

JIS G3448 Light Gauge Stainless Steel Pipes for Ordinary Piping

1. Scope

This Japanese Industrial Standard specified the stainless steel pipes (hereafter referred to as "pipes") used for the piping of water supply, hot water supply, drainage, cold and hot water supply and there, of which maximum working pressure is 1MPa or under.

Remarks: The standards cited in this Standard are shown in Attached Table 1.

2. Grade and symbol

Pipes shall be classified into two grades, and their symbols shall be as given in Table 1.

Table 1. Symbol of grade

Symbol of grade	Use (Informative reference)
SUS 304 TPD	For ordinary piping of water supply, hot water supply, drainage, cold and hot water supply, etc.
SUS 316 TPD	For use to require corrosion resistance higher than SUS 304 to cope with water quality, environments, etc.

World standard comparative table

KS		JIS	
Grade Number	GRADE	Grade Number	GRADE
D3595	STS 304 TPD	G-3448	SUS 304 TPD
	STS 316 TPD		SUS 316 TPD

3. Materials and method of manufacture

The materials of pipes and the method of manufacture shall be as follows:

3.1 Materials steel plates or stripe used for the pipes shall be as specified in either JIS G 4304, JIS 4305

3.2 Method of manufacture The pipes shall be manufactured by automatic arc welding, laser welding, or electric resistance welding, and shall, as a rule, be not heat-treated. The heat treatment, if applied, shall be made by solution treatment to be followed by acid cleaning or similar treatments, Heat treatments other than the solution treatment shall be as agreed upon between the purchaser and supplier.

4. Mechanical properties

4.1 Tensile strength and elongation

Pipes shall be tested in accordance with 9.1 and the resulted tensile strength and elongation shall conform to Table 2.

Table 2. Tensile strength and elongation

Symbol of grade	Tensile strength kgf/mm ² {N/mm ² }	Elongation %		
		No.11 test piece	No. 5 test piece	
		Longitudinal direction		Lateral direction
		SUS 304 TPD	520 min.	35 min.
SUS 316 TPD				

Remarks

No.12 test piece or No.5 test piece shall be taken from seamless portions.

4.2 Flattening resistance

Pipes shall be tested in accordance with 9.2 and free from flaws and cracks on the wall of the pipes. In this case, the distance between the flat plates shall be 2/3 of the outside diameter of the pipe.

5. Hydraulic or pneumatic test characteristic, or nondestructive test characteristic

Pipes shall be tested in accordance with 9.2 and free from flaws and cracks on the wall of the pipes. In this case, the distance between the flat plates shall be 2/3 of the outside diameter of the pipe.

5.1 Hydraulic or pneumatic test characteristic When a hydraulic pressure of 2.5 MPa or a pneumatic pressure of 0.6 MPa is applied, the pipe shall withstand it without any leakage.

5.2 Nondestructive test characteristic Pipes shall be subjected to the nondestructive test by the Eddy current test, and there shall be no signal equal to or greater than the signals produced by the artificial flaws of the reference test piece of the sensitivity of the flaw detection division EY specified in JIS G 0583.

6. Dimensions, dimensional tolerances, and mass

6.1 Outside diameter, thickness, dimensional tolerances, and mass of pipes shall be as given in Table 3.

Table 3. Outside diameter, thickness, dimensional tolerances, and mass

Unit: mm

Designation Su	Outside diameter	Tolerance on outside diameter		Thickness	Tolerance on thickness	Unit mass (kg/m)	
		Outside diameter	Circumference			STS 304 TPD	STS 316 TPD
8	9.52	0 -0.37	-	0.7	【0.12	0.154	0.155
10	12.70			0.8		0.237	0.239
13	15.88			0.8		0.301	0.303

20	22.22			1.0		0.529	0.532	
25	28.58			1.0		0.687	0.691	
30	34.0	【0.34	【0.20	1.2		0.980	0.986	
40	42.7	【0.43		1.2		1.24	1.25	
50	48.6	【0.49	【0.25	1.2		1.42	1.43	
60	60.5	【0.60		1.5	【0.15	2.20	2.21	
75	76.3		1.5			2.79	2.81	
80	89.1		【0.8%	2.0	【0.30	4.34	4.37	
100	114.3			2.0			5.59	5.63
125	139.8			2.0			6.87	6.91
150	165.2	【1%		3.0	【0.40	12.1	12.2	
200	216.3		3.0	15.9		16.0		
250	267.4		3.0	19.8		19.9		
300	318.5		3.0	23.6		23.8		

Remarks

1. The outside diameter in the tolerance on outside diameter means the tolerance on the measured value of the pipe.
2. The circumference in the tolerance on outside diameter means the tolerance on the value obtained by dividing the measured value of the circumference of the pipe by 3.1416.
3. The numerical value of unit mass shall be calculated according to the following equations and be rounded off to three significant digits in accordance with JIS Z 8401.

Symbol of grade	Fundamental masskg	Equation
SUS 304 TPD	7.93	$W=0.02491 t (D - t)$
SUS 316 TPD	7.98	$W=0.02507 t (D - t)$

where,

W: unit mass of pipe (kg/m)

t: thickness of pipe (mm)

D: outside diameter of pipe (mm)

Further, the fundamental mass means the mass of the stainless steel of 1 mm in thickness and 1m in area.

6.2 Length and its tolerances

The length of one pipe shall generally be 4000 mm. The tolerances on length shall be provided on the plus side only.

7. Appearance

The appearance of pipes shall be as follows:

- (1) The pipes shall be straight for practical use and their both ends shall be at right angles to the axes of the pipes.
- (2) The internal and external surfaces of the pipes shall be well finished and free from defects injurious to use.

8. Influence on water quality

Pipes to be used for city water of the like shall not exert any bad influences on the quality of water. The water quality standard in this case shall be as specified in 4. Annex.

9. Tests

9.1 Tensile test

9.1.1 Sampling of test specimen and number of test piece

For the sampling of a test specimen and the number of test pieces, one test specimen shall be sampled from each 250 pipes of the same dimensions in the same manufacturing lot of its fraction, and one tensile test piece, and one flattening test piece shall be sampled from the test specimen.

9.2.2 Test piece The test piece shall be as specified in JIS 2241.

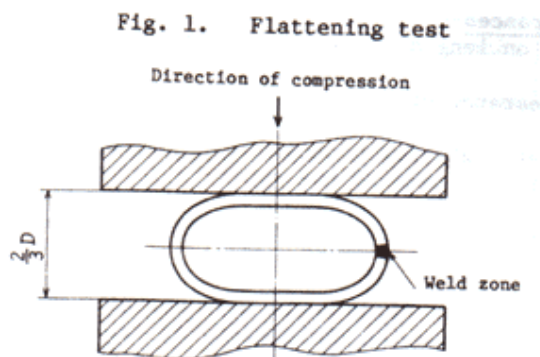
9.2 Flattening test

9.2.1 Test piece

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

9.2.2 Test method

Place a test piece between two flat plates at ordinary temperature, compress it until the distance between the two plates reaches the specified value, and examine the existence of flaws or cracks on the wall of the compressed pipe.



9.3 Flaring test

- (1) Sampling of test specimen and number of test piece.
- (2) Eddy current examination The test method shall be as specified in JIS G 0583.

9.4 Elution test

The method for elution test shall be as specified in Annex.

10. Inspection

10.1 Inspection

The inspection shall be as follows:

- (1) General matters of inspection shall be as specified in JIS G 0303.
- (2) The mechanical properties shall conform to the requirements specified in 4.
- (3) The hydraulic or pneumatic test, or Eddy current examination shall conform to the requirements specified in 5.
- (4) The dimensions shall conform to the requirements specified in 6.

10.2 Retest Pipes having passed the inspection shall be marked with the following items on each pipe. The order of arranging the items is not specified. However, when approved by the purchaser, the pipes may be handled and the items may be marked on each bundle by a suitable method.

11. Marking

Pipes having passed the inspection shall be marked with the following items on each pipe. The order of arranging the items is not specified. However, when approved by the purchaser, the pipes may be bundled and the items may be marked on each bundle by a suitable method.

- (1) Symbol of grade
- (2) Symbol expressing manufacturing method⁽¹⁾⁽²⁾
- (3) Dimensions⁽³⁾
- (4) Manufacturer's name or abbreviation

Notes (1) The symbol expressing the manufacturing method shall be as follows. However, the sign of dash may be replaced by a space.

Automatic arc welded steel pipe: -A

Electric resistance welded steel pipe: -E

Laser welded steel pipe: -L

Note (2) The symbol of heat treatment, if conducted, shall be -HT to be suffixed next to A, E, or L.

Note (3) The size shall be expressed by "designation".

Example: 30 Su

12. Report

If required by the purchaser in advance, the manufacturer shall submit the test report.

Informative reference The chemical composition for JIS G 4303 and JIS G 4305 shall be as specified in Informative reference(Chemical Composition) Table 1.

Informative reference Table 1.

Symbol of grade	Chemical Composition %							
	C	Si	Mn	P	S	Ni	Cr	Mo
SUS 304	0.08 max.	1.00 max.	2.00 max.	0.045 max.	0.030 max.	8.00~10.50	18.00~20.00	-
SUS 316	0.08 max.	1.00 max.	2.00 max.	0.045 max.	0.030 max.	10.00~14.00	16.00~18.00	2.00~3.00

Annex

Methods and criteria of elution test for light gauge stainless steel pipes for ordinary piping.

1. Scope

This Annex specifies the methods and criteria of elution test for light gauge stainless pipes for ordinary piping.

2. Test item

Turidity, chromaticity, loss of residual chlorine, odour, taste, iron, and hexavalent chromium.

3. Test method

3.1 Preparation of test water

3.1.1 Preparation of calcium hydroxide solution

After thoroughly mixing calcium hydroxide $[\text{Ca}(\text{OH})_2]$ with pure water ⁽¹⁾ at a rate of about 2 w/v & shield air, and allow to stand for 24 h or longer. Take a suitable aliquot of the supernatant, add the same amount of pure water, filter with filter paper of class 5 C of JIS p 3801, and preserve in a sealed container, When a film or a precipitate is generated in this solution, use it after filtration.

Note (1) The pure water herein is distilled water or dematerialized water of which electric conductivity is at most $2 \mu\text{S}/\text{cm}(25^\circ\text{C})$.

3.1.2 Measurement of calcium hardness of calcium hydroxide solution

(1) Reagents

(a) Indicator for calcium

Thoroughly grind down 0.5 g of 2-hydroxy-1-(2-hydroxy-4-sulfo-1-naphthylazo)-3-naphthoate $[\text{C}_{20}\text{H}_{10}\text{N}_2 \cdot (\text{OH})_2\text{COOH} \cdot \text{SO}_3\text{H}]$ and 50g of powdery potassium sulfate to uniform mixture.

(b) 0.01 M EDTA Solution

Take 3.722g of disodium ethylenediaminetetracetate $[(\text{CH}_2\text{COO})_2\text{N} \cdot \text{CH}_2 \cdot \text{CH}_2 \cdot \text{N}(\text{CH}_2\text{COO})_2\text{H}_2 \cdot \text{Na}_2 \cdot 2\text{H}_2\text{O}]$, dried at $80 \times \text{C}$ for 5 h and left to cool in a desiccator, into

a l . volumetric flask, dissolve with pure water, and dilute to make the volume to 1 l. Reserve this solution in a brown bottle.

1 ml of this solution is equivalent to 1 mg of calcium carbonate.

(2) Test operation

Take 100 ml of pure water into a 300 ml Erlenmeyer flask, and add accurately 5 ml of calcium hydroxide solution thereto. Thereafter, add 9 ml of sodium hydroxide solution thereto so that the calcium hardness becomes about 30 mg/ l. Thereafter, regulate pG value to 7.5 to 8.0 by passing carbon dioxide, then add sodium hypochlorite solution of chlorine water, allow to stand for 12 h to 48 h , and allow to contain 1.0 mg/ l to 1.2 mg /l in free residual chlorine concentration.

Calcium hardness (CaCO₃ mg/l)= $\frac{100}{5}$

3.1.3 Preparation of test water take a necessary amount of pure water into a suitable container, and add calcium hydroxide solution thereto so that the calcium hardness becomes about 30 mg/l. Thereafter, regulate pH value to 7.5 to 8.0 by passing carbon dioxide, then add sodium hypochlorite solution or chlorine water, allow to stand for 12 h to 48 h, and allow to contain 1.0 mg/l to 1.2 mg/l in free residual chlorin concentration.

Then, take 1/5 to 1/10 amount of this solution into another container, pass carbon dioxide there through, prepare solution of low pH value, add it little by little to the original solution, adjust pH value to 7.0 \pm 0.2, and take solution as the test water.

3.2 Elution method

Cut a test pipe by a length given in Annex table 1, and wash it with clean water (city water or the like) for 1 h at a flow rate of not more than 5 m/min. Remove the water drops and clog up one end thereof with a stopper weapped in a polyethylene film (2). Thereafter, rinse once with test water, and fill the pipe with the test water. Clog up the other end in the same way, and allow it to stand for 24h at ordinary temperature. Then, take the water therein as sample water. Further fill a hard glass bottle with ground-in stopper of 1 l with test water simultaneously, stopper it tightly, shield light, allow to stand in the same place as the sample water for 24 h, and take it as black test water.

Annex Table 1.

Designation Su	Length m
8	20
10	12
13	8
20	4
25, 30	2 min.
40, 50	1 min.
60 or over	0.5 min.

Remarks: The length herein means the total length of test pipes.

3.3 Water quality analysis

The method for analysis of water quality shall be performed by a suitable method. However, the loss of residual chlorine shall be in accordance with 33.1 or 33.2 of JIS K 0102.

4. Criteria

Results of an elution test shall be expressed by the difference between the test value and the black test value. The criteria shall be as follows:.

Turbidity	0.5 degree max.
Chromativity	1degree max.
Loss of residual chlorine	0.7mg max.
Odour	Normal
Taste	Normal
Irom	0.06 mg Max.
Hexavalent chromium	0.01 mg Max.

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	
G3448 G3459	SUS		A312	TP304	SUS	3605	304S18	SUS	2462	X5CrNi189	SUS	A49-117	TUZ6 CN18.09	SUS	2604/2	TS47	SUS	C008
	304TP	SUS	A376	TP304	SUS	"	304S25	SUS	2463	Z5CrNi189	SUS	A49-147	TUZ CN18.09	SUS				
	304TPD	SUS				4128	-	SUS				A49-230	TUZ6 CN18.09	SUS				
	SUS		A312	TP304H	SUS	3605	304S59	SUS							2604/2	TS48	SUS	
	304HTP	SUS	A376	TP304H	SUS													
	SUS		A312	TP304L	SUS	3605	304A14	SUS	2462	X2CrNiMo 1810	SUS	A49-117	TUZ2 CN18.10	SUS	2604/2	TS46	SUS	
	304LTP	SUS				"	304S22	SUS	2463	X2CrNi189	SUS	A49-147	TUZ2 CL18.10	SUS				
												A49-230	TUZ2 CL18.10	SUS				

											A49-645	TUZ2 CL18.10	SUS						
											A49-647	TUZ2 CL18.10	SUS						
	SUS		A312																
	309TP	SUS																	
	309STP	SUS																	
	SUS		A312								A49-117	TUZ12 CN24.12	SUS	2604/2	TS68	SUS			
	310TP	SUS																	
	310STP	SUS																	
	SUS		A312	TP316	SUS	3605	316S18	SUS	2462	X5CrNiMo 1810	SUS	A49-117	TUZ6CND 17.11	SUS	1604/2	TS60	SUS		
	316TP	SUS	A376	TP316	SUS	"			2643	X5CrNiMo 1810	SUS	A49-147	TUZ6CND 17.11	SUS	"	TS61	SUS		
	316TPD	SUS	A651	TP316	SUS				"	X5CrNiMo 1812	SUS	A49-230	TUZ6CND 17.11	SUS					
										(17440)	SUS								
	SUS		A312	TP316H	SUS										2604/2	TS63	SUS		
	316HTP	SUS	A376	TP316H	SUS														
	SUS		A312	TP316L	SUS	3605	316A14	SUS	2462	X2CrNiMo 1810	SUS				2604/3	TS63	SUS		
	316LTP	SUS				"	316S22	SUS	"	X2CrNiMo 1812	SUS				"	TS58	SUS		
									2463	X2CrNiMo 1810	SUS								
									"	X2CrNiMo 1812	SUS								

