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Arc welded carbon steel pipes

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Foreword

This translation has been made based on the original Japanese Industrial Standard 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 the draft being attached, based on the provision of Article 12 Clause 1 of the Industrial Standardization Law applicable to the case of revision by the provision of Article 14.

Consequently **JIS G 3457 : 1988** is replaced with this Standard.

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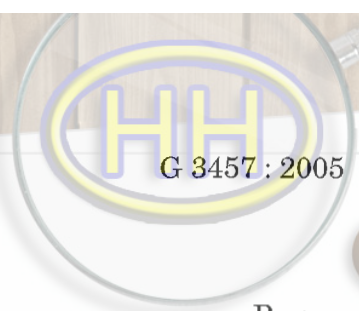
In the event of any doubts arising as to the contents,
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Arc welded carbon steel pipes

1 Scope This Japanese Industrial Standard specifies the arc welded carbon steel pipes (hereafter referred to as “pipes”) used for piping for steam, water, gas, air, etc. of comparatively low working pressure.

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 methods for heat analysis of steel products*

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

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

JIS G 0584 *Ultrasonic examination for arc welded steel pipes*

JIS Z 2201 *Test pieces for tensile test for metallic materials*

JIS Z 2241 *Method of tensile test for metallic materials*

JIS Z 3121 *Methods of tensile test for butt welded joints*

JIS Z 8401 *Guide to the rounding of numbers*

3 Grade and designation The pipes shall be classified into one grade and its letter symbol shall be as given in table 1.

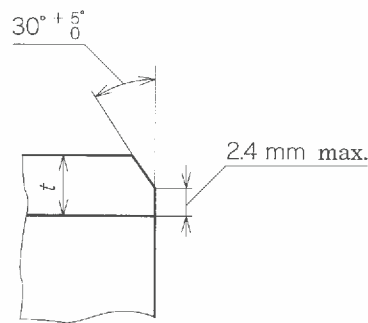
Table 1 Letter symbol of grade

Designation of grade
STPY 400

4 Method of manufacture The method of manufacture of pipe shall be as follows:

- a) The pipes shall be manufactured by spiral seam or straight seam welding. In either case, the internal and external surfaces of the pipe shall be automatic submerged arc welded in a butt joint.
- b) The pipes shall be either as welded or as cold-expanded after welding, and, as a rule, should not be subjected to heat treatment.
- c) Both ends of the pipe shall be finished plain ended or bevel ended⁽¹⁾.

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



t : thickness 22 mm max.

Figure 1 Shape of bevel end

5 Chemical composition The pipes shall be tested in accordance with 10.1 and the resulting ladle analysis values shall conform to table 2.

Table 2 Chemical composition

Unit: %

Designation of grade	C	P	S
STPY 400	0.25 max.	0.040 max.	0.040 max.

6 Mechanical properties

6.1 Tensile strength, yield point or proof stress and elongation The pipes or either the steel strips or steel plates used for the pipes shall be tested in accordance with 10.2 and the resulting tensile strength, yield point or proof stress and elongation shall comply with table 3. The minimum value of elongation for the pipes under 8 mm in wall thickness shall be in accordance with table 4.

Remarks : The values in table 4 are calculated by nominally subtracting 1.5 from the elongation rates given in table 3 for each decrease of 1 mm from 8 mm in wall thickness, and rounded off to an integer in accordance with rule A of **JIS Z 8401**.

6.2 Tensile strength of welds The welds of the pipes shall be tested in accordance with 10.3 and the resulting tensile strength shall comply with table 3. However, for the pipes cold-expanded later, the tensile test at the welded portion may be omitted according to the agreement between the purchaser and the manufacturer.

Table 3 Mechanical properties

Designation of grade	Tensile strength N/mm ²	Yield point or proof stress N/mm ²	Elongation % No. 5 test piece, transverse
STPY 400	400 min.	225 min.	18 min.

Remarks 1 The test piece shall be taken from the portion which does not involve welded seams.

2 1 N/mm² = 1 MPa

Table 4 Calculation examples of elongation of No. 5 test piece (transverse) for pipes under 8 mm in wall thickness

Unit : %

Division of wall thickness	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
Elongation	18	16	15

7 Hydraulic test characteristic or nondestructive test characteristic The pipes shall be tested in accordance with **10.3** and the resulting hydraulic test characteristic or nondestructive test characteristic shall conform to the following:

- a) **Hydraulic test characteristic** When a hydraulic test of **10.3 a)** is applied, the pipes shall withstand it without leakage.
- b) **Nondestructive test characteristic** The pipes shall be subjected to the non-destructive examination specified in **10.3 b)**, and there shall be no signal greater than those produced by the artificial defects of the reference test block grade UY of the working sensitivity division specified in **JIS G 0584**.

8 Dimensions, mass and dimensional tolerances

8.1 Dimensions and mass The outside diameter, wall thickness and mass of the pipes shall be as specified in table 5.



Table 5 Dimensions and unit mass of arc welded carbon steel pipes

Unit: kg/m

Nominal diameter		Outside dia. mm	Wall thickness mm														
			6.0	6.4	7.1	7.9	8.7	9.5	10.3	11.1	11.9	12.7	13.1	15.1	15.9		
A	B																
350	14	355.6	51.7	55.1	61.0	67.7											
400	16	406.4	59.2	63.1	69.9	77.6											
450	18	457.2	66.8	71.1	78.8	87.5											
500	20	508.0	74.3	79.2	87.7	97.4	107	117									
550	22	558.8	81.8	87.2	96.6	107	118	129	139	150	160	171					
600	24	609.6	89.3	95.2	105	117	129	141	152	164	175	187					
650	26	660.4	96.8	103	114	127	140	152	165	178	190	203					
700	28	711.2	104	111	123	137	151	164	178	192	205	219					
750	30	762.0		119	132	147	162	176	191	206	220	235					
800	32	812.8		127	141	157	173	188	204	219	235	251	258	297	312		
850	34	863.6				167	183	200	217	233	250	266	275	316	332		
900	36	914.4				177	194	212	230	247	265	282	291	335	352		
1 000	40	1 016.0				196	216	236	255	275	295	314	324	373	392		
1 100	44	1 117.6						260	281	303	324	346	357	411	432		
1 200	48	1 219.2						283	307	331	354	378	390	448	472		
1 350	54	1 371.6									399	426	439	505	532		
1 500	60	1 524.0									444	473	488	562	591		
1 600	64	1 625.6											521	600	631		
1 800	72	1 828.8											587	675	711		
2 000	80	2 032.0												751	791		

- Remarks 1 To indicate the nominal diameter of the pipe, either the letter A or B shall be used, A or B being suffixed to the figures of nominal diameter for identification.
- 2 The value of mass shall be calculated from the following formula assuming 1 cm³ of steel to be 7.85 g and rounded off to 3 significant digits in accordance with rule A of JIS Z 8401. However, the value exceeding 1 000 kg/m shall be rounded off to a whole number of kg/m.

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

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

- 3 When the dimensions not given in the above table are necessary, agreement shall be made between the purchaser and the manufacturer.

8.2 Dimensional tolerances The tolerances on outside diameter and wall thickness of the pipes shall be as specified in table 6.



Table 6 Tolerances on outside diameter and wall thickness

Unit: %

Outside diameter		±0.5 (Measurement based on the length of circumference.)
Tolerance on wall thickness	Nominal diameter 450 A or under	+15 -12.5
	Nominal diameter Over 450 A	+15 -10

Remarks 1 In determining the outside diameter, either the measured value of the length of circumference or the diameter derived from the measured value may be used. In this case, the outside diameter (D) and the length of circumference (l) shall be calculated by transposing the following formula.

$$l = \pi \times D$$

where, l : length of circumference (mm)

$$\pi = 3.1416$$

D : outside diameter (mm)

2 To the portions under repairs and the like, the above tolerances on outside diameter shall not be actually applied, provided it is confirmed that the wall thickness is within the tolerance range.

8.3 Pipe length The length of each pipe shall be 4 000 mm or over.

9 Appearance The appearance of pipe shall be as follows:

- a) The pipe shall be straight for practical purposes, and both of its ends shall be at right angles 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.

10 Test

10.1 Chemical analysis

10.1.1 General matters of chemical analysis and sampling method General matters common to chemical analysis and method of sampling specimens for analysis shall be in accordance with clause 8 of **JIS G 0404**.

10.1.2 Analytical method The analytical method shall be in accordance with **JIS G 0320**.

10.2 Tensile test

10.2.1 Sampling of specimens and number of test pieces The method of sampling test specimens and the number of test pieces for the tensile test and the tensile test for welds shall be as specified in table 7 and table 8.



Table 7 Method of sampling test specimens and number of test pieces (in case of tensile test)

To be taken from the pipe	To be taken from the steel strip in coil	To be taken from the steel plate
Take one test specimen for each 1 200 m or its fraction from the pipes of the same dimensions ⁽²⁾ , and then take one test piece from it.	Take one test specimen from each lot of the same heat and thickness, and take one test piece from it. However, take two test specimens from each lot exceeding 50 t.	Take one test specimen from each lot of the same heat of the maximum thickness of the plate within twice the minimum thickness. However, take two test specimens from each lot exceeding 50 t.

Note ⁽²⁾ The term “same dimensions” means the same wall thickness combined with the same outside diameter.

Table 8 Method of sampling test specimens and number of test pieces (in the case of tensile test of welds)

To be taken from the pipe	To be taken from the end of tubular one welded under the same conditions as the pipe
Take one test specimen from each 1 200 m or its fraction of the pipes of the same dimensions ⁽²⁾ , and then take one test piece for tensile test for welds from it.	Take one test specimen from each quantity equivalent to 1 200 m or its fraction of the pipes of the same dimensions ⁽²⁾ , and take one test piece for tensile test for welds from it.

10.2.2 Test pieces Test pieces shall be as follows:

- a) **Tensile test** The test specimen shall be No. 5 test piece specified in **JIS Z 2201** to be cut off from the pipe by either of the following methods:
- 1) The test piece shall be cut off transversely from the pipes for cold expansion and finished into a flat piece.
 - 2) The test piece shall be cut off transversely from the pipes other than those for cold expansion and finished into a flat piece or cut off from the steel strip in coil or steel plate used for the pipe.
- b) **Tensile test of welds** The test piece shall be No. 1 test piece specified in **JIS Z 3121** to be cut off from the pipe or from the test specimen prepared from the end of the tubular one welded under the same conditions as the pipe itself, and shall be finished into a flat piece.

10.2.3 Test method The test method shall be as specified in **JIS Z 2241**.

10.3 Hydraulic test or nondestructive examination Conduct either the hydraulic test or the nondestructive examination for each pipe. Preference of either method shall be subject to the discretion of the manufacturer, unless specified by the purchaser.

- a) **Hydraulic test** The pipe is subjected to a hydraulic pressure of 2.5 MPa for a minimum duration of 5 s and check for any leakage.
- b) **Nondestructive examination** The test method of the nondestructive examination shall be as specified in **JIS G 0584**.

11 Inspection

11.1 Inspection The inspection shall be as follows:

- a) General matters of inspection shall be as specified in **JIS G 0404**.
- b) The chemical composition shall conform to the requirement of clause **5**.
- c) The mechanical properties shall conform to the requirement of clause **6**.
- d) The hydraulic test characteristic and nondestructive test characteristic shall conform to the requirement of clause **7**.
- e) The dimension, mass and tolerances shall conform to the requirement of clause **8**.
- f) The appearance shall conform to the requirement of clause **9**.

11.2 Reinspection The pipe which has failed in the tensile test is entitled to a retest specified in **9.8** of **JIS G 0404** for final acceptance.

12 Marking Each pipe having passed the inspection shall be marked with the following items. The order of arranging the items is not specified. With the approval of the purchaser, the items may be partially omitted.

- a) Letter symbol of grade
- b) Dimensions⁽³⁾
- c) Manufacturer's name or identifying brand

Note ⁽³⁾ The dimensions shall be expressed as follows:

Nominal diameter × wall thickness or outside diameter × wall thickness

Example: 400 A × 6.4

13 Report The manufacturer shall, as a rule, submit to the purchaser the report on the test results, ordered dimensions, quantity and work lot number traceable to the manufacturing conditions, etc. In this case, the report shall conform to the requirements of clause **13** in **JIS G 0404**. The type of report shall be, unless otherwise specified, type 2.3 or 3.1.B in table 1 of **JIS G 0415**.



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