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Structural steels —

Part 6: Technical delivery conditions for seismic-proof improved structural steels for building

Aciers de construction —

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*Partie 6: Conditions techniques de livraison pour aciers de
construction améliorés sismiques pour bâtiment*

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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This document was prepared by Technical Committee ISO/TC 17, *Steel*, Subcommittee SC 4, *Steels for structural purposes*.

This second edition cancels and replaces the first edition (ISO 630-6:2014), which has been technically revised.

The main changes are as follows:

- steel grades and qualities have been updated in the scope with the addition of a new grade (SA390) and four qualities (D, D+, E and E+);
- the maximum nominal thickness for plate has been changed from 125 mm to 150 mm;
- the specification of delivery conditions has been added to the scope to align with other parts of the ISO 630 series;
- the list of normative references has been updated;
- some terms and definitions concerning heat treatments have been deleted because they are already included in 630-1;
- four qualities (D, D+, E and E+) have been added to [4.2](#);
- in the tables, the designations concerning thickness have been changed to “nominal thickness”;
- specified values for SA390 have been added to [Tables 1, 3, 4, 5, 6, 7](#) and [8](#);
- four new qualities (D, D+, E and E+) have been added to [Table 8](#)
- the layout of [Table 3, 4, 5, 6, B.1](#), and [B.2](#) has been updated.

A list of all parts in the ISO 630 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Structural steels —

Part 6:

Technical delivery conditions for seismic-proof improved structural steels for building

1 Scope

This document specifies qualities for steels for seismic-proof improved structural use. It is applicable to steel plates rolled on a reversing mill, wide flats, hot-rolled sections, which are used in the as-rolled condition, with the exception of grade SA440, which is normally produced using quenched and tempered or thermomechanical controlled process and normally intended for welded or bolted structures.

This document covers 5 steel grades and 7 qualities. Grades SA235, SA325, SA345, SA390 and SA440 are covered. Not all grades are available in all qualities, and some qualities have Charpy V-notch requirements.

The steels specified in this document are applicable to hot-rolled plates, wide flats, and sections with a minimum nominal thickness of 6 mm and a maximum nominal thickness of 150 mm for steel plates, and a maximum nominal thickness of 140 mm for wide flats and hot-rolled sections.

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

- sheet and strip, e.g. ISO 4995 or ISO 4996;
- tubular products, e.g. ISO 12633-1, ISO 12633-2.

NOTE The term "thickness" is considered as "nominal thickness", unless otherwise stated.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 630-1, *Structural steels — Part 1: General technical delivery conditions for hot-rolled products*

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

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

ISO 7778, *Through-thickness characteristics for steel products*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 630-1 apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

4 Classification and designation

4.1 Classification

The steel grades specified in this document shall be classified as unalloyed or alloy steels.

4.2 Designation (grades and qualities)

This document specifies 5 steel grades— Grades SA235, SA325, SA345, SA390 and SA440. Each grade is available in up to 7 qualities.

- Quality A: no impact testing.
- Quality C: impact testing at 0 °C.
- Quality C+: impact testing at 0 °C and through-thickness characteristics testing.
- Quality D: impact testing at -20 °C.
- Quality D+: impact testing at -20 °C and through-thickness characteristics testing.
- Quality E: impact testing at -40 °C.
- Quality E+: impact testing at -40 °C and through-thickness characteristics testing.

5 Information to be supplied by purchaser

5.1 Mandatory information

The information that shall be supplied by the purchaser at the time of the order is specified in ISO 630-1.

5.2 Options

The options of ISO 630-1 may apply. In addition, the following options may apply.

- a) Testing of impact properties in the transverse direction using Charpy V-notch test pieces in accordance with ISO 630-1.
- b) Testing of tensile and impact properties at a frequency per each plate as heat-treated.
- c) On special request of the purchaser, the manufacturer may inform the purchaser at the time of the order which of the alloying elements appropriate to the steel grade required will be deliberately added to the material to be delivered and reported in the heat analysis.
- d) On special request of the purchaser, the manufacturer may inform the purchaser at the time of the order which of the alloying elements appropriate to the steel grade required will be deliberately added to the material to be delivered and reported in the product analysis. The product analysis may be carried out at an agreed frequency when specified at the time of the order.

6 Requirements

6.1 Steel-making process

The steel making process shall be in accordance with ISO 630-1.

6.2 Delivery condition

The products covered by this document are generally delivered in the as-rolled condition, with the exception of grade SA440 which is normally produced using quenched and tempered or a thermomechanical controlled process. For all other grades, unless otherwise agreed, the as-rolled condition, normalized rolled, normalized or quenched and tempered condition are allowed at the manufacturer's discretion. The thermomechanical controlled process is not allowed at the manufacturer's discretion. When agreed upon between the purchaser and the manufacturer, thermomechanical controlled process may be applied to any grade.

6.3 Chemical composition

6.3.1 Heat analysis

The chemical composition determined by heat analysis shall conform with the values specified in [Table 1](#).

Table 1 — Chemical composition % by mass (heat analysis)

Grade	Nominal thickness ^a <i>t</i> mm	C % max.	Si % max.	Mn %	P % max.	S ^b % max.	Cu % max.	Ni % max.	Cr % max.	Mo % max.	Nb + V + Ti % max.
SA235	6 ≤ <i>t</i> < 50	0,20	0,35	0,50 to 1,50	0,030	0,045	0,60	0,45	0,35	0,15	0,15
	50 ≤ <i>t</i> ≤ 150	0,22									
SA325	6 ≤ <i>t</i> < 50	0,18	0,55	0,50 to 1,65	0,030	0,045	0,60	0,45	0,35	0,15	0,15
	50 ≤ <i>t</i> ≤ 150	0,20									
SA345	6 ≤ <i>t</i> < 50	0,23	0,55	0,50 to 1,65	0,030	0,045	0,60	0,45	0,35	0,15	0,15
	50 ≤ <i>t</i> ≤ 150										
SA390	6 ≤ <i>t</i> ≤ 150	0,20	0,55	0,50 to 1,65	0,030	0,045	0,60	0,45	0,35	0,15	0,15
SA440	6 ≤ <i>t</i> < 50	0,18	0,55	0,50 to 1,65	0,030	0,045	0,60	0,45	0,35	0,15	0,15
	50 ≤ <i>t</i> ≤ 150	0,20									

If agreed between the purchaser and the manufacturer, the limitations of alloying elements other than those given may be applied.

^a For the H-section, the dimension t_2 (flange thickness) in [Figure 1](#) shall apply.

^b If agreed between the purchaser and the manufacturer, the lower limit of a maximum sulfur content may be applied.

6.3.2 Product analysis

The permissible deviations of product analysis shall conform with the values given in [Table 2](#). See [5.2](#).

Table 2 — Permitted deviation for the product analysis relative to the specified heat analysis

Element	Specified limits %	Permitted deviation %
C	≤0,23	+0,03
Si	≤0,55	+0,05
Mn	≥0,50; ≤1,65	+0,10, -0,10
P	≤0,030	+0,005
S	≤0,045	+0,005
Cu	≤0,60	+0,07
Ni	≤0,45	+0,05
Cr	≤0,35	+0,05

Table 2 (continued)

Element	Specified limits %	Permitted deviation %
Mo	≤0,15	+0,03
Nb + V + Ti	≤0,15	+0,02

6.3.3 Carbon equivalent value (CEV) or parameter crack measurement (P_{CM})

6.3.3.1 Carbon equivalent value (CEV)

The carbon equivalent value (C_{EV}) requirements shall be as given in [Table 3](#).

The carbon equivalent value (C_{EV}) shall be determined using the IIW (International Institute for Welding) formula, given as [Formula \(1\)](#):

$$C_{EV} = C + \frac{Mn}{6} + \frac{Cu + Mo + V}{5} + \frac{Ni + Cu}{15} \tag{1}$$

If agreed between the purchaser and the manufacturer, [Annex B](#) may be used for the formula of carbon equivalent and maximum value of carbon equivalent in place of [Table 3](#).

Table 3 — CEV based on the heat analysis

Grade	Nominal thickness ^a t mm	Maximum C_{EV} %
	SA235	$6 \leq t \leq 50$
$50 < t \leq 150$		0,35
SA325	$6 \leq t \leq 50$	0,46
	$50 < t \leq 150$	0,48
SA345	$6 \leq t \leq 50$	0,45
	$50 < t \leq 150$	0,47
SA390	$6 \leq t \leq 50$	0,45
	$50 < t \leq 150$	0,47
SA440	$6 \leq t \leq 50$	0,47
	$50 < t \leq 150$	0,49

^a For the H-section, the dimension t_2 (flange thickness) in [Figure 1](#) shall apply.

6.3.3.2 Parameter crack measurement (P_{CM})

If agreed between the purchaser and manufacturer, the value of parameter crack measurement requirements (P_{CM}) shown in [Table 4](#) may be used instead of the CEV. For determining the P_{CM} , the heat analysis value and [Formula \(2\)](#) shall be used:

$$P_{CM} = C + \frac{Si}{30} + \frac{Mn}{20} + \frac{Cu}{20} + \frac{Ni}{60} + \frac{Cr}{20} + \frac{Mo}{15} + \frac{V}{10} + 5B \tag{2}$$

In this respect, all the elements designated in the [Formula \(2\)](#) shall be used for calculation and reported, regardless of whether those elements are intentionally added or not.