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Steel products—Definitions and classification

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Foreword

This translation has been made based on the original Japanese Industrial Standard established by the Minister of International Trade and Industry through deliberations at the Japanese Industrial Standards Committee according to the proposal of establishing a Japanese Industrial Standard from Japan Iron and Steel Federation (JISF)/Japanese Standards Association (JSA), with a draft of Industrial Standard based on the provision of Clause 1, Article 12 of the Industrial Standardization Law applied in accordance with Article 14.

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Steel products— Definitions and classification

Introduction This Japanese Industrial Standard has been prepared on the basis of the first edition of **ISO 6929** *Steel products—Definitions and classification* published in 1987. The required supplements and modifications were added in the content of provisions, taking domestic affairs and other related **JIS** into consideration.

In this Standard, for better understanding of the content, Annex 1 (informative) *Classification of steel products and specified terms* and Annex 2 (informative) *Related International Standards* were added.

Further, in this Standard the portions underlined with dots are the matters not specified in the corresponding International Standard.

1 Scope

1.1 This Japanese Industrial Standard defines and classifies steel products according to

- a) their stage of manufacture;
- b) their shape and dimensions⁽¹⁾;
- c) their appearance.

Although the products are generally classified independently of their end uses or manufacturing processes, it has sometimes been necessary to make reference to these criteria.

Note ⁽¹⁾ All dimensions given in this Standard are nominal.

Remarks 1 The following International Standard was referred to for the preparation of this Standard.

ISO 6929 : 1987 *Steel products—Definitions and classification*

2 The classification of steel industry products and other steel products is shown in Annex 1 (informative).

3 The related standards from ISO are shown in Annex 2 (informative).

1.2 Section one defines and classifies steel industry products⁽²⁾.

Note ⁽²⁾ The term “steel industry products”, in the strict sense of the expression, is not yet currently applied in all countries. Its introduction should preferably bring about conformity, particularly in the field of statistics, without changing anything in existing practices.

1.3 Section two defines and classifies other steel products as follows:

- a) powder metallurgy products;
- b) castings;

- c) forged finished and stamped finished products;
- d) bright products;
- e) cold-formed products;
- f) welded sections;
- g) wire;
- h) tubes, hollow sections and hollow bars.

2 Normative references In this Standard, normative references of **ISO 6929** are listed in Annex 2 (informative) as an informative reference.

Section one : Steel industry products

3 General classification The range of products covered in Section one of this Standard is grouped into the following categories according to their stage of manufacture:

- a) crude products (clause 4);
- b) semi-finished products (clause 5);
- c) rolled finished products and end products (clause 6) and finished products forged in lengths (clause 7).

4 Crude products Products which are either in the liquid state (see 4.1) or solid in the form of ingots (see 4.2)⁽³⁾.

Note ⁽³⁾ Production statistics include under the definition of “crude steel” not only solid products obtained by casting into ingot moulds and liquid steel for castings, but also solid products obtained by continuous casting which are otherwise regarded as semi-finished products [see Note ⁽⁶⁾ of 4.2].

4.1 liquid steel: Steel in the liquid state ready for pouring and obtained directly from the melting of raw materials. A distinction is made between the following:

4.1.1 liquid steel for pouring into ingot moulds or for continuous casting;

4.1.2 liquid steel for castings.

4.2 ingots⁽⁴⁾: Products obtained by pouring liquid steel into a mould of shape appropriate to the subsequent processing⁽⁵⁾ into semi-finished or finished products, generally by hot rolling or forging⁽⁶⁾.

Notes ⁽⁴⁾ Ingots for the production of seamless tubes are classified as crude products.

⁽⁵⁾ In the case of ingots remelted by the vacuum arc or electroslag process, the products are obtained by melting, in a mould of appropriate shape, steel electrodes that have been previously cast, forged or rolled.

- (6) Although their structure is similar to that of ingots, products obtained by continuous casting are regarded in this Standard and in delivery statistics as semi-finished products according to their shape and dimensions, while in production statistics they are regarded as crude products.

The shape generally resembles a pyramid or truncated cone; the side surfaces may be corrugated and the corners more or less rounded. Depending on their subsequent conversion requirements, and without altering their classification as “ingots”, they may

- a) have been totally or partially dressed, for example by tool or torch, to remove surface defects;
- b) have been shortened (top or bottom cropping) or have been cut into lengths to facilitate the envisaged conversion;
- c) or have undergone both operations.

According to their cross-section, they are classified as ingots (see 4.2.1) or slab ingots (see 4.2.2).

4.2.1 ingots have a cross-section which may be square, rectangular (the width being less than twice the thickness), polygonal, round, oval or shaped according to the profile to be rolled.

4.2.2 slab ingots have a rectangular cross-section, the width being equal to or greater than twice the thickness.

5 Semi-finished products Products obtained either by rolling or forging of ingots or by continuous casting, and generally intended for conversion into finished products by rolling or forging.

Their cross-section can be of various shapes (see 5.1 to 5.4); the cross-sectional dimensions are constant along the length, with wider tolerances than those of the corresponding finished products, and the corners are more or less rounded.

The side faces are sometimes slightly convex or concave, retaining rolling or forging marks, and may be partially or totally dressed, for example by tool, torch or grinding.

The semi-finished products defined in 5.1 to 5.5 are classified according to their shape, their cross-sectional dimensions and their use⁽⁷⁾ (see Annex 1 figure 1).

Note (7) The designations used for certain types of semi-finished products (blooms, billets, slabs) originated from the time when the type of mill on which each of these products was rolled depended essentially on the cross-section of the product to be reduced. Today, blooms can be rolled on so-called billet mills and ingots on so-called slab mills, and vice versa.

5.1 Semi-finished products of square cross-section⁽⁸⁾ (excluding the semi-finished products defined in 5.5) According to their dimensions, these products are traditionally classified as follows:

Note (8) These definitions are not yet applied in all countries. It is, however, recommended that they be applied as far as possible, especially for statistical purposes.

5.1.1 square blooms: Products with side greater than 200 mm.

Reference : By the definition of **ISO**, the product with side greater than 120 mm.

5.1.2 square billets: Products with side generally equal to or greater than 50 mm and less than or equal to 200 mm.

Remarks : Dimensions of square billets can be less than as above for certain types of high alloy steels such as high-speed steels, etc.

Reference : By the definition of **ISO**, products with side generally equal to or greater than 50 mm and less than or equal to 120 mm.

5.2 Semi-finished products of rectangular cross-section (excluding the semi-finished products defined in 5.3 and 5.5) According to their cross-sectional dimensions, these products are traditionally classified as follows:

5.2.1 rectangular blooms: Products having a cross-sectional area greater than 40 000 mm², with a ratio of width to thickness greater than 1 and less than 2.

Reference : By the definition of **ISO**, product having a cross-sectional area greater than 14 400 mm².

5.2.2 rectangular billets: Products having a cross-sectional area equal to or greater than 2 500 mm² and less than or equal to 40 000 mm², with a ratio of width to thickness greater than 1 and less than 2.

Reference : By the definition of **ISO**, products having a cross-sectional area greater than 2 500 mm² and less than or equal to 14 400 mm².

5.3 Flat semi-finished products

5.3.1 slabs: Flat semi-finished products of thickness equal to or greater than 50 mm and with a ratio of width to thickness equal to or greater than 2. Slabs with a ratio of width to thickness greater than 4 are called "flat slabs". They are used as rolled material of steel sheet and strip.

5.3.2 sheet bars: Semi-finished products having cross-section of rectangle and strip shape of which thickness is not exceeding 50 mm and width about 250 mm. They are used as materials for steel sheet made by the pullover rolling mill.

Reference : By the definition of **ISO**, semi-finished products of sheet shape having width of 150 mm or over and thickness of over 6 mm up to and excluding 50 mm.

5.4 Blank for sections, beam blank Semi-finished products intended for the manufacture of heavy sections and sheet piles and which have been preformed for that purpose. The cross-sectional area of these semi-finished products is generally greater than 2 500 mm². They are also called shaped blooms. (However, in most cases the finished products in question are obtained directly by rolling semi-finished products of square or rectangular section.)

5.5 Semi-finished products for seamless tubes The cross-section of these products may be round, square, rectangular or polygonal.

6 Rolled finished products and end products⁽⁹⁾

Note ⁽⁹⁾ The classification of the products defined in clause 6, in rolled finished products (see 6.2) and end products (see 6.3) is derived from a classification corresponding to production and delivery statistics. However, sometimes they differ from the classification corresponding to production and delivery statistics.

6.1 General

6.1.1 rolled finished products and end products: Products which have been manufactured generally by rolling and which are normally not further hot worked in the steelworks.

A general term is “rolled steels” and they are steel products formed in shapes such as steel bars, wire rods, sections, steel sheets and plates, steel strip in coil, and steel flats by means of a rolling mill.

The cross-section is uniform over the whole length. It is usually defined by a standard which fixes the normal size ranges and the tolerances on shape and dimension. The surface is generally smooth, but reinforcing bars or floor plates, for example, may have a regularly raised or indented pattern.

6.1.2 According to shape and dimensions, a distinction is made as follows:

- a) long products (see 6.2.1. Long products manufactured by hot rolling of heavy sections, steel bar, medium sections and light sections.);
- b) rod or wire rod (see 6.2.2. Hot rolling products which are wound to irregular coil in hot rolling process.);
- c) flat products (see 6.2.6 and 6.3. Steel flats, sheet, plate, steel strip in coil, surface treatment steel sheet, flat rolled magnetic steel sheet, black plate etc. and including steel products by hot rolling and cold rolling.).

6.1.3 According to the stage of manufacture, a distinction is made as follows:

- a) **hot-rolled finished products and end products:** Products generally obtained by hot rolling of semi-finished products and, more rarely, by hot rolling of crude products⁽¹⁰⁾. They are rolled at a high temperature about 800 °C or higher under normal conditions (usually, A_{r3} transition temperature or higher) in hot rolling.

Note ⁽¹⁰⁾ Finished products obtained by extrusion are classified in the statistics as hot-rolled finished products: on the other hand, tyres and similar products are classified as forged products.

- b) **cold-rolled finished products and end products:** Products generally obtained by the cold rolling of hot-rolled finished products.

6.1.4 According to surface condition, a distinction is made as follows:

- a) Products which have not undergone any surface treatment, apart from those products which may have received a sample protective coating against corrosion or mechanical damage in handling or storage, or to facilitate their use.

The simple protective coating may be produced, for example, by one of the following methods:

- 1) **passivation** (with chromic or phosphoric acid) — the product is electrochemically or chemically coated with a layer of chromate or phosphate; as distinct from surface treatment by chromating or phosphating [see **6.3.1 b) 3)**] the layer deposited is so thin as to be hardly discernible by optical means;

Reference : ISO specifies 7 to 10 mg/m² per one side.

- 2) **application of an organic coating** — the coating itself offers no protection against corrosion but serves as a surface preparation for the subsequent application of other undercoats or coatings forming part of an anti-corrosion system;
- 3) **application of protective films**, e.g. adhesive coating, adhesive paper, lacquer;
- 4) application of a film of grease, oil, tar, asphalt, lime or any soluble material.

- b) Products which have been surface treated (see **6.3.1**).

6.2 Rolled finished products

6.2.1 Hot-rolled long products Products as defined in **6.1.1**, **6.1.3 a)** and **6.1.4**, with the cross-section resembling the shapes described in **6.2.1 a)** and **6.2.1 b)** or similar shapes. These products are rolled generally in box passes or in universal rolling mills. When the cross-section is rectangular, the dimensional limitations given in **6.2.1 b) 1.3)** apply to differentiate them from wide flats.

These products are mostly delivered in straight lengths, rarely in folded bundles, but never in coils (which differentiates them from rod).

- a) **heavy sections, sections:** Rolled products with cross-section resembling the letter **I**, **H**, **L** (angles) or **U** (channels, see Annex 1 figure 2). They have the following characteristics in common:

- the height h is equal to or greater than 80 mm;
- the surfaces of the webs are continued by fillets to the inside faces of the flange;
- the flanges are generally symmetrical and of equal widths b [see also **6.2.1 a) 4)**];
- the outside faces of the flanges are parallel;
- the flanges are either of decreasing thickness from the web to the edge, in which case it is called sloping flanged, or of uniform thickness, in which case the corresponding section is called “parallel flanged”.

These products are sub-divided into:

- 1) **I and H sections:** Products with cross-section resembling the letter I and H and with characteristics listed in **6.2.1 a).**⁽¹¹⁾ They are classified into narrow beam, medium width beam and column according to the relation between height and side.

- 1.1) **bearing piles:** I or H sections in which the thicknesses of web and flanges are identical.

Note ⁽¹¹⁾ Subsequent slitting of I or H sections in order to obtain two Tee sections does not alter their classification. These are called CT sections.

Reference : In **ISO**, a distinction is made between:

- 1) **I and H sections:** Products with cross-section resembling the letter I and H and with characteristics listed in **6.2.1 a).**⁽¹¹⁾

- **parent sections:** Sections with web and flange thickness considered as standard.
- **thin sections:** Sections manufactured with the same series of rolls as used in producing the corresponding parent section but which, for an approximately equal web height, have thinner web and/or flanges (as a result of adjustment of the vertical or horizontal rolls).
- **thick sections:** Sections manufactured with the same series of rolls as used in producing the corresponding parent section but which, for an approximately equal web height, have a thicker web and/or flanges (as a result of adjustment of the vertical or horizontal rolls).

Among I and H sections a further distinction is made between:

- 1.1) **narrow and medium flanges (I sections):** Flanges with width equal to or less than $0.66 \times$ the nominal height of the section and less than 300 mm.
 - 1.2) **broad or very broad flanges (H sections and columns):** Flanges with width greater than $0.66 \times$ the nominal height, or 300 mm or over (except sections for colliery arches). Sections with flanges wider than $0.8 \times$ the nominal height are sometimes called "columns".
- 2) **U sections (channels):** Products with cross-section resembling the letter U and with characteristics listed in **6.2.1 a).**

Reference : In **ISO**, the following specifications are also included.

In the normal series, the flanges with tapered internal faces have a maximum width of $0.5 h + 25$ mm. There are series which are thinner or thicker than the parent series, and series with parallel flanges.