

# Materials Used for Piping Systems

## Amended Rules and Guidance

Rules for the Survey and Construction of Steel Ships Part K

Guidance for the Survey and Construction of Steel Ships Part K

Guidance for the Approval and Type Approval of Materials and Equipment for Marine Use

## Reason for Amendment

Part K of the Rules for the Survey and Construction of Steel Ships specifies requirements related to the materials used for the Group I piping and Group II piping, fuel piping and process piping systems of ships using low-flashpoint fuels, cargo piping and process piping systems of ships carrying liquefied gases in bulk and the cargo piping systems of ships carrying dangerous chemicals in bulk.

In common practice, however, piping not manufactured in accordance Part K of the Rules but manufactured in accordance with JIS or other standards tend to be equivalent in quality for the most part, in cases where the equivalency of the material used with that of the materials specified in Part K of the Rules is ensured. Moreover, many of the JIS or other standards are used for Group III piping and are referred to as standard values for chemical composition or strength for materials specified in Part K of the Rules.

Accordingly, relevant requirements are amended so as to treat piping manufactured in accordance with JIS or other standards as being piping manufactured using materials specified in Part K of the Rules.

## Outline of Amendment

Amends relevant requirements to specify that piping manufactured in accordance with JIS or other standards are piping manufactured using materials required by Part K of the Rules, subject to manufacturing process approval and Society surveyor attendance at shop test.

“Rules for the survey and construction of steel ships” has been partly amended as follows:

## Part K MATERIALS

### Chapter 4 STEEL PIPES

#### 4.1 Steel Tubes for Boilers and Heat Exchangers

Paragraph 4.1.1 has been amended as follows.

##### 4.1.1 Application

1 The requirements mainly apply to steel tubes intended for heat transfer at inside or outside of the tubes ; for example, smoke tubes, water tubes, stay tubes, super-heater tubes of boilers, other tubes for high temperature heat exchangers, etc. (hereinafter referred to as “steel tubes” in 4.1).

2 Pipes which comply with standard deemed equivalent by the Society may be treated as pipes that comply with this section. Such pipes are, in principle, to satisfy the following conditions.

(1) Their manufacturers are subjected to manufacturing process approval in accordance with the Guidance for the Approval and Type Approval of Materials and Equipment for Marine Use.

(2) Their material tests and inspections are carried out in the presence of the Society’s surveyor.

~~23~~ Except where specified in 2 above, ~~S~~steel tubes having characteristics differing from those specified in 4.1 are to comply with the requirements in 1.1.1-3.

##### 4.1.2 Kinds

The steel tubes are classified into 7 grades as specified in Table K4.1.

Table K4.1 has been amended as follows.

Table K4.1 Grades of Tubes

Grade	Symbol	Material Category	Description
Grade 2	KSTB33	<u>Carbon Steels</u>	Low carbon seamless steel tubes and electric-resistance welded steel tubes
Grade 3	KSTB35		Low carbon killed seamless steel tubes and electric-resistance welded steel tubes
Grade 4	KSTB42		Medium carbon killed seamless steel tubes and electric-resistance welded steel tubes
Grade 12	KSTB12	<u>Molybdenum Steels</u>	$\frac{1}{2}Mo$ alloy seamless steel tubes and electric-resistance welded steel tubes
Grade 22	KSTB22	<u>Chromium Molybdenum Steels</u>	$1Cr - \frac{1}{2}Mo$ alloy seamless steel tubes and electric-resistance welded steel tubes
Grade 23	KSTB23		$1\frac{1}{4}Cr - \frac{1}{2}Mo - \frac{3}{4}Si$ alloy seamless steel tubes
Grade 24	KSTB24		$2\frac{1}{4}Cr - 1Mo$ alloy seamless steel tubes and electric-resistance welded steel tubes

Note:

The symbols indicating the method of manufacture are to be fitted at the end of the above symbols, as follows:

Hot finished seamless steel tube	: -S-H
Cold finished seamless steel tube	: -S-C
Electric-resistance welded steel tube of other than hot and cold working	: -E-G
Electric-resistance welded steel tube of hot working	: -E-H
Electric-resistance welded steel tube of cold working	: -E-C

## 4.2 Steel Pipes for Pressure Piping

Paragraph 4.2.1 has been amended as follows.

### 4.2.1 Application

**1** The requirements are mainly to apply to steel pipes intended for use in pipings classified as Group 1 and Group 2 specified in **Part D** (hereinafter referred to as “steel pipes” in 4.2).

**2** Pipes which comply with standard deemed equivalent by the Society may be treated as pipes that comply with this section. Such pipes are, in principle, to satisfy the following conditions.

(1) Their manufacturers are subjected to manufacturing process approval in accordance with the Guidance for the Approval and Type Approval of Materials and Equipment for Marine Use.

(2) Their material tests and inspections are carried out in the presence of the Society’s surveyor.

~~33~~ Carbon steel pipes for ordinary piping (steel gas pipes) specified in 12.1.5-1, **Part D** are to be in accordance with the followings, regardless of the requirements in 1.2, 1.4 and 4.2.2 to 4.2.9.

(1) They are to conform to the requirements in *JIS G 3452* (Carbon Steel Pipes for Ordinary Piping) or equivalent there to.

(2) The manufacturing approval tests by the Society is not required.

~~34~~ Except where specified in 2 and 3 above, ~~S~~steel pipes having characteristics differing from those specified in 4.2 are to comply with the requirements in 1.1.1-3.

### 4.2.2 Kinds

The steel pipes are classified into 12 grades as specified in **Table K4.10**.

Table K4.10 has been amended as follows.

Table K4.10 Grades of Pipes

Grade		Symbol	Material Category	Description
Grade 1	No.2	<i>KSTPG38</i>	<u>Carbon steels</u>	Low carbon seamless steel pipe and electric-resistance welded steel pipe
	No.3	<i>KSTPG42</i>		Medium carbon seamless steel pipe and electric-resistance welded steel pipe
Grade 2	No.2	<i>KSTS38</i>		Low carbon killed seamless steel pipe
	No.3	<i>KSTS42</i>		Medium carbon killed seamless steel pipe
	No.4	<i>KSTS49</i>		
Grade 3	No.2	<i>KSTPT38</i>		Low carbon coarse grain killed seamless steel pipe and electric-resistance welded steel pipe
	No.3	<i>KSTPT42</i>		Medium carbon coarse grain killed seamless steel pipe and electric-resistance welded steel pipe
	No.4	<i>KSTPT49</i>		Medium carbon coarse grain killed seamless steel pipe
Grade 4	No.12	<i>KSTPA12</i>	<u>Molybdenum steels</u>	$\frac{1}{2}Mo$ alloy seamless steel pipe
	No.22	<i>KSTPA22</i>	<u>Chromium Molybdenum steels</u>	$1Cr - \frac{1}{2}Mo$ alloy seamless steel pipe
	No.23	<i>KSTPA23</i>		$1\frac{1}{4}Cr - \frac{1}{2}Mo - \frac{3}{4}Si$ alloy seamless steel pipe
	No.24	<i>KSTPA24</i>		$2\frac{1}{4}Cr - 1Mo$ alloy seamless steel pipe

Notes:

The symbols indicating the method of manufacture are to be fitted at the end of the above symbols, as follows:

Hot finished seamless steel pipe	: -S-H
Cold finished seamless steel pipe	: -S-C
Electric-resistance welded steel pipe of other than hot & cold working	: -E-G
Electric-resistance welded steel pipe of hot working	: -E-H
Electric-resistance welded steel pipe of cold working	: -E-C

### 4.3 Stainless Steel Pipes

Paragraph 4.3.1 has been amended as follows.

#### 4.3.1 Application

1 The requirements apply to the stainless steel pipes for low temperature service or corrosion-resistance service (hereinafter referred to as “stainless steel pipes” in 4.3).

2 Pipes which comply with standard deemed equivalent by the Society may be treated as pipes that comply with this section. Such pipes are, in principle, to satisfy the following conditions.

(1) Their manufacturers are subjected to manufacturing process approval in accordance with the Guidance for the Approval and Type Approval of Materials and Equipment for Marine Use.

(2) Their material tests and inspections are carried out in the presence of the Society’s surveyor.

~~2.3~~ Stainless steel pipes having characteristics differing from those specified in 4.3 are to comply with the requirements in 1.1.1-3.

#### 4.3.2 Kinds

The stainless steel pipes are classified as specified in **Table K4.19**.

Table K4.19 has been amended as follows.

Table K4.19 Grades and Chemical Composition

Grade  (Symbol)	<u>Material Category</u>	Chemical composition (%)								
		<i>C</i>	<i>Si</i>	<i>Mn</i>	<i>P</i>	<i>S</i>	<i>Ni</i>	<i>Cr</i>	<i>Mo</i>	Others
<i>K304TP</i>	<u>Austenitic stainless steels</u>	0.08 max.	1.00 max.	2.00 max.	0.040 max.	0.030 max.	8.00~ 11.00	18.00~ 20.00	-	-
<i>K304LTP</i>		0.030 max.					9.00~ 13.00			
<i>K309STP</i>		0.08 max.					12.00~ 15.00	22.00~ 24.00		
<i>K310STP</i>			1.50 max.				19.00~ 22.00	24.00~ 26.00		
<i>K316TP</i>							10.00~ 14.00	16.00~ 18.00	2.00~ 3.00	
<i>K316LTP</i>		0.030 max.					12.00~ 16.00			
<i>K317TP</i>		0.08 max.					11.00~ 15.00	18.00~ 20.00	3.00~ 4.00	
<i>K317LTP</i>		0.030 max.								
<i>K321TP</i>		0.08 max.					9.00~ 13.00	17.00~ 19.00	-	
<i>K329J1TP</i>	<u>Austenitic Ferritic stainless steels</u>	0.08 max.	1.00 max.	1.50 max.	0.040 max.	0.030 max.	3.00~ 6.00	23.00~ 28.00	1.00~ 3.00	-
<i>K329J3LTP</i>		0.030 max.	1.00 max.	1.50 max.	0.040 max.	0.030 max.	4.50~ 6.50	21.00~ 24.00	2.50~ 3.50	$N$ : 0.08~0.20
<i>K329J4LTP</i>		0.030 max.	1.00 max.	1.50 max.	0.040 max.	0.030 max.	5.50~ 7.50	24.00~ 26.00	2.50~ 3.50	$N$ : 0.08~0.30
<i>K347TP</i>	<u>Austenitic stainless steels</u>	0.08 max.	1.00 max.	2.00 max.	0.040 max.	0.030 max.	9.00~ 13.00	17.00~ 19.00	-	$Nb \geq 10 \times C$

Notes:

Symbols indicating the method of manufacture are to be added to the ends of the above-mentioned symbols as follows:

Hot finished seamless steel tube : -S-H

Cold finished seamless steel tube : -S-C

Automatic arc welded steel tube : -A

Cold finished automatic arc welded steel tube : -A-C

Bead conditioned automatic arc welded steel tube	: -A-B
Laser welded steel tube	: -L
Cold finished laser welded steel tube	: -L-C
Bead conditioned laser welded steel tube	: -L-B
Electric-resistance welded steel tube (other than hot and cold finished)	: -E-G
Cold finished electric-resistance welded steel tube	: -E-C

## 4.4 Headers

### 4.4.1 Application

- 1 The requirements are to apply to the headers to be used for boilers.
- 2 Headers having characteristics differing from those specified in 4.4 are to comply with the requirements in 1.1.1-3.

### 4.4.2 Kinds

The headers are classified into 6 grades as specified in **Table K 4.23**.

Table K4.23 has been deleted as follows.

~~Table K4.23 — Grades of Headers~~

<del>Grade</del>	<del>Grade 1</del>	<del>Grade 2</del>	<del>Grade 3</del>	<del>Grade 4</del>	<del>Grade 5</del>	<del>Grade 6</del>
<del>Symbol</del>	<del>KBH 1</del>	<del>KBH 2</del>	<del>KBH 3</del>	<del>KBH 4</del>	<del>KBH 5</del>	<del>KBH 6</del>

### 4.4.3 Heat Treatment

Headers are to be heat treated by annealing or normalizing.

Paragraph 4.4.4 has been amended as follows.

### 4.4.4 Chemical Composition

Headers are to have the chemical composition given in **Table K4.243**.

Paragraph 4.4.5 has been amended as follows.

### 4.4.5 Mechanical Properties

Headers are to conform to the following requirements as to mechanical properties:

- (1) Tensile test:  
Headers are to be subjected to tensile test and to conform to the requirements given in **Table K 4.254**.
- (2) Bend test:  
The test specimen is to stand being bent cold through 180 degrees without flaw and cracking on the outside of bent portion to an inside radius of 12 mm. Where the test specimen of 20 mm in thickness can not be taken, the test specimen may be as original in thickness, in which case, however, the width of test specimen is not to be less than 1.5 times the thickness and the inside radius of bend is to be equal to the thickness.

Table K4.24 has been amended as follows.

**Table K4.243 Grades and Chemical Composition**

Grade	Symbol	Material Category	Chemical composition(%)						
			<i>C</i>	<i>Si</i>	<i>Mn</i>	<i>P</i>	<i>S</i>	<i>Cr</i>	<i>Mo</i>
Grade 1	<i>KBH-1</i>	<u>Carbon steels</u>	0.25 max.	0.10 ~0.35	0.30 ~0.80	0.040 max.	0.040 max.	—	—
Grade 2	<i>KBH-2</i>		0.30 max.	0.10 ~0.35	0.30 ~0.80	0.040 max.	0.040 max.	—	—
Grade 3	<i>KBH-3</i>	<u>Molybdenum steels</u>	0.10 ~0.20	0.10 ~0.50	0.30 ~0.80	0.030 max.	0.040 max.	—	0.45 ~0.65
Grade 4	<i>KBH-4</i>	<u>Chromium Molybdenum steels</u>	0.10 ~0.20	0.10 ~0.50	0.30 ~0.60	0.030 max.	0.030 max.	0.80 ~1.20	0.20 ~0.45
Grade 5	<i>KBH-5</i>		0.15 max.	0.10 ~0.50	0.30 ~0.60	0.030 max.	0.030 max.	0.80 ~1.20	0.45 ~0.65
Grade 6	<i>KBH-6</i>		0.15 max.	0.10 ~0.50	0.30 ~0.50	0.030 max.	0.030 max.	2.00 ~2.50	0.90 ~1.10

Table K4.25 has been renumbered to Table K4.24.

**Table K4.254 Tensile Test**  
(Table is omitted.)

Paragraph 4.4.6 has been amended as follows.

#### **4.4.6 Selection of Test Specimen**

**1** Tensile test specimens are to be taken lengthwise or crosswise to the direction of rolling and bend test specimens to be taken at right angle to the direction of rolling from the open ends of headers respectively.

**2** For the headers of the same size made from the same melt and subjected to the heat treatment simultaneously in the same furnace, tensile and bend test specimens are to be selected in accordance with the requirements given in **Table K4.265**.

**3** Where the both ends of header are closed by reforcing, the test coupons of proper size may be cut from the open ends before reforcing. In this case, the test coupons are to be heat treated simultaneously with the body in the same furnace.

**4** Where test coupons cut from circular headers, etc. are necessary to be flattened, the test coupons are to be taken from the body before being subjected to the heat treatment and after flattening the test coupons are to be heat treated simultaneously with the body in the same furnace, or the test coupons are to be cut from the structures after being subjected to the heat treatment and after flattening cold, they are to be heated to the temperature of 600°C to 650°C for the purpose of removing the distortion due to the flattening, and the required test specimens are to be cut from the coupons.

**5** Tensile and bend test specimens are to comply with the requirements specified in **Tables K2.1** and **K2.4** respectively.

Table K4.26 has been renumbered to Table K4.25.

**Table K4.265 Number of Test Specimens**  
(Table is omitted.)

## 4.5 Steel Pipes for Low Temperature Service

Paragraph 4.5.1 has been amended as follows.

### 4.5.1 Application

**1** The requirements are to apply to the seamless steel pipes and electric resistance welded steel pipes not exceeding 25 mm in thickness, intended to be used at the design temperature lower than 0°C in liquefied gas carriers or ships using low-flashpoint fuels (hereinafter referred to as “steel pipes” in 4.5).

**2** Pipes which comply with standard deemed equivalent by the Society may be treated as pipes that comply with this section. Such pipes are, in principle, to satisfy the following conditions.

(1) Their manufacturers are subjected to manufacturing process approval in accordance with the Guidance for the Approval and Type Approval of Materials and Equipment for Marine Use.

(2) Their material tests and inspections are carried out in the presence of the Society’s surveyor.

~~33~~ Any requirement regarding the steel pipes over 25 mm in thickness is left to the discretion of the Society.

~~34~~ Steel pipes having characteristics differing from these specified in 4.5 are to comply with the requirements in 1.1.1-3.

Paragraph 4.5.2 has been amended as follows.

### 4.5.2 Kinds

The steel pipes are classified into 6 grades as given in Table K4.276.

Paragraph 4.5.3 has been amended as follows.

### 4.5.3 Deoxidation Practice and Chemical Composition

The deoxidation practice and chemical composition of each grade are to comply with the requirements given in Table K4.276.

Table K4.27 has been amended as follows.

Table K4.276 Grades and Chemical Compositions (%)

Grade	<u>Material Category</u>	Deoxidation	<i>C</i>	<i>Si</i>	<i>Mn</i>	<i>P</i>	<i>S</i>	<i>Ni</i>
<i>KLPA</i>	<u>Carbon steels</u>	Fully killed fine grain	0.25 max.	0.35 max.	1.35 max.	0.035 max.	0.035 max.	-
<i>KLPB</i>			0.18 max.	0.35 max.	1.60 max.	0.035 max.	0.035 max.	-
<i>KLPC</i>			0.18 max.	0.35 max.	1.60 max.	0.035 max.	0.035 max.	-
<i>KLP2</i>			0.19 max.	0.10~ 0.35	0.90 max.	0.035 max.	0.035 max.	2.00~ 2.60
<i>KLP3</i>	<u>Nickel steels</u>		0.18 max.	0.10~ 0.35	0.30~ 0.60	0.030 max.	0.030 max.	3.20~ 3.80
<i>KLP9</i>			0.13 max.	0.10~ 0.35	0.90 max.	0.030 max.	0.030 max.	8.50~ 9.50

Note:

Other alloying elements than those given in the above table may be added if necessary.

Paragraph 4.5.4 has been amended as follows.

### 4.5.4 Heat Treatment

The steel pipes are to be heat treated in accordance with the requirements in Table K4.287.

Paragraph 4.5.5 has been amended as follows.

#### **4.5.5 Mechanical Properties**

**1** The steel pipes are to comply with the following requirements as to mechanical properties:

(1) **Tensile test**

The steel pipes are to be subjected to tensile test and to comply with the requirements in **Table K4.287**.

(2) **Impact test**

The steel pipes are to be subjected to impact test and to comply with the requirements in **Table K4.287**.

(3) **Flattening test**

Flattening test is to be carried out in accordance with the requirement given in **4.2.5(2)**. Where this requirement is applied, the value of  $e$  is to be taken as 0.08.

For steel pipes of 50 mm and under in outside diameter, bend test specified in below may be substituted for flattening test.

Bend test: Test specimen of tubular section which is taken from the end of the pipe and has sufficient length is to stand being bent cold, up to the specified value in **Table K4.287**, without flaw and cracking on the wall.

Moreover, electric resistance welded pipes are to be bent in such a way that the welded line is placed on the outside of bent portion.

(4) **Hydraulic test**

All steel pipes are to be subjected to hydraulic test in accordance with the requirements given in **4.2.5(3)**.

**2** Where deemed necessary by the Society, other tests may be required in addition to the tests specified in -1.

**3** For steel pipes to which the requirement in **17.12, Part N** is applicable, the specified value of the maximum yield point or proof stress may be set after obtaining the verification by the Society.

Table K4.28 has been renumbered to Table K4.27.

Table K4.287 Heat Treatment and Mechanical Properties  
(Table and Notes are omitted.)

Paragraph 4.5.7 has been amended as follows.

#### **4.5.7 Dimensional Tolerance**

The tolerances for outside diameter and wall thickness of steel pipes are to be in accordance with the requirements given in **Table K4.298**.

Table K4.29 has been renumbered to Table K4.28.

Table K4.298 Tolerances for Outside Diameter and Wall Thickness<sup>(1)</sup>  
(Table and Notes are omitted.)



## Chapter 8 ALUMINIUM ALLOYS

Title of Section 8.2 has been amended as follows.

### 8.2 Aluminium Alloy ~~P~~Pipes

Paragraph 8.2.1 has been amended as follows.

#### 8.2.1 Application

**1** The requirements in this section apply to aluminium alloy seamless pipes and aluminium alloy longitudinally welded pipes (hereinafter referred as “aluminium alloy pipes”) intended to be used for the cargo and process piping of ships carrying liquefied gases in bulk and for the fuel and process piping of ships using low-flashpoint fuels.

**2** Aluminium alloy longitudinally welded pipes are not required to be subjected to approval of manufacturing process. Such pipes are, however, to comply with the following requirements:

- (1) Aluminium alloy plates approved in accordance with the requirement of 8.1 are to be used.
- (2) Welding procedure tests for aluminium alloy longitudinally welded pipes are to be carried out according to the requirements of **6.5.4, Part N of the Rules** in cases where the pipes are used for the cargo and process piping of liquefied gas carriers, or the requirements of **16.3.4, Part GF of the Rules** in cases where the pipes are used for the fuel and process piping of ships using low-flashpoint fuels.
- (3) Welding work for pipe welds is to be performed by welders who have passed the welder qualification tests related to aluminium alloys specified in **Chapter 5 of Part M of the Rules**.
- (4) Welding consumables approved in accordance with the requirements in **Chapter 6 of Part M of the Rules** are to be used.

**3** Aluminium alloy seamless pipes which comply with standard deemed equivalent by the Society may be treated as pipes that comply with this section. Such pipes are, in principle, to satisfy the following conditions.

- (1) Their manufacturers are subjected to manufacturing process approval in accordance with the **Guidance for the Approval and Type Approval of Materials and Equipment for Marine Use**.
- (2) Their material tests and inspections are carried out in the presence of the Society’s surveyor.

~~3.4~~ Aluminium alloy pipes having characteristics differing from those specified in 8.2 are to comply with the requirements in **1.1.1-3**.

“Guidance for the survey and construction of steel ships” has been partly amended as follows:

## **Part K        MATERIALS**

### **K4     STEEL PIPES**

#### **K4.1     Steel Tubes for Boilers and Heat Exchangers**

Paragraph K4.1.1 has been added as follows.

##### **K4.1.1     Application**

**1     The wording “standard deemed equivalent to the Society” in 4.1.1-2, Part K of the Rules means *JIS G 3461*, *JIS G 3462* or an equivalent standard thereto.**

#### **K4.2     Steel Pipes for Pressure Piping**

Paragraph K4.2.1 has been added as follows.

##### **K4.2.1     Application**

**1     The wording “standard deemed equivalent to the Society” in 4.2.1-2, Part K of the Rules means *JIS G 3454*, *JIS G 3455*, *JIS G 3456*, *JIS G 3458* or an equivalent standard thereto.**

#### **K4.3     Stainless Steel Pipes**

Paragraph K4.3.1 has been added as follows.

##### **K4.3.1     Application**

**1     The wording “standard deemed equivalent to the Society” in 4.3.1-2, Part K of the Rules means *JIS G 3459* or an equivalent standard thereto.**

Section K4.5 has been added as follows.

#### **K4.5     Steel Pipes for Low Temperature Service**

##### **K4.5.1     Application**

**1     The wording “standard deemed equivalent to the Society” in 4.5.1-2, Part K of the Rules means *JIS G 3460* or an equivalent standard thereto.**

## **K8 ALUMINIUM ALLOYS**

### **K8.2 Aluminium Alloy Pipes**

Paragraph K8.2.1 has been added as follows.

#### **K8.2.1 Application**

**1** The wording “standard deemed equivalent to the Society” in 8.2.1-3, Part K of the Rules means *JIS H 4080* or an equivalent standard thereto.

“Guidance for the approval and type approval of materials and equipment for marine use” has been partly amended as follows:

## Part 1 METALLIC MATERIALS

### Chapter 2 APPROVAL OF MANUFACTURING PROCESS OF STEEL PIPES

#### 2.4 Approval Test

##### 2.4.2 Details of Test

1 Items of the approval test are to be as given in **Table 1.2-1**.

2 The test method and evaluation criteria are to be in accordance with each of the given requirements in **Chapter 4, Part K of the Rules**. However, where accordance with these requirements are difficult, decisions are left to the discretion of the Society.

Table 1.2-1 has been amended as follows.

Table 1.2-1 Approval Test Items for Steel Pipes

Steel pipes	Steel pipes for boilers and heat exchanger	KSTB33 KSTB24				
	Steel pipes for pressure piping	KSTPG38 KSTPA24				
	Steel pipes for low temp. service	KLPA KLP9				
	Stainless steel pipes	K304TP K347TP				
	Headers	KBH1 KBH6				
Test items						
A. base metal test		☞	☞	☞	☞	☞
	Chemical analysis	☞	☞	☞	☞	☞
	Microstructure	☞	☞	☞	☞	☞
	Tensile test	☞	☞	☞	☞	☞
	Charpy impact test	☞	☞	☞	☞	☞
	Bend test	☞	☞	☞	☞	☞
	Flattening test		☞	☞	☞	☞
	Flanging test					☞
	Flaring test					☞
	Crushing test					☞
	Reverse flattening					☞
	U-shaped bend test					☞
	Hydraulic test		☞	☞	☞	☞
C. Corrosion resistance test			☞			
	Corrosion test					

Steel pipes	Steel pipes for boilers and heat exchanger	Carbon steels													
		Molybdenum steels													
		Chromium Molybdenum steels													
	Steel pipes for pressure piping	Carbon steels													
		Molybdenum steels													
		Chromium Molybdenum steels													
	Steel pipes for low temp. service	Carbon steels													
		Nickel steels													
	Stainless steel pipes	Austenitic stainless steels													
		Austenitic Ferritic stainless steels													
	Headers	Carbon steels													
		Molybdenum steels													
		Chromium Molybdenum steels													
Test items															
A. Base metal test			○	○	○	○	○	○	○	○	○	○	○	○	
	Chemical analysis		○	○	○	○	○	○	○	○	○	○	○	○	
	Microstructure		○	○	○	○	○	○	○	○	○	○	○	○	
	Tensile test		○	○	○	○	○	○	○	○	○	○	○	○	
	Charpy impact test					○	○	○	○						
	Bend test		○	○	○	○	○	○	○	○	○	○	○	○	
	Flattening test					○	○	○	○	○	○	○	○	○	
	Flanging test											○	○	○	
	Flaring test											○	○	○	
	Crushing test											○	○	○	
	Reverse flattening											○	○	○	
	U-shaped bend test											○	○	○	
	Hydraulic test					○	○	○	○	○	○	○	○	○	
C. Corrosion resistance test						○	○								
	Corrosion test					○	○								

Notes:

- (1) Approval tests for each steel pipe are to be performed each test item indicated with a ○ mark in the table. Moreover, the application of the flattening, flanging, flaring, crushing, reverse flattening and bending tests are to be in accordance with the requirements in Chapter 4, Part K of the Rules.
- ~~(2) Where steel pipes with similar strength level, pipe production method, heat treatment method etc. as steel pipes for pressure piping and low temperature service have passed tests of high grade quality, tests may be omitted for steel pipes of lower grade when deemed appropriate.~~
- ~~(3) Where steel pipes with similar chemical composition (carbon steel or low alloy steel), pipe manufacturing process, heat treatment method etc., as steel pipes other than those of the preceding (2) have passed tests of high strength level, tests may be omitted for steel pipes of lower strength level by considering appropriate data (i.e. requirements of chemical composition, heat treatment etc., for each steel pipe).~~
- (42) Where the steel pipes are not specified in the Rules or the steel pipes are used in special applications, tests other than those indicated in the table (e.g. tests for welded parts) or the submission of reference data may be requested. Moreover, where low temperature toughness is considered necessary, the CTOD test is required.
- ~~(53)~~ Approval test items for primary materials of steel pipes are to be chemical analysis, sulphur print and macro-structure.

## **2.5 Approval**

Paragraph 2.5.4 has been added as follows.

### **2.5.4 Changes in the Approved Content**

**1** In case of changes in the approved content such as those given in the following **(1)** through **(9)** are occurred, in response to the content of changes, three copies of documents corresponding to the requirements in **2.2.2** are to be submitted to the Society, in addition to one copy of the appropriate application form (**Form 1-5**) and a “Certificate of Approval” (copy).

- (1) Addition to material ~~grades~~ categories
- (2) Changes in the steel making process
- (3) Changes in the casting making process
- (4) Changes in the rolling process
- (5) Changes in the limits of outer diameter and thickness
- (6) Changes in the heat treatment process
- (7) Changes in the chemical composition, added element etc.
- (8) In case of a part of manufacturing process (rolling, heat treatment etc.) is assigned to other works
- (9) Use of semi-finished products manufactured by other works

**2** Upon studying the items of changes in approved content specified in **-1**, the Society requests the factory inspection and approval test in accordance with the requirement in **2.4** as necessary.

**3** The Society is to examine the submitted data specified in **-1** and reports of factory inspection and approval test specified in **-2**, and if the Society considers them appropriate, is to approve the changes in the approved content. In this case, as a rule, the validity of the “Certificate of Approval” specified in **-1** is not changed.

**4** Manufacturers whose request for changes in approved content is accepted are to return the old “Certificate of Approval” and the relevant “Particulars of Approval Conditions” to the Society as soon as possible after receiving the new certificate and the term of validity of the old certificate expires.