Carbon steel pipes for ordinary piping

Introduction This Standard comes to be conformed with "unifying performance test method of the equipments for water supply service" established following the revision of "standard of the structure and material of a water supply facility based on Water Works Low". However, since steel pipes of this Standard are not suitable for water supply service based on the Water Works Law, water supply service is eliminated from the applicable range by this revision.

1 Scope This Japanese Industrial Standard specifies the carbon steel pipes (hereafter referred to as the "pipes") used for the pipings for conveying steam, water (excepting public water supply service), oil, gas, air, etc. at comparatively low working pressures.

2 Normative references The standards shown in Attached Table 1 contain provisions which, through reference in this Standard, constitute provisions of this Standard. The most recent editions of the standards indicated below shall be applied.

3 Grade and designation The pipe shall be classified into one grade and its letter symbol shall be as given in Table 1, and subdivided into black pipes and galvanized ones according to nonexistence or existence of zinc-coated layers.

Table 1 Letter symbol of grade

Letter symbol of grade	Division	Remarks
SGP	Black pipe	Pipe without zinc coating
	Galvanized pipe	Black pipe with zinc coating

Remarks: Where it is necessary to identify the galvanized pipe by the letter symbol on the drawing and other documents, "−ZN" shall be suffixed to the letter symbol of the grade. This notation, however, shall not be applied to the product itself.

4 Chemical composition The pipe shall be subjected to the test of **11.1** and the resulting ladle analysis values shall be as given in Table 2.

Table 2 Chemical composition

Unit: %

Letter symbol of grade	P	S
SGP	0.040 max.	0.040 max.

5 Mechanical properties

5.1 Tensile strength and elongation The black pipe shall be subjected to the test of **11.3** and the resulting tensile strength and elongation shall be as given in Table 3.

Table 3 Mechanical properties

Letter symbol of grade	Tensile strength N/mm²	Elongation %	
		No. 11 and No. 12 test pieces	No. 5 test piece
		Longitudinal	Transverse
SGP	290 min.	30 min.	25 min.

Remarks 1 When the tensile test is carried out for No. 12 or No. 5 test piece for the pipe under 8 mm in wall thickness, the minimum value of elongation shall be obtained by subtracting 1.5 % from the values of elongation given in Table 3 for each 1 mm decrease in wall thickness, and rounding off to an integer in accordance with **JIS Z 8401**.

Examples of calculation are given in Informative reference Table 1.

2 The values of elongation given in Table 3 shall not be applied to the pipe whose nominal size is 32 A or smaller. However, the value of elongation shall be recorded.

3 In sampling the tensile test pieces, No. 12 or No. 5 test piece shall be taken from the portion not involving welded seams.

Informative reference Table 1 Examples of elongation values calculated for No. 12 test piece (longitudinal) and No. 5 test piece (transverse) taken from pipes under 8 mm in wall thickness

Shape of test piece	Elongation values for wall thickness divisions %				
	Over 7 mm to and excl. 8 mm	Over 6 mm up to and incl. 7 mm	Over 5 mm up to and incl. 6 mm	Over 4 mm up to and incl. 5 mm	Over 3 mm up to and incl. 4 mm
No. 12 test piece	30	28	27	26	24
No. 5 test piece	25	24	22	20	19

5.2 Flatness The black pipe, when tested by **11.4** shall not generate flaws or cracks on its wall surface and in this case, the distance between the two plates shall be 2/3 of the outside diameter of the pipe.

5.3 Bend ability For the black pipe of nominal size 50 A or smaller, the purchaser may specify the bend test instead of the flattening test. In the test of **11.5**, the pipe shall be free from the occurrence of flaws or cracks on its wall surface. In this case, the pipe shall be bent through 90° around an inside diameter that is 6 times its outside diameter.

6 Uniformity of zinc coating The galvanized pipe shall be tested by **11.6** and the number of dips in the uniformity test shall be as given in Table 4. In this case, the pipe shall not show a fixed deposit of zinc even after the successive dipping operations of frequency given in Table 4.

Table 4 Uniformity test

Letter symbol of grade	Number of dips (One minute per dip)
SGP	5

7 Hydrostatic test characteristics or nondestructive test characteristics The black pipe shall be tested by **11.7** and the resulting hydrostatic characteristic or nondestructive characteristic shall conform either of the following two. Though the preference depends upon the specification by the purchaser, when not specified by the purchaser, the preference shall be selected by the manufacturer.

a) For hydrostatic test characteristics, when a hydrostatic pressure of 2.5 MPa is applied, the black pipe shall withstand it without leakage.

b) For nondestructive examination characteristics, a nondestructive examination by either an ultrasonic test on an eddy current test is carried out on the black pipe, and there shall be no signal greater than those produced by the artificial defects of the reference test block of division UE of the working sensitivity specified in **JIS G 0582** or of division EZ of the working sensitivity specified in **JIS G 0583**.

8 Dimensions, weight and dimensional tolerances The dimensions, weight and dimensional tolerances of the pipes shall be as follows:

a) The dimensions, weight and dimensional tolerances of the black pipe shall be as specified in Table 5.

Table 5 Dimensions, weights and dimensional tolerances

Nominal diameter		Outside diameter	Tolerances on outside diameter		Wall thickness	Tolerances on wall thickness	Unit mass excluding socket
A	B	mm	Pipes to be cut in taper thread	Other pipes	mm		kg/m
6	1/8	10.5	±0.5 mm	±0.5 mm	2.0	+ Not specified −12.5 %	0.419
8	1/4	13.8	±0.5 mm	±0.5 mm	2.3		0.652
10	3/8	17.3	±0.5 mm	±0.5 mm	2.3		0.851
15	1/2	21.7	±0.5 mm	±0.5 mm	2.8		1.31
20	3/4	27.2	±0.5 mm	±0.5 mm	2.8		1.68
25	1	34.0	±0.5 mm	±0.5 mm	3.2		2.43
32	1 1/4	42.7	±0.5 mm	±0.5 mm	3.5		3.38
40	1 1/2	48.6	±0.5 mm	±0.5 mm	3.5		3.89
50	2	60.5	±0.5 mm	±1 %	3.8		5.31
65	2 1/2	76.3	±0.7 mm	±1 %	4.2		7.47
80	3	89.1	±0.8 mm	±1 %	4.2		8.79
90	3 1/2	101.6	±0.8 mm	±1 %	4.2		10.1
100	4	114.3	±0.8 mm	±1 %	4.5		12.2
125	5	139.8	±0.8 mm	±1 %	4.5		15.0
150	6	165.2	±0.8 mm	±1.6 mm	5.0		19.8
175	7	190.7	±0.9 mm	±1.6 mm	5.3		24.2
200	8	216.3	±1.0 mm	±0.8 %	5.8		30.1
225	9	241.8	±1.2 mm	±0.8 %	6.2		36.0
250	10	267.4	±1.3 mm	±0.8 %	6.6		42.4
300	12	318.5	±1.5 mm	±0.8 %	6.9		53.0
350	14	355.6	−	±0.8 %	7.9		67.7
400	16	406.4	−	±0.8 %	7.9		77.6
450	18	457.2	−	±0.8 %	7.9		87.5
500	20	508.0	−	±0.8 %	7.9		97.4

Remarks 1 For the nominal size, either A or B shall be used, and letter symbol A or B shall be suffixed to the figures of nominal size to identify A or B series, respectively.

2 For the pipe whose nominal size is 350 A or larger, the tolerances on outside diameter may be determined by the measurement of the length of circumference. In this case, the tolerances shall be ±0.5 %.

When the length of circumference is used in measuring the outside diameter, either the measured value of the length of circumference or the diameter derived from the measured value may be used as the criteria. In both cases, the same value (±0.5 %) of tolerances shall be applied. The diameter (D) and the length of circumstance (l) shall be calculated reversibly from the following formula.

$$l = \pi \cdot D$$

where, $\pi = 3.141\,6$

3 In the case where the tolerances on wall thickness are confirmed to meet the specifications in the table 5, the tolerances on outside diameter in the table 5 shall not be applied to the local part being subjected to repairing, etc.

4 The value of mass shall be calculated from the following formula assuming 1 cm^3 of steel to be 7.85 g and rounding it off to 3 significant figures in accordance with **JIS Z 8401**.

$$W = 0.024\,66\,t(D-t)$$

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

b) The length of each pipe shall, as a rule, be 5 500 mm or over. The purchaser, however, may specify a length 3 600 mm or over, as necessary.

9 Appearance The appearance shall be as follows.

a) The pipe shall be practically straight, and its both ends shall be at a right angle to its axis.

b) The inside and outside surfaces of the pipe shall be well-finished and free from defects that are detrimental to practical use. Especially, the inside and outside surfaces of the galvanized pipe shall be practically smooth.

10 Method of manufacture The manufacturing method shall be as follows.

a) The pipe shall be manufactured by butt welding or electric resistance welding.

b) The pipe shall stay as manufactured. However, the cold-finished pipe shall be annealed after manufacture.

c) Both ends of the pipe of nominal size 300 A or smaller shall be threaded or plain-ended and those for 350 A or larger shall be plain ended. When required by the purchaser, the pipe may be furnished with bevel ends (1).

Note (1) Unless otherwise specified, the shape of the bevel end shall be as shown in Fig. 1.

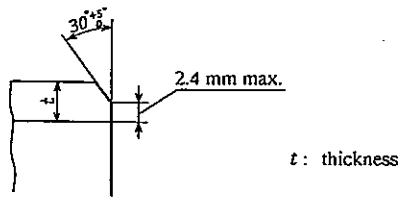

Fig. 1 Shape of bevel end

d) For the threaded pipe, taper threads (2) specified in **JIS B 0203** shall be applied on both ends, and a socket **JIS B 2302** or **JIS B 2301** shall be screwed into one end of the threads. The other end with no socket shall be provided with a thread protecting ring.

For the smaller pipes this part may be protected by other suitable means. When specified by the purchaser, however, the threaded pipe may dispense with such a socket.

Note (2) The inspection of taper threads shall be in accordance with JIS B 0253.

e) For the galvanized pipe, the pipe and the socket shall be galvanized before threading. In this case, the black pipe and the socket that have passed inspection shall be thoroughly cleaned by sand blasting, pickling, etc. and then galvanized by the hot-dipped galvanizing process.

f) The zinc used for galvanizing shall be at least equal to the distilled zinc metal Class 1 specified in JIS H 2107.

11 Test

11.1 Sampling of test material and number of test pieces

a) The sampling of test specimen and the number of test pieces for the tensile test, the flattening test or bending test, and the zinc coating test shall be as follows: For the tensile test and the flattening test or bending test, take as test specimens as specified in Table 6, and take one test piece from each test specimen.

Table 6 Method of sampling specimen

Division	Method of sampling specimen
Nominal size, 50 A or under	One pipe shall be taken from each 2 000 pipes or its fraction of the same dimensions (3)
Nominal size, 60 A or over up to and incl. 125 A	One pipe shall be taken from each 1 000 pipes or its fraction of the same dimensions
Nominal size, 350 A or over up to and incl. 300 A	One pipe shall be taken from each 500 pipes or its fraction of the same dimensions
Nominal size, 350 A or over	One pipe shall be taken from each 300 pipes or its fraction of the same dimensions

Note (3) The expression "same dimensions" means the same outside diameter as well as the same wall thickness.

b) Either the hydrostatic test or the nondestructive examination shall be performed for each pipe.

c) For the test of uniformity of zinc coating, one pipe shall be taken as the test specimen from each 500 pipes or its fraction of the same dimensions, from which each one set of test pieces (two) conforming to the specifications of 4 in JIS H 0401 shall be taken.

11.2 Chemical analysis

11.2.1 Chemical analysis General matters common to chemical analysis and method of sampling specimen for analysis shall be in accordance with 3 in JIS G 0303.

11.2.2 Analytical method The analytical method shall be in accordance with any one of the following Standards:

JIS G 1214

JIS G 1215

JIS G 1253

JIS G 1256

JIS G 1257

11.3 Tensile test

11.3.1 Test piece The test specimen shall be No. 11, No. 12A, No. 12B, No. 12C or No. 5 test piece specified in JIS Z 2201 and shall be sampled from a pipe.

11.3.2 Test method The test method shall be in accordance with JIS Z 2241.

11.4 Flattening test

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

11.4.2 Test method The test piece shall be placed between two flat plated at ordinary temperature and flattened by compression until the distance between the plates becomes the specified value, and checked for the occurrence of flaws or cracks on its wall surface. In this case, the weld shall be placed at right angles to the direction of compression as shown in Fig. 2.

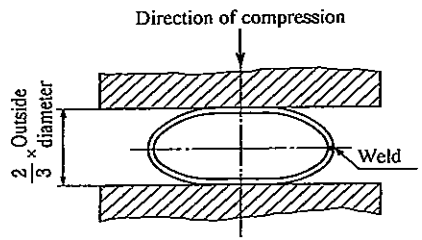

Fig. 2 Flattening test

11.5 Bend test

11.5.1 Test piece A test piece with an appropriate length shall be cut off from the end of a pipe.

11.5.2 Test method The test piece shall be bent at ordinary temperature through the angle around a cylinder with the inside radius specified in 5.3, and checked for the occurrence of flaws or cracks on its wall surface. In this case, the weld shall be placed at approximately 90° to the outermost bent portion.

11.6 Zinc coating test The test for the uniformity of zinc coating shall be in accordance with **JIS H 0401**.

11.7 Hydrostatic test or nondestructive examination The hydrostatic test or nondestructive examination shall be in accordance with (a) or (b), respectively.

a) When the pipe is subjected to hydrostatic pressure and kept under the specified pressure, its strength to withstand the pressure without leakage shall be examined.

b) The test method of nondestructive examination shall be in accordance with either **JIS G 0582** or **JIS G 0583**.

12 Inspection

12.1 Inspection The inspection shall be as follows:

a) General matters common to inspection shall be in accordance with **JIS G 0303**.

b) The chemical composition, mechanical properties, uniformity of zinc coating, hydrostatic characteristic or nondestructive characteristic, appearance and dimensions shall conform to the requirements of **4**, **5**, **6**, **7**, **8** and **9**.

12.2 Reinspection The pipe may be determined for final acceptance by a retest specified in **4.4** in **JIS G 0303**.

13 Marking Each pipe having passed the inspection shall be marked with the following items. However, the smaller pipes and other pipes specified by the purchaser may be bundled together and marked for each bundle by a suitable means. In both cases, the order of arranging the marked items is not specified. When approved by the purchaser, part of the items may be omitted.

a) Letter symbol of grade

b) Letter symbol denoting the manufacturing processes (4)

c) Dimensions (5)

d) Manufacturer's name or its identifying brand

Notes (4) The letter symbol indicating the manufacturing processes shall be as follows, provided that the dash may be omitted leaving a blank.

Electric-resistance welded steel pipe other than hot finished or cold-finished ones—E—G

Hot-finished electric-resistance welded steel pipe—E—H Cold-finished electric-resistance welded steel pipe—E—C Butt-welded steel pipe—B

(5) The dimensions shall be expressed by the nominal size.

14 Report The manufacturer shall submit the test report when previously required by the purchaser.

Attached Table 1 Normative references

JIS B 0203	*Taper pipe threads*
JIS B 0253	*Gauges for taper pipe threads*
JIS B 2301	*Screwed type malleable cast iron pipe fittings*
JIS B 2302	*Screwed type steel pipe fittings*
JIS G 0303	*General rules for inspection of steel*
JIS G 0582	*Ultrasonic examination for steel pipes and tubes*
JIS G 0583	*Eddy current examination of steel pipes and tubes*
JIS G 1214	*Methods for determination of phosphorus in iron and steel*
JIS G 1215	*Iron and steel—Methods for determination of sulfur content*
JIS G 1253	*Iron and steel—Method for spark discharge atomic emission spectrometric analysis*
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 H 0401	*Methods of test for hot dip galvanized coatings*
JIS H 2107	*Zinc metal*
JIS Z 2201	*Test pieces for tensile test for metallic materials*
JIS Z 2241	*Method of tensile test for metallic materials*
JIS Z 8401	*Rules for rounding off of numerical values*