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Rolled steels for general structure

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Foreword

This Japanese Industrial Standard has been revised by the Minister of Economy, Trade and Industry based on the provision of Article 14, paragraph (1) of the Industrial Standardization Act applied mutatis mutandis pursuant to the provision of Article 16 of the said Act in response to a proposal for revision of Japanese Industrial Standard with a draft being attached, submitted by The Japan Iron and Steel Federation (JISF), an accredited standards development organization. This edition replaces the previous edition (**JIS G 3101 : 2022**), which has been technically revised.

However, **JIS G 3101 : 2022** may be applied in the **JIS** mark certification based on the relevant provisions of Article 30, paragraph (1), etc. of the Industrial Standardization Act until 19 February 2025.

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Rolled steels for general structure

Introduction

This Japanese Industrial Standard has been prepared based on **ISO 630-1** : 2021, Edition 2, and **ISO 630-2** : 2021, Edition 3, with some modifications of the technical contents.

Annex JA to Annex JC are unique to **JIS** and not given in the corresponding International Standards. The vertical lines on both sides and dotted underlines indicate changes from the corresponding International Standards. A list of modifications with the explanations is given in Annex JD.

1 Scope

This Standard specifies requirements for the hot rolled steels used for general structures such as bridges, ships and rolling stock (hereafter referred to as steel products) and hot extruded sections.

The quality requirements specific to hot extruded sections and deformed flats are given in Annex JB and Annex JC, respectively.

NOTE The International Standards corresponding to this Standard and the symbol of degree of correspondence are as follows.

ISO 630-1 : 2021 *Structural steels — Part 1 : General technical delivery conditions for hot-rolled products*

ISO 630-2 : 2021 *Structural steels — Part 2 : Technical delivery conditions for structural steels for general purposes* (overall evaluation : MOD)

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 21-1**.

2 Normative references

Part or all of the provisions of the following standards, through reference in this text, constitute provisions of this Standard. The most recent editions of the standards (including amendments) indicated below shall be applied.

JIS G 0202 *Glossary of terms used in iron and steel (Testing)*

JIS G 0203 *Glossary of terms used in iron and steel (Products and quality)*

JIS G 0320 *Standard test method 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 0416 *Steel and steel products — Location and preparation of samples and test pieces for mechanical testing*

JIS G 3191 *Dimensions, mass, shape and permissible variations of hot rolled steel bars and bar in coil*

JIS G 3192 *Dimensions, shape, mass and permissible variations of hot rolled steel sections*

JIS G 3193 *Dimensions, shape, mass and permissible variations of hot rolled steel plates, sheets and strips*

JIS G 3194 *Dimensions, shape, mass and permissible variations of hot rolled flat steel*

JIS Z 2241 *Metallic materials — Tensile testing — Method of test at room temperature*

JIS Z 2248 *Metallic materials — Bend test*

3 Terms and definitions

For the purpose of this Standard, the terms and definitions given in **JIS G 0202** and **JIS G 0203** apply.

4 Symbols of grade and applicable dimensions

The steel products are classified into four grades, and their symbols and applicable dimensions shall be as given in Table 1.

Table 1 Symbols of grade and applicable dimensions

Symbol of grade	Shape of steel product	Applicable dimensions mm
SS330	Plate/sheet, strip in coil, and bar	—
	Flat	≤100 mm in thickness ^{a)}
SS400 SS490	Plate/sheet, strip in coil, section, and bar	—
	Flat	≤100 mm in thickness ^{a)}
SS540	Plate/sheet, strip in coil, section, and flat	≤40 mm in thickness ^{a), b)}
	Bar	≤40 in diameter or width across flats
Note ^{a)} The thickness of deformed flats shall be the maximum thickness.		
Note ^{b)} The thickness of sections shall be t or t_2 in Table 3 of JIS G 3192 , t_2 in Table 4 of JIS G 3192 and t_2 in Table 5 of JIS G 3192 .		

5 Chemical composition

Steel products shall be tested in accordance with 9.1, and their heat analysis values shall conform to Table 2.

Table 2 Chemical composition ^{a)}

				Unit: %
Symbol of grade				
SS330	SS400	SS490	—	—
SS540				≤0.050
				≤0.040
Note ^{a)}				Elements in the table with no limit values or elements not given in the table may be added as necessary.

6 Mechanical properties

Steel products shall be tested in accordance with 9.2, and satisfy the following mechanical properties requirements.

- a) Requirements given in Table 3 for plates/sheets, strips in coil, flats and sections.
- b) Requirements given in Table 4 for bars.

Sections with a leg length under 70 mm and flats with a width under 50 mm shall satisfy the following mechanical properties requirements.

- c) Requirements in Annex JA for sections with a leg length under 40 mm, and requirements in Annex JA for sections with a leg length 40 mm or over to and excluding 70 mm.
- d) Requirements in Annex JA for flats with a width under 40 mm, and requirements in Annex JA for flats with a width 40 mm or over to and excluding 50 mm.

In a bend test, if performed, the test piece shall be free from cracks on its outside surface.

NOTE For the details of bend test, see 9.2.1.

Table 3 Mechanical properties (plates/sheets, strips in coil, flats and sections)

Symbol of grade	Yield point or proof stress ^{a)}		Tensile strength N/mm ²	Elongation			Bendability		
	Thickness ^{b), c)} mm	N/mm ²		Thickness ^{b), c)} mm	Test piece	%	Bending angle	Inner radius	Test piece ^{e)}
SS330	≤16	≥205	330 to 430	≤5	No. 5	≥26	180°	0.5 × thickness	No. 1
	>16 ≤ 40	≥195		>5 ≤ 16	No. 1A	≥21			
				>16 ≤ 40	No. 1A	≥26			
	>40 ≤ 100	≥175		>40 ≤ 50	No. 1A	≥26			
					No. 4	≥28			
	>100	≥165		>50	No. 4	≥28 ^{d)}			
SS400	≤16	≥245	400 to 510	≤5	No. 5	≥21	180°	1.5 × thickness	No. 1
	>16 ≤ 40	≥235		>5 ≤ 16	No. 1A	≥17			
				>16 ≤ 40	No. 1A	≥21			
	>40 ≤ 100	≥215		>40 ≤ 50	No. 1A	≥21			
					No. 4	≥23			
	>100	≥205		>50	No. 4	≥23 ^{d)}			
SS490	≤16	≥285	490 to 610	≤5	No. 5	≥19	180°	2.0 × thickness	No. 1
	>16 ≤ 40	≥275		>5 ≤ 16	No. 1A	≥15			
				>16 ≤ 40	No. 1A	≥19			
	>40 ≤ 100	≥255		>40 ≤ 50	No. 1A	≥19			
					No. 4	≥21			
	>100	≥245		>50	No. 4	≥21 ^{d)}			
SS540	≤16	≥400	≥540	≤5	No. 5	≥16	180°	2.0 × thickness	No. 1
	>16 ≤ 40	≥390		>5 ≤ 16	No. 1A	≥13			
				>16 ≤ 40	No. 1A	≥17			
NOTE	1 N/mm ² = 1 MPa								
Note ^{a)}	Unless otherwise specified, the yield point to be determined shall be the upper yield point, <i>R_{eH}</i> , or, wherever this is not pronounced, the 0.2 % proof stress, <i>R_{p0.2}</i> .								
Note ^{b)}	For sections, the thickness shall be that at the location of test pieces.								
Note ^{c)}	The thickness of deformed flats shown in Figure JC.1 shall be <i>t</i> ₁ for Shape A and <i>t</i> for Shape B and Shape C. Other thickness may be applied upon agreement between the purchaser and the manufacturer.								
Note ^{d)}	For the elongation of Test piece No. 4 of steel plate/sheet of thickness over 90 mm, subtract 1 from the values of this table for each increment of 25 mm or its fraction in thickness. The number subtracted shall not exceed 3.								
Note ^{e)}	For the bend test of steel products of thickness 5 mm or under, Test piece No. 3 may be used.								

Table 4 Mechanical properties (bars)

Symbol of grade	Yield point or proof stress ^{a)}		Tensile strength N/mm ²	Elongation			Bendability		
	Diameter or width across flats ^{b)} mm	N/mm ²		Diameter or width across flats ^{b)} mm	Test piece	%	Bending angle	Inner radius	Test piece
SS330	≤16	≥205	330 to 430	≤25	No. 2	≥25	180°	0.5 × diameter or width across flats	No. 2
	>16 ≤ 40	≥195		>25	No. 14A	≥28			
	>40 ≤ 100	≥175							
	>100	≥165							
SS400	≤16	≥245	400 to 510	≤25	No. 2	≥20	180°	1.5 × diameter or width across flats	No. 2
	>16 ≤ 40	≥235		>25	No. 14A	≥22			
	>40 ≤ 100	≥215							
	>100	≥205							
SS490	≤16	≥285	490 to 610	≤25	No. 2	≥18	180°	2.0 × diameter or width across flats	No. 2
	>16 ≤ 40	≥275		>25	No. 14A	≥20			
	>40 ≤ 100	≥255							
	>100	≥245							
SS540	≤16	≥400	≥ 540	≤25	No. 2	≥13	180°	2.0 × diameter or width across flats	No. 2
	>16 ≤ 40	≥390		>25 ≤ 40	No. 14A	≥16			
NOTE 1 N/mm ² = 1 MPa									
Note ^{a)} Unless otherwise specified, the yield point to be determined shall be the upper yield point, <i>R_{eH}</i> , or, wherever this is not pronounced, the 0.2 % proof stress, <i>R_{p0.2}</i> .									
Note ^{b)} Diameter for round bars and width across flats for square and hexagonal bars.									

7 Shape, dimensions, mass and tolerances

The shape, dimensions, mass and tolerances of steel products shall be in accordance with **JIS G 3191**, **JIS G 3192**, **JIS G 3193** and **JIS G 3194**. Tolerances on width and length, unless otherwise specified, shall be as follows.

- For width of cut-edged plates/sheets and strips in coil, Tolerance A given in Table 7 of **JIS G 3193** shall apply.
- For length of plates/sheets, the tolerances given in Table 8 of **JIS G 3193** shall apply.

8 Appearance

The appearance of steel products shall be in accordance with Clause 9 of **JIS G 3191**, Clause 10 of **JIS G 3192**, Clause 7 of **JIS G 3193**, and Clause 8 of **JIS G 3194**.

9 Tests

9.1 Chemical analysis