Steel Strip, Commercial Quality.
- A450 - General Requirements for Carbon, Ferritic Alloy, and Austenitic Alloy Steel Tubes.
- A457 - Hot-Worked, Hot-Cold-Worked, and Cold-Worked Alloy Steel Plate, Sheet and Strip for High Strength at Elevated Temperatures.
- A463 - Steel Sheet, Cold-Rolled, Aluminum Coated Type 1.
- A474 - Aluminum-Coated Steel Wire Strand.
- A475 - Zinc-Coated Steel Wire Strand.
- A480 - General Requirements for Delivery of Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip.
- A484 - General Requirements for Stainless and Heat-Resisting Wrought Steel Products (Except Wire).
- A491 - Aluminum-Coated Steel Chain-Link Fence Fabric.
- A496 - Deformed Steel Wire for Concrete Reinforcement.
- A497 - Welded Deformed Steel Wire Fabric for Concrete Reinforcement.
- A500 - Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
- A501 - Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
- A505 - General Requirements for Hot-Rolled and Cold-Rolled Alloy Steel Sheet and Strip.
- A510 - General Requirements for Carbon Steel Hot-Rolled Wire Rod and Round Wire.
- A511 - Seamless Stainless Steel Mechanical Tubing.
- A519 - Seamless Carbon and Alloy Steel Mechanical Tubing.
- A523 - Plain End Seamless and Electric-Resistance-Welded Steel Pipe for High Pressure Pipe-Type Cable Circuits.
- A525 - General Requirements for Delivery of Zinc-Coated (Galvanized) Iron or Steel Sheet, Coils or Cut Lengths Coated by the Hot-Dip Method.
- A530 - General Requirements for Specialized Carbon and Alloy Steel Pipe.
- A539 - Electric-Resistance-Welded Coiled Steel Tubing for Gas and Fuel Oil Lines.
- A547 - Alloy Steel Wire For Cold Heading of Hexagon-Head Bolts.
- A548 - Cold-Heading Wire for Tapping or Sheet Metal Screws.
- A549 - Cold-Heading Wire for Wood Screws.
- A554 - Welded Stainless Steel Mechanical Tubing.
- A555 - General Requirements for Stainless and Heat-Resisting Steel Wire.
- A568 - General Requirements for Carbon and High-Strength Low Alloy Steel, Hot-Rolled Strip, Hot-Rolled Sheets, and Cold-Rolled Sheets.
- A584 - Aluminum-Coated Steel Farm-Field and Right-of-Way Fencing.
- A585 - Aluminum-Coated Steel Barbed Wire.
- A587 - Electric-Welded Low-Carbon Steel Pipe for the Chemical Industry.
- A589 - Seamless and Welded Carbon Steel Water-Well Pipe.
- A595 - Steel Tubes Low Carbon, Tapered for Structural Use.
- A615 - Deformed Billet-Steel Bars for Concrete Reinforcement.
- A616 - Rail-Steel Deformed Bars for Concrete Reinforcement.
- A617 - Axle-Steel Deformed Bars for Concrete Reinforcement.
- A623 - General Requirements for Tin Mill Products.
- A625 - Single-Reduced Black Plate.
- F55 - Stainless Steel Bars and Wire for Surgical Implants.

(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 established distribution points in their agencies.)

S9. Cross-references. Cross references of acceptable industry standards including permissible variations in dimensions of steels are listed in the following tables, and tables under the subsequent paragraphs.

S9.1 Steel bars. Tolerances for steel bars shall be in accordance with table I, and tolerances for concrete reinforcing bars and wire shall be in accordance with table II.

TABLE I. Steel bars

Title	Fed. Std. 48	Fed. Std. 48B
Hot-rolled carbon steel bars.		
Cross-section for round and square bars, and round-cornered squares.	1a1	ASTM A29 ^{1/}
Cross-section for hexagonal bars.	1a2	"
Thickness and width tolerances for square-edge and round-edge flat bars.	1a3	"
Thickness and length for rolled bar size angles.	1a4	"
Sectional dimensions for standard bar size channels.	1a5	"
Cross section for hexagonal and octagonal bars.	---	ASTM A29 ^{1/}
Length for rounds, squares, hexagons, and flats.	1c8, 1c9	"
Length for special straightened bars machine cut on both ends.	---	"
Thickness and width, square-edge, and round-edge flat bars.	---	"
Straightness for bars and bar size sections.	1b4, 1b5, 1b6, 1c10	"
Corrosion-resisting hot rolled steel bars.		
Size tolerances for rounds, squares, hexagons, octagons, and flats.	1d1, 1d2, 1d3	ASTM A484 ^{2/}
Length tolerances, all bars.	1d4	"
Straightness tolerances, all bars.	1d5	"
Cold finished carbon steel bars.		
Size tolerances for: Cold finished bars.	2a1	ASTM A29 ^{1/}
Rounds, turned and polished.	"	"
Rounds, cold drawn ground and polished.	2a2	"
Rounds turned, ground and polished.	"	"
Random lengths.	2a3	^{3/}
Specific lengths.	2a4	^{4/}
Straightness.	2a5	ASTM A29 ^{1/}
Cold finished alloy steel bars.		
Size tolerances for: Cold-drawn rounds, hexagons, squares and flats.	2b1, 2c1	"
Cold-drawn, ground and polished rounds.	2b2, 2c1	"
Turned, ground and polished rounds.	"	"

^{1/} ASTM A29 includes tolerances for ASTM's A108, A304, A306, A311, A321, A322, A331, A355, A434, A575 and A576.

^{2/} ASTM A484 includes tolerances for ASTM's A276, A314, A429, A473, A479, and A582.

^{3/} Random lengths for carbon cold finished bars. The following ranges in length are applicable to random lengths:

	Other sections	Length	Range
Rounds Up to 2-15/16 inches	23 lb/ft or under in weight	5 to 20 ft, inclusive Over 20 to 24 ft. incl.	24 inches 36 inches
2-15/16 inches and over	Over 23 lb/ft. in. weight	5 to 20 ft, inclusive Over 20 to 24 ft. incl.	36 inches 48 inches

1/ Specific lengths for carbon, and alloy cold finished bars. Length of carbon and alloy cold finished bars are variable. Accordingly, when a specific length is desired it should be included in the applicable procurement document.

TABLE II. Bars and wire, concrete reinforcement

Title	Fed. Std. 48	Fed. Std. 48B
Bars.		
Weight tolerances.	3a1	
Deformed billet-steel bars.	"	ASTM A615
Rail-steel deformed bars.	"	ASTM A616
Axle-steel deformed bars.	"	ASTM A617
Length, all bars 1/.	3a2	---
Random length, all bars 1/.	3a3	---
Wire.		
Gage tolerance, cold-drawn steel wire.	---	ASTM A82
Weight, deformed steel wire.	---	ASTM A496
Wire diameter and weight, welded deformed steel wire fabric.	---	ASTM A497
Wire diameter and over-all dimensions.	---	ASTM A185

1/ Length, and random length concrete reinforcing bars. Length of bars vary between 30 to 60 feet inclusive, and when a specific length is desired it should be included in the applicable procurement document.

S9.2 Steel plate. Tolerances for steel plate shall be in accordance with table III.

TABLE III. Steel plate

Title	Fed. Std. 48	Fed. Std. 48B
Carbon steel, and alloy steel plate.		
Thickness and weight for rectangular sheared plates and universal mill carbon and alloy steel plates 15 inches and under in thickness, when ordered to thickness.	4a1, 4a3, 4b2, 4c1, 4c3	ASTM A6 1/ and A20 2/
Thickness for alloy steel rectangular mill and universal mill plates over 2 inches in thickness.	4b1	"
Weight for rectangular sheared plates and universal mill plates 612.0 pounds per square foot and under when ordered to weight.	4a2	ASTM A6 1/
Width and length for sheared carbon steel plates 1-1/2 inches and under in thickness and sheared alloy-mill carbon-steel plates 2-1/2 inches and under in thickness and alloy steel plates 2 inches and under in thickness.	4a4, 4b3 4c4	ASTM A6 1/ and A20 2/ ASTM A20 2/
Rolled width for universal mill carbon-steel and alloy-steel plates 15 inches and under in thickness.	4a5, 4b4, 4c5	ASTM A6 1/ and A20 2/

TABLE III. Steel plate (con.)

Title	Fed. Std. 48	Fed. Std. 48B
Width and length for rectangular carbon-steel plates when gas cutting is specified or required ^{2/} .	4a6, 4c6	"
Width for mill edge carbon steel plates in coils and cut lengths for carbon steel plates produced on strip mills.	---	ASTM A6 ^{1/}
Diameter for sheared circular carbon and alloy-steel plates 1 inch and under in thickness.	4a7, 4b6, 4c7	ASTM A20 ^{2/}
Diameter for gas-cut carbon, and alloy steel plates ^{3/} .	4a8, 4b7, 4c8	ASTM A6 ^{1/} and A20 ^{2/}
Camber for carbon steel sheared or gas cut rectangular plates, all thicknesses ^{2/} .	---	"
Camber for carbon and alloy steel universal mill plates and alloy steel sheared or gas-cut rectangular plates ^{3/} .	4a9, 4a10, 4b8, 4b9	ASTM A20 ^{2/}
Camber for carbon, alloy and high strength low-alloy universal mill plates and alloy and high-strength low-alloy sheared special cut or gas-cut rectangular plates ^{3/} .	4a9, 4a10, 4c9, 4c10	ASTM A6 ^{1/}
Flatness for carbon and alloy steel rectangular sheared mill plates, and circular and sketch plates ^{4/} .	4a11 4a11, 4b10, 4b11, 4c11	" ASTM A20 ^{2/}
Flatness for high-strength low-alloy and alloy steel rectangular sheared plates, universal mill plates, and circular and sketch plates, hot rolled or thermally treated ^{4/} .	---	---
Corrosion-resisting steel plates.		
Thickness, only ^{5/} .	4d1	ASTM A480 ^{6/}
Width and length for rectangular sheared mill plates and universal mill plates.	4d2	"
Diameter for circular plates.	4d3	"
Camber for sheared mill and universal mill plates.	4d4	"
Flatness, annealed plates.	4a5	"
Flame cutting allowances to clean up in machining.	---	"
Abrasive cutting width and length.	---	"
Heat resisting, high strength at elevated temperature, steel plate.		
Thickness, only ^{5/} .	4d1	ASTM A457
Width and length for rectangular sheared sheared mill plates and universal mill plates.	4d2	"
Diameter of circular plates.	4d3	"
Camber of sheared mill and universal mill plates.	4d4	"
Flatness of annealed plates.	4d5	"

TABLE III. Steel plate (con.)

Title	Fed. Std. 48	Fed. Std. 48B
Clad steel plate.		
Corrosion-resisting chromium steel clad plate.	---	ASTM A263
Thickness.	---	"
Overweight.	---	"
Corrosion-resisting chromium-nickel steel clad plate.	---	ASTM A264
Thickness.	---	"
Overweight.	---	"
Nickel and nickel-base alloy clad steel plate.	---	ASTM A265
Thickness.	---	"
Overweight.	---	"

1/ ASTM A6 includes tolerances for ASTM's A26, A113, A131, A242, A283, A284, A328, A440, A441, A514, A529, A572, A573, and A588.

2/ ASTM A20 includes tolerances for ASTM's A202, A203, A204, A225, A285, A299, A300, A302, A353, A357, A387, A410, A433, A442, A455, A515, A516, A517, A533, A537, A538, A542, A543, A553, A562, A590, and A593.

3/ Gas cutting includes oxy-acetylene cutting process.

4/ Sketch plates are plates that are gas cut to ordered shape.

5/ Corrosion-resisting and heat-resisting plates no longer require weight tolerances since thickness suffices.

6/ ASTM A480 includes tolerances for ASTM's A167, A176, A177, A240, A357, and A410.

S9.2.1 Rolled floor plates. Tolerances for carbon steel rolled plates 5a1, 5a2, 5a3 and 5a4, and for high-strength low-alloy rolled plates shall be in accordance with table IV, V and VI.

TABLE IV. Tolerance for thickness and weight, rolled floor plate 1/

Thickness	Nominal weight	Excess in average weight of lots, expressed in percentage of nominal weights 2,3,4,5/
inch	p.s.f.	percent
1/8	6.75	14
3/16	8.70	10
1/4	11.25	9
5/16	13.80	8
3/8	16.25	7
7/16	18.90	6
1/2	21.45	5.5
9/16	24.00	5.5
5/8	26.50	5
3/4	31.65	5
7/8	36.75	5
1	41.85	5

1/ These tolerances are applicable when plate is ordered to thickness.

2/ Lot is applicable to all plates of the same thickness ready for shipment at one time.

3/ Overweight tolerances for lots of circular, and sketch plates having 3 or more sides and forms other than circles, squares and rectangles, are 1-1/4 times the applicable percentage.

4/ Overweight tolerances for single plates are 1-1/3 times the applicable percentage.

5/ Overweight tolerances for single circular and stretch are 1-2/3 the applicable percentage.

TABLE V. Tolerance for weight, rolled floor plate ^{1/}

Weights p.s.f.	Tolerance for average weight of lots expressed in percentage of specified weight ^{2,3,4,5/}	
	Over percent	Under percent
To but not including 3.00	10	5
3.00 - 6.15	8	5
6.15 - 8.70	6	5
8.70 - 11.25	5.5	3
11.25 - 13.80	5	3
13.80 - 16.35	4.5	3
16.35 - 18.90	4	3
18.90 - 21.45	3.5	2.5
21.45 - 26.55	3	2.5
26.55 - 41.85	2.5	2.5

- 1/ These tolerances are applicable when plate is ordered to weight.
- 2/ Lot is applicable to all plates of the same weight group ready for inspection at one time.
- 3/ Overweight tolerances for lots of circular and stretch plates are 1-1/4 times the applicable percentages.
- 4/ Overweight tolerances for single plates are 1-2/3 times the applicable percentages.
- 5/ Overweight tolerances for single circular and stretch plates are 1-2/3 times the applicable percentages.

TABLE VI. Tolerances for width and length, rolled floor plate

Plate dimensions. Width Length		Tolerances over width and length for thickness and equivalent weights ^{1/} .					
		Under 3/8 inch Under 16.35 p.s.i.		3/8 to 5/8 inch 16.35 to 26.55 p.s.i.		5/8 to 1 inch inclusive 26.55 to 41.85 inclusive	
Width	Length	Width	Length	Width	Length	Width	Length
inches	inches	inch	inches	inch	inches	inch	inches
To 90 incl.	Under 120	3/8	1/2	7/16	5/8	1/2	1
"	120 - 240	3/8	3/4	1/2	7/8	5/8	1-1/8
"	240 - 360	3/8	1	1/2	1-1/8	5/8	1-1/2
"	360 - 480 incl.	7/16	1-1/4	1/2	1-3/8	5/8	1-5/8

- 1/ Tolerances for 3/16, 1/4 and 5/16 inch thick plate is 1/4 inch for width and length, and for thicknesses under 3/16 inch the tolerance is 1/8 inch.

S9.2.2 Terne plate. Terne plate has thicknesses for sheet steel. Accordingly, the term for it should be terne sheet which has a lead-tin alloy coat on both sides. Short terne is terne sheet in which the base metal is less than 0.014 inch in thickness, and long terne base metal is 0.014 inch or greater in thickness. Tolerances for terne sheet shall be in accordance with table VII.

TABLE VII. Tolerances for terne sheet

Title	Fed. Std. 48	Fed. Std. 48B
Weight tolerances. Long terne. Short Terne.	--- 6a1	ASTM A308 1/
Width and length tolerances. Long terne. Short terne.	--- 6a2	ASTM A308 1/
Out-of squareness tolerances. Long terne. Short terne.	--- 6a3	ASTM A308 1/
Resquared tolerances. Long terne. Short terne.	--- 6a4	ASTM A308 1/
Camber tolerances. Long terne. Short terne.	--- 6a5	ASTM A308 1/
Flatness tolerances. Long terne. Short terne.	--- ---	ASTM A308 2/

1/ Weight, width and length, and camber. These tolerances for short terne sheet shall be the same as for tin mill products according to ASTM A623.

2/ Flatness tolerance, short terne. Maximum deviation from a horizontal flat surface shall be 1/8 inch.

S9.2.3 Tinplate. Tolerances for tin-coated steel sheet mill products shall be in accordance with table VIII.

TABLE VIII. Tolerances for tin mill products

Title	Fed. Std. 48	Fed. Std. 48B
Base weight tolerances.	7a1	ASTM A623
Thickness tolerances, and base box.	---	"
Coil length variation.	7a2	"
Width tolerance.	7a2	"
Out-of-square tolerances.	7a3	"
Resquaring.	7a4	1/
Camber tolerances.	7a5	ASTM A625
Shearing overrun.	---	"

1/ Resquaring tolerances shall be the same as for long terne sheet according to ASTM A308.

S9.3 Steel billets, blooms, and slabs. Tolerances for billet, blooms, and slabs shall be in accordance with table IX.

TABLE IX. Steel billets, blooms, and slabs

Title	Fed. Std. 48	Fed. Std. 48B
Carbon steel. Weight tolerances.	8a1	ASTM A273
Alloy steel. Weight tolerances.	8b	ASTM A274

S9.4 Structural shapes. Tolerance for structural shapes shall be in accordance with table X.

TABLE X. Structural shapes

Title	Fed. Std. 48	Fed. Std. 48B
Carbon steel, high-strength steel, and high strength low-alloy steel shapes.		
Cross section.		
Standard beams, mill H-beams and channels.	9a2	ASTM A6 ^{1/}
Angles, bulb angles, rolled tees and zees.	9a3	ASTM A6 ^{1/}
Wide flange shapes.	9a4	ASTM A6 ^{1/}
Cross sectional area and weight, structural shapes.	9a1	ASTM A6 ^{1/}
Length.		
Standard shapes.	9a5	ASTM A6 ^{1/}
Wide flange shapes.	9a6	ASTM A6 ^{1/}
Length and ends out-of-square, milled structural sections.	9a6	ASTM A6 ^{1/}
Ends out-of-square for structural shapes.	9a5	ASTM A6 ^{1/}
Straightness.		
Standard shapes.		
Camber.	9a7	ASTM A6 ^{1/}
Sweep.	---	ASTM A6 ^{1/}
Wide flange shapes.		
Camber.	9a8	ASTM A6 ^{1/}
Sweep.	9a10	ASTM A6 ^{1/}
Dimensions for slip tees and angles.	---	ASTM A6 ^{1/}
Sectional dimensions for standard bar size.		
Angles.	---	ASTM A6 ^{1/}
Channels.	---	ASTM A6 ^{1/}
Tees.	---	ASTM A6 ^{1/}
Cross sectional area and weight, structural size shapes.	9a1	ASTM A6 ^{1/}
Cross section for wide flange shapes.	9a4	ASTM A6 ^{1/}
Corrosion-resisting, and heat-resisting steel shapes.		
Angles.		
Weight.	9d1	ASTM A484 ^{2/}
Length of legs.	9d2	ASTM A484 ^{2/}
Squareness of legs.	---	ASTM A484 ^{2/}
Size of.		
Hot-rolled channels.	9d5	ASTM A484 ^{2/}
Hot-rolled tees.	---	ASTM A484 ^{2/}
Hot-extruded shapes.	---	ASTM A484 ^{2/}
Camber for hot-rolled or extruded shapes.	---	ASTM A484 ^{2/}
Angularity for extruded shapes	---	ASTM A484 ^{2/}
Length for hot-rolled or extruded shapes.	9d3, 9d4	ASTM A484 ^{2/}

^{1/} ASTM A6 includes tolerances for ASTM's listed in note ^{1/} under table III.

^{2/} ASTM A484 includes tolerances for ASTM's listed in note ^{2/} under table I.

S9.5 Steel piles. Tolerances for sheet and pipe piles shall be in accordance with table XI.

TABLE XI. Steel sheet, and pipe piling

Title	Fed. Std. 48	Fed. Std. 48B
Sheet piling.		
Weight and length tolerances.		
Carbon steel.	10a1, 10a2	ASTM A6 1/
High strength low alloy steel.	10c1	"
Steel pipe piles.		
Permissible variations in:		
Weight.	----	ASTM A252
Outside diameter.	----	"
Wall thickness.	----	"
Length.	----	"

TABLE XII. Steel sheet

Title	Fed. Std. 48	Fed. Std. 48B
Carbon and high-strength low-alloy steel sheet.		
Hot rolled steel sheet.		
Coils and cut lengths, including pickled sheets.		
Weight tolerance, mill edge and cut edge sheets.	11a1, 11a2	ASTM A568 1/
Thickness tolerances.	11a2, 11c1, 12b1	"
Width tolerances for mill-edge sheets.	11a5, 11c3	"
Width tolerances for cut-edge sheets, not resquared.	11a4, 11c2 12b2	"
Length tolerance for sheet, not resquared, including pickled sheets.	11a6, 12b3, 11c4, 12c3	"
Diameter tolerances for sheared circles.	11a11, 12b6	"
Camber tolerances.	11a12, 11c7 12c6	"
Hot rolled and pickled sheets.		
Out-of-square tolerances, cut-edge, cut-edge, cut-length sheets, not resquared.	11a9, 11c5 12b4, 12c4	"
Resquared tolerances.	11a10, 11c6, 12b5, 12c5	"
Allowance in width and length, cut-length sheets specified to stretcher-leveled standard of flatness, not resquared.	11a8, 11a7	"
Flatness tolerances.		
Hot-rolled sheets and pickled sheets, cut length sheets not specified to stretcher leveled standard of flatness.	11a3, 11c8, 12b8, 12c7	"
Hot-rolled cut length sheets, not specified to stretcher leveled standard of flatness.	11a14	"
Cold rolled sheets.		
Weight tolerances, sheets all of one gage and size.	12a1	"
Thickness tolerances, coils and cut lengths, sheets over 12 inches in width.	12a2, 12c1	"

TABLE XII. Steel sheet (con.)

Title	Fed. Std. 48	Fed. Std. 48B
Width tolerances for sheets, coils, and cut lengths, sheets over 12 inches in width, not resquared.	12a3, 12c2	ASTM A568 1/
Length tolerances of cut-length sheets over 12 inches in width, not resquared.	12a4	"
Allowances in width and length for cut-length sheets specified to stretcher leveled standard of flatness, not resquared.	11a7, 11a8 12a5	"
Diameter tolerances for sheared circles.	12a8	"
Camber tolerances for sheets over 12 inches wide.	12a9	"
Out-of-square tolerances for sheets over 12 inches in width, not resquared.	11a9, 12a6	"
Resquared tolerances for sheets over 12 inches in width.	12a7	"
Flatness tolerances. Cut-length sheets over 12 inches in width, not specified to stretcher-leveled standard of flatness.	12a10	"
Width tolerances. Mill edge of hot or cold-rolled sheets, coils and cut lengths.	11b2	ASTM A505 2/
Cut edge of hot or cold-rolled sheets, coils or cut lengths.	----	"
Length tolerances for hot or cold-rolled sheets.	11b3	"
Out-of-square tolerances for hot-rolled sheets, cut edge not resquared.	11b4	"
Resquared sheets 2/.	11b5	"
Sheared circles 4/.	11b6	"
Camber tolerances for hot or cold rolled sheets.	11b7	"
Flatness tolerances for cut lengths of hot or cold rolled sheets.	11b8	"
Cut-length sheets specified to stretcher-leveled standard of flatness.	12a11	ASTM A568 1/
Slit sheets. Tolerances for sheets 2 to 12 inches in width and 0.0142 to 0.0821 inch in thickness.		"
Thickness.	----	"
Width.	----	"
Length.	----	"
Camber tolerances for slit sheets in coils.	----	"
Flat-rolled carbon steel sheets, structural quality. Gage weight for mill edge and cut edge sheets.	----	ASTM A245
Thickness for coils and cut lengths.	----	"
Width, sheets not squared, coils and cut lengths including pickled sheets, cut-edge and mill-edge sheets.	----	"
Length, sheet not resquared.	----	"
Camber.	----	"
Out-of-square, cut edge not resquared.	----	"
High-strength low-alloy steel sheet. Hot rolled sheet. Thickness, coils and cut lengths, including pickled sheets.	----	ASTM A375
Width, coils and cut lengths, including pickled sheets.	----	"

TABLE XII. Steel sheet (con.)

Title	Fed. Std. 48	Fed. Std. 48B
Length, sheets not resquared, including pickled sheets.	12a11	ASTM A375
Camber for sheets in cut lengths, sheets not resquared, including pickled sheets.	----	"
Flatness, flat sheet, not in coils.	----	"
Cold rolled sheet.		
Thickness, coils and cut lengths.	----	ASTM A374
Width, coils and cut lengths, sheet not resquared.	----	"
Length, sheets not resquared.	----	"
Camber, sheets in cut lengths, sheets not resquared.	----	ASTM A374
Flatness, flat sheet, not in coils.	----	"
Alloy steel sheet.		
Thickness tolerances.		
Hot rolled sheets, continuous mill products, coils or cut lengths.	11b1	ASTM A505 2/
Hot rolled sheets, hand mill product.	----	"
Cold-rolled sheets, coils or cut lengths.	----	"
High strength alloy steel sheet, hot-rolled, and cold-rolled.		
Thickness.	----	ASTM A457
Width and length.		
Resquared sheets, stretcher leveled standard of flatness.	----	"
Sheets not resquared.	----	"
Camber.	----	"
Flatness.		
Sheets not specified to stretcher leveled standard of flatness.	----	"
Sheets specified to stretcher leveled standard of flatness.	----	"
Diameter, sheared circles.	----	"
Weight.	----	"
Zinc-coated, hot dipped galvanized sheets, and special surface sheets.		
Thickness, sheets specified to decimal thickness.	13a2, 13a13	ASTM A525 5/
Width, sheets, coils and cut lengths, not resquared.	13a3, 13a14	"
Length, sheets not resquared.	13a4, 13a15	"
Allowance in width and length, sheets specified to stretcher leveled standard of flatness, not resquared.	13a5, 13a16	"
Camber tolerances.	13a9, 13a20	"
Diameter tolerances for sheared circles.	13a8, 13a19	"
Out-of-square tolerances, sheets not resquared.	13a6, 13a17	"
Resquared tolerances.	13a7, 13a18	"
Flatness tolerances.		
Sheets over 12 inches in width not specified to stretcher leveled standard of flatness.	13a10, 13a21	"
Sheets to stretcher leveled standard of flatness.	13a11, 13a22	"
Variations from specified gage weight for flat-cut lengths sheets all of one gage and size 6/.	13a1	"

TABLE XII. Steel sheet (con.)

Title	Fed. Std. 48	Fed. Std. 48B
Aluminum coated cold-rolled steel, coating type 1. <u>1/</u>		
Thickness.	13a1	ASTM A463
Width, coils and cut lengths, not resquared.	----	"
Width and length for sheets specified to stretcher leveled standard of flatness, not resquared.	----	"
Length, not resquared.	----	"
Camber.	----	"
Out-of-square, not resquared.	----	"
Resquared.	----	"
Flatness.		
Sheets over 12 inches in width, not specified to stretcher leveled standard of flatness.	----	"
Sheets ordered to stretcher leveled standard of flatness.	----	"
Steel sheets for porcelain enameling.		
Thickness.	----	ASTM A424
Width.	----	"
Width and length, sheets specified to stretcher leveled standard of flatness and not resquared.	----	"
Camber.	----	"
Flatness.		
Cut lengths.	----	"
Sheets specified to stretcher leveled standard of flatness.	----	"
Corrosion-resisting and heat-resisting steel sheets.		
Hot and cold rolled sheets.		
Weight.	12d1	ASTM A480 <u>B/</u>
Thickness for hot rolled sheets in cut lengths and cold rolled sheets in cut lengths and coils.	12d2	"
Width for sheets not resquared and cold-rolled coils.	12d3	"
Length for sheets, not resquared.	12d4	"
Width and length resquared sheets, stretcher leveled standard of flatness.	12d5	"
Diameter for sheared circles.	12d6	"
Camber for sheets, not resquared, and cold rolled coils.	12d7	"
Flatness.		
Sheets not specified to stretcher-leveled standard of flatness, not including hard tempers of 200 and 300 series, dead soft sheets and deep drawing sheets.	12d8	"
Sheets specified to stretcher-leveled standard of flatness, not including hard tempers of 200 and 300 series.	12d9	"
Cold rolled sheets, flatness.		
Flatness of 200 and 300 series specified to 1/4 and 1/2 hard tempers.	12d10	"
Clad steel sheets.		
Corrosion-resisting chromium-nickel steel clad sheet, standard sheet, numbers 1 and 2 finishes. <u>2/</u>		
Thickness.	----	ASTM A264

TABLE XII. Steel sheet (con.)

Table	Fed. Std. 48	Fed. Std. 48B
Width	12d10	ASTM A264
Length.	----	"
Weight.	----	"
Corrosion-resisting chromium steel clad sheet, standard sheet, numbers 1 and 2 finishes. ^{2/}		
Thickness.	----	ASTM A263
Width.	----	"
Length.	----	"
Weight.	----	"

1/ ASTM A568 includes tolerances for ASTM's A366, A569, A570, A617, A620, A621, and A622.

2/ ASTM A505 includes tolerances for ASTM's A506 and A507.

3/ and 4/ Resquared alloy sheet and sheared circles for alloy steel sheet are not included in ASTM A505, but may be the same for carbon and high-strength low-alloy steel.

5/ ASTM A525 includes tolerances for ASTM's A361, A444, A446, A526, A527 and A528.

6/ Weight tolerances on tonnage basis has been replaced by tolerances on gage weights.

7/ Coating type 1, aluminum coated cold-rolled sheets. There are two types of coatings. Type 1 is produced in two coating weights, regular and light, and is used primarily for heat resisting applications and where adherence is a prime factor. Regular coating weight is 0.40 ounces per square foot and light coating 0.25 ounces per square foot, minimum coatings triple spot test limits, and both weights are the total coating on both surfaces. Coating type 2 has a coated weight of 1 ounce per square foot and is used where atmospheric corrosion resistance is the prime factor.

8/ ASTM A480 includes tolerances for ASTM's listed in note 6/ under table III.

9/ Finishes for corrosion-resisting steel. Finish number 1 is a dull finish produced by rolling the steel on hand sheet mills to specified thicknesses, annealing and descaling. Number 2 finishes includes 2 D finish, a dull finish produced on either hand sheet mills or continuous mills by cold rolling to the specified thickness, annealing and descaling, and 2B finish, a bright cold-rolled finish commonly produced in the same way as number 2D finish except that the annealed and descaled sheet receives a final light cold roll pass on polished rolls. For information on the intended use for these finishes, and for information on other finishes refer to ASTM A480 or American Society for Metals Handbook, volume 2, Heat Treating, Cleaning and Finishing.

S9.6 Steel strip. Tolerances for steel strip shall be in accordance with table XIII.

TABLE XIII. Steel strip

Title	Fed. Std. 48	Fed. Std. 48B
Carbon and high-strength low-alloy steel.		
Hot rolled steel strip.		
Thickness.	14a1, 15c1	ASTM A568 ^{1/}
Crown.	14a2, 15c2	"
Width.	14a3, 15c3, 15c4	"
Length.	14a4, 15c5	"
Camber, applicable to mill edge, square edge, and slit or cut edge.	14a5, 15c6	"
Flatness. ^{2/}	14a6, 15c7	"
Cold rolled steel strip.		
Thickness.	15a1	ASTM A109
Crown. ^{3/}	15a2	"

TABLE XIII. Steel strip (con.)

Title	Fed. Std. 48	Fed. Std. 48B
Width		
Numbers 1, 4, 5, and 6 edges. $\frac{1}{2}$	15a3	ASTM A109
Number 2 edge. $\frac{1}{2}$	15a4	"
Number 3 edge. $\frac{1}{2}$	15a5	"
Length, for specified lengths.	15a6	"
Camber.	15a7	"
High strength low alloy steel strip.		
Hot rolled steel strip.		
Thickness, coils and cut lengths.	----	ASTM A375
Crown.	----	"
Width.	----	"
Length.	----	"
Camber.	----	"
Cold rolled steel strip.		
Thickness.	----	ASTM A374
Crown.	----	"
Width.	----	"
Mill-edge strip.	----	"
Slit-edge strip.	----	"
Length.	----	"
Camber.	----	"
Hot rolled carbon steel strip, commercial quality.		
Thickness.	----	ASTM A425
Crown.	----	"
Width.	----	"
Camber.	----	"
Length.	----	"
Alloy steel strip.		
Camber tolerances for hot or cold rolled	15b5	ASTM A505 $\frac{1}{2}$
Hot rolled alloy steel strip.		
Fiatness tolerances for cut lengths, as-rolled or thermally treated and flattened.	15b6	"
Thickness, coils or cut lengths.	----	"
Crown, strip, coils, or cut lengths.	----	"
Width, strip, coils or cut lengths.	----	"
Length.	----	"
Cold-rolled alloy steel strip for high strength at elevated temperatures.		
Thickness.	----	ASTM A457
Crown.	----	"
Width.	----	"
Edges number 1 and 5. $\frac{1}{2}$	----	"
Edge number 3. $\frac{1}{2}$	----	"
Length.	----	"
Cold-rolled alloy steel strip.		
Thickness.	15b1	ASTM A505 $\frac{1}{2}$
Crown.	15b2	"
Width.		"
Numbers 1, 4, 5, and 6 edges. $\frac{1}{2}$		"
Number 2 edge. $\frac{1}{2}$		"
Number 3 edge. $\frac{1}{2}$	15b3	"
Length.	15b4	"
Corrosion-resisting and heat resisting cold-rolled steel strip.		
Strip in coils and cut lengths.		
Thickness.	15d1	ASTM A480 $\frac{1}{2}$
Crown.	15d2	"

TABLE XIII. Steel strip (con.)

Title	Fed. Std. 48	Fed. Std. 48B
Width.		
Numbers 1 and 5 edges. ^{4/}	15d3	ASTM A480 ^{5/}
Number 3 edge. ^{4/}	15d4	"
Camber.	15d6	"
Strip in cut lengths only.		
Length.	15d5	"
Flatness. ^{2/}	15d7	"
Corrosion-resisting clad strip.		
Chromium steel.		
Hot, and cold-rolled strip.		
Thickness.	----	ASTM A263
Width.	----	"
Length.	----	"
Camber.	----	"
Chromium-nickel steel.		
Hot rolled strip.	----	ASTM A264
Thickness.	----	"
Length.	----	"
Camber.	----	"
Cold rolled strip.		
Thickness.	----	"
Width, edges 1, 3, 5 and 6. ^{4/}	----	"
Length.	----	"
Camber.	----	"

^{1/} ASTM A568 includes tolerances for ASTM's listed in note ^{1/} under table XII.

^{2/} Flatness for hot-rolled steel strip is not included in ASTM A568, but may be the same hot-rolled alloy steel strip in ASTM A505.

^{3/} Crown for cold-rolled steel strip is not included in ASTM A109, but may be the same for corrosion-resisting and heat-resisting cold-rolled steel strip in ASTM A48C.

^{4/} Edges. Type of edges 1 through 6 are as follows:

- (a) Number 1 edge. Prepared edge of a specified round or square contour which is produced when a very accurate width is required.
- (b) Number 2 edge. Natural mill edge carried through cold rolling from the hot-rolled strip without additional processing of the edge.
- (c) Number 3 edge. Approximately square edge produced by slitting.
- (d) Number 4 edge. Rounded edge produced by edge rolling either the natural edge of hot-rolled strip or slit strip, and is used when an approximately round edge is desired and when the finish is not important.
- (e) Number 5 edge. Approximately square edge produced by rolling or filing for the purpose of eliminating burr.
- (f) Number 6 edge. Square edge produced by edge rolling the natural edge of hot-rolled strip or slit-edge strip, when width tolerances and finish required are not as exacting as for the number 1 edge.

^{5/} ASTM A505 includes tolerances for ASTM's listed in note ^{2/} under table XII.

^{6/} ASTM A480 includes tolerances for ASTM's listed in note ^{5/} under table III.

S9.7 Steel pipe. Tolerances for carbon steel, alloy steel, and corrosion-resisting steel pipe shall be in accordance with table XIV.

TABLE XIV. Steel pipe, carbon steel alloy steel, and corrosion-resisting steel

Title	Fed. Std. 48	Fed. Std. 48B
Carbon steel, alloy steel, and corrosion-resisting specialized steel pipe.		ASTM A530 1/
Weight, seamless and welded pipe.		
Wall Thickness.		
Seamless and welded.	16ab2	"
Forged and bored.	----	"
Cast.	----	"
Inside diameter, forged and bored, and cast.	----	"
Outside diameter all pipe.	16ab1	"
Length.		
Seamless and welded.	16ab3	"
Forged and bored, cast, and cast cold-wrought.	----	"
Straightness, all pipe.		
Corrosion-resisting steel pipe, centrifugally cast.		ASTM A362
Outside diameter.	----	"
Wall thickness.	----	"
Length, machine cut ends.	----	"
Welded and seamless, uncoated and hot-dip galvanized pipe, sizes 1/8 to 26 inches, inclusive.		ASTM A53
Weight.	16ab4	"
Outside diameter.	16ab1	"
Wall thickness.	16ab2	"
Length.	16ab3	"
Uncoated, and hot-dipped galvanized welded and seamless pipe, ordinary use, p/8 to 16 inches inclusive.		ASTM A120
Weight.	16ab4	"
Outside diameter.	16ab1	"
Wall thickness.	16ab2	"
Length.	16ab3	"
Arc-welded steel plate pipe, 16 inches and over in diameter.		ASTM A134
Weight.	----	"
Circumference.	----	"
Wall Thickness.	----	"
Length.	----	"
Straightness.	----	"
Arc-welded steel pipe, straight and spiral seam 4 to 42 inch diameter, inclusive.		ASTM A139
Weight.	----	"
Circumference.	----	"
Wall thickness.	----	"
Length.	----	"
Straightness.	----	"
Electric-resistance-welded steel pipe, 2 to 30 inch diameter, inclusive.		ASTM A135
Weight.	16ab4	"
Outside diameter.	16ab1	"
Wall thickness.	16ab2	"
Length.	16ab3	"
Spiral welded steel pipe, 4 to 48 inch diameter, inclusive.		ASTM A211
Weight.	----	"
Outside diameter.	----	"
Length.	----	"

TABLE XIV. Steel pipe, carbon steel alloy steel, and corrosion-resisting steel (con.)

Title	Fed. Std. 48	Fed. Std. 48B
Plain end seamless and electric-resistance welded steel pipe for high pressure-type cable circuits, 4 to 12 inch diameter, inclusive.		
Weight.	16ab4	ASTM A523
Outside diameter.	16ab1	"
Wall thickness.	16ab2	"
Length.	16ab3	"
Beveled weld ends.		"
Electric-resistance welded low carbon steel pipe for chemical process lines, 1/2 to 4 inches diameter, inclusive.		
Outside diameter.	----	ASTM A587
Wall thickness.	----	"
Straightness.	----	"
Length.	----	"
Seamless and welded carbon steel water-well pipe, 1/2 to 4 inches diameter, inclusive.		
Weight.	----	ASTM A589
Inside diameter, reamed and drifted pipe.	----	"
Wall thickness.	----	"
Length.	----	"

1/ ASTM A530 includes tolerances for ASTM's A106, A155, A312, A333, A335, A358, A369, A376, A381, A405, A409, A426, A430, A451, A452, and A524.

S9.8 Steel tubes. Tolerances for carbon steel, alloy steel, and corrosion resisting steel tubes shall be in accordance with table XV. Tolerances for carbon steel and alloy steel mechanical tubes shall be in accordance with table XVI, and tolerances for corrosion-resisting steel mechanical tubes shall be in accordance with table XVII.

TABLE XV. Steel tube carbon steel, alloy steel, and corrosion-resisting steel

Title	Fed. Std. 48	Fed. Std. 48B
Carbon steel, alloy steel, and corrosion-resisting steel tubes.		
Outside diameter and ovality.		ASTM A450 1/
Seamless, hot-finished tubes.	16ab1	"
Seamless, cold drawn and welded tubes.	----	"
Cold drawn tubes.	----	"
Wall thickness.		"
Seamless, hot finished tubes.	16ab2	"
Seamless, cold drawn tubes.	----	"
Welded tubes.	----	"
Length, all tubes.	16ab3	"
Straightness, all tubes.	---	"
Height of weld flash on electric-resistance welded tubes.	---	"
Cold-formed welded and seamless carbon steel structural tubing.		
Round structural tubing.		
Outside diameter.	16ab1	ASTM A500
Wall thickness.	16ab2	"
Length.	16ab3	"
Straightness.		"
Square and rectangular tubing.		
Outside dimensions.	----	"
Wall thickness.	----	"
Corner radii.	----	"
Twist.	----	"

TABLE XV. Steel tube carbon steel, alloy steel, and corrosion-resisting steel (con.)

Title	Fed. Std. 48	Fed. Std. 48B
Length.	16ab3	ASTM A500
Straightness.	----	"
Hot-formed welded and seamless carbon steel structural tubing.		
Round structural tubing.		ASTM A501
Outside diameter.	----	"
Weight.	----	"
Length.	----	"
Straightness.	----	"
Square and rectangular tubes.		"
Outside dimension.	----	"
Weight.	----	"
Corner radii.	----	"
Twist.	----	"
Squareness.	----	"
Length.	----	"
Straightness.	----	"
Electric-resistance welded coiled tubing.		ASTM A539
Outside diameter.	----	"
Wall thickness.	----	"
Low-carbon taped steel tubes, structural use.		ASTM A 5
Outside diameter.	----	"
Wall thickness.	----	"
Length.	----	"
Straightness.	----	"

1/ ASTM A450 includes tolerances for ASTM's A161, A178, A177, A192, A199, A200, A209, A210, A213, A214, A226, A249, A250, A254, A268, A269, A270, A271, A334, A423, A556, and A557.

TABLE XVI. Mechanical tubes carbon, and alloy steel

Title	Fed. Std. 48	Fed. Std. 48B
Seamless carbon and alloy steel tubes.		
Round tubing.		
Hot finished mechanical tubing.	16ab5	ASTM A519
Outside diameter.	----	"
Wall thickness.	----	"
Cold finished mechanical tubing.	16ab6	"
Outside diameter.	----	"
Wall thickness.	----	"
Rough-turned mechanical tubing.	----	"
Outside diameter.	----	"
Wall thickness.	----	"
Ground mechanical tubing, outside diameter.	----	"
All round tubing.		
Length tolerance.	16ab3	"
Straightness tolerance.	16ah12	"
Square and rectangular tubing.		
Outside dimensions.	----	"
Wall thickness.	----	"
Corner radii.	----	"

TABLE XVI. Mechanical tubes, carbon and alloy steel (con.)

Title	Fed. Std. 48	Fed. Std. 48B
Tolerances for:		
Squareness.	16ab12	ASTM A519
Twist.	----	"
Length.	----	"
Straightness.	----	"
Cold-drawn butt-weld carbon steel mechanical tubing.		
Round tubing.		
Diameter.	16ab11	"
Ovality.	----	"
Wall thickness	----	"
Length.	16ab3	"
Straightness.	----	"
Square and rectangular tubing.		
Outside dimensions.	----	"
Wall thickness.	----	"
Corner radii.	----	"
Squareness.	----	"
Twist.	----	"
Length.	----	"
Straightness.	----	"
Square and rectangular tubing.		
Outside dimensions.	----	"
Wall thickness.	----	"
Corner radii.	----	"
Length.	----	"
Twist.	----	"
Straightness.	----	"

TABLE XVII. Mechanical tubes corrosion-resisting steel

Title	Fed. Std. 48	Fed. Std. 48B
Seamless corrosion-resisting steel tubes.		
Round tubing.		
Cold finished tubes.		
Outside diameter.	16d1	ASTM A511
Ovality.	16d1	"
Wall thickness.	16d1	"
Length.	16d4	"
Straightness.	16d5	"
Hot finished tubes.		
Outside diameter.	----	"
Wall thickness.	----	"
Length.	----	"
Straightness.	----	"
Square and rectangular tubes, cold finished.		
Outside diameter.	----	"
Corner radii.	----	"
Twist.	----	"
Squareness.	----	"
Length.	----	"
Welded corrosion-resisting steel tubes.		
Round tubing.		
Outside diameter.	16d2	ASTM A554
Wall thickness.	16d3	"
Ovality.	16d2	"
Length.	16d4	"
Straightness.	16d5	"

TABLE XVII. Mechanical tubes corrosion-resisting steel (con.)

Title	Fed. Std. 48	Fed. Std. 48B
Square and rectangular tubing.		
Outside dimensions.	16d5	ASTM A554
Corner radii.	----	"
Twist.	----	"
Squareness.	----	"
Length.	----	"

S9.9 Steel wire. Tolerances for steel wire shall be in accordance with table XVIII. Tolerances for coiled coarse zinc-coated steel wire, 17a2, shall be in accordance with table XIX. Tolerances for coiled annealed tinne wire, 17a4, and coiled zinc-coated wire, 17a5, shall be in accordance with table XX.

TABLE XVIII. Wire, steel

Title	Fed. Std. 48	Fed. Std. 48B
Carbon steel wire uncoated.		
Coarse wire.	17a1	ASTM A510 1/
Fine wire.	17a3	"
Length for straightened and cut wire.	----	"
Burr on straightened and cut wire.	----	"
Wire diameter.		
Hard drawn spring wire.	17a6	ASTM A227
Music spring wire.	17a6	ASTM A228
Oil tempered spring wire.	----	ASTM A229
Valve spring wire.	17a6	ASTM A230
Upholstery spring wire for coiled type springs.	----	ASTM A407
Upholstery spring wire for zig-zag, square formed, and no-sag types spring units.	----	ASTM A417
Dimensions.		
Cold-heading wire for tapping or sheet metal screws.	----	ASTM A548
Cold-heading wire for wood screws.	----	ASTM A549
Carbon steel wire, coated.		
Zinc-coated high tensile telephone and telegraph line wire.	----	ASTM A326
Zinc-coated (galvanized) iron or steel farm-field and railroad right-of-way wire fencing.	----	ASTM A116
Zinc-coated (galvanized) steel tie wires.	----	ASTM A112
Zinc-coated (galvanized) steel overhead ground wire strand.	----	ASTM A363
Aluminum-coated steel barbed wire.	----	ASTM A585
Aluminum-coated steel chain-link fence fabric.	----	ASTM A491
Zinc-coated (galvanized) steel barbed wire.	----	ASTM A121
Zinc-coated (galvanized) low-carbon steel armor wire.	----	ASTM A411
Zinc-coated steel wire strand, individual coated wire.	17a7	ASTM A475
Aluminum-coated steel wire strand, individual coated wires.	----	ASTM A474
Aluminum-coated steel farm-field and right-of-way fencing.	----	ASTM A584
Alloy steel wire, uncoated.		
Diameter.		
Chromium-vanadium spring wire.	17b1 and 17b2	ASTM A231
Chromium-vanadium valve spring wire.	17b1 and 17b2	ASTM A232
Chromium-silicon spring wire.	17b1 and 17b2	ASTM A401

TABLE XVIII. Wire, steel (con.)

Title	Fed. Std. 48	Fed. Std. 48B
Dimensions. Alloy steel wire for cold heading of hexagon	17b1 and 17b2	ASTM A547
Corrosion-resisting and heat resisting steel wires. Diameter and out-of-round tolerances for round wire, drawn, polished, centerless ground and polished.	17d1 and 17d3	ASTM A555 ^{2/}
Size tolerances for drawn wire in hexagons, octagons, and squares.	----	"
Size tolerances for wire for which the final operation is a surface treatment for the purpose of removing scale or drawing lubricant.	17d2	"
Length tolerances for round and shape, straightened and cut wire, exact length resheared wire.	17d4	"
Thickness and width tolerances for cold finished flat wire.	----	"
Permissible variations in diameter of wire for surgical implants.	----	ASTM F55

TABLE XIX. Tolerances, coiled coarse zinc-coated steel wire

Wire diameter	Coating weight, and tolerances on coated wire. Ounces per square foot 1 tolerance, plus or minus, inch ^{1/}				
	inch	oz./ft ² , inch	oz./ft ² , inch	oz./ft ² , inch	oz./ft ² , inch
0.500 to .251 inch	0.65, 0.003	0.75, 0.003	0.90, 0.004	1.80, 0.005	2.70, 0.006
.192 to .177 to .148 incl.	.50, .003	.70, .003	.90, .003	1.80, .004	2.70, .005
.135 to .099 inch	.40, .003	.60, .003	.80, .003	1.60, .004	2.40, .005
.092 to .080 to .076	.30, .003	.50, .003	.70, .003	1.40, .004	2.10, .004
0.072 and 0.063	.30, .003	.45, .003	.65, .003	1.30, .004	1.95, .004
.054 and .0475	.25, .003	.40, .003	.60, .003	1.20, .004	1.80, .004
.0410 and .0348	.20, .003	.35, .002	1.50, .002	1.00, .002	1.50, .003
	.15, .002	.30, .002	0.40, 0.002	0.80, 0.002	1.20, .003
	.10, .002	.30, .002	.40, .002	.80, .002	1.20, .003

^{1/} Coating weights and tolerances. Coating weights are minimum ounces of zinc per square foot of uncoated wire surface. There are no requirements for weight of coating on regular wire, tolerances on diameter of regular wire, however, are the same as the wire in the first column after wire diameter.

^{1/} ASTM A510 includes tolerances for ASTM's A544, A545, and A546.

^{2/} ASTM A555 includes tolerances for ASTM's A313, A368, A478, A492, A493, A580, and A581.

TABLE XX. Tolerances for coiled annealed tinned wire, and zinc-coated wire, low, medium low, and medium high carbon steels ^{1/}

Size diameter	Annealed and tinned wire tolerances. ^{2/}		Zinc-coated annealed wire tolerances. ^{2,3/}	
	plus	minus	plus	minus
inch	inch	inch	inch	inch
0.0625 - 0.0348	0.0015	0.0015	0.002	0.002
.0347 - .0271	.0010	.0010	.0015	.0012
.0270 - .020	.0006	.0008	.0013	.0007
.0199 - .0151	.0005	.0007	.001	.0007
.0150 - .0101	.0004	.0006	.0008	.0006
.010 - .006	.0003	.0005	.0005	.0005

^{1/} Low carbon steels, for example, include AISI 1008 and 1010, and medium low carbon steels such as AISI 1013 to 1022 inclusive. Medium high carbon steels include such as AISI 1025 to 1041 inclusive.

^{2/} The two annealed wires are heat treated prior to tinning or galvanizing as applicable.

^{3/} There are no requirements for the weight of zinc on the zinc-coated wires.

MILITARY CUSTODIANS

Army - MR
 Navy - SH
 Air Force - 11

Preparing activity:

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1. SPECIFICATION

Fed. Std. No. 48B Tolerances for Steel Wrought Products, and for Centrifugally Cast Steel

2. CONTRACT NO. (If any)

3. QUANTITY ON CONTRACT (Optional)

4. DOLLAR VALUE (Optional)

5. GENERAL NATURE OF PROBLEM (e.g., inspection difficulties, manufacturers unable to meet tolerances, containers collapse under normal warehousing conditions, etc.)

6. SPECIFIC REQUIREMENTS AFFECTED (Include paragraph number and lines of wording)

7. SPECIFIC PROBLEMS (e.g. tests in 4.2.2 will not assure that the battery will last required time; temperature ranges in table 2 do not conform to commercially available items.)

8. RECOMMENDATIONS

9. NAME OF MANUFACTURER, ASSOCIATION, GOVT., AGENCY, ETC.

10. ADDRESS (Number, Street, City, State and Zip Code)

11. NAME AND TITLE OF SUBMITTER

12. DATE

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