JIS G3454 Carbon Steel Pipes for Pressure Service

1. Scope

This Japanese Industrial Standard specifies the carbon steel pipes, hereinafter referred to as the "pipes", used for pressure service at an approximate maximum temperature of 350℃. The pipes for high pressure service shall be in accordance with JIS G 3455.

Remarks

1. Pertaining to the electric-resistance welded steel tubes, when previously agreed upon with the manufacturer, the purchaser may designate the supplementary quality requirements Z 3 or Z 4 specified in Appendix, in addition to the items specified in this text.

Appendix Z 3 Ultrasonic Examination

Appendix Z 4 Eddy Current Examination

2. The units and numerical values given in { } in this Standard are based on the international System of Units (SI) and are appended for informative reference.

Further, the traditional units accompanied by numerical values in this Standard shall be converted to the SI units and numerical values on Jan. 1, 1991.

2. Grade and Designation

The pipe shall be classified into two grades and their letter symbols shall be as given in Table 1-1 or Table 1-2.

Table1

Letter symbol of grade	(Informative reference) Traditional letter symbol of glade
STPG 370	STPG 38
STPG 410	STPG 42

World standard comparative table

KS		ASTM		JIS		DIN		BS	
Grade Number	GRADE	Grade Number	GRADE	Grade Number	GRADE	Grade Number	GRADE	Grade Number	GRADE
D 3562	SPPS 370 SPPS 38	A 53 A 135	Gr A Gr A	G-3454	STPG 370 (STPG 38)	1626 1628 1629 1630 17172	St 37.0 St 37.4 St 37.0 St 37.4 StE240.7	3601 778	ERW 360 S 360 HFS 22 CDS 22 ERW 22

	SPPS 410 SPPS 42	A 53 A 135	Gr B Gr B		STPG 410 (STPG 42)	1626 1628 1629 1630 17172	St 44.0 St 44.4 St 44.0 St 44.4 StE290.7	3601	ERW 360 S 360 HFS 27 CDS 27 ERW 27

API	
Grade Number	GRADE
5L	Gr A Gr B
	X 42 X 52 X 56 X 60 X 65 X 70 X 80

3. Method of Manufacture.

The Method of manufacture shall be as follows:

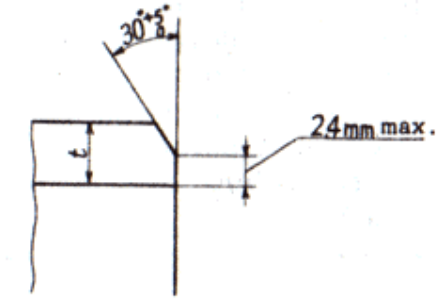
3.1 The pipe shall be manufactured by either the seamless of the electric resistance welding process.

3.2 (Applicable till the end of 1990) The pipe shall stay as manufactured. However, the cold- finished steel pipe shall be annealed after manufacture.

The purchaser may specify heat treatment for the weld of the electric resistance welded steel pipe of grade STPG 42, as necessary.

3.3 When required by the purchaser, the pipe may be furnished with a becwl end(1)

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



4. Chemical Composition

The pipe shall be tested in accordance with 9.1 and the ladle analysis values obtained shall conform to Table 2-1 or Table 2-2.

Table 2

Letter symbol of grade	Elongation %				
	C	Si	Mn	P	S
STPG 370	0.25 max.	0.35 max.	0.30 to 0.90	0.040 max.	0.040 max.
STPG 410	0.30 max.	0.35 max.	0.30 to 1.00	0.040 max.	0.040 max.

5. Mechanical Properties

5.1 Tensile Strength, Yield Point or Proof Stress and Elongation

The pipe shall be tested in accordance with 9.2 and the tensile strength, yield point or proof stress and elongation obtained shall comply with Table 3-1

Letter symbol of grade	Table 3 Mechanical Properties					
	Tensile strength	Yield point or proof stress	Elongation %			
	kgf/mm^2 {N/mm^2}	kgf/mm^2 {N/mm^2}	No.11 and No.12 test pieces	No. 5 test pieces	No. 4 test piece	
			Longitudinal	Transverse	Longitudinal	Transverse
STPG 370	38 {373}min	22{216} min	30 min	25 min	23 min	28 min
STPG 410	42{412}min	25{245} min	25 min	20 min	19 min	24 min

Remarks.

1. When the tensile test is carried out for No. 12 or No.5 test piece for the pipe under 8mm in wall thickness, the minimum value of elongation shall be obtained by subtracting 1.5% from the values of elongation given in Table 3-1 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 Table1.

2. The values of elongation given in Table 3-1 shall not be applied to the pipe whose nominal diameter is 25A or smaller. However, the value of elongation shall be recorded.

3. In sampling the tensile test pieces from the electric resistance welded steel pipe, 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 8mm in wall thickness

Letter symbol of grade	shape of test piece	Elongation value relating to wall thickness %						
		Over 7mm to and excl.8mm	Over 6mm to and excl7mm	Over 5mm to and excl.6mm	Over 4mm to and excl. 5mm	Over 3mm to and excl. 4mm	Over 2mm to and excl. 3mm	Over 1mm to and excl. 2mm
STPG 370	No12 test piece	30	28	27	26	24	22	21
	No5. test piece	25	24	22	20	19	18	16
STPG 410	No. 12 test piece	25	24	22	20	19	18	16
	No 5. test piece	20	18	17	16	14	12	11

5.2 Flatness

When tested in accordance with 9.3, the pipe shall not generate flaws of cracks on its wall surface. In this case, the distance between the two plates shall be in accordance with the following formula:

In the case of seamless steel pipe :

$$H = \frac{(1 + e)t}{e + \frac{t}{D}}$$

In the case of of electric resistance welded steel pipe:

for weld = H=(2/3)D

for the portion without weld = H=(1/3)D

where

H : distance between flattening plates (mm)

t : wall thickness of pipe (mm)

D :outside diameter of pipe (mm)

e : constant individual defined for each grade of pipe

0.08 for STPG 370

0.07 for STPG 410

5.3 Bendability For the pipe whose nominal diameter is 40A or smaller, In the test of 9.4 the pipe shall ve free from the occurrence of flaws or cracks on its wall surface, In this case the pipe shall be vent through 90ì around an inside radius that is 6 times its outside diameter

6. Hydrostatic Test of Nondestructive Test

The pipe shall be tested in accordance with 9.5 and the resulting hydrostatic characteristic or nondestructive characteristic shall conform to either of the following two. The preference for which of them shall be left to the specification by the purchaser or to the discretion of the manufacturer.

6.1 Hydrostatic Test

When a hydrostatic pressure specified in Attached Table 1-1 or 1-2 is applied, the pipe shall withstand it without leakage.

6.2 Nondestructive Test A nondestructive examination by either an ultrasonic test or an eddy current test shall be made on the pipe, and there shall be no signal greater than those produced by the artificial defects of the reference test block of division UD of the working sensitivity specified in JIS G 0582 or of division EY of the working sensitivity specified in JIS G 0583.

Hydrostatic Test Pressure

Unit: kgf/㎠{bar}

Schedule number Sch	10	20	30	40	60	80
Hydrostatic Test Pressure	20 {20}	35 {34}	50 {49}	60 {59}	90 {88}	120 {118}

Remark: 1 bar=10^5Pa

7. Appearance

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

7.2 The inside and outside surfaces of the pipe shall be well-finished and free form defects that are detrimental to practical use.

8. Dimensions, Mass and Dimensional Tolerances

8.1 Dimensions and Mass

The outside diameter, wall thickness and mass of the pipe shall be as specified in Attached Table 2.

8.2 Dimensional Tolerances

The tolerances on the outside diameter and wall thickness of the pipe shall conform to Table 4. The length of a pipe shall be 4000mm or over.

Table 4. Tolerances on Outside Diameter and Wall Thickness

Division	Tolerances on outside diameter	Tolerances on wall thickness
Hot-finished seamless steel pipe	40 A or under 【0.5mm	Under 4mm

	50A or over up to and incl. 125 A 【1%	+0.6mm -0.5mm
	150A 【1.6mm	4mm or over +15% -12.5%
	200A or over 【0.8% For the pipe of nominal size 350 A or over, 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%.	
Cold-finished seamless steel pipe and electric resistance welded steel pipe	25 A or under 【0.3mm	Under 3mm 【0.3mm 3mm or over 【10%
	32 A or over 【0.8% For the pipe of nominal size 350 A or over, 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%.	

Remarks

1. 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 form 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 circumference (ラ) shall be calculated reversibly from the following formula.

ラ=ヰD

where ヰ=3.1416

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

9. Test

9.1 Chemical analysis

9.1.1 Chemical analysis

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

9.1.2 Analytical Method

The analytical method shall be in accordance with 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

9.2 Tensile Test

9.2.1 Test Piece

The test piece shall be No. 11, No. 12 A, No. 12 B, No. 12 C, No. 4 or No. 5 test piece specified in JIS Z 2201 and shall be sampled from a pipe. In this case, the gauge length for No. 4 test piece shall be 50 mm.

9.2.2 Test Method

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

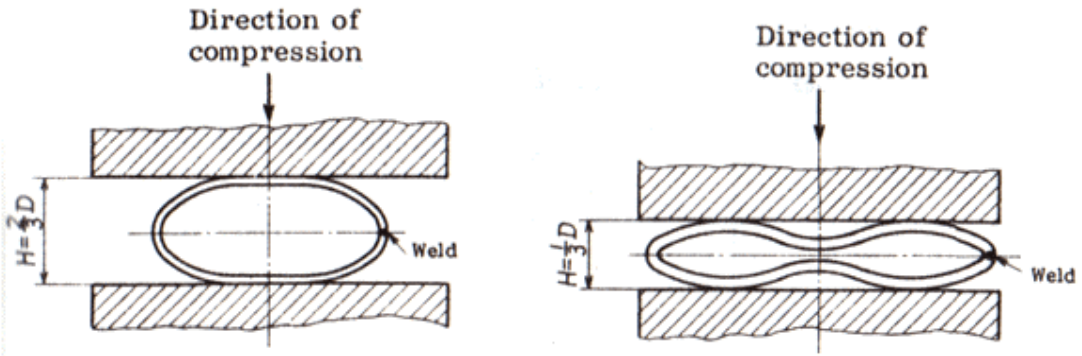
9.3 Flattening Test

9.3.1 Test Piece

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

9.3.2 Test Method

The test piece shall be placed between two flat plates at ordinary temperature and flattened by compression until the distance between the plates comes to the specified value, and checked for the occurrence of flaws of cracks on its wall surface. For the electric resistance welded steel pipe, the weld shall be placed at right angles to the direction of compression, and either the weld in case H=(2/3)D or the portion other than the weld in case H=(1/3)D shall be examined as shown in Fig. 2 and Fig. 3.



9.4 Bending Test

9.4.1 Test piece

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

9.4.2 Test Method

The test piece shall be bent at ordinary temperature through the angle around a cylinder with the inside radius specified in 4.3, and checked for the occurrence of flaws or cracks onit wall surface. In this case, for the electric resistance welded steel pipe, the weld shall be placed in the outermost bent portion.

9.5 Hydrostatic Test of Nondestructive Examination

The hydrostatic test or nondestructive examination shall be in accordance with either one of the following:

9.5.1 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.

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

10. Inspection

10.1 Inspection

Inspection shall be as following:

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

10.2 The chemical composition, mechanical properties, hydrostatic characteristic of nondestructive characteristics, dimensions and appearance shall conform to the requirements specified in 3,. 4,. 5,. 6,. and 7 However, appropriate nondestructive examinations other than those specified in 9.5 (2) may substitute as agreed upon by the purchaser and the manufacturer.

Further, when the supplementary quality requirements given in Appendix are specified by agreement between the purchaser and the manufacturer, the results of inspection shall conform to the requirements specified in Z 3 or Z 4.

10.3 Either the hydrostatic test of the nondestructive examination shall be performed for each pipe.

10.4 For the tensile test and flattening test of bending test, take pipes as test specimens as specified in Table 5 , and take one test piece from each test specimen.

Table 5. Method of Sampling Specimen

Division	Method of sampling specimen and number of test pieces
Nominal diameter, 50 A or under	On shall be taken form each 1000 pipes of its fraction of the same dimensions (2)
Nominal diameter, 65 A or over up to and incl. 125 A	one shall be taken from each 500 pipes or its fraction of the same dimensions
Nominal diameter, 150 A or over up to and incl. 300 A	One shall be taken form each 250 pipes of its fraction of the same dimensions
Nominal diameter, 350 A or over	One shall be taken form each 150 pipes or its fraction of the same dimensions

Note (2) The expression "same dimensions" means the same outside diameter as well as the same wall thickness..

11.Reinspection

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

12. Marking

Each pipe having passed the inspection shall be marked with the following items. However, the smaller pipes or 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, a part of the items may be omitted.

(1) Letter symbol of grade

(2) Letter symbol indicating the manufacturing processes(3)

(3) Dimensions([4])

(4) Manufacturer's name or its identifying brand

(5) Letter symbol denothing the supplementary quality requirement, Z

Note([3])

The letter symbol indicating the manufacturing processes(3) shall be as follows, provided that the dash may be omitted leaving a blank.

Hot-finished seamless steel pipe - S - H

Cold-finished seamless steel pipe- S - C

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

Hot-finished electric resistance welded steel pipe- E - H

Cold-finished electric resistance welded steel pipe - E - C

Note([4])

The dimensions shall be expressed as follows.

Nominal diameter × Nominal wall thickness

Example: 50A × Sch 40, 2 B × Sch 40

13. Report

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

Appendix. Supplementary quality Requirements

The supplementary quality requirements shall be applied when requested by the purchaser, and the designated items among them shall be carried out by the manufacturer.

Z3 Ultrasonic Examination

Z3.1The criterion of the working sensitivity for the ultrasonic examination shall comply with the division UC specified in JIS G 0582, and there shall be no signal greater than those produced by the artificial defects of the reference test block.

Z3.2 The test method of the ultrasonic examination shall be in accordance with JIS G 0582.

Z3.3 The ultrasonic examination shall be performed for each pipe and the results shall conform to the requirements specified in (1)

Z4 Eddy Current Examination

Z4.1 The criterion of the working sensitivity for the eddy current examination shall comply with the division EW specified in JIS G 0583, and there shall be no signal greater than those produced by the artificial defects of the reference test block.

Z4.2 The test method of the eddy current examination shall be in accordance with JIS G 0583.

Z4.3 The eddy current examination shall be performed for each pipe and the results shall conform to the requirements specified in (1).

JIS Number and Corresponding Foreign Standards

JIS			ASTM			BS			DIN			NF			ISO			Index Number
Standard Number	Grade	Type	Standard Number	Grade	Type	Standard Number	Grade	Type	Standard Number	Grade	Type	Standard Number	Grade	Type	Standard Number	Grade	Type	
G3454	STPG370 (STPG38)	C	A135	Gr A	C	3601	ERW360	C	1626	St37.0	C	A49-112	TS27b	C	559	TS4	C	C002
			A587	-	C	"	S360	C	1629	St37.0	C	A49-141	TS37a	C	2604/2	TS4	C	
									17172	StE210.7	C	A49-142	TS37a	C	2604/3	TW4	C	
												"	TS37b	C				
												A49-150	TSE235	C				
												A49-212	TS37c	C				
												A49-242	TS37c	C				
												A49-250	TAE24a	C				
												A49-400	TSE220	C				
	STPG410 (STPG42)	C	A135	GrB	C	3601	ERW410	C	1626	St44.0	C	A49-112	TS42b	C	559	TS9	C	
			A524	-	C	"	S410	C				A49-141	TS42b	C	2604/2	TW9	C	
												A49-212	TS42c	C	2604/3	TW9	C	
												A49-242	TS42c	C	3183	E24-1	C	
												A49-250	TSE26b	C	"	E24-2		
												A49-400	TSE250	C				