

JIS

JAPANESE INDUSTRIAL STANDARD

Carbon steel tubes for general structural purposes

Ⓔ JIS G 3444—1994

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**In the event of any doubt arising,
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JAPANESE INDUSTRIAL STANDARD

J I S

Carbon steel tubes
for general structural purposes

G 3444-1994

1. Scope This Japanese Industrial Standard specifies the carbon steel tubes (hereafter referred to as "tubes") used for civil engineering, architecture, steel towers, scaffoldings, struts, piles for suppression of landslide ⁽¹⁾ and other structures.

Note ⁽¹⁾ The tubes used for piles for suppression of landslide are limited to seamless steel tubes and welded steel tubes of under 318.5 mm in outside diameter.

Remarks 1. This Standard shall not apply to the foundation piles of the welded steel tube of 318.5 mm or larger in outside diameter and piles for suppression of landslide.

2. The standards cited in this Standard are shown in Attached Table 2.

Informative reference

1. The foundation piles for structures and piles for suppression of landslide are also specified in JIS A 5525.
2. Piles for suppression of landslide of centrifugally cast steel tubes are specified in JIS G 5201.

2. Grades and symbols Tubes shall be classified into 5 grades, and their symbols shall be as given in Table 1.

3. Method of manufacture The manufacturing method shall be as follows:

- (1) The tube shall be manufactured by seamless process, electric resistance welding, butt-welding or arc-welding (spiral seam and straight seam) process.
- (2) The tube shall, as a rule, be as-manufactured without heat treatment.

4. Chemical composition The tube shall be tested in accordance with 8.1 and the cast analysis values shall conform to Table 1.

Table 1. Chemical composition

Unit: %

Symbol of grade	C	Si	Mn	P	S
STK290	—	—	—	0.050 max.	0.050 max.
STK400	0.25 max.	—	—	0.040 max.	0.040 max.
STK500	0.24 max.	0.35 max.	0.30 to 1.30	0.040 max.	0.040 max.
STK490	0.18 max.	0.55 max.	1.50 max.	0.040 max.	0.040 max.
STK540	0.23 max.	0.55 max.	1.50 max.	0.040 max.	0.040 max.

- Remarks
1. Alloying elements other than those in the above table may be added, if necessary.
 2. For the tube of grade STK540 exceeding 12.5 mm in wall thickness, the chemical composition may be agreed upon by the purchaser and manufacturer.
 3. When the purchaser requires product analysis for the tube made of killed steel, the tolerances for the values given in the above table shall be as specified in Table 1 (Tolerance on product analysis) in JIS G 0321.

5. Mechanical properties The tube shall be tested in accordance with 8.2, 8.3 and 8.4, and the resulting tensile strength, yield point or proof stress, elongation, bendability, flattening and tensile strength in welded zone shall conform to Table 2.

In the case of bendability or flattening test, the tube shall be free from flaws or cracks on its wall surface.

Further, the tensile test for the electric resistance welded and arc welded steel tube exceeding 350 mm in outside diameter may be substituted by the tensile test made on the steel coil or plate, unless expansion forming process is applied.

Table 2. Mechanical properties

Mechanical properties	Tensile strength N/mm ²	Yield point or proof stress N/mm ²	Elongation %		Bendability (°)		Flattening Distance between flattening plates (<i>H</i>) (<i>D</i> : outside diameter of tube)	Tensile strength in welded zone N/mm ²
			No. 11 and No. 12 test pieces	No. 5 test piece	Bend angle	Inside radius (<i>D</i> : outside diameter of tube)		
			Longitudinal direction	Transverse direction				
Method of manufacture	Seamless, butt-welding, electric resistance welding and arc welding process				Seamless, butt-welding, electric resistance welding process	Seamless, butt-welding, electric resistance welding process	Arc welding process	
Outside diameter	Full range	Full range	Over 40 mm		50 mm or under	Full range	Over 350 mm	
STK290	290 min.	—	30 min.	25 min.	90°	$\frac{2}{3}D$	290 min.	
STK400	400 min.	235 min.	23 min.	18 min.	90°	$\frac{2}{3}D$	400 min.	
STK500	500 min.	355 min.	15 min.	10 min.	90°	$\frac{7}{8}D$	500 min.	
STK490	490 min.	315 min.	23 min.	18 min.	90°	$\frac{7}{8}D$	490 min.	
STK540	540 min.	390 min.	20 min.	16 min.	90°	$\frac{7}{8}D$	540 min.	

Note (2) The bend test, instead of the flattening test, shall be applied to the tube 50 mm or under in outside diameter only when specified by the purchaser.

Remarks 1. When the tensile test for the tube under 8 mm in wall thickness is performed using No. 12 or No. 5 test piece, the minimum elongation value shall be determined by reducing 1.5 % per 1 mm decrease in wall thickness from the values in Table 2 and rounding off the value obtained to an integer in accordance with JIS Z 8401. Samples of calculation are given in Informative reference Table 1.

2. The elongation values for the tube 40 mm or under in outside diameter, if particularly required, shall be agreed upon by the purchaser and manufacturer.

3. No. 12 or No. 5 test piece for the tensile test to be sampled from a butt-welded, electric resistance welded or arc welded steel tube shall be taken from a portion without seams.

Informative reference Table 1. Examples for calculation of elongation values in the case of No. 12 test piece (longitudinal direction) and No. 5 test piece (transverse direction) of tubes under 8 mm in wall-thickness.

Symbol of grade	The shape of test piece	Elongation value per each range of wall thickness %								
		Over 7 mm to and excl. 8 mm	Over 6 mm to and incl. 7 mm	Over 5 mm to and incl. 6 mm	Over 4 mm to and incl. 5 mm	Over 3 mm to and incl. 4 mm	Over 2 mm to and incl. 3 mm	Over 1 mm to and incl. 2 mm	1 mm or under	
STK290	No. 12 test piece	30	28	27	26	24	22	21	20	
	No. 5 test piece	25	24	22	20	19	18	16	14	
STK400	No. 12 test piece	23	22	20	18	17	16	14	12	
	No. 5 test piece	18	16	15	14	12	10	9	8	
STK500	No. 12 test piece	15	14	12	10	9	8	6	4	
	No. 5 test piece	10	8	7	6	4	2	1	—	
STK490	No. 12 test piece	23	22	20	18	17	16	14	12	
	No. 5 test piece	18	16	15	14	12	10	9	8	
STK540	No. 12 test piece	20	18	17	16	14	12	11	10	
	No. 5 test piece	16	14	13	12	10	8	7	6	

6. Dimensions, mass and tolerance on dimensions

6.1 Dimensions and mass Unless otherwise specified, the outside diameter, wall thickness and mass of the tube shall be as given in Attached Table 1.

6.2 Tolerances on dimensions Tolerances on dimensions shall be as follows:

- (1) The tolerances on outside diameter and wall thickness of the tube shall be as specified in Tables 3 and 4, respectively. In this case, unless otherwise specified, Class 1 shall be applied.

Table 3. Tolerances on outside diameter

Classification	Tolerances	
Class 1	Under 50 mm	± 0.5 mm
	50 mm or over	± 1 %
Class 2	Under 50 mm	± 0.25 mm
	50 mm or over	± 0.5 %

- Remarks
1. The tolerances on the outside diameter of hot finished seamless steel tubes shall follow Class 1.
 2. The tolerance on the outside diameter of electric resistance welded and arc welded steel tubes exceeding 350 mm in outside diameter shall follow Class 1 in Table 3, and the tolerances thereof at tube ends shall be within ± 0.5 %.
 3. The outside diameter of tubes exceeding 350 mm in outside diameter may be determined by the length of circumference.

Table 4. Tolerances on wall thickness

Classification	Tolerance			
	Seamless steel tube		Other than seamless steel tube	
Class 1	Under 4 mm	+ 0.6 mm - 0.5 mm	Under 4 mm	+ 0.6 mm - 0.5 mm
	4 mm or over	+ 15 % - 12.5 %	4 mm or over to and excl. 12 mm	+ 15 % - 12.5 %
			12 mm or over	+ 15 % - 1.5 mm

Table 4. (continued)

Classification	Tolerance			
	Seamless steel tube		Other than seamless steel tube	
Class 2	Under 3 mm	± 0.3 mm	Under 3 mm	± 0.3 mm
	3 mm or over	± 10 %	3 mm or over to and excl. 12 mm	± 10 %
			12 mm or over	+ 10% - 1.2 mm

Remarks 1. The tolerances on wall thickness of hot finished seamless steel tubes shall follow Class 1.

2. The tolerance on wall thickness of tubes exceeding 1016.0 mm in outside diameter may be agreed upon between the purchaser and the manufacturer.

(2) The tolerances on length of tubes shall, unless otherwise specified, be not less than the specified length.

7. Appearance The appearance shall be as follows:

- (1) The tube shall be practically straight, and both ends shall be at a right angle to the axis of the tube.
- (2) The tube shall be free from defects which are detrimental to practical use.
- (3) When particularly required by the purchaser, the surface finishing and plating of the tube shall be agreed upon by the purchaser and the manufacturer.

8. Tests

8.1 Chemical analysis

8.1.1 Chemical analysis General requirements on chemical analysis and the methods of sampling specimens for analysis shall be in accordance with 3. (Chemical composition) in JIS G 0303.

8.1.2 Analysis method The analysis methods shall be in accordance with any one of the following standards:

JIS G 1211, JIS G 1212, JIS G 1213, JIS G 1214,
JIS G 1215, JIS G 1253, JIS G 1256, JIS G 1257

8.1.3 Number of product analysis samples The number of product analysis samples shall be determined as agreed upon between the purchaser and manufacturer.

8.2 Tensile test

8.2.1 Test piece The test piece shall be as follows:

- (1) The test piece shall be No. 11, No. 12A, No. 12B, No. 12C or No. 5 test piece specified in JIS Z 2201, and cut off from the tube. No. 5 test piece may be used on request by the purchaser, or for the tube 200 mm or over in outside diameter, and it shall be cut from a tube in a transverse direction to be made into a flat piece. However, the electric resistance welded and arc welded steel tubes exceeding 350 mm in outside diameter shall be in accordance with (2) and (3).
- (2) For an electric resistance welded and arc welded steel tube over 350 mm in outside diameter, the test piece shall be No. 5 test piece specified in JIS Z 2201 and the sampling method shall be either one of the following:
 - (a) For the tube made by expansion forming process, a test piece shall be cut off from the tube itself.
 - (b) For the tube not by expansion forming process, a test piece shall be cut off from the tube itself, steel coil or plate as the material of tube.
- (3) In the case of the tensile test piece for the welded zone of the arc welded steel tube, a test specimen shall be cut either from the tube itself or from the part of tube end that is welded under the same conditions as the tube itself to be flattened. Afterward, the test piece taken from this specimen shall be finished into No. 1 test piece specified in JIS Z 3121.

8.2.2 Test method The test method shall be in accordance with JIS Z 2241. For a welded zone, its tensile strength shall be examined.

8.2.3 Number of test piece The sampling method of a test specimen and the number of test pieces shall be as given in Table 5.

8.3 Bend test

8.3.1 Test piece A test piece of appropriate length shall be cut off from the end of a tube.

8.3.2 Test method The test piece shall be bent at ordinary temperature through 90° around a cylinder of an inside radius specified in Table 2, and checked for the existence of flaws or cracks on the surface of the tubular test piece. For electric resistance welded steel tubes and butt-welded steel tubes, the welded zone shall be placed in the outermost part of bent portion.

8.3.3 Number of test piece The sampling method of test specimen and the number of test piece shall be as given in Table 5.

8.4 Flattening test

8.4.1 Test piece A test piece 50 mm or over in length shall be cut off from the end of a tube.

8.4.2 Test method The test piece shall be placed at ordinary temperature between two flat plates and flattened by compression until the distance between the plates reaches the specified value, and then examined for the existence of flaws or cracks on the surface of tubular test piece. In the case of electric resistance welded and butt-welded steel tubes, however, the welded zone shall be placed at right angles to the direction of compression as shown in Fig. 1.

8.4.3 Number of test piece The sampling method of a test specimen and the number of test piece shall be as given in Table 5.

Fig. 1

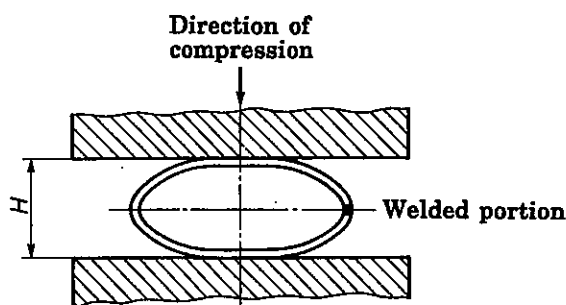


Table 5. Method of sampling test specimens and number of test pieces

Division of outside diameter	Method of sampling test specimens and number of test pieces
Under 100 mm	Take one test specimen from each 5000 m or its fraction of tubes of the same dimensions, and then prepare from it one tensile test piece and either one flattening test piece or one bending test piece.
Over 100 mm up to and incl. 200 mm	Take one test specimen from each 2500 m or its fraction of tubes of the same dimensions, and then prepare from it one tensile test piece and one flattening test piece.
Over 200 mm up to and incl. 350 mm	Take one test specimen from each 1250 m or its fraction of tubes of the same dimensions, and then prepare from it one tensile test piece and one flattening test piece.
Over 350 mm	<ol style="list-style-type: none"> In the case of sampling from the tube Take one test specimen from each 1250 m or its fraction of tubes of the same dimensions, and then prepare from it one tensile test piece and one for tensile test in welded zone or one flattening test piece. In the case of sampling for tensile test from the steel strips or plates in coil The method of sampling specimens for tensile test from steel strips or plates in coil shall be in accordance with Group A in JIS G 0303. As to the number of tensile test pieces, for steel plates, take one test piece from each lot of plates of the maximum thickness within twice the minimum thickness and at the same time belonging to the same heat, and take two test pieces from each lot exceeding 50 t. For steel strips, take one test piece from each lot of the same heat and thickness and take two from each lot exceeding 50 t.

Table 5. (continued)

Division of outside diameter	Method of sampling test specimens and number of test pieces
Over 350 mm (continued)	<p>3. In the case of sampling tensile test piece for welded zone from the specimen welded under the same conditions as the tube itself</p> <p>Take one test specimen from each 1250 m or its fraction of tubes with the same dimensions, and then prepare from it one tensile test piece for welded zone.</p>

9. Inspection

9.1 Inspection The inspection shall be carried out as follows:

- (1) The general requirements for inspection shall be as specified in JIS G 0303.
- (2) The chemical composition shall conform to the requirements specified in 4.
- (3) The mechanical properties shall conform to the requirements specified in 5. However, the flattening test and the tensile test in welded zone can be omitted when approved by the purchaser.
- (4) The dimensions shall conform to the requirements specified in 6.
- (5) The appearance shall conform to the requirements specified in 7.
- (6) The purchaser can specify hydrostatic test, nondestructive test in welded zone, etc. in addition to the inspection items specified in (2) to (5).

In this case, the test items, sampling method, test method and their acceptance criteria shall previously be agreed upon by the parties concerned.

9.2 Reinspection The tube may be determined for acceptance or not by carrying out the retest as specified in 4.4 (Retest) of JIS G 0303.

10. Marking Each tube having passed the inspection shall be marked with the following items. The arrangement of items is not specified. However, smaller tubes and those especially specified by the purchaser may be bundled together to be marked for each bundle by suitable means.

When approved by the purchaser, part of the items may be omitted.

- (1) Symbol of grade
- (2) Symbol which denotes method of manufacture ⁽³⁾
- (3) Dimensions
- (4) Manufacturer's name or its identifying brand

Note ⁽³⁾ The symbol which denotes the method of manufacture shall be as follows. However, the dash may be replaced by a blank.

Hot finished seamless steel tube	: -S-H
Cold finished seamless steel tube	: -S-C
Electric resistance welded steel tube other than hot finished or cold finished steel tube	: -E-G
Hot finished electric resistance welded steel tube	: -E-H
Cold finished electric resistance welded steel tube	: -E-C
Butt-welded steel tube	: -B
Arc-welded steel tube	: -A

11. Report The manufacturer shall submit a test report when previously requested by the purchaser.

Related standards:

JIS A 5525 Steel pipe piles

JIS G 5201 Centrifugally cast steel pipes for welded structure

Attached Table 1. Dimensions and mass of carbon steel tubes
for general structural purposes

Outside diameter mm	Thickness mm	Unit mass kg/m	Informative reference			
			Cross- sectional area cm ²	Geometrical moment of inertia cm ⁴	Modulus of section cm ³	Radius of gyration of area cm
21.7	2.0	0.972	1.238	0.607	0.560	0.700
27.2	2.0	1.24	1.583	1.26	0.930	0.890
	2.3	1.41	1.799	1.41	1.03	0.880
34.0	2.3	1.80	2.291	2.89	1.70	1.12
42.7	2.3	2.29	2.919	5.97	2.80	1.43
	2.5	2.48	3.157	6.40	3.00	1.42
48.6	2.3	2.63	3.345	8.99	3.70	1.64
	2.5	2.84	3.621	9.65	3.97	1.63
	2.8	3.16	4.029	10.6	4.36	1.62
	3.2	3.58	4.564	11.8	4.86	1.61
60.5	2.3	3.30	4.205	17.8	5.90	2.06
	3.2	4.52	5.760	23.7	7.84	2.03
	4.0	5.57	7.100	28.5	9.41	2.00
76.3	2.8	5.08	6.465	43.7	11.5	2.60
	3.2	5.77	7.349	49.2	12.9	2.59
	4.0	7.13	9.085	59.5	15.6	2.58
89.1	2.8	5.96	7.591	70.7	15.9	3.05
	3.2	6.78	8.636	79.8	17.9	3.04
101.6	3.2	7.76	9.892	120	23.6	3.48
	4.0	9.63	12.26	146	28.8	3.45
	5.0	11.9	15.17	177	34.9	3.42
114.3	3.2	8.77	11.17	172	30.2	3.93
	3.5	9.58	12.18	187	32.7	3.92
	4.5	12.2	15.52	234	41.0	3.89
139.8	3.6	12.1	15.40	357	51.1	4.82
	4.0	13.4	17.07	394	56.3	4.80
	4.5	15.0	19.13	438	62.7	4.79
	6.0	19.8	25.22	566	80.9	4.74
165.2	4.5	17.8	22.72	734	88.9	5.68
	5.0	19.8	25.16	808	97.8	5.67
	6.0	23.6	30.01	952	115	5.63
	7.1	27.7	35.26	110×10	134	5.60
190.7	4.5	20.7	26.32	114×10	120	6.59
	5.3	24.2	30.87	133×10	139	6.56
	6.0	27.3	34.82	149×10	156	6.53
	7.0	31.7	40.40	171×10	179	6.50
	8.2	36.9	47.01	196×10	206	6.46
216.3	4.5	23.5	29.94	168×10	155	7.49
	5.8	30.1	38.36	213×10	197	7.45
	6.0	31.1	39.64	219×10	203	7.44
	7.0	36.1	46.03	252×10	233	7.40
	8.0	41.1	52.35	284×10	263	7.37
	8.2	42.1	53.61	291×10	269	7.36
267.4	6.0	38.7	49.27	421×10	315	9.24
	6.6	42.4	54.08	460×10	344	9.22
	7.0	45.0	57.26	486×10	363	9.21
	8.0	51.2	65.19	549×10	411	9.18
	9.0	57.3	73.06	611×10	457	9.14
	9.3	59.2	75.41	629×10	470	9.13
318.5	6.0	46.2	58.91	719×10	452	11.1
	6.9	53.0	67.55	820×10	515	11.0
	8.0	61.3	78.04	941×10	591	11.0
	9.0	68.7	87.51	105×10 ²	659	10.9
	10.3	78.3	99.73	119×10 ²	744	10.9
355.6	6.4	55.1	70.21	107×10 ²	602	12.3
	7.9	67.7	86.29	130×10 ²	734	12.3
	9.0	76.9	98.00	147×10 ²	828	12.3
	9.5	81.1	103.3	155×10 ²	871	12.2
	12.0	102	129.5	191×10 ²	108×10	12.2
	12.7	107	136.8	201×10 ²	113×10	12.1

Attached Table 1. (continued)

Outside diameter mm	Thickness mm	Unit mass kg/m	Informative reference			
			Cross-sectional area cm ²	Geometrical moment of inertia cm ⁴	Modulus of section cm ³	Radius of gyration of area cm
406.4	7.9	77.6	98.90	196×10^2	967	14.1
	9.0	88.2	112.4	222×10^2	109×10	14.1
	9.5	93.0	118.5	233×10^2	115×10	14.0
	12.0	117	148.7	289×10^2	142×10	14.0
	12.7	123	157.1	305×10^2	150×10	13.9
	16.0	154	196.2	374×10^2	184×10	13.8
	19.0	182	231.2	435×10^2	214×10	13.7
457.2	9.0	99.5	126.7	318×10^2	140×10	15.8
	9.5	105	133.6	335×10^2	147×10	15.8
	12.0	132	167.8	416×10^2	182×10	15.7
	12.7	139	177.3	438×10^2	192×10	15.7
	16.0	174	221.8	540×10^2	236×10	15.6
	19.0	205	261.6	629×10^2	275×10	15.5
500	9.0	109	138.8	418×10^2	167×10	17.4
	12.0	144	184.0	548×10^2	219×10	17.3
	14.0	168	213.8	632×10^2	253×10	17.2
508.0	7.9	97.4	124.1	388×10^2	153×10	17.7
	9.0	111	141.1	439×10^2	173×10	17.6
	9.5	117	148.8	462×10^2	182×10	17.6
	12.0	147	187.0	575×10^2	227×10	17.5
	12.7	155	197.6	606×10^2	239×10	17.5
	14.0	171	217.3	663×10^2	261×10	17.5
	16.0	194	247.3	749×10^2	295×10	17.4
	19.0	229	291.9	874×10^2	344×10	17.3
	22.0	264	335.9	994×10^2	391×10	17.2
558.8	9.0	122	155.5	588×10^2	210×10	19.4
	12.0	162	206.1	771×10^2	276×10	19.3
	16.0	214	272.8	101×10^3	360×10	19.2
	19.0	253	322.2	118×10^3	421×10	19.1
	22.0	291	371.0	134×10^3	479×10	19.0
600	9.0	131	167.1	730×10^2	243×10	20.9
	12.0	174	221.7	958×10^2	320×10	20.8
	14.0	202	257.7	111×10^3	369×10	20.7
	16.0	230	293.6	125×10^3	418×10	20.7
609.6	9.0	133	169.8	766×10^2	251×10	21.2
	9.5	141	179.1	806×10^2	265×10	21.2
	12.0	177	225.3	101×10^3	330×10	21.1
	12.7	187	238.2	106×10^3	348×10	21.1
	14.0	206	262.0	116×10^3	381×10	21.1
	16.0	234	298.4	132×10^3	431×10	21.0
	19.0	277	352.5	154×10^3	505×10	20.9
	22.0	319	406.1	176×10^3	576×10	20.8
700	9.0	153	195.4	117×10^3	333×10	24.4
	12.0	204	259.4	154×10^3	439×10	24.3
	14.0	237	301.7	178×10^3	507×10	24.3
	16.0	270	343.8	201×10^3	575×10	24.2
711.2	9.0	156	198.5	122×10^3	344×10	24.8
	12.0	207	263.6	161×10^3	453×10	24.7
	14.0	241	306.6	186×10^3	524×10	24.7
	16.0	274	349.4	211×10^3	594×10	24.6
	19.0	324	413.2	248×10^3	696×10	24.5
	22.0	374	476.3	283×10^3	796×10	24.4
812.8	9.0	178	227.3	184×10^3	452×10	28.4
	12.0	237	301.9	242×10^3	596×10	28.3
	14.0	276	351.3	280×10^3	690×10	28.2
	16.0	314	400.5	318×10^3	782×10	28.2
	19.0	372	473.8	373×10^3	919×10	28.1
	22.0	429	546.6	428×10^3	105×10^2	28.0
914.4	12.0	267	340.2	348×10^3	758×10	31.9
	14.0	311	396.0	401×10^3	878×10	31.8
	16.0	354	451.6	456×10^3	997×10	31.8
	19.0	420	534.5	536×10^3	117×10^2	31.7
	22.0	484	616.5	614×10^3	134×10^2	31.5

Attached Table 1. (continued)

Outside diameter mm	Thickness mm	Unit mass kg/m	Informative reference			
			Cross-sectional area cm ²	Geometrical moment of inertia cm ⁴	Modulus of section cm ³	Radius of gyration of area cm
1 016.0	12.0	297	378.5	477×10^3	939×10	35.5
	14.0	346	440.7	553×10^3	109×10^2	35.4
	16.0	395	502.7	628×10^3	124×10^2	35.4
	19.0	467	595.1	740×10^3	146×10^2	35.2
	22.0	539	687.0	849×10^3	167×10^2	35.2

Remarks: Mass listed above shall be calculated from the following formula assuming that the mass of steel of 1 cm³ is 7.85 g and rounding off the value obtained to three significant digits in accordance with JIS Z 8401. However, the value exceeding 1000 kg/m shall be rounded off to the integral value in kg/m.

$$W = 0.02466 t (D - t)$$

where, W : unit mass of the tube (kg/m)
 t : wall thickness of the tube (mm)
 D : outside diameter of the tube (mm)

Attached Table 2. Cited standards

JIS G 0303	General rules for inspection of steel
JIS G 0321	Product analysis and its tolerance for wrought steel
JIS G 1211	Methods for determination of carbon in iron and steel
JIS G 1212	Methods for determination of silicon in iron and steel
JIS G 1213	Methods for determination of manganese in iron and steel
JIS G 1214	Methods for determination of phosphorus in iron and steel
JIS G 1215	Methods for determination of sulfur in iron and steel
JIS G 1253	Method for photoelectric emission spectrochemical analysis of iron and steel
JIS G 1256	Method for X-ray fluorescence spectrometric analysis of iron and steel
JIS G 1257	Iron and steel — Methods for atomic absorption spectrometric analysis
JIS Z 2201	Test pieces for tensile test for metallic materials
JIS Z 2241	Methods of tensile test for metallic materials
JIS Z 3121	Methods of tensile test for butt welded joints
JIS Z 8401	Rules for rounding off of numerical values

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