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**Carbon steel square and rectangular
tubes for general structure**

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Foreword

This Japanese Industrial Standard has been revised by the Minister of Economy, Trade and Industry through deliberations at the Japanese Industrial Standards Committee as the result of proposal for revision of Japanese Industrial Standard submitted by The Japan Iron and Steel Federation (JISF) with a draft being attached, based on the provision of Article 12, paragraph (1) of the Industrial Standardization Act applied mutatis mutandis pursuant to the provision of Article 16 of the said Act. This edition replaces the previous edition (**JIS G 3466** : 2018), which has been technically revised.

However, **JIS G 3466** : 2018 may be applied in the **JIS** mark certification based on the relevant provisions of Article 30, paragraph (1), etc. of the Industrial Standardization Act until 21 February 2022.

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Carbon steel square and rectangular tubes for general structure

1 Scope

This Japanese Industrial Standard specifies requirements for the carbon steel square and rectangular tubes (hereafter referred to as tubes), used for civil engineering, architecture and other structures.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this Standard. The most recent editions of the standards (including amendments) indicated below shall be applied.

JIS G 0320 *Standard test method for heat analysis of steel products*

JIS G 0321 *Product analysis and its tolerance for wrought steel*

JIS G 0404 *Steel and steel products — General technical delivery requirements*

JIS G 0415 *Steel and steel products — Inspection documents*

JIS G 3302 *Hot-dip zinc-coated steel sheet and strip*

JIS G 3313 *Electrolytic zinc-coated steel sheet and strip*

JIS G 3314 *Hot-dip aluminium-coated steel sheet and strip*

JIS G 3317 *Hot-dip zinc-5 % aluminium alloy-coated steel sheet and strip*

JIS G 3321 *Hot-dip 55 % aluminium-zinc alloy-coated steel sheet and strip*

JIS G 3323 *Hot-dip zinc-aluminium-magnesium alloy-coated steel sheet and strip*

JIS Z 2241 *Metallic materials — Tensile testing — Method of test at room temperature*

JIS Z 8401 *Rounding of numbers*

3 Symbol of grade

The tubes shall be classified into two grades, and symbols of grade shall be as given in Table 1.

Table 1 Symbol of grade

Symbol of grade
STKR400
STKR490

4 Manufacturing method

The manufacturing method shall be as follows.

- a) The manufacturing method of the tubes shall be in accordance with one of the following.
 - 1) The tubes shall be manufactured by forming either the welded steel tubes (electric resistance welded, butt-welded or automatic arc welded) or seamless steel tubes into square shape.
 - 2) The tubes shall be manufactured by forming steel strips into square cross-sectioned tubes or into a pair of channel sections and then welding them together continuously by electric resistance welding or automatic arc welding.
- b) The tubes shall be supplied as manufactured, and shall not be heat treated except for special cases.
- c) The tubes may be manufactured using coated steel sheet or coated steel strip, if so requested by the purchaser. In this case, the type of coating and coating mass applied should be in accordance with Annex A.
- d) The tubes shall be finished with plain ends unless otherwise specified. If the purchaser specifies bevel end finishing, the shape of the bevel end shall be as agreed between the purchaser and the manufacturer. If the purchaser does not specify the shape, the bevel end shall be as shown in Figure 1.

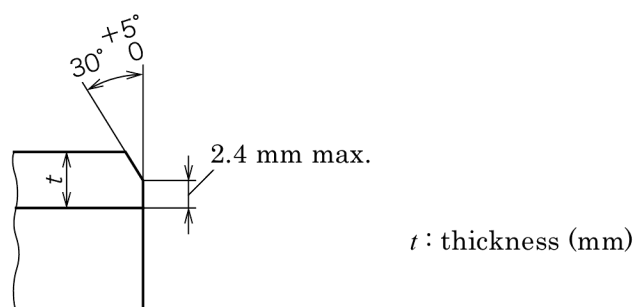


Figure 1 Shape of bevel end

5 Chemical composition

The tubes shall be tested in accordance with 9.1 and the heat analysis values shall conform to Table 2. When the product analysis is requested by the purchaser, the tubes shall be tested in accordance with 9.1 and the obtained product analysis values shall satisfy the requirements in Table 2 within tolerances given in Table 2 of JIS G 0321.

Table 2 Chemical composition

Unit: %

Symbol of grade	C	Si	Mn	P	S
STKR400	0.25 max.	—	—	0.040 max.	0.040 max.
STKR490	0.18 max.	0.55 max.	1.65 max.	0.035 max.	0.035 max.
If necessary, other alloy elements than those given in this table and elements indicated by “—” may be added.					

6 Mechanical properties**6.1 Tensile strength, yield point or proof stress, and elongation**

The tubes shall be tested in accordance with 9.2, and the obtained tensile strength, yield point or proof stress, and elongation shall satisfy the requirements specified in Table 3. For tubes with a wall thickness of under 8 mm, however, the elongation shall be in accordance with Table 4.

Table 3 Tensile strength, yield point or proof stress, and elongation

Symbol of grade	Tensile strength N/mm ²	Yield point or proof stress N/mm ²	Elongation %	
			Tensile test piece	Test direction
			Test piece No. 5	Tube axis direction
STKR400	400 min.	245 min.	23 min.	
STKR490	490 min.	325 min.	23 min.	
NOTE 1 N/mm ² = 1 MPa				

Table 4 Elongation of tubes with a wall thickness of under 8 mm, tested using Test piece No. 5 (tube axis direction)

Unit: %

Symbol of grade	Wall thickness							
	1 mm or under	Over 1 mm up to and incl. 2 mm	Over 2 mm up to and incl. 3 mm	Over 3 mm up to and incl. 4 mm	Over 4 mm up to and incl. 5 mm	Over 5 mm up to and incl. 6 mm	Over 6 mm up to and incl. 7 mm	Over 7 mm to and excl. 8 mm
STKR400 STKR490	12 min.	14 min.	16 min.	17 min.	18 min.	20 min.	22 min.	23 min.
NOTE The elongation values in this table are given by deducting 1.5, for every 1 mm decrease in wall thickness from 8 mm, from the values given in Table 3 and rounding the results to the whole number according to Rule A of JIS Z 8401.								

6.2 Bendability

The welded tubes, if required by the purchaser, shall be subjected to the bend test at the weld, in which case, the required characteristics, test method and sampling method shall be as agreed between the purchaser and the manufacturer.

7 Dimensions, unit mass and dimensional tolerances

7.1 Dimensions and unit mass

The dimensions and unit mass of tubes shall be in accordance with Table 5 for tubes with square sections, and with Table 6 for tubes with rectangular sections. The bend radius of corners shall generally be equal to twice the wall thickness at the outer surface of the bend.

The standard lengths of the tubes shall be 6 m, 8 m, 10 m and 12 m.

Dimensions not specified in Table 5 or Table 6 may be used upon agreement between the purchaser and the manufacturer. In this case, the unit mass shall be calculated by the following formula assuming 1 cm³ steel to be 7.85 g, and the result shall be rounded off to 3 significant figures according to Rule A of **JIS Z 8401**.

$$W = 0.015\ 7t (A + B - 3.287t)$$

where, W : unit mass of tube (kg/m)
 t : wall thickness of tube (mm)
 A, B : side length of tube (mm)
 0.015 7 : unit conversion factor for obtaining W

NOTE The unit mass values in Table 5 and Table 6 are the results of the calculation given above.

Table 5 and Table 6 show the sectional area, geometric moment of inertia (I_x, I_y), section modulus (Z_x, Z_y) and radius of gyration of cross-section (i_x, i_y) for reference.

Table 5 Dimensions and unit mass of tubes (square)

Side length $A \times B$ mm	Wall thick-ness t mm	Unit mass W kg/m	Reference			
			Sectional area cm ²	Geomet-ric mo-ment of inertia I_X, I_Y cm ⁴	Section modulus Z_X, Z_Y cm ³	Radius of gy-ration of cross-section i_X, i_Y cm
40 × 40	1.6	1.88	2.392	5.79	2.90	1.56
40 × 40	2.3	2.62	3.332	7.73	3.86	1.52
50 × 50	1.6	2.38	3.032	11.7	4.68	1.96
50 × 50	2.3	3.34	4.252	15.9	6.34	1.93
50 × 50	3.2	4.50	5.727	20.4	8.16	1.89
60 × 60	1.6	2.88	3.672	20.7	6.89	2.37
60 × 60	2.3	4.06	5.172	28.3	9.44	2.34
60 × 60	3.2	5.50	7.007	36.9	12.3	2.30
75 × 75	1.6	3.64	4.632	41.3	11.0	2.99
75 × 75	2.3	5.14	6.552	57.1	15.2	2.95
75 × 75	3.2	7.01	8.927	75.5	20.1	2.91
75 × 75	4.5	9.55	12.17	98.6	26.3	2.85
80 × 80	2.3	5.50	7.012	69.9	17.5	3.16
80 × 80	3.2	7.51	9.567	92.7	23.2	3.11
80 × 80	4.5	10.3	13.07	122	30.4	3.05
90 × 90	2.3	6.23	7.932	101	22.4	3.56
90 × 90	3.2	8.51	10.85	135	29.9	3.52
100 × 100	2.3	6.95	8.852	140	27.9	3.97
100 × 100	3.2	9.52	12.13	187	37.5	3.93
100 × 100	4.0	11.7	14.95	226	45.3	3.89
100 × 100	4.5	13.1	16.67	249	49.9	3.87
100 × 100	6.0	17.0	21.63	311	62.3	3.79
100 × 100	9.0	24.1	30.67	408	81.6	3.65
100 × 100	12.0	30.2	38.53	471	94.3	3.50
125 × 125	3.2	12.0	15.33	376	60.1	4.95
125 × 125	4.5	16.6	21.17	506	80.9	4.89
125 × 125	5.0	18.3	23.36	553	88.4	4.86
125 × 125	6.0	21.7	27.63	641	103	4.82
125 × 125	9.0	31.1	39.67	865	138	4.67
125 × 125	12.0	39.7	50.53	103 × 10	165	4.52
150 × 150	4.5	20.1	25.67	896	120	5.91
150 × 150	5.0	22.3	28.36	982	131	5.89
150 × 150	6.0	26.4	33.63	115 × 10	153	5.84
150 × 150	9.0	38.2	48.67	158 × 10	210	5.69
175 × 175	4.5	23.7	30.17	145 × 10	166	6.93
175 × 175	5.0	26.2	33.36	159 × 10	182	6.91
175 × 175	6.0	31.1	39.63	186 × 10	213	6.86
200 × 200	4.5	27.2	34.67	219 × 10	219	7.95
200 × 200	6.0	35.8	45.63	283 × 10	283	7.88
200 × 200	8.0	46.9	59.79	362 × 10	362	7.78
200 × 200	9.0	52.3	66.67	399 × 10	399	7.73
200 × 200	12.0	67.9	86.53	498 × 10	498	7.59
250 × 250	5.0	38.0	48.36	481 × 10	384	9.97

Table 5 (concluded)

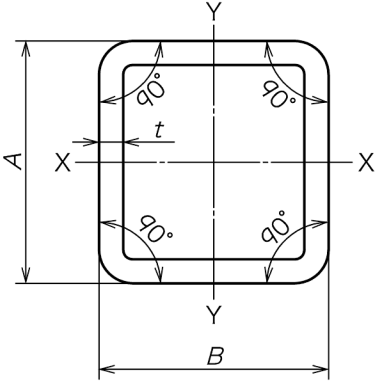
Side length $A \times B$ mm	Wall thickness t mm	Unit mass W kg/m	Reference			
			Sectional area cm ²	Geometric moment of inertia I_X, I_Y cm ⁴	Section modulus Z_X, Z_Y cm ³	Radius of gyration of cross-section i_X, i_Y cm
250 × 250	6.0	45.2	57.63	567 × 10	454	9.92
250 × 250	8.0	59.5	75.79	732 × 10	585	9.82
250 × 250	9.0	66.5	84.67	809 × 10	647	9.78
250 × 250	12.0	86.8	110.5	103 × 10 ²	820	9.63
300 × 300	4.5	41.3	52.67	763 × 10	508	12.0
300 × 300	6.0	54.7	69.63	996 × 10	664	12.0
300 × 300	9.0	80.6	102.7	143 × 10 ²	956	11.8
300 × 300	12.0	106	134.5	183 × 10 ²	122 × 10	11.7
350 × 350	9.0	94.7	120.7	232 × 10 ²	132 × 10	13.9
350 × 350	12.0	124	158.5	298 × 10 ²	170 × 10	13.7
The symbols in this table are as follows. 						

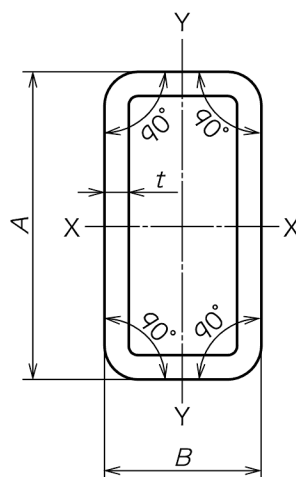
Table 6 Dimensions and unit mass of tubes (rectangular)

Side length $A \times B$ mm	Wall thick- ness t mm	Unit mass W kg/m	Reference						
			Sectional area cm ²	Geometric moment of inertia		Section modulus		Radius of gyration of cross-section	
				I_X cm ⁴	I_Y cm ⁴	Z_X cm ³	Z_Y cm ³	i_X cm	i_Y cm
50 × 20	1.6	1.63	2.072	6.08	1.42	2.43	1.42	1.71	0.829
50 × 20	2.3	2.25	2.872	8.00	1.83	3.20	1.83	1.67	0.798
50 × 30	1.6	1.88	2.392	7.96	3.60	3.18	2.40	1.82	1.23
50 × 30	2.3	2.62	3.332	10.6	4.76	4.25	3.17	1.79	1.20
60 × 30	1.6	2.13	2.712	12.5	4.25	4.16	2.83	2.15	1.25
60 × 30	2.3	2.98	3.792	16.8	5.65	5.61	3.76	2.11	1.22
60 × 30	3.2	3.99	5.087	21.4	7.08	7.15	4.72	2.05	1.18
75 × 20	1.6	2.25	2.872	17.6	2.10	4.69	2.10	2.47	0.855
75 × 20	2.3	3.16	4.022	23.7	2.73	6.31	2.73	2.43	0.824
75 × 45	1.6	2.88	3.672	28.4	12.9	7.56	5.75	2.78	1.88
75 × 45	2.3	4.06	5.172	38.9	17.6	10.4	7.82	2.74	1.84
75 × 45	3.2	5.50	7.007	50.8	22.8	13.5	10.1	2.69	1.80
80 × 40	1.6	2.88	3.672	30.7	10.5	7.68	5.26	2.89	1.69
80 × 40	2.3	4.06	5.172	42.1	14.3	10.5	7.14	2.85	1.66
80 × 40	3.2	5.50	7.007	54.9	18.4	13.7	9.21	2.80	1.62
90 × 45	2.3	4.60	5.862	61.0	20.8	13.6	9.22	3.23	1.88
90 × 45	3.2	6.25	7.967	80.2	27.0	17.8	12.0	3.17	1.84
100 × 20	1.6	2.88	3.672	38.1	2.78	7.61	2.78	3.22	0.870
100 × 20	2.3	4.06	5.172	51.9	3.64	10.4	3.64	3.17	0.839
100 × 40	1.6	3.38	4.312	53.5	12.9	10.7	6.44	3.52	1.73
100 × 40	2.3	4.78	6.092	73.9	17.5	14.8	8.77	3.48	1.70
100 × 40	4.2	8.32	10.60	120	27.6	24.0	13.8	3.36	1.61
100 × 50	1.6	3.64	4.632	61.3	21.1	12.3	8.43	3.64	2.13
100 × 50	2.3	5.14	6.552	84.8	29.0	17.0	11.6	3.60	2.10
100 × 50	3.2	7.01	8.927	112	38.0	22.5	15.2	3.55	2.06
100 × 50	4.5	9.55	12.17	147	48.9	29.3	19.5	3.47	2.00
125 × 40	1.6	4.01	5.112	94.4	15.8	15.1	7.91	4.30	1.76
125 × 40	2.3	5.69	7.242	131	21.6	20.9	10.8	4.25	1.73
125 × 75	2.3	6.95	8.852	192	87.5	30.6	23.3	4.65	3.14
125 × 75	3.2	9.52	12.13	257	117	41.1	31.1	4.60	3.10
125 × 75	4.0	11.7	14.95	311	141	49.7	37.5	4.56	3.07
125 × 75	4.5	13.1	16.67	342	155	54.8	41.2	4.53	3.04
125 × 75	6.0	17.0	21.63	428	192	68.5	51.1	4.45	2.98
150 × 75	3.2	10.8	13.73	402	137	53.6	36.6	5.41	3.16
150 × 80	4.5	15.2	19.37	563	211	75.0	52.9	5.39	3.30
150 × 80	5.0	16.8	21.36	614	230	81.9	57.5	5.36	3.28
150 × 80	6.0	19.8	25.23	710	264	94.7	66.1	5.31	3.24
150 × 100	3.2	12.0	15.33	488	262	65.1	52.5	5.64	4.14
150 × 100	4.5	16.6	21.17	658	352	87.7	70.4	5.58	4.08
150 × 100	6.0	21.7	27.63	835	444	111	88.8	5.50	4.01
150 × 100	9.0	31.1	39.67	113 × 10	595	151	119	5.33	3.87
200 × 100	4.5	20.1	25.67	133 × 10	455	133	90.9	7.20	4.21
200 × 100	6.0	26.4	33.63	170 × 10	577	170	115	7.12	4.14

Table 6 (concluded)

Side length $A \times B$ mm	Wall thick- ness t mm	Unit mass W kg/m	Reference						
			Sectional area cm ²	Geometric moment of inertia		Section modulus		Radius of gyration of cross-section	
				I_X cm ⁴	I_Y cm ⁴	Z_X cm ³	Z_Y cm ³	i_X cm	i_Y cm
200 × 100	9.0	38.2	48.67	235 × 10	782	235	156	6.94	4.01
200 × 150	4.5	23.7	30.17	176 × 10	113 × 10	176	151	7.64	6.13
200 × 150	6.0	31.1	39.63	227 × 10	146 × 10	227	194	7.56	6.06
200 × 150	9.0	45.3	57.67	317 × 10	202 × 10	317	270	7.41	5.93
250 × 150	6.0	35.8	45.63	389 × 10	177 × 10	311	236	9.23	6.23
250 × 150	9.0	52.3	66.67	548 × 10	247 × 10	438	330	9.06	6.09
250 × 150	12.0	67.9	86.53	685 × 10	307 × 10	548	409	8.90	5.95
300 × 200	6.0	45.2	57.63	737 × 10	396 × 10	491	396	11.3	8.29
300 × 200	9.0	66.5	84.67	105 × 10 ²	563 × 10	702	563	11.2	8.16
300 × 200	12.0	86.8	110.5	134 × 10 ²	711 × 10	890	711	11.0	8.02
350 × 150	6.0	45.2	57.63	891 × 10	239 × 10	509	319	12.4	6.44
350 × 150	9.0	66.5	84.67	127 × 10 ²	337 × 10	726	449	12.3	6.31
350 × 150	12.0	86.8	110.5	161 × 10 ²	421 × 10	921	562	12.1	6.17
400 × 200	6.0	54.7	69.63	148 × 10 ²	509 × 10	739	509	14.6	8.55
400 × 200	9.0	80.6	102.7	213 × 10 ²	727 × 10	107 × 10	727	14.4	8.42
400 × 200	12.0	106	134.5	273 × 10 ²	923 × 10	136 × 10	923	14.2	8.23

The symbols in this table are as follows.



7.2 Dimensional tolerances

The tolerances on side length, wall thickness, unevenness of flat portion of each side, corner dimensions, angularity between adjacent flat portions, length and unstraightness of the tubes shall be as given in Table 7. The measurement of dimensions of sectional profile and angularity (excluding length and unstraightness) shall be made at any position except both ends of the tubes. The tolerances on the wall thickness shall apply to the flat portions and those on the unstraightness shall apply to the long pitch bend along the whole length.

The tolerances on side length and wall thickness for tubes manufactured from coated

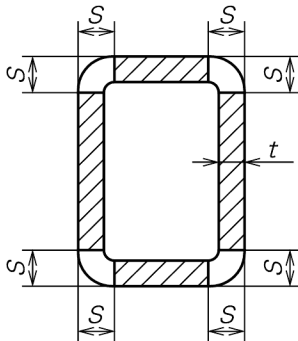
steel sheet or coated steel strip shall be as given in Table 7. The plus tolerances shall apply to the side length and wall thickness plus the coating layer thickness, and the minus tolerances shall apply to the side length and wall thickness values reduced by the equivalent or actually measured coating thickness.

Equivalent coating thickness shall be as specified in **JIS G 3302** in the case of hot-dip zinc coating, as specified in **JIS G 3313** in the case of electrolytic zinc coating, as specified in **JIS G 3314** in the case of hot-dip aluminium coating, as specified in **JIS G 3317** in the case of hot-dip zinc-5 % aluminium alloy coating, as specified in **JIS G 3321** in the case of hot-dip 55 % aluminium-zinc alloy coating and as specified in **JIS G 3323** in the case of hot-dip zinc-aluminium-magnesium alloy coating.

Table 7 Dimensional tolerances

Applicable dimension/range of dimension			Dimensional tolerances
Side length ^{a)}	100 mm or under		±1.5 mm
	Over 100 mm		±1.5 %
Wall thickness of flat portion : t	Welded tubes	Under 3 mm	±0.3 mm
		3 mm or over	±10 %
	Seamless tubes	Under 4 mm	±0.6 mm
		4 mm or over	±15 %
Unevenness of flat portion of each side	Side length 100 mm or under		0.5 mm max.
	Side length over 100 mm		0.5 % max. of side length
Corner dimension : S ^{b)}			3 t max.
Angularity between adjacent flat portions			90° ± 1.5°
Length ^{c)}			+ not specified 0
Unstraightness			0.3 % max. of the entire length

The following drawing illustrates the positions of flat portions and corners. The hatched parts indicate the flat portions. Parts other than the hatched parts indicate the corners.



t : wall thickness of flat portion
 S : corner dimension

Notes ^{a)} For local repaired parts, the side length tolerance in this table shall not apply.

^{b)} The tolerance on corner dimension may be agreed between the purchaser and the manufacturer.

^{c)} The tolerance on length may be agreed between the purchaser and the manufacturer.

8 Appearance

The appearance shall be as follows.

- a) The tubes shall be free from defects detrimental to practical use. The detrimental defects, if any, may be repaired by grinding, machining or other method or repaired by welding. In this case, the conditions shall be as follows.
 - 1) The tubes shall be repaired by grinding, machining or other method as follows.
 - The wall thickness after repair shall be within the specified tolerance on wall thickness.
 - The surface of the repaired part shall be smooth along the contour of the tube.
 - 2) The tubes shall be repaired by welding as follows.
 - Repair by welding shall be carried out only on the parent metal of welded steel tubes and the weld of automatic arc-welded steel tubes.
 - When tubes are used for columns for building, the corner shall not be repaired by welding.
 - The detrimental defects of tubes shall be completely removed by chipping, grinding or other suitable methods prior to welding. For the parent metal, the depth of removed part shall be 20 % or under of nominal wall thickness of tubes, and the total of repaired area on the surface shall be 2 % or under of surface area of tubes.
 - Repair by welding shall be carried out by means of an appropriate method according to the grade of steel. For the weld, repair by welding shall be carried out by means of an appropriate method according to characteristics of the weld.
 - The parts repaired by welding shall be free from undercuts or overlapping on the edge. The weld reinforcement shall be of the height at least equal to the rolled surface and shall be removed by chipping, grinding or other methods. It shall come into contact smoothly with adjacent parts and the original weld beads in the case of the weld and shall be well-finished.
 - For heat treated tubes, the tube body shall be heat treated again after the repair by welding.
- b) In the case where any special surface finishing or plating of tubes is requested by the purchaser, the appearance requirement shall be as agreed between the purchaser and the manufacturer.

9 Tests

9.1 Chemical analysis

9.1.1 General requirements and sampling method

General requirements for chemical analysis and sampling method for heat analysis

shall be in accordance with Clause 8 of **JIS G 0404**. When the product analysis is requested by the purchaser, the sampling method for product analysis shall be in accordance with Clause 4 of **JIS G 0321**.

9.1.2 Analytical method

The heat analysis method shall be in accordance with **JIS G 0320**. The product analysis method shall be in accordance with **JIS G 0321**.

9.2 Mechanical tests

9.2.1 General

General requirements for mechanical tests shall be in accordance with Clauses 7 and 9 of **JIS G 0404**. However, the sampling method for mechanical tests shall be in accordance with Class A in 7.6 of **JIS G 0404**.

The mechanical tests for tubes manufactured from coated steel sheets or coated steel strip shall be performed on tubes with the coating applied.

9.2.2 Sampling method and number of test pieces

The sampling method and the number of test pieces shall be as given in Table 8. The tensile test piece for welded tubes shall be taken from a portion not including the weld.

Table 8 Sampling method and number of test pieces

Length of longer side	Sampling method and number of test pieces
100 mm or under	Take one sample from every 5 000 m length or its fraction of tubes of the same dimensions ^{a)} , and take one tensile test piece from it.
Over 100 mm up to and incl. 200 mm	Take one sample from every 2 500 m length or its fraction of tubes of the same dimensions ^{a)} , and take one tensile test piece from it.
Over 200 mm	Take one sample from every 1 250 m length or its fraction of tubes of the same dimensions ^{a)} , and take one tensile test piece from it.
Note ^{a)} The same dimensions refer to those of the same side length and the same wall thickness.	

9.2.3 Tensile test

The tensile test shall be as follows.

- a) **Test piece and direction of sampling** The test piece shall be Test piece No. 5 specified in **JIS Z 2241**, taken from the flat portion of the tube in parallel to the tube axis direction.

For tubes manufactured from coated steel sheet or coated steel strip, the wall thickness value used for calculation of the yield point or proof stress, and tensile strength shall be in accordance with either of the following.

- Actually measured wall thickness after removal of coating

- Actually measured wall thickness including the coating layer, from which the equivalent coating thickness has been deducted
- Actually measured wall thickness including the coating layer, from which the coating thickness obtained through conversion of the actually measured coating mass has been deducted

b) **Test method** The test method shall be in accordance with **JIS Z 2241**.

10 Inspection and reinspection

10.1 Inspection

The inspection shall be as follows.

- a) The general requirements of inspection shall be as specified in **JIS G 0404**.
- b) The chemical composition shall conform to the requirements given in Clause 5.
- c) The mechanical properties shall conform to the requirements given in Clause 6.
- d) The dimensions shall conform to the requirements given in Clause 7.
- e) The appearance shall conform to the requirements given in Clause 8.

10.2 Reinspection

The tubes having failed in the mechanical tests may be subjected to the retest according to 9.8 of **JIS G 0404** for further acceptance judgement.

11 Marking

Each tube having passed the inspection shall be marked with the following information. When the marking on each tube is difficult because its side length is short or when so requested by the purchaser, the marking may be given on each bundle of tubes by a suitable means. The order of markings is not specified. A part of the following items may be omitted as agreed between the purchaser and the manufacturer as far as the product can still be identified.

- a) Symbol of grade
- b) Dimensions, marked with side length and wall thickness, unless otherwise specified.
- c) Name of manufacturer or identifying brand
- d) Symbol indicating the type of coating (in the case of using coated steel sheet or coated steel strip). The symbol shall be as agreed between the purchaser and the manufacturer.

Example STKR400 (symbol indicating coating type : —PZ)

12 Report

When previously requested by the purchaser, the manufacturer shall submit the inspection document. In this case, the report shall comply with the requirements in

Clause 13 of **JIS G 0404**. Unless otherwise specified at the time of ordering, the type of the inspection document to be submitted shall be in accordance with 5.1 of **JIS G 0415**.

Annex A (normative)

Type of coating and coating mass for tubes manufactured from coated steel sheet or coated steel strip

A.1 Type of coating and coating mass

The type of coating and coating mass applied should be as follows.

- a) One of the following six types of coatings is applied : hot-dip zinc coating, electrolytic zinc coating, hot-dip aluminium coating, hot-dip zinc-5 % aluminium alloy coating, hot-dip 55 % aluminium-zinc alloy coating and hot-dip zinc-aluminium-magnesium alloy coating. Other types of coatings may be applied upon agreement between the purchaser and the manufacturer [see c)]. When applying equivalent thickness coating, the coating mass as specified in **JIS G 3302**, **JIS G 3313**, **JIS G 3314**, **JIS G 3317**, **JIS G 3321** and **JIS G 3323** is applied.
- b) In the case of applying hot-dip zinc coating and hot-dip 55 % aluminium-zinc alloy coating, the coating mass may be different between the front and rear surfaces of the coated steel sheet or coated steel strip (differential thickness coating). In this case, the following conditions should be satisfied.
 - 1) The coating mass on the outer surface ¹⁾ of the tube for hot-dip zinc coating should meet the minimum triple-spot average and single-spot values ¹⁾ of 30 g/m² and 26 g/m², respectively, and for hot-dip 55 % aluminium-zinc alloy coating, 35 g/m² and 30 g/m², respectively.

Note ¹⁾ See 5.3.2 of **JIS G 3302**.
 - 2) The coating mass on the inner surface of the tube for both hot-dip zinc coating and hot-dip 55 % aluminium-zinc alloy coating should meet the minimum triple-spot average and single-spot values of 30 g/m² and 26 g/m², respectively.
- c) Upon agreement between the purchaser and the manufacturer, other types of hot-dip coating or electrolytic coating than stated in a) may be applied. In this case, the following conditions should be satisfied.
 - 1) For hot-dip coating, the total coating mass of both surfaces should meet the minimum triple-spot average and single-spot values of 60 g/m² and 51 g/m², respectively.
 - 2) For electrolytic coating, the coating mass on one surface should meet the minimum value of 8.5 g/m² in the case of equal thickness coating and 8 g/m² in the case of differential thickness coating.

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