INTERNATIONAL STANDARD

ISO 630-1

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Structural steels —

Part 1: General technical delivery conditions for hot-rolled products

Aciers de construction —

Partie 1: Conditions générales techniques de livraison pour les produits laminés à chaud

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 630-1 was prepared by Technical Committee ISO/TC 17, *Steel*, Subcommittee SC 3, *Steels for structural purposes*.

This first edition cancels and replaces ISO 630:1995 and ISO 630:1995/Amd 1:2003.

ISO 630 consists of the following parts, under the general title *Structural steels*:

— *Part 1: General technical delivery conditions for hot-rolled products*

— *Part 2: Technical delivery conditions for structural steels for general purposes*

— *Part 3: Technical delivery conditions for fine grain structural steels*

— *Part 4: Technical delivery conditions for high yield strength quenched and tempered structural steel plates*

Technical delivery conditions for structural steels with improved atmospheric corrosion resistance will form the subject of a future Part 5.

Technical delivery conditions for seismic improved structural steels for building will form the subject of a future Part 6.

Structural steels —

Part 1:
General technical delivery conditions for hot-rolled products

1 Scope

This part of ISO 630 specifies the general technical delivery conditions for steel flat and long products (plate/sections/wide flats and bars) used principally for general-purpose structural steels. The steels specified in this part of ISO 630 are intended for use in welded or bolted structures.

The specific requirements for structural steels are given in the individual parts of ISO 630.

This part of ISO 630 does not include the following structural steels, some of which are covered by other International Standards:

— sheet and strip: refer to ISO TC 17/SC 12 “Continuous mill flat rolled products”;

— tubular products: refer to ISO TC 5/SC 1 “Steel tubes”.

NOTE Lists of standards covered by ISO/TC 17/SC 12 and ISO/TC 5/SC 1 are available on the ISO Web site.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 148-1, *Metallic materials — Charpy pendulum impact test — Part 1: Test method*

ISO 377, *Steel and steel products — Location and preparation of samples and test pieces for mechanical testing*

ISO 404, *Steel and steel products — General technical delivery requirements*

ISO 630-2, *Structural steels — Part 2: Technical delivery conditions for structural steels for general purposes*

ISO 630-3*, Structural steels — Part 3: Technical delivery conditions for fine grain structural steels*

ISO 630-4*, Structural steels — Part 4: Technical delivery conditions for high yield strength quenched and tempered structural steel plates*

ISO 657-1, *Hot-rolled steel sections — Part 1: Equal-leg angles — Dimensions*

ISO 657-2, *Hot-rolled steel sections — Part 2: Unequal-leg angles — Dimensions*

ISO 657-5, *Hot-rolled steel sections — Part 5: Equal-leg angles and unequal-leg angles — Tolerances for metric and inch series*

ISO 657-11, *Hot-rolled steel sections — Part 11: Sloping flange channel sections (Metric series) — Dimensions and sectional properties*

ISO 657-15, *Hot-rolled steel sections — Part 15: Sloping flange beam sections (Metric series) — Dimensions and sectional properties*

ISO 657-16, *Hot-rolled steel sections — Part 16: Sloping flange column sections (Metric series) — Dimensions and sectional properties*

ISO 657-19, *Hot-rolled steel sections — Part 19: Bulb flats (metric series) — Dimensions, sectional properties and tolerances*

ISO 657-21, *Hot-rolled steel sections — Part 21: T-sections with equal depth and flange width — Dimensions*

ISO 1035-1, *Hot-rolled steel bars — Dimensions of round bars*

ISO 1035-2, *Hot-rolled steel bars — Dimensions of square bars*

ISO 1035-3, *Hot-rolled steel bars — Dimensions of flat bars*

ISO 1035-4, *Hot-rolled steel bars — Tolerances*

ISO 2566-1, *Steel — Conversion of elongation values — Part 1: Carbon and low alloy steels*

ISO 4885, *Ferrous products — Heat treatments — Vocabulary*

ISO 4948-1, *Steels — Classification — Part 1: Classification of steels into unalloyed and alloy steels based on chemical composition*

ISO 4948-2, *Steels — Classification — Part 2: Classification of unalloyed and alloy steels according to main quality classes and main property or application characteristics*

ISO/TS 4949, *Steel names based on letter symbols*

ISO 6892-1, *Metallic materials — Tensile testing — Part 1: Method of test at room temperature*

ISO 6929, *Steel products — Definitions and classification*

ISO 7452, *Hot-rolled structural steel plates — Tolerances on dimensions and shape*

ISO 7778, *Steel plate with specified through-thickness characteristics*

ISO 7788, *Steel — Surface finish of hot-rolled plates and wide flats — Delivery requirements*

ISO 9034, *Hot-rolled structural steel wide flats — Tolerances on dimensions and shapes*

ISO 9443, *Heat-treatable and alloy steels — Surface quality classes for hot-rolled round bars and wire rods — Technical delivery conditions*

ISO/TS 9769, *Steel and iron — Review of available methods of analysis*

ISO 10474, *Steel and steel products — Inspection documents*

ISO 14284, *Steel and iron — Sampling and preparation of samples for the determination of chemical composition*

ISO 17577, *Steel —Ultrasonic testing for steel flat products of thickness equal to or greater than 6 mm*

ISO 20723, *Structural steels — Surface condition of hot-rolled sections — Delivery requirements*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 4885, ISO 4948-1, ISO 4948-2 and ISO 6929 and the following apply.

3.1
non-specific inspection
inspection carried out by the manufacturer in accordance with his own procedures to assess whether products defined by the same product specification, and made by the same manufacturing process, are in compliance with the requirements of the order or not

NOTE The products inspected may not necessarily be the products actually supplied.

3.2
specific inspection
inspection carried out, before delivery, according to the product specification, on the products to be supplied or on test units of which the products supplied are part, in order to verify that these products are in compliance with the requirements of the order

4 Classification and designation

4.1 Classification

The classification of the steel grades in accordance with ISO 4948-1 and ISO 4948-2 is given in the individual parts of ISO 630, depending on the steel-grade chemical composition and treatment condition.

4.2 Designation

The steel grades specified in the individual parts of ISO 630 are designated with steel names in accordance with ISO/TS 4949.

NOTE To distinguish the grades in Annex A and Annex B in the individual parts of ISO 630, an additional letter G is used for the grades in Annex B.

5 Information to be supplied by the purchaser

5.1 Mandatory information

The following information shall be supplied by the purchaser at the time of enquiry and order:

a) the quantity required;

b) the type of product;

c) the nominal dimensions and tolerances on dimensions and shape of the product;

d) the number of the relevant part of ISO 630;

e) the steel name (grade);

f) all required options (see 5.2);

g) inspection document to be issued (see 7.1).

5.2 Options

A number of options for agreement between the manufacturer and purchaser are specified in this part of ISO 630 and listed below. If the purchaser does not specify any of these options at the time of enquiry and order, the products shall be supplied in accordance with the basic specification (see 5.1):

a) specification of the steel-making process (see 6.1);

b) deviating delivery condition (see 6.2);

c) product analysis (see 6.3.2);

d) mechanical properties after additional heat treatment (see 6.4.1);

e) specification of special classes for the reduction of area (see 6.4.3);

f) additional tests (see 6.6 and 7.2.2);

g) deviating frequency of testing (see 8.2);

h) specification of an analytical method (see 9.1);

i) deviating testing temperature for the impact test (see 9.3);

j) marking method (see Clause 10);

k) information to be given by marking (see Table 1);

l) suitability for hot-dip galvanizing upon agreement with a referenced standard;

m) ultrasonic testing upon agreement with a referenced standard;

n) alternative weldability formula (see 6.3.3).

6 Requirements

6.1 Steel-making process

6.1.1 Unless a special steel-making process has been agreed upon at the time of enquiry and order, the steel-making process for steels in accordance with this part of ISO 630 shall be at the discretion of the manufacturer. If a special steel-making process has been specified, this shall be reported in the inspection document.

6.1.2 The method of deoxidation shall be as given in the individual parts of ISO 630.

6.2 Delivery condition

The delivery conditions are given in the individual parts of ISO 630.

6.3 Chemical composition

6.3.1 Heat analysis

The heat analysis reported by the steel producer shall comply with the requirements of the individual parts of ISO 630 and shall be included in the relevant inspection document.

6.3.2 Product analysis

The product analysis shall be carried out when agreed and specified at the time of enquiry and order.

The permissible product analysis tolerances on the limiting values given for the cast analysis are specified in the individual parts of ISO 630.

6.3.3 Carbon-equivalent value

For determining the carbon-equivalent value (CEV), the following IIW (International Institute for Welding) formula shall be used.

$$CEV = C + Mn/6 + (Cr + Mo + V)/5 + (Ni + Cu)/15$$

NOTE If agreed upon at the time of enquiry and order [see 5.2 n)], other formulae for the CEV and for weld-crack sensitivity composition (P_{CM}) can be used.

The following formula for P_{CM} should be used:

$$P_{CM} = C + Si/30 + Mn/20 + Cu/20 + Ni/60 + Cr/20 + Mo/15 + V/10 + 5B$$

6.4 Mechanical properties

6.4.1 General

Under the inspection and testing conditions specified in Clauses 7, 8 and 9, and in the delivery condition as specified in 6.2, mechanical properties shall comply with the relevant requirements given in the individual parts of ISO 630. Agreement shall be reached, where appropriate, at the time of enquiry and order about the mechanical properties to be adhered to after additional heat treatment such as stress relief [see option 5.2 d)].

6.4.2 Impact properties

Impact properties shall comply with the requirements of the individual parts of ISO 630. If specified, the products over 12 mm in thickness shall be tested with a full-size test piece in accordance with 9.3. If agreed upon at the time of enquiry and order, sub-sized test pieces shall be used in the case of nominal product thicknesses of $6 \leq t \leq 12$ mm. Impact tests shall not be required for nominal thickness $t < 6$ mm. For sections, thickness refers to the part thickness where test pieces are prepared as specified in ISO 377.

6.4.3 Through-thickness characteristics

By agreement, products of the grades and qualities specified in the individual parts of ISO 630 shall comply with one of the improved deformation properties perpendicular to the surface of the product as specified in ISO 7778.

6.5 Surface condition

The surface properties shall be in accordance with ISO 7788 for plates and wide flats, ISO 20723 for sections and ISO 9443 for bars. Other surface-condition standards may be used if agreed upon at the time of enquiry and order.

6.6 Internal soundness

By agreement, ultrasonic requirements together with the conditions of their verification shall be specified. See 9.5.

6.7 Dimensions, tolerances on dimensions and shape, and mass

6.7.1 Dimensions, and tolerances on dimensions and shape

The nominal dimensions and tolerances on dimensions for the products shall be agreed upon at the time of enquiry and order, with reference to the dimensional standards listed below:

a) for hot-rolled flat products, see ISO 7452 for plates and ISO 9034 for wide flats;

b) for hot-rolled long products, see ISO 657-1, ISO 657-2, ISO 657-5, ISO 657-11, ISO 657-15, ISO 657-16, ISO 657-19 and ISO 657-21 for sections, or ISO 1035-1 to ISO 1035-4 for bars.

NOTE By agreement, the relevant standards shown in Annex A may be used.

6.7.2 Calculation of mass

A density of 7 850 kg/m^3 shall be used as the basis for the calculation of the nominal mass from the nominal dimensions of all steels in the individual parts of ISO 630.

7 Inspection

7.1 Types of inspection and inspection documents

The products shall be delivered either with specific or non-specific inspection (see ISO 404) as specified in the individual parts of ISO 630 to confirm compliance with the order and this part of ISO 630.

In case of specific inspection, the purchaser shall state the required type of inspection documents in accordance with ISO 10474. If the purchaser requires the presence of an authorized representative or an inspector designated by the official regulations, the purchaser shall notify the manufacturer of the name and address of the organization or person who is to carry out the inspection and produce the inspection document.

7.2 Tests to be carried out

7.2.1 The following tests shall be carried out according to the requirements of the individual parts of ISO 630 and shall be reported on the relevant inspection document:

— heat analysis (see 6.3.1);

— tensile test (see 6.4.1, 8.2.2 and 9.2);

— impact test, if ordered and applicable (see 6.4.2, 8.2.3 and 9.3);

— visual examination of the surface condition (see 6.5);

— dimensional inspection (see 6.7).

7.2.2 If agreed upon at the time of enquiry and order, the following specific tests shall be carried out according to the requirements of the individual parts of ISO 630 and shall be reported on the relevant inspection document:

— product analysis (see 6.3.2);

— ultrasonic test for verification of internal soundness (see 6.6 and 9.5).

7.3 Retests

Retests shall follow the provisions of ISO 404.

8 Sampling

8.1 General

The samples and test pieces shall be marked in a way that the product itself is traceable and the position of the samples and test pieces in the product is unambiguously known.

8.2 Frequency of testing

8.2.1 Verification of chemical composition

The verification of the heat analysis shall be per cast (heat). For the product analysis, if specified and unless otherwise agreed, one test piece per cast shall be taken in order to determine those elements, indicated with numerical values for the particular steel grade, in the relevant parts of ISO 630.

8.2.2 Verification of mechanical properties

The verification of mechanical properties shall be as specified in the individual parts of ISO 630. The test unit shall be as specified in the individual parts of ISO 630.

8.2.3 Tests to be carried out for specific inspection

The tests to be carried out for specific inspection shall be as specified in the individual parts of ISO 630.

8.3 Selection and preparation of samples and test pieces

8.3.1 Sampling and sample preparation

Sampling and sample preparation shall be in accordance with the requirements of ISO 377 and ISO 14284.

8.3.2 Preparation of samples and test pieces

8.3.2.1 General

Requirements for the location and orientation of samples and test pieces for mechanical tests applicable for the individual parts of ISO 630 are given in the following.

8.3.2.2 Test pieces for the tensile test

8.3.2.2.1 One test piece shall be prepared in accordance with ISO 6892-1 for the tensile test from each test unit. The test piece shall be rectangular unless a circular test piece is permitted, as stated in 8.3.2.2.3.

8.3.2.2.2 At least one rolled surface shall be retained on rectangular test pieces. However, both rolled surfaces shall be retained on the test piece in the case of product thicknesses $\leq$ 20 mm.

8.3.2.2.3 Circular test pieces are permissible, but shall only be provided for product thicknesses $>$ 20 mm. Test piece diameters shall be at least 10 mm.

8.3.2.3 Test pieces for the impact test

Standard V-notched test pieces shall be prepared from the samples for the impact test, in accordance with ISO 148-1. In the case of nominal product thickness 6 mm $\leq t \leq$ 12 mm, sub-sized test pieces shall be machined. The largest possible standard sub-sized test piece (7,5 mm or 5,0 mm) shall be used. Test pieces shall not be machined for product thicknesses $<$ 6 mm. The notch shall be perpendicular to the surface of the product.

9 Test methods

9.1 Chemical analysis

9.1.1 Unless otherwise agreed at the time of enquiry and order, the choice of a suitable analytical method for the chemical analysis shall be at the discretion of the manufacturer.

9.1.2 In case of dispute about analytical methods, the chemical composition shall be determined in accordance with a reference method in one of the International Standards listed in ISO/TS 9769. If no standard exists, the method to be used shall be agreed between the parties concerned.

9.2 Tensile test

The tensile test shall be carried out in accordance with ISO 6892-1, generally using a proportional test piece of gauge length $L_0 = 5{,}65\sqrt{S_0}$, where S_0 is the original cross-sectional area of the test piece. Test pieces with a constant gauge length may be used; in this case, the elongation value shall be converted in accordance with ISO 2566-1. The yield strength to be determined shall be the upper yield strength, R_{eH}, or, wherever this is not pronounced, either the 0,2 % proof strength, $R_{p0,2}$, or the 0,5 % total elongation proof strength, $R_{0,5}$, may be used.

9.3 Impact test

The impact test on V-notched test pieces shall be carried out in accordance with ISO 148-1. The specifications of the individual parts of ISO 630 shall apply.

Where sub-sized test pieces are used (see 8.3.2.3), the minimum impact energy values given in the specific parts of ISO 630 shall be reduced in proportion to the cross-sectional area of the test piece. For product thicknesses < 6 mm, the impact test shall not be carried out.

The minimum impact values given in the individual parts of ISO 630 apply for the mean of three test pieces. One individual value may be lower than the specified value, provided that it is not less than 70 % of the specified value. If the above conditions are not met, an additional set of three test pieces shall be taken from the same sample and shall be tested. In order to regard the test unit as acceptable after testing the second set, the following requirements shall be met:

a) the mean value of six tests shall be greater than or equal to the specified minimum value;

b) not more than two of the six individual values shall be less than the specified minimum value;

c) not more than one of the six individual values shall be less than 70 % of the specified minimum value.

If these requirements are not met, the sample product shall be rejected and retests shall be carried out on two new sample products among the remainder of the test unit.

9.4 Through-thickness characteristics

The test methods for the through-thickness characteristics shall be given in ISO 7778.

9.5 Ultrasonic test

By agreement, an ultrasonic test shall be carried out:

— for flat products of thickness ≥ 6 mm in accordance with ISO 17577 or with test methods and acceptance criteria agreed upon;

— for sections and bars with test methods and acceptance criteria agreed upon.

10 Marking

The products shall be marked durably and readably in an accessible and visible place with the information given in Table 1. The method of marking and the material of marking shall, unless otherwise agreed, be at the manufacturer's discretion. It is permissible to supply products in securely tied bundles. In this case, the marking shall be on a label or tag attached to the bundle.

Table 1 — Marking of the products

Marking of	Symbol [a]	Marking of	Symbol [a]
Manufacturer's name, trade marks or logo	+	Direction of rolling [b]	(+)
The number of this part of ISO 630	(+)	Nominal thickness	(+)
Steel name (grade)	+	Nominal dimensions other than thickness	(+)
Type of finish	(+)	Inspector's mark	+ [c]
Identification number [d]	+ [e]	Purchaser's order No.	(+)

[a] +: the marking shall be applied; (+): the marking shall be applied if so agreed, or at the manufacturer's discretion.

[b] The direction of rolling is normally obvious from the shape of the product and the position of the marking. Marking may be longitudinally applied by roller stamping, or it may be placed near to one end of the piece and transverse to the rolling direction. A specific separate indication of the principal rolling direction will not normally be required, but may be requested by the purchaser.

[c] The inspector's mark may be omitted if the relevant inspector can be identified in another way.

[d] The numbers or letters used for identification shall allow the product(s) to be related to the relevant inspection certificate or inspection report.

[e] This shall permit the traceability of the heat number.

Annex A
(informative)

Applicable standards on dimensions, tolerances, shape and mass

Table A.1 — Applicable standards on dimensions, tolerances, shape and mass

Plates	Sections	Wide flats	Bars
EN 10029	EN 10024 EN 10034 EN 10055 EN 10056 EN 10279		EN 10058 EN 10059 EN 10060 EN 10061
ASTM A6M	ASTM A6M	ASTM A6M	ASTM A6M
JIS G 3193	JIS G 3192	JIS G 3194	JIS G 3191
IS 1730	IS 808 IS 1252 IS 2314 IS 3954 IS 10182 (Parts 1 and 2) IS 12778	IS 1863	IS 1173 IS 1732

Bibliography

[1] ASTM A6M, *Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling*

[2] EN 10024, *Hot rolled taper flange I sections — Tolerances on shape and dimensions*

[3] EN 10029, *Hot rolled steel plates 3 mm thick or above — Tolerances on dimensions and shape*

[4] EN 10034, *Structural steel I and H sections — Tolerances on shape and dimensions*

[5] EN 10048, *Hot rolled narrow steel strip — Tolerances on dimensions and shape*

[6] EN 10051, *Continuously hot-rolled strip and plate/sheet cut from wide strip of non-alloy and alloy steels — Tolerances on dimensions and shape*

[7] EN 10055, *Hot rolled steel equal flange tees with radiused root and toes — Dimensions and tolerances on shape and dimensions*

[8] EN 10056, *Mechanical vibration — Measurement and analysis of whole-body vibration to which passengers and crew are exposed in railway vehicles*

[9] EN 10058, *Hot rolled flat steel bars for general purposes — Dimensions and tolerances on shape and dimensions*

[10] EN 10059, *Hot rolled square steel bars for general purposes — Dimensions and tolerances on shape and dimensions*

[11] EN 10060, *Hot rolled round steel bars for general purposes — Dimensions and tolerances on shape and dimensions*

[12] EN 10061, *Hot rolled hexagon steel bars for general purposes — Dimensions and tolerances on shape and dimensions*

[13] EN 10279, *Hot rolled steel channels — Tolerances on shape, dimensions and mass*

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

[15] JIS G 3192, *Dimensions, mass and permissible variations of hot rolled steel sections*

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

[17] JIS G 3194, *Dimensions, mass and permissible variations of hot rolled flat steel*

[18] IS 808, *Dimensions for hot rolled steel beam, column, channel and angle sections*

[19] IS 1173, *Hot rolled slit steel tee bars*

[20] IS 1252, *Hot rolled steel bulb angles — Dimensions*

[21] IS 1730, *Steel plates, sheets, strips and flats for structural and general engineering purposes — Dimensions*

[22] IS 1732, *Dimensions for round and square steel bars for structural and general engineering purposes*

[23] IS 1863, *Hot rolled steel bulb flats*

[24] IS 2314, *Steel sheet billing sections*

[25] IS 3954, *Hot rolled steel channel sections for general engineering purposes — Dimensions*

[26] IS 10182-1, *Dimensions and tolerances for hot rolled trade shoe sections — Part 1: Sections TS 1.1*

[27] IS 10182-2, *Dimensions and tolerances for hot rolled trade shoe sections — Part 2: Sections TS 4.1*

[28] IS 12778, *Dimensions for hot rolled steel parallel flange beam and column sections*

[29] CSA G40.20, *General requirements for rolled or welded structural quality steel*

[30] CSA G40.21, *General requirements for structural quality steel*

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