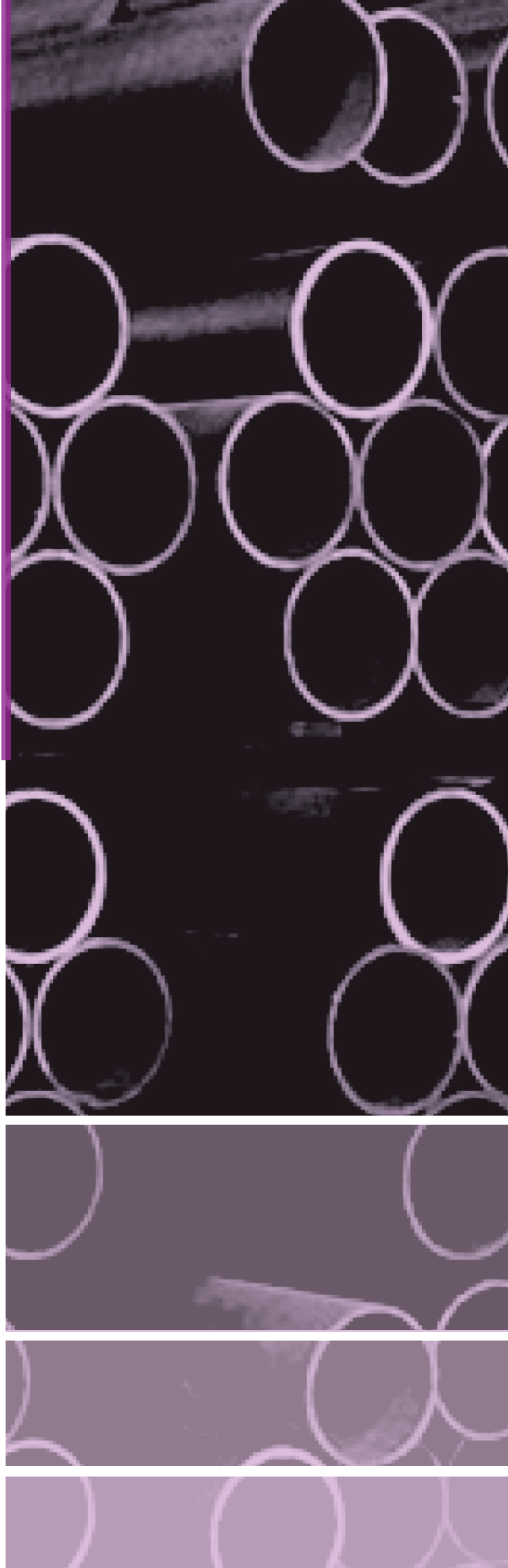


# STEEL PIPES



## 7i) Carbon Steel Tubes For General Structural Purposes

Japanese Industrial Standard ( Extracts from JIS G 3444 : 2006 )

<b>General Information</b>	This Japanese Industrial Standard specifies the carbon steel tubes used for civil engineering, architecture, steel towers, scaffoldings, struts, piles for suppression of landslide and other structures. Tubes shall be classified into 5 grades. (STK290, STK400, STK490, STK500, STK540)																																																																																																					
<b>Chemical Composition</b>	<p>The Chemical composition values shall conform to Table 1.</p> <p>Table 1. Chemical Composition <span style="float: right;">Unit: %</span></p> <table border="1"> <thead> <tr> <th>Symbol Of Grade</th> <th>C</th> <th>Si</th> <th>Mn</th> <th>P</th> <th>S</th> </tr> </thead> <tbody> <tr> <td>STK 290</td> <td>-</td> <td>-</td> <td>-</td> <td>0.050 max.</td> <td>0.050 max.</td> </tr> <tr> <td>STK 400</td> <td>0.25 max.</td> <td>-</td> <td>-</td> <td>0.040 max.</td> <td>0.040 max.</td> </tr> <tr> <td>STK 490</td> <td>0.18 max.</td> <td>0.55 max.</td> <td>1.50 max.</td> <td>0.040 max.</td> <td>0.040 max.</td> </tr> <tr> <td>STK 500</td> <td>0.24 max.</td> <td>0.35 max.</td> <td>0.30 to 1.30</td> <td>0.040 max.</td> <td>0.040 max.</td> </tr> <tr> <td>STK 540</td> <td>0.23 max.</td> <td>0.55 max.</td> <td>1.50 max.</td> <td>0.040 max.</td> <td>0.040 max.</td> </tr> </tbody> </table>	Symbol Of Grade	C	Si	Mn	P	S	STK 290	-	-	-	0.050 max.	0.050 max.	STK 400	0.25 max.	-	-	0.040 max.	0.040 max.	STK 490	0.18 max.	0.55 max.	1.50 max.	0.040 max.	0.040 max.	STK 500	0.24 max.	0.35 max.	0.30 to 1.30	0.040 max.	0.040 max.	STK 540	0.23 max.	0.55 max.	1.50 max.	0.040 max.	0.040 max.																																																																	
Symbol Of Grade	C	Si	Mn	P	S																																																																																																	
STK 290	-	-	-	0.050 max.	0.050 max.																																																																																																	
STK 400	0.25 max.	-	-	0.040 max.	0.040 max.																																																																																																	
STK 490	0.18 max.	0.55 max.	1.50 max.	0.040 max.	0.040 max.																																																																																																	
STK 500	0.24 max.	0.35 max.	0.30 to 1.30	0.040 max.	0.040 max.																																																																																																	
STK 540	0.23 max.	0.55 max.	1.50 max.	0.040 max.	0.040 max.																																																																																																	
<b>Mechanical Strength (Tensile Test)</b>	<p>The tensile strength, yield point or proof stress, and tensile strength in weld zone shall conform to Table 2.</p> <p>Table 2. Mechanical properties</p> <table border="1"> <thead> <tr> <th rowspan="3">Symbol Of Grade</th> <th>Tensile Strength</th> <th>Yield Points Or Proof Strength</th> <th>Tensile Strength In Weld Zone</th> </tr> <tr> <th>N/mm<sup>2</sup></th> <th>N/mm<sup>2</sup></th> <th>N/mm<sup>2</sup></th> </tr> <tr> <th colspan="3">Applied Outside Diameter</th> </tr> <tr> <th></th> <th>All Outside Diameter</th> <th>All Outside Diameter</th> <th>Over 350 mm</th> </tr> </thead> <tbody> <tr> <td>STK 290</td> <td>290 min.</td> <td>-</td> <td>290 min.</td> </tr> <tr> <td>STK 400</td> <td>400 min.</td> <td>235 min.</td> <td>400 min.</td> </tr> <tr> <td>STK 490</td> <td>490 min.</td> <td>315 min.</td> <td>490 min.</td> </tr> <tr> <td>STK 500</td> <td>500 min.</td> <td>355 min.</td> <td>500 min.</td> </tr> <tr> <td>STK 540</td> <td>540 min.</td> <td>390 min.</td> <td>540 min.</td> </tr> </tbody> </table> <p>The minimum value of elongation shall be in accordance with Table 3 corresponding to manufacturing method and outside diameter. However, *No. 5 test piece may be applied to the tubes of 200 mm or more outside diameter and may be applied to those of other outside diameter under the agreement of the purchaser.</p> <p>Table 3. Test piece used for tensile test and the minimum value of elongation test <span style="float: right;">Unit: %</span></p> <table border="1"> <thead> <tr> <th rowspan="6">Symbol Of Grade</th> <th colspan="5">Production Method Of Tubes</th> </tr> <tr> <th>Seamless And Butt Welded</th> <th colspan="2">Electric Resistance Welded And Arc Welded</th> <th colspan="2">All Production Methods</th> </tr> <tr> <th colspan="5">Applied Outside Diameter</th> </tr> <tr> <th>All Outside Diameters</th> <th>350 mm or under</th> <th>Over 350 mm</th> <th colspan="2">All Outside Diameter</th> </tr> <tr> <th colspan="5">Test Piece And Direction Of Test Piece</th> </tr> <tr> <th>*No. 11 Test Piece *No. 12 Test Piece</th> <th>*No. 11 Test Piece *No. 12 Test Piece</th> <th>*No. 5 Test Piece</th> <th colspan="2">*No. 4 Test Piece</th> </tr> <tr> <th></th> <th>Longitudinal Direction</th> <th>Longitudinal Direction</th> <th>Transverse Direction</th> <th>Longitudinal Direction</th> <th>Transverse Direction</th> </tr> </thead> <tbody> <tr> <td>STK 290</td> <td>30</td> <td>30</td> <td>25</td> <td>28</td> <td>23</td> </tr> <tr> <td>STK 400</td> <td>23</td> <td>23</td> <td>18</td> <td>21</td> <td>17</td> </tr> <tr> <td>STK 490</td> <td>23</td> <td>23</td> <td>18</td> <td>21</td> <td>17</td> </tr> <tr> <td>STK 500</td> <td>15</td> <td>15</td> <td>10</td> <td>14</td> <td>9</td> </tr> <tr> <td>STK 540</td> <td>20</td> <td>20</td> <td>16</td> <td>19</td> <td>15</td> </tr> </tbody> </table>	Symbol Of Grade	Tensile Strength	Yield Points Or Proof Strength	Tensile Strength In Weld Zone	N/mm <sup>2</sup>	N/mm <sup>2</sup>	N/mm <sup>2</sup>	Applied Outside Diameter				All Outside Diameter	All Outside Diameter	Over 350 mm	STK 290	290 min.	-	290 min.	STK 400	400 min.	235 min.	400 min.	STK 490	490 min.	315 min.	490 min.	STK 500	500 min.	355 min.	500 min.	STK 540	540 min.	390 min.	540 min.	Symbol Of Grade	Production Method Of Tubes					Seamless And Butt Welded	Electric Resistance Welded And Arc Welded		All Production Methods		Applied Outside Diameter					All Outside Diameters	350 mm or under	Over 350 mm	All Outside Diameter		Test Piece And Direction Of Test Piece					*No. 11 Test Piece *No. 12 Test Piece	*No. 11 Test Piece *No. 12 Test Piece	*No. 5 Test Piece	*No. 4 Test Piece			Longitudinal Direction	Longitudinal Direction	Transverse Direction	Longitudinal Direction	Transverse Direction	STK 290	30	30	25	28	23	STK 400	23	23	18	21	17	STK 490	23	23	18	21	17	STK 500	15	15	10	14	9	STK 540	20	20	16	19	15
Symbol Of Grade	Tensile Strength		Yield Points Or Proof Strength	Tensile Strength In Weld Zone																																																																																																		
	N/mm <sup>2</sup>		N/mm <sup>2</sup>	N/mm <sup>2</sup>																																																																																																		
	Applied Outside Diameter																																																																																																					
	All Outside Diameter	All Outside Diameter	Over 350 mm																																																																																																			
STK 290	290 min.	-	290 min.																																																																																																			
STK 400	400 min.	235 min.	400 min.																																																																																																			
STK 490	490 min.	315 min.	490 min.																																																																																																			
STK 500	500 min.	355 min.	500 min.																																																																																																			
STK 540	540 min.	390 min.	540 min.																																																																																																			
Symbol Of Grade	Production Method Of Tubes																																																																																																					
	Seamless And Butt Welded	Electric Resistance Welded And Arc Welded		All Production Methods																																																																																																		
	Applied Outside Diameter																																																																																																					
	All Outside Diameters	350 mm or under	Over 350 mm	All Outside Diameter																																																																																																		
	Test Piece And Direction Of Test Piece																																																																																																					
	*No. 11 Test Piece *No. 12 Test Piece	*No. 11 Test Piece *No. 12 Test Piece	*No. 5 Test Piece	*No. 4 Test Piece																																																																																																		
	Longitudinal Direction	Longitudinal Direction	Transverse Direction	Longitudinal Direction	Transverse Direction																																																																																																	
STK 290	30	30	25	28	23																																																																																																	
STK 400	23	23	18	21	17																																																																																																	
STK 490	23	23	18	21	17																																																																																																	
STK 500	15	15	10	14	9																																																																																																	
STK 540	20	20	16	19	15																																																																																																	

Remark: As for the tubes of outside diameter of 40 mm or under, the elongation value in table 4 shall be not be applied.

The minimum elongation value of tensile test in the case of \*No. 12 test piece or \*No. 5 test piece of tubes under 8 mm in wall thickness shall conform to Table 4.

Table 4. The minimum elongation value of tensile test 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

Unit: mm

Symbol Of Grade	The Shape Of Test Piece	Elongation For Each Division Of Thickness							
		1 mm or under	Over 1mm up to and incl. 2mm	Over 2mm up to and incl. 3mm	Over 3mm up to and incl. 4mm	Over 4mm up to and incl. 5mm	Over 5mm up to and incl. 6mm	Over 6mm up to and incl. 7mm	Over 7mm up to and incl. 8mm
STK 290	*No. 12 Test Piece	20	21	22	24	26	27	28	30
	*No. 5 Test Piece	14	16	18	19	20	22	24	25
STK 400	*No. 12 Test Piece	12	14	16	17	18	20	22	23
	*No. 5 Test Piece	8	9	10	12	14	15	16	18
STK 490	*No. 12 Test Piece	12	14	16	17	18	20	22	23
	*No. 5 Test Piece	8	9	10	12	14	15	16	18
STK 500	*No. 12 Test Piece	4	6	8	9	10	12	14	15
	*No. 5 Test Piece	-	1	2	4	6	7	8	10
STK 540	*No. 12 Test Piece	10	11	12	14	16	17	18	20
	*No. 5 Test Piece	6	7	8	10	12	13	14	16

\* Please refer to Appendix 'A' Tension Test Pieces for Metallic Materials - JIS Z 2201 ( pg153-155)

The purchaser may specify the bendability test instead of flattening test for the tubes of 50 mm or under of outside diameter. A test piece of an appropriate length shall be cut off from the end of a tube. The test piece shall be bent at an ordinary temperature around a cylinder of the bend angle and the inside radius specified in Table 5, and then examined for the existence of flaws or cracks on the test piece. The weld zone shall be placed in the outermost part of the bent portion. In bending test, the test piece shall be free from flaws or cracks.

Table 5. Bending Test

Mechanical Properties	Bendability	
	Bend Angle	Inside Radius ( <i>D</i> : Outside Diameter Of Tube)
Outside Diameter	50 mm Or Under	
STK 290	90°	6 <i>D</i>
STK 400	90°	6 <i>D</i>
STK 490	90°	6 <i>D</i>
STK 500	90°	8 <i>D</i>
STK 540	90°	6 <i>D</i>

Bending Test

A test piece 50 mm or over in length shall be cut off from the end of the pipe. 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 values in Table 6, and then examined for the existence of flaws or cracks on the test piece. The welded zone shall be placed at right angles to the direction of compression. In flattening test, the test piece shall be free from flaws or cracks.

Table 6. Flattening Test

Symbol Of Grade	Flattening
	Distance Between Flattening Plates ( <i>H</i> ) ( <i>D</i> : Outside Diameter Of Tube)
	All Outside Diameter
STK 290	2/3 <i>D</i>
STK 400	2/3 <i>D</i>
STK 490	7/8 <i>D</i>
STK 500	7/8 <i>D</i>
STK 540	7/8 <i>D</i>

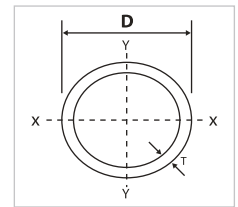
Cold Flattening Test

<b>Tolerances On Dimensions and Mass</b>	The tolerances on dimensions shall respectively conform to Table 7.					
	Table 7. Tolerance on dimensions					
	Classification		Class 1		Class 2	
	Outside Diameter		Under 50 mm	$\pm 0.5$ mm	Under 50 mm	$\pm 0.25$ mm
			50 mm Or Over	$\pm 1\%$	50 mm Or Over	$\pm 0.5\%$
	Thickness	For Seamless steel tube	Under 4 mm	+ 0.6 mm - 0.5 mm	Under 3 mm	$\pm 0.3$ mm
			4 mm or over	+ 15 % - 12.5 %	3 mm or over	$\pm 10\%$
		For other than seamless steel tube	Under 4 mm	+ 0.6 mm - 0.5 mm	Under 3 mm	$\pm 0.3$ mm
			4 mm or over to and excl. 12 mm	+ 15 % - 12.5 %	3 mm or over to and excl. 12 mm	$\pm 10\%$
			12 mm or over	+ 15 % - 1.5 mm	12 mm or over	+ 10 % - 1.2 mm
	Length		Pipe shall be the specified length or over			
	Straightness		Pipe shall be practically straight			
	Out-of-roundness ( <i>o</i> )		-			
	Concavity / convexity		-			
	Radius of Corners		-			
	Squareness of side		-			
	Twist		-			
	Inner Flash		-			
	End tolerance on diameter		-			
	End Facing		-			
Pipe End Angle		Both ends shall be at a right angle to its axis				
Mass ( <i>m</i> ) per unit length		-				

# Pipes JIS G 3444

## 7i(i) Dimension And Unit Mass Of Carbon Steel Tubes For General Structural Purposes

Japanese Industrial Standard ( Extracts from JIS G 3444 : 2006 )

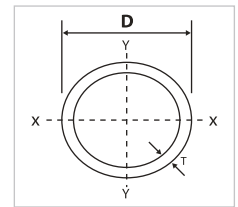


Outside Diameter D mm	Thickness t mm	Unit Mass W Kg/m	Informative			
			Cross-sectional Area cm <sup>2</sup>	Geometrical Moment Of Inertia cm <sup>4</sup>	Modulus Of Section cm <sup>3</sup>	Radius Of Gyration Of Area cm
21.7	2.0	0.972	1.238	0.607	0.560	0.700
27.2	2.0	1.24	1.583	1.26	0.930	0.890
	2.3	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	9.56	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	1100	134	5.60
190.7	4.5	20.7	26.32	1140	120	6.59
	5.3	24.2	30.87	1330	139	6.56
	6.0	27.3	34.82	1490	156	6.53
	7.0	31.7	40.40	1710	179	6.50
	8.2	36.9	47.01	1960	206	6.46
216.3	4.5	23.5	29.94	1680	155	7.49
	5.8	30.1	38.36	2130	197	7.45
	6.0	31.1	39.64	2190	203	7.44
	7.0	36.1	46.03	2520	233	7.40
	8.0	41.1	52.35	2840	263	7.37
	8.2	42.1	53.61	2910	269	7.36

# Pipes JIS G 3444

## 7i(i) Dimension And Unit Mass Of Carbon Steel Tubes For General Structural Purposes

Japanese Industrial Standard ( Extracts from JIS G 3444 : 2006 )

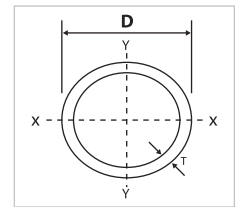


Outside Diameter D mm	Thickness t mm	Unit Mass W Kg/m	Informative				
			Cross-sectional Area cm <sup>2</sup>	Geometrical Moment Of Inertia cm <sup>4</sup>	Modulus Of Section cm <sup>3</sup>	Radius Of Gyration Of Area cm	
<b>267.4</b>	<b>6.0</b>	38.7	49.27	4210	315	9.24	
	<b>6.6</b>	42.4	54.08	4600	344	9.22	
	<b>7.0</b>	45.0	57.26	4860	363	9.21	
	<b>8.0</b>	51.2	65.19	5490	411	9.18	
	<b>9.0</b>	57.3	73.06	73.06	6110	457	9.14
	<b>9.3</b>	59.2	75.41	75.41	6290	470	9.13
<b>318.5</b>	<b>6.0</b>	46.2	58.91	7190	452	11.1	
	<b>6.9</b>	53.0	67.55	8200	515	11.0	
	<b>8.0</b>	61.3	78.04	9410	591	11.0	
	<b>9.0</b>	68.7	87.51	10500	659	10.9	
	<b>10.3</b>	78.3	99.73	11900	744	10.9	
<b>355.6</b>	<b>6.4</b>	55.1	70.21	10700	602	12.3	
	<b>7.9</b>	67.7	86.29	13000	734	12.3	
	<b>9.0</b>	76.9	98.00	14700	828	12.3	
	<b>9.5</b>	81.1	103.3	15500	871	12.2	
	<b>12.0</b>	102	129.5	19100	1080	12.2	
	<b>12.7</b>	107	136.8	20100	1130	12.1	
<b>406.4</b>	<b>7.9</b>	77.6	98.90	19600	967	14.1	
	<b>9.0</b>	88.2	112.4	22200	1090	14.1	
	<b>9.5</b>	93.0	118.5	23300	1150	14.0	
	<b>12.0</b>	117	148.7	28900	1420	14.0	
	<b>12.7</b>	123	157.1	30500	1500	13.9	
	<b>16.0</b>	154	196.2	37400	1840	13.8	
	<b>19.0</b>	182	231.2	43500	2140	13.7	
<b>457.2</b>	<b>9.0</b>	99.5	126.7	31800	1400	15.8	
	<b>9.5</b>	105	133.6	33500	1470	15.8	
	<b>12.0</b>	132	167.8	41600	1820	15.7	
	<b>12.7</b>	139	177.3	43800	1920	15.7	
	<b>16.0</b>	174	221.8	54000	2360	15.6	
	<b>19.0</b>	205	261.6	62900	2750	15.5	
<b>500</b>	<b>9.0</b>	109	138.8	41800	1670	17.4	
	<b>12.0</b>	144	184.0	54800	2190	17.3	
	<b>14.0</b>	168	213.8	63200	2530	17.2	
<b>508</b>	<b>7.9</b>	97.4	124.1	38800	1530	17.7	
	<b>9.0</b>	111	141.1	43900	1730	17.6	
	<b>9.5</b>	117	148.8	46200	1820	17.6	
	<b>12.0</b>	147	187.0	57500	2270	17.5	
	<b>12.7</b>	155	197.6	60600	2390	17.5	
	<b>14.0</b>	171	217.3	66300	2610	17.5	
	<b>16.0</b>	194	247.3	74900	2950	17.4	
	<b>19.0</b>	229	291.9	87400	3440	17.3	
	<b>22.0</b>	264	335.9	99400	3910	17.2	

# Pipes JIS G 3444

## 7i(i) Dimension And Unit Mass Of Carbon Steel Tubes For General Structural Purposes

Japanese Industrial Standard ( Extracts from JIS G 3444 : 2006 )



Outside Diameter D mm	Thickness t mm	Unit Mass W Kg/m	Informative			
			Cross-sectional Area cm <sup>2</sup>	Geometrical Moment Of Inertia cm <sup>4</sup>	Modulus Of Section cm <sup>3</sup>	Radius Of Gyration Of Area cm
<b>558.8</b>	<b>9.0</b>	122	155.5	58800	2100	19.4
	<b>12.0</b>	162	206.1	77100	2760	19.3
	<b>16.0</b>	214	272.8	101000	3600	19.2
	<b>19.0</b>	253	322.2	118000	4210	19.1
	<b>22.0</b>	291	371.0	134000	4790	19.0
<b>600</b>	<b>9.0</b>	131	167.1	73000	2430	20.9
	<b>12.0</b>	174	221.7	95800	3200	20.8
	<b>14.0</b>	202	257.7	111000	3690	20.7
	<b>16.0</b>	230	293.6	125000	4180	20.7
<b>609.6</b>	<b>9.0</b>	133	169.8	76600	2510	21.2
	<b>9.5</b>	141	179.1	80600	2650	21.2
	<b>12.0</b>	177	225.3	101000	3300	21.1
	<b>12.7</b>	187	238.2	106000	3480	21.1
	<b>14.0</b>	206	262.0	116000	3810	21.1
	<b>16.0</b>	234	298.4	132000	4310	21.0
	<b>19.0</b>	277	352.5	154000	5050	20.9
	<b>22.0</b>	319	406.1	176000	5760	20.8
<b>700</b>	<b>9.0</b>	153	195.4	117000	3330	24.4
	<b>12.0</b>	204	259.4	154000	4390	24.3
	<b>14.0</b>	237	301.7	178000	5070	24.3
	<b>16.0</b>	270	343.8	201000	5750	24.2
<b>711.2</b>	<b>9.0</b>	156	198.5	122000	3440	24.8
	<b>12.0</b>	207	263.6	161000	4530	24.7
	<b>14.0</b>	241	306.6	186000	5240	24.7
	<b>16.0</b>	274	349.4	211000	5940	24.6
	<b>19.0</b>	324	413.2	248000	6960	24.5
	<b>22.0</b>	374	476.3	283000	7960	24.4
<b>812.8</b>	<b>9.0</b>	178	227.3	184000	4520	28.4
	<b>12.0</b>	237	301.9	242000	5960	28.3
	<b>14.0</b>	276	351.3	280000	6900	28.2
	<b>16.0</b>	314	400.5	318000	7820	28.2
	<b>19.0</b>	372	473.8	373000	9190	28.1
	<b>22.0</b>	429	546.6	428000	10500	28.0
<b>914.4</b>	<b>12.0</b>	267	340.2	348000	7580	31.9
	<b>14.0</b>	311	396.0	401000	8780	31.8
	<b>16.0</b>	354	451.6	456000	9970	31.8
	<b>19.0</b>	420	534.5	536000	11700	31.7
	<b>22.0</b>	484	616.5	614000	13400	31.5
<b>1016.0</b>	<b>12.0</b>	297	378.5	477000	9390	35.5
	<b>14.0</b>	346	440.7	553000	10900	35.4
	<b>16.0</b>	395	502.7	628000	12400	35.4
	<b>19.0</b>	467	595.1	740000	14600	35.2
	<b>22.0</b>	539	687.0	849000	16700	35.2