

## Hot-rolled Mild Steel Plates, Sheets and Strip

### 1. Scope

This Japanese Industrial Standard specifies the hot-rolled mild steel plates, sheets and strips, hereinafter referred to as the "sheet", intended for general fabrication purposes and forming by drawing.

Remark: The units and numerical values given in ( ) in this standard are in accordance with the International System of Units (SI), and are appended for informative reference.

Further, the customary units and numerical values in this standard shall be unified into the SI units and numerical values on and after January 1, 1991.

### 2. Grade and Designation

The sheet and strip shall be classified into 3 grades, and their designations shall be as given in Table 1.

Table 1. Designations of Grade

Designation of grade	Applicable thickness	Remark
SPHC	1.2 and over, up to and incl. 14	Commercial quality
SPHD	1.2 and over, up to and incl. 14	Drawing quality
SPHE	1.2 and over, up to and incl. 6	Deep drawing quality

Reference: Grade SPHE shall be manufactured by special process, such as application of special killed steel, to improve formability.

3. Chemical Composition

The sheet shall be tested in accordance with 7.1, and the cast analysis shall be as given in Table 2.

Table 2. Chemical Composition

Designation of grade	Chemical composition %	
	P	S
SPHC	0.050 max.	0.050 max.
SPHD	0.050 max.	0.050 max.
SPHE	0.050 max.	0.050 max.

Reference: Although the contents of C and Mn are not expressly specified here, in common practice the SPHC sheet is made of carbon steel which contains within 0.15 % of C and also within 0.60 % of Mn, the SPHD and SPHE within 0.10 % of C and within 0.50 % of Mn, respectively.

4. Mechanical Properties

The sheet shall be tested in accordance with 7.2 and the tensile strength, elongation and bendability of the sheet shall be as given in Table 3-1 or Table 3-2. In the test of bendability, however, the sheet shall have no cracking on the outside of the bent portion.

Further, the drawability of SPHE may be agreed on between the parties concerned.

Table 3-1. Mechanical Properties (Applicable till the end of 1990)

Designation of grade	Tensile strength kgf/mm <sup>2</sup> {N/mm <sup>2</sup> }	Elongation %						Tensile test piece	Bendability			
		Thickness 1.2 mm and over, up to 1.6 mm	Thickness 1.6 mm and over, up to 2.0 mm	Thickness 2.0 mm and over, up to 2.5 mm	Thickness 2.5 mm and over, up to 3.2 mm	Thickness 3.2 mm and over, up to 4.0 mm	Thickness 4.0 mm and over		Inside radius		Test piece	
									Bending angle	Thick-ness up to 3.2 mm		Thick-ness 3.2 mm and over
SPHC	28 min. {275} min.	27 min.	29 min.	29 min.	29 min.	31 min.	31 min.	No. 5, rolling direction	180°	Flat on itself	Thick-ness × 0.5	No. 3, rolling direction
SPHD	28 min. {275} min.	30 min.	32 min.	33 min.	35 min.	37 min.	39 min.		180°	Flat on itself	Flat on itself	
SPHE	28 min. {275} min.	31 min.	33 min.	35 min.	37 min.	39 min.	41 min.		180°	Flat on itself	Flat on itself	

Remark: The values specified shall not be applied to the irregular portions at either end of the sheet in coil.

Table 3-2. Mechanical Properties (Applicable on and after Jan. 1, 1991)

Designation of grade	Tensile strength {N/mm <sup>2</sup> }	Elongation %						Tensile test piece	Bendability			
		Thickness 1.2 mm and over, up to 1.6 mm	Thickness 1.6 mm and over, up to 2.0 mm	Thickness 2.0 mm and over, up to 2.5 mm	Thickness 2.5 mm and over, up to 3.2 mm	Thickness 3.2 mm and over, up to 4.0 mm	Thickness 4.0 mm and over		Inside radius		Test piece	
									Bending angle	Thick-ness up to 3.2 mm		Thick-ness 3.2 mm and over
SPHC	270 min.	27 min.	29 min.	29 min.	29 min.	31 min.	31 min.	No. 5, rolling direction	180°	Flat on itself	Thick-ness × 0.5	No. 3, rolling direction
SPHD	270 min.	30 min.	32 min.	33 min.	35 min.	37 min.	39 min.		180°	Flat on itself	Flat on itself	
SPHE	270 min.	31 min.	33 min.	35 min.	37 min.	39 min.	41 min.		180°	Flat on itself	Flat on itself	

Remark: The values specified shall not be applied to the irregular portions at either end of the sheet in coil.

### 5. Shape, Dimensions, Mass and Tolerances

The shape, dimensions, mass and tolerances of the sheet shall conform to JIS G 3193. In this case, tolerance A shall be applied to the length of sheet and to the width of cut edged one, unless otherwise specified, and the tolerances on thickness shall be as given in Table 4.

Table 4. Tolerances on Thickness

Unit: mm

Specified thickness	Specified width					
	Up to 800	800 and over, up to 1000	1000 and over, up to 1250	1250 and over, up to 2600	1600 and over, up to 2000	1000 and over, up to and incl. 2300
1.20 and over, up to 1.25	±0.14	±0.14	±0.15	±0.16	—	—
1.25 and over, up to 1.60	±0.15	±0.15	±0.16	±0.17	—	—
1.60 and over, up to 2.00	±0.17	±0.18	±0.19	±0.20	±0.21	—
2.00 and over, up to 2.50	±0.20	±0.21	±0.22	±0.23	±0.25	—
2.50 and over, up to 3.15	±0.23	±0.24	±0.25	±0.27	±0.30	±0.35
3.15 and over, up to 4.00	±0.26	±0.27	±0.28	±0.31	±0.35	±0.40
4.00 and over, up to 5.00	±0.29	±0.30	±0.32	±0.35	±0.40	±0.45
5.00 and over, up to 6.00	±0.32	±0.33	±0.36	±0.40	±0.45	±0.50
6.00 and over, up to 8.00	±0.45	±0.45	±0.45	±0.50	±0.55	±0.60
8.00 and over, up to and incl. 14.00	±0.55	±0.55	±0.55	±0.60	±0.65	±0.70

Remarks-1. The thickness shall be measured at any point on the sheet 20 mm or over apart from a side edge. For width of the strip under 40 mm, measurement shall be made on the center line of the strip.

2. The values specified shall not be applied to the irregular portions at either end of the sheet in coil.

6. Appearance

The appearance of sheet shall conform to 7. of JIS G 3193.

7. Test

7.1 Chemical Analysis Chemical analysis shall be as follows:

(1) The general requirements for chemical analysis and method of sampling specimen for analysis shall be in accordance with the specification of 3. in JIS G 0303.

(2) The analytical method shall comply with any one of the following standards:

JIS G 1214, JIS G 1215, JIS G 1253, JIS G 1256, JIS G 1257

7.2 Mechanical Test

7.2.1 Tests in General General matters common to the mechanical test shall be in accordance with the specification of 4. in JIS G 0303. However, the method of sampling a specimen shall conform to Class A, and the number of test pieces and sampling position shall be as follows:

(1) Number of Test Pieces for Tensile Test and Bend Test

- (a) From Sheets and Strips in Coil and Cut Length One test piece shall be taken from each lot of the same heat rolled to the same thickness. However, two test pieces shall be taken from each lot with a mass over 50 t.
- (b) From Steel Plates (Excluding Plate in Cut Length from Coil) One test piece shall be taken from each lot of the same heat having the maximum thickness of the sheet within twice the minimum thickness. However, two test pieces shall be taken from each lot with a mass over 50 t.

- (2) Sampling Position and Direction of Tensile Test Piece and Bend Test Piece The test piece shall be taken parallel to the rolling direction and also the center of each test piece shall be half of the width inward from a side edge. Where the above location is impossible, the sampling position shall be made as close to it as possible.

7.2.2 Test Piece The tensile test piece and the bend test piece shall conform to the following requirements.

- (1) No. 5 test piece specified in JIS Z 2201
- (2) No. 3 test piece specified in JIS Z 2204

7.2.3 Test Methods The test methods of tensile test and bend test shall conform to the following standards:

- (1) JIS Z 2241
- (2) JIS Z 2248

8. Inspection

Inspection shall be as follows:

- (1) Chemical composition, mechanical properties, shape, dimensions and appearance shall conform to the requirements specified in 3., 4., 5. and 6.
- (2) The sheet that has failed in the tensile test or bend test or both may be subjected to a retest for acceptance according to the specification of 4.4 in JIS G 0303.

9. Marking

The sheet having passed the inspection shall be marked with the following items on each bundle by suitable means. However, the sheet which is not bundled shall be marked on each sheet with the following items (excluding the number of sheet and mass).

- (1) Designation of grade
- (2) Heat number or inspection number
- (3) Dimension
- (4) Serial number of sheet or mass (omissible when marking is made on each sheet)
- (5) Manufacturer's name or its abbreviation

10. Report

The manufacturer shall submit to the purchaser a report in accordance with the specification of 8. in JIS G 0303 when previously required by the purchaser.