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JIS G 3131 : 2005

(JISF)

**Hot-rolled mild steel plates, sheets and
strips**

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G 3131 : 2005

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 3131 : 1996** is replaced with this Standard.

This revision has been made based on **ISO 3573 : 1999 *Hot-rolled carbon steel sheet of commercial and drawing qualities*** for the purpose of making it easier to compare this Standard with International Standard; to prepare Japanese Industrial Standard conforming with International Standard; and to propose a draft of an International Standard which is based on Japanese Industrial Standard.

Attention is drawn to the possibility that some parts of this Standard may conflict with a patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have technical properties. The relevant Minister and the Japanese Industrial Standards Committee are not responsible for identifying the patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have the said technical properties.

Editor's notice : New **JIS** Mark Scheme went into effect on October 1st, 2005 according to the revision of the Industrial Standardization Law, so old **JIS** mark indication is omitted from this English version. Up-to-date information including list of **JIS** subject to New **JIS** Marking System is issued on the website of JISC (<http://www.jisc.go.jp>).

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Hot-rolled mild steel plates, sheets and strips

Introduction This Japanese Industrial Standard has been prepared based on the third edition of **ISO 3573** *Hot-rolled carbon steel sheet of commercial drawing qualities* published in 1999 with some modifications of the technical contents.

The portions given sidelines or dotted underlines are the matters modified from the original International Standard. A list of modifications with the explanation is given in Annex (informative).

1 Scope This Standard specifies the hot-rolled mild steel plates, sheets and strips (hereafter referred to as "steel sheet and coil") intended for general fabrication purposes and drawing.

Remarks 1 The steel sheet and coil may be descaled by pickling or shot blasting after the hot-rolling operation on request by the purchaser.

2 The International Standard corresponding to this Standard is as follows.

In addition, symbols which denote the degree of correspondence in the contents between the relevant International Standard and **JIS** are **IDT** (identical), **MOD** (modified), and **NEQ** (not equivalent) according to **ISO/IEC Guide 21**.

ISO 3573 :1999 Hot-rolled carbon steel sheet of commercial and drawing qualities (MOD)

2 Normative references The standards listed in attached table 1 contain provisions which, through reference in this text, constitute provisions of this Standard. The most recent editions (including amendments) of the standards listed shall be applied.

3 Grade and symbols The steel sheet and coil shall be classified into 4 categories, and their symbols shall be as given in table 1.

Table 1 Symbol of grade

Symbol of grade	Applicable thickness mm	Remarks
SPHC	1.2 or over up to and incl. 14	Commercial quality
SPHD	1.2 or over up to and incl. 14	Drawing quality
SPHE	1.2 or over up to and incl. 8	Deep drawing quality
SPHF	1.4 or over up to and incl. 8	Deep drawing quality aluminium killed

4 Chemical composition The steel sheet and coil shall be tested in accordance with 8.1, and their cast analysis values shall be as given in table 2.

Table 2 Chemical composition

Unit : %

Symbol of grade	C	Mn	P	S
SPHC	0.15 max.	0.60 max.	0.050 max.	0.050 max.
SPHD	0.10 max.	0.50 max.	0.040 max.	0.040 max.
SPHE	0.10 max.	0.50 max.	0.030 max.	0.035 max.
SPHF	0.08 max.	0.50 max.	0.025 max.	0.025 max.

5 Mechanical properties

5.1 Tensile strength and elongation The steel sheet and coil shall be tested in accordance with 8.2 and their tensile strength and elongation shall be as specified in table 3.

5.2 Bendability When the SPHC steel sheet and coil are tested in accordance with 8.2 and the bendability conditions specified in table 3, there shall not be any cracks on the outer surface of the test piece. However, this bend test may be omitted unless it is requested by the purchaser.

Table 3 Mechanical properties

Sym- bol of grade	Tensile strength N/mm ²	Elongation %						Tensile test piece	Bendability			Test piece
		Thick- ness 1.2 mm or over to and excl. 1.6 mm	Thick- ness 1.6 mm or over to and excl. 2.0 mm	Thick- ness 2.0 mm or over to and excl. 2.5 mm	Thick- ness 2.5 mm or over to and excl. 3.2 mm	Thick- ness 3.2 mm or over to and excl. 4.0 mm	Thick- ness 4.0 mm or over		Bending angle	Inside radius		
										Thick- ness up to and excl. 3.2 mm	Thickness 3.2 mm or over	
SPHC	270 min.	27 min.	29 min.	29 min.	29 min.	31 min.	31 min.	No. 5, in roll- ing direc- tion	180°	Flat on itself	Thickness × 0.5	No. 3, in rolling direction
SPHD	270 min.	30 min.	32 min.	33 min.	35 min.	37 min.	39 min.		—	—	—	
SPHE	270 min.	31 min.	33 min.	35 min.	37 min.	39 min.	41 min.		—	—	—	
SPHF	270 min.	37 min.	38 min.	39 min.	39 min.	40 min.	42 min.		—	—	—	

Remarks 1 The following may be applied for upper limit of tensile strength as agreed between the purchaser and the manufacturer:

SPHC : 440 N/mm², SPHD : 420 N/mm², SPHE : 400 N/mm²,
 SPHF : 380 N/mm².

2 The values specified in table 3 shall not be applied to the irregular portions of both ends of the steel coil.

3 1 N/mm² = 1 MPa

5.3 Deep drawability The deep drawability of SPHE and SPHF may be as agreed between the purchaser and the manufacturer.

6 Shape, dimensions, mass and tolerances The shape, dimensions, mass and their tolerances of the steel sheet and coil shall conform to **JIS G 3193**. However, the tolerances on thickness shall be in accordance with table 4 and the measurement of edge camber shall be carried out when requested by the purchaser.

With this respect, tolerances on length for the steel sheet and those on width for the cut edged steel sheet shall, unless otherwise specified, be in accordance with the tolerance A.

Table 4 Tolerances on thickness

Unit : mm

Nominal thickness	Nominal width			
	Under. 1 200	1 200 or over to and excl. 1 500	1 500 or over to and excl. 1 800	1 800 or over up to and incl. 2 300
Under. 1.60	±0.14	±0.15	±0.16 ⁽¹⁾	—
1.60 or over to and excl. 2.00	±0.16	±0.17	±0.18	±0.21 ⁽²⁾
2.00 or over to and excl. 2.50	±0.17	±0.19	±0.21	±0.25 ⁽²⁾
2.50 or over to and excl. 3.15	±0.19	±0.21	±0.24	±0.26
3.15 or over to and excl. 4.00	±0.21	±0.23	±0.26	±0.27
4.00 or over to and excl. 5.00	±0.24	±0.26	±0.28	±0.29
5.00 or over to and excl. 6.00	±0.26	±0.28	±0.29	±0.31
6.00 or over to and excl. 8.00	±0.29	±0.30	±0.31	±0.35
8.00 or over to and excl. 10.0	±0.32	±0.33	±0.34	±0.40
10.0 or over to and excl. 12.5	±0.35	±0.36	±0.37	±0.45
12.5 or over up to and incl. 14.0	±0.38	±0.39	±0.40	±0.50

Notes ⁽¹⁾ The value shall be applied to the steel sheet and coil under 1 600 mm in width.

⁽²⁾ The value shall be applied to the steel sheet and coil under 2 000 mm in width.

Remarks 1 The thickness shall be measured at any point on the steel sheet and coil not less than 20 mm from a side edge. For the steel sheet and coil under 40 mm in width, measurement shall be made at the mid-width thereof.

2 The values specified in table 4 shall not be applied to the irregular portions of both ends of the steel coil.

3 The tolerance on thickness of the steel sheet which is not manufactured from the steel coil may be agreed between the purchaser and the supplier.

7 Appearance The appearance of the steel sheet and coil shall conform to clause 6 of **JIS G 3193**.

8 Tests

8.1 Chemical analysis

8.1.1 General requirements and sampling method for chemical analysis The chemical composition of the steel sheet and coil shall be determined by cast analysis, and the general requirements for chemical analysis and the sampling method of specimen for analysis shall be as specified in clause 8 of JIS G 0404.

8.1.2 Analysis method The method for chemical analysis shall be in accordance with JIS G 0320.

8.2 Mechanical test

8.2.1 General requirements for mechanical test The general requirements for mechanical testing shall be in accordance with the specifications in clause 9 of JIS G 0404. With this respect, the sampling method of specimen shall conform to Class A of 7.6 of JIS G 0404, and the number of test pieces and the sampling position shall be as follows:

- a) **Number of test pieces** The number of test pieces shall be as follows.
 - 1) **For steel coil and cut lengths therefrom** One test piece each for tensile and bend tests shall be taken from each test lot of the same heat rolled to the same thickness. When the mass of one test lot exceeds 50 t, however, two sets of test pieces shall be taken from the lot.
 - 2) **For steel sheet (excluding cut lengths therefrom)** One test piece each for tensile and bend tests shall be taken from each test lot of the same heat where the maximum thickness of the steel sheet is within twice the minimum thickness thereof. When the mass of one test lot exceeds 50 t, however, two sets of test pieces shall be taken from the lot.
- b) **Sampling position and direction of tensile test and bend test pieces** The test piece shall be taken parallel to the rolling direction and the centre of the test piece shall be at a quarter-width from a side edge. When it is infeasible to allow the centre of the test piece to be at a quarter-width from a side edge, the sampling should be performed as close to the aforementioned position as possible.

8.2.2 Tensile test The tensile test shall be carried out as given in the following:

- a) As to a test piece, No. 5 test piece specified in JIS Z 2201 shall be used.
- b) The test method shall be as specified in JIS Z 2241.

8.2.3 Bend test The bend test shall be carried out as given in the following:

- a) As to a test piece, No. 3 test piece specified in JIS Z 2204 shall be used.
- b) The test method shall be as specified in JIS Z 2248.

8.2.4 Deep drawability test The test method and sampling of test pieces for deep drawability test shall be as agreed between the purchaser and the manufacturer.

9 Inspection

9.1 Inspection The inspection shall be carried out as follows:

- a) The general requirements for inspection shall be as specified in **JIS G 0404**.
- b) The chemical composition shall conform to the requirements specified in clause 4.
- c) The mechanical properties shall conform to the requirements specified in clause 5.
- d) The shape, dimensions and mass shall conform to the requirements specified in clause 6.
- e) The appearance shall conform to the requirements specified in clause 7.

9.2 Reinspection The steel sheet and coil having failed to meet the requirements of the mechanical test may be subjected to a retest for final acceptance according to the specifications of 9.8 in **JIS G 0404**.

10 Marking The steel sheet and coil having passed the inspection shall be marked with the following details for each bundle by suitable means. The steel sheets which are not bundled shall be marked for each sheet.

- a) Symbol of grade
- b) Heat number or inspection number
- c) Dimensions
- d) The number of sheets for each bundle or mass
- e) Manufacturer's name or its identifying brand

11 Report The report shall be in accordance with the requirements of clause 13 in **JIS G 0404**. When requested by the purchaser in advance, the manufacturer shall submit an inspection document including the test results, the manufacturing method, the ordered size and quantity, and manufacturing record, etc. The type of inspection document shall be, unless otherwise specified, 2.3 or 3.1B in table 1 of **JIS G 0415**.

Attached Table 1 Normative references

- 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 3193 *Dimensions, mass and permissible variations of hot rolled steel plates, sheets and strips*
- JIS Z 2201 *Test pieces for tensile test for metallic materials*
- JIS Z 2204 *Bend test pieces for metallic materials*
- JIS Z 2241 *Method of tensile test for metallic materials*
- JIS Z 2248 *Method of bend test for metallic materials*

Annex (informative)
Comparison table between JIS and corresponding International Standard

JIS G 3131 : 2005 <i>Hot-rolled mild steel plates, sheets and strips</i>		ISO 3573 : 1999 <i>Hot-rolled carbon steel sheet of commercial and drawing qualities</i>					
(I) Requirements in JIS		(III) Requirements in International Standard		(IV) Classification and details of technical deviation between JIS and the International Standard by clause		(V) Justification for the technical deviation and future measures	
Clause	Content	Clause	Content	Classification by clause	Detail of technical deviation		
1 Scope	Hot-rolled mild steel plates, sheets and strips intended for general fabrication purposes and drawing	1	Hot-rolled mild steel plates, sheets and strips intended for general fabrication purposes and drawing	IDT			
2 Normative references	JIS Z 2241 JIS standards shown in attached table (excluding JIS Z 2241)	2	ISO 6892 —	IDT MOD/addition	In JIS, JIS standard necessary for analytical tests and JIS standard for bend tests are added.	In JIS, JIS standard for analytical tests is necessary and the bend test is specified.	
3 Grade and symbols	Four types of grades are specified.	1	Four types of grades are specified.	IDT			
4 Chemical composition	Chemical compositions of four elements C, Mn, P, S are specified for each of four grades.	5.2	Chemical compositions of four elements C, Mn, P, S are specified for each of four grades.	MOD/alteration	Upper limit values of each element in JIS are higher than in ISO.	Since modification of chemical compositions has a large influence on mechanical properties, the conventional JIS values are kept and not modified.	

(I) Requirements in JIS		(II) International Standard number	(III) Requirements in International Standard		(IV) Classification and details of technical deviation between JIS and the International Standard by clause		(V) Justification for the technical deviation and future measures
Clause	Content		Clause	Content	Classification by clause	Detail of technical deviation	
5 Mechanical properties	Tensile strength, elongation and bendability are specified.		5.6	Tensile strength and elongation are specified.	MOD/addition MOD/alteration	In ISO, bendability was deleted at the revision. JIS and ISO differ in tensile strength and elongation. ISO specifies tensile strength by the upper limit, contrary to the lower limit in JIS. It was permitted in JIS to apply the upper limit values of ISO according to the agreement. JIS and ISO also differ in the shape of the test piece and the tensile direction.	Responding to the deletion of bendability in ISO, bendability was specified in JIS to be applied when required.
6 Shape, dimensions, mass and tolerances	The shape, dimensions, mass and their tolerances are specified.		6 13	Tolerances of the shape and dimensions are specified. It is required to specify the inside diameter, the maximum outside diameter and the maximum mass of the coil.	MOD/alteration MOD/alteration	In JIS, some tolerances are greater or smaller compared to those in ISO. In JIS there is no description of the inside diameter and the maximum outside diameter of the coil.	JIS and ISO differ in the tolerances. The inside diameter and the maximum outside diameter of the coil are matters of contract and not the items to be specified in JIS.
7 Appearance	The appearance is specified.		11	The appearance is specified.	IDT		

(I) Requirements in JIS		(II) International Standard number	(III) Requirements in International Standard		(IV) Classification and details of technical deviation between JIS and the International Standard by clause		(V) Justification for the technical deviation and future measures
Clause	Content		Clause	Content	Classification by clause	Detail of technical deviation	
8 Tests	Analytical test, tensile test and bend test are specified.		5.3 Analytical test is specified. 7 Sampling frequency of the tensile test piece is specified. 8 Tensile test method is specified.	5.3 7 8	IDT IDT MOD/alteration MOD/addition		Modification of the tensile direction will cause the confusion in the market. Responding to the deletion of bend test in ISO, bend test was specified in JIS to be applied when required.
9.1 Inspection	Inspection is specified.		No clause in ISO.	—	MOD/addition	JIS specifies inspection in one integrated clause, while ISO specifies it in each clause.	This is the unique configuration of JIS.
9.2 Reinspection	Reinspection and the judgment are specified.		Reinspection is specified. Judgment of the reinspection is specified.	9 10	IDT IDT		

(I) Requirements in JIS		(II) International Standard number	(III) Requirements in International Standard		(IV) Classification and details of technical deviation between JIS and the International Standard by clause		(V) Justification for the technical deviation and future measures
Clause	Content		Clause	Content	Classification by clause	Detail of technical deviation	
10	Marking of five items is specified.		14	Marking of seven items is specified.	MOD/deletion	In ISO, marking of the number of the standard and the order number are specified in addition to five items in JIS.	In JIS, the number of the standard can be replaced by the symbol of grade. The order number is a matter of contract and is assumed to be unnecessary.
11	Report		—	No clause in ISO.	MOD/addition	In JIS, the report is specified.	For addition of the specification of the report, proposal will be submitted to ISO.
			3	Terms and definitions are specified.	MOD/deletion	In JIS, terms and definitions are deleted.	Terms are defined in JIS G 0203.
			4	Other information is described.	MOD/deletion	Other information is deleted in JIS.	Other information is for reference only and not the normative matters.
			12	Inspection observed by the purchaser is specified.	MOD/deletion	Inspection observed by the purchaser is deleted in JIS.	This Standard covers general purpose products and there is no requirement for the inspection observed by the purchaser.
			15	Information to be supplied by the purchaser is specified.	MOD/deletion	Information to be supplied by the purchaser is deleted in JIS.	Information to be supplied by the purchaser is the content of the contract and not the item to be specified in JIS.

Designated degree of correspondence between JIS and International Standard: MOD

- Remarks 1 Symbols in sub-columns of classification by clause in the above table indicate as follows:
- IDT : Identical in technical contents.
 - MOD/deletion : Deletes the specification items(s) or content(s) in International Standard.
 - MOD/addition : Adds the specification item(s) or content(s) which are not included in International Standard.
 - MOD/alteration : Alters the specification content(s) which are included in International Standard.
- 2 Symbol in column of designated degree of correspondence between **JIS** and International Standard in the above table indicates as follows:
- MOD : Modifies International Standard.

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