
**Structural steels — Cold-formed, welded,
structural hollow sections — Technical
delivery requirements**

*Aciers de construction — Profils creux pour la construction soudés formés à
froid — Conditions techniques de livraison*

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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 3.

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 International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 10799 was prepared by Technical Committee ISO/TC 5, *Ferrous metal pipes and metallic fittings*, Subcommittee SC 1, *Steel tubes*.

Annexes A, B and C form a normative part of this International Standard.

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Structural steels — Cold-formed, welded, structural hollow sections — Technical delivery requirements

1 Scope

This International Standard specifies the technical delivery requirements for cold-formed, welded, steel structural hollow sections of circular, square or rectangular form. It is applicable to structural hollow sections formed cold without subsequent heat treatment.

The grades, chemical composition and mechanical properties for non-alloy steels and fine-grain steels are given in annexes A and B, respectively.

NOTE 1 Requirements for tolerances, dimensions and sectional properties are given in ISO 4019.

NOTE 2 For hot-finished structural hollow sections, see ISO 630-2.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 148:1983, *Steel — Charpy impact test (V-notch)*.

ISO 377:1997, *Steel and steel products — Location and preparation of samples and test pieces for mechanical testing*.

ISO 404:1992, *Steel and steel products — General technical delivery requirements*.

ISO 643:1983, *Steels — Micrographic determination of the ferritic or austenitic grain size*.

ISO 2566-1:1984, *Steel — Conversion of elongation values — Part 1: Carbon and low alloy steels*.

ISO 4019:—¹⁾, *Structural steels — Cold-formed, welded, structural hollow sections — Dimensions and sectional properties*.

ISO 6892:1998, *Metallic materials — Tensile testing at ambient temperature*.

ISO 9001:2000, *Quality management systems — Requirements*.

ISO 9304:1989, *Seamless and welded (except submerged arc-welded) steel tubes for pressure purposes — Eddy current testing for the detection of imperfections*.

ISO 9402:1989, *Seamless and welded (except submerged arc-welded) steel tubes for pressure purposes — Full peripheral magnetic transducer/flux leakage testing of ferromagnetic steel tubes for the detection of longitudinal imperfections*.

1) To be published. (Revision of ISO 4019:1982)

ISO 9606-1:1994, *Approval testing of welders — Fusion welding — Part 1: Steels.*

ISO 9764:1989, *Electric resistance and induction welded steel tubes for pressure purposes — Ultrasonic testing of the weld seam for the detection of longitudinal imperfections.*

ISO 9765:1990, *Submerged arc-welded steel tubes for pressure purposes — Ultrasonic testing of the weld seam for the detection of longitudinal and/or transverse imperfections.*

ISO 9956-1:1995, *Specification and approval of welding procedures for metallic materials — Part 1: General rules for fusion welding.*

ISO 9956-2:1995, *Specification and approval of welding procedures for metallic materials — Part 2: Welding procedure specification for arc welding.*

ISO 9956-3:1995, *Specification and approval of welding procedures for metallic materials — Part 3: Welding procedure tests for arc welding of steels.*

ISO 10474:1991, *Steel and steel products — Inspection documents.*

ISO 12096:1996, *Submerged arc-welded steel tubes for pressure purposes — Radiographic testing of the weld seam for the detection of imperfections.*

ISO 14284:1996, *Steel and iron — Sampling and preparation of samples for the determination of chemical composition.*

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3 Terms and definitions

For the purposes of this International Standard, the following terms and definitions apply.

3.1 tube

hollow long product open at both ends of any cross-sectional shape

3.2 structural hollow section

tube intended to be used for structural purposes

3.3 normalizing rolling

rolling process in which the final deformation is carried out in a certain temperature range leading to a material condition equivalent to that obtained after normalizing, so that the specified values of the mechanical properties are retained even after normalizing

3.4 cold forming

process whereby the main forming is done at ambient temperature

3.5 thermomechanical rolling

rolling process in which the final deformation is carried out in a certain temperature range leading to a material condition with certain properties which cannot be achieved or repeated by heat treatment alone (subsequent heating above 580 °C may lower the strength values)

NOTE Thermomechanical rolling leading to the delivery condition M can include processes with an increasing cooling rate, with or without tempering, including self-tempering but excluding direct quenching and quenching and tempering.

4 Classification and designations

4.1 Classification

4.1.1 Within the steel grades of the non-alloy steels given in annex A, three qualities, JR, J0 and J2, are specified. These qualities differ in respect of specified impact requirements, limits on values of various elements with particular reference to sulfur and phosphorus, and in inspection and testing requirements.

4.1.2 Within the steel grades of the fine-grain steels given in annex B, four qualities, N, NL, M and ML, are specified. These differ in respect of the carbon, sulfur and phosphorus content and low temperature-impact properties.

4.2 Designations

4.2.1 For non-alloy steel structural hollow sections the steel designation consists of:

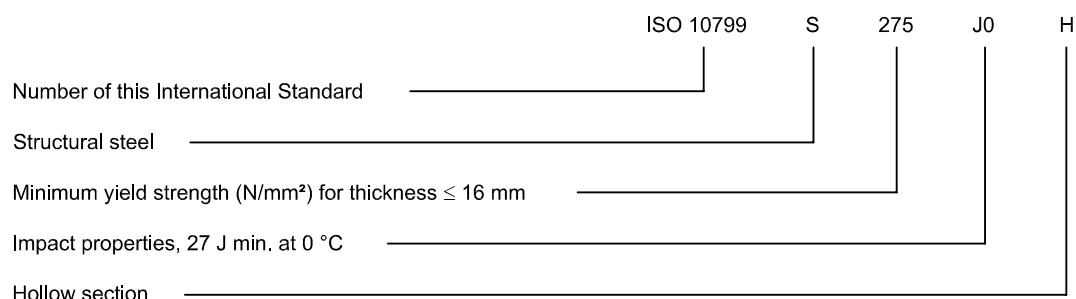
- the number of this International Standard (i.e. ISO 10799);
- the capital letter S for structural steel;
- the indication of the minimum specified yield strength for thicknesses ≤ 16 mm, expressed in newtons per square millimetre (N/mm²);
- the capital letters JR for the qualities with specified impact properties at room temperature;
- the capital letter J and a number 0 or 2 for the qualities with specified impact properties at 0 °C and –20 °C, respectively;
- the capital letter H to indicate hollow sections.

4.2.2 For fine-grain steel structural hollow sections the steel designation consists of:

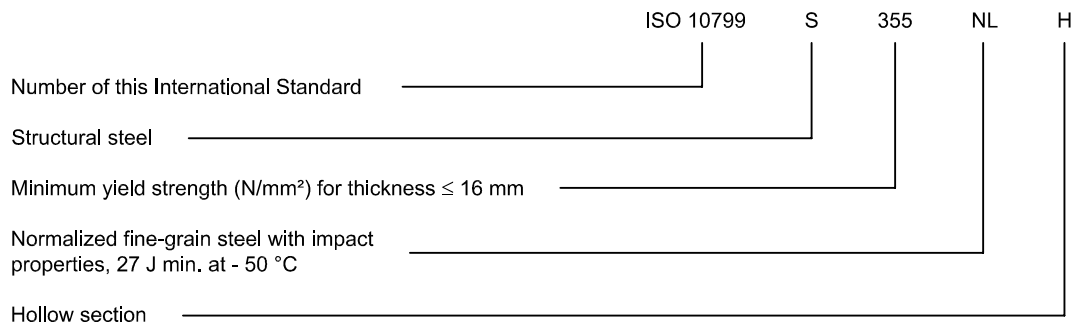
- the number of this International Standard (i.e. ISO 10799);
- the capital letter S for structural steel;
- the indication of the minimum specified yield strength for thicknesses ≤ 16 mm, expressed in newtons per square millimetre (N/mm²);
- the capital letter N to indicate normalized or normalized rolled feedstock material (see 6.3);
- the capital letter M to indicate thermomechanically rolled feedstock material (see 6.3);
- the capital letter L for the qualities with specified minimum values of impact energy at a temperature of –50 °C;
- the capital letter H to indicate hollow sections.

4.2.3 The product shall be designated as illustrated by the following examples:

EXAMPLE 1



EXAMPLE 2



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 (mass or total length or number);
- b) the type and range of length or the length (see ISO 4019);
- c) details of the product form:
 - CFCHS = cold-formed welded circular hollow section,
 - CFRHS = cold-formed welded square or rectangular hollow section;
- d) the steel designation (see 4.2);
- e) the dimensions (see ISO 4019);
- f) the options required (see 5.2);
- g) the type of inspection document required (see 7.2 and Tables 2 and 3).

5.2 Options

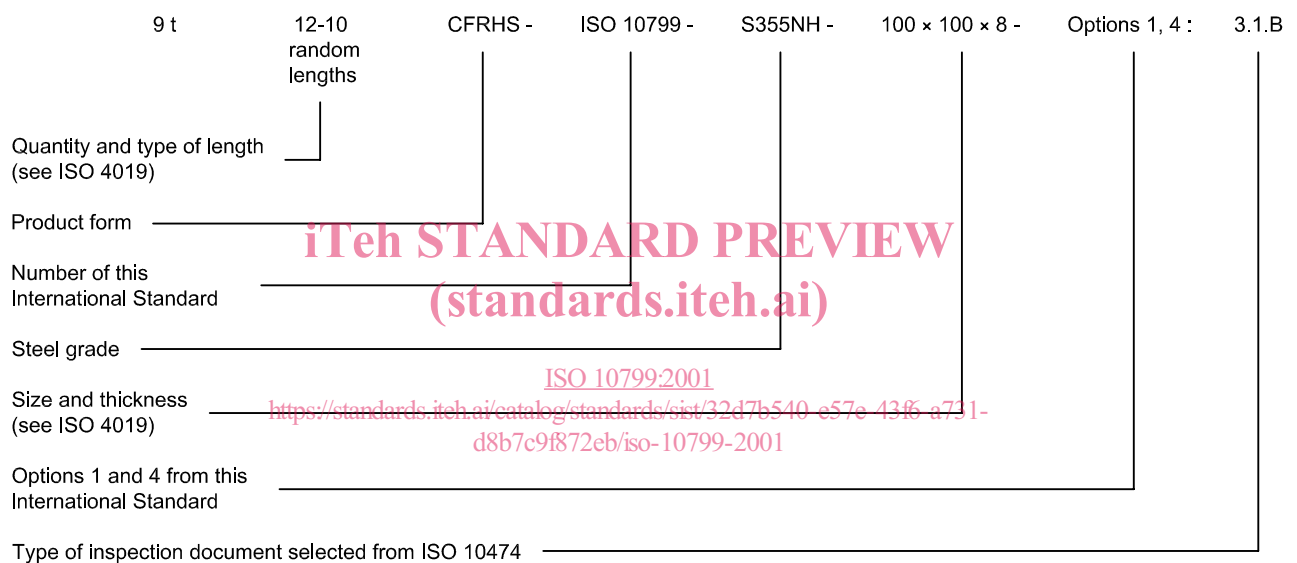
A number of options are given in this International Standard, listed below with their subclause references. In the event that the purchaser does not indicate the wish to implement any of these options at the time of enquiry and order, the products shall be supplied in accordance with the basic specification (see 5.1).

Options:

- 1 Product analysis shall be carried out (see 6.6.1).
- 2 A maximum carbon equivalent value in accordance with Table A.2 shall be provided for non-alloy grades (see 6.6.2).
- 3 The Cr, Cu, Mo, Ni, Ti and V cast analysis contents shall be reported in the inspection certificate or report for non-alloy grades (see 6.6.2).
- 4 A maximum carbon equivalent value in accordance with Table B.3 shall be provided for the fine-grain steels S275, S355 and S420 (see 6.6.3).

- 5 The cast-analysis limits for grade S460 (see 6.6.3) shall be:
 - a) $V + Nb + Ti \leq 0,22 \%$; and
 - b) $Mo + Cr \leq 0,30 \%$.
- 6 Impact properties of quality J0 and JR shall be verified. This option applies only when products are ordered with specific inspection and testing (see 6.7.4).
- 7 The material shall be suitable for hot-dipped galvanized coating (see 6.8.2).
- 8 Weld repairs to the body of non-alloy structural steel hollow sections shall not be permitted (see 6.9.4).
- 9 Specific inspection and testing for non-alloy grades of qualities JR and J0 shall be applied (see 7.1.1).

5.3 Example



6 Requirements

6.1 General

Structural hollow sections of non-alloy steels shall comply with the requirements of annex A; structural hollow sections of fine-grain steels shall comply with the requirements of annex B.

6.2 Steel manufacturing process

6.2.1 The steel-manufacturing process shall be at the discretion of the steel producer.

6.2.2 For the non-alloy structural steels given in annex A, the method of deoxidation shall be as given in Table A.1.

6.2.3 For the fine-grain steels given in annex B the method of deoxidation shall be as given in Table B.1 or Table B.2.

6.2.4 The fine-grain steels given in annex B shall have a ferritic grain size equal to, or finer than, 6 when measured in accordance with ISO 643 (see 6.7.3).

6.3 Condition of feedstock material

According to the designation given in the order, the following delivery conditions apply for the feedstock material used for the manufacture of cold-formed hollow sections:

- as rolled or normalized/normalized rolled (N) for steels of qualities JR, J0 and J2, according to annex A;
- normalized/normalized rolled (N) for steels of qualities N and NL, according to annex B;
- thermomechanically rolled (M) for steels of quality M and ML, according to annex B.

6.4 Structural hollow section manufacturing process

6.4.1 Structural hollow sections shall be manufactured by electric or submerged arc welding without subsequent heat treatment (see 6.5). Hollow sections manufactured by a continuous process shall not include welds used for joining lengths of the flat rolled-strip prior to forming the hollow section, except that for helically welded, submerged arc-welded hollow sections, such welds shall be permitted when tested in accordance with 9.4.3.

6.4.2 Electric-welded hollow sections are normally supplied without trimming of the internal weld bead.

6.4.3 For quality assurance requirements, see ISO 404. If the purchaser specifies quality assurance, the appropriate standard is ISO 9001:2000.

6.5 Delivery conditions

The hollow sections shall be delivered cold-formed without subsequent heat treatment except that the weld seam may be in the as-welded or heat-treated condition.

NOTE For submerged arc-welded hollow sections with a greater than 508 mm outside diameter it could be necessary to perform a warm shaping operation, which does not affect the mechanical properties, in order to meet the out-of-roundness tolerance requirements.

6.6 Chemical composition

6.6.1 The cast analysis reported by the steel producer shall apply, and shall comply with the requirements of Table A.1, B.1 or B.2.

Option 1 (see 5.2): A product analysis shall be carried out for hollow sections supplied with specific inspection and testing.

The permissible deviations of the product analysis from the specified limits cast analysis are given in Table 1.

When a carbon equivalent value (CEV) is required it shall be determined from the cast analysis using the formula:

$$CEV = C + \frac{Mn}{6} + \frac{Cr + Mo + V}{5} + \frac{Ni + Cu}{15}$$

6.6.2 For non-alloy steel products the following additional requirements can be requested at the time of enquiry and order for products supplied with specific inspection and testing (see 7.1).

Option 2 (see 5.2): The CEV in accordance with Table A.2.

Option 3 (see 5.2): The recording on the inspection certificate or inspection report of the Cr, Cu, Mo, Ni, Ti and V content (cast analysis).