INTERNATIONAL STANDARD

ISO 630-3

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Structural steels —

Part 3: Technical delivery conditions for fine-grain structural steels

Aciers de construction —

Partie 3: Conditions techniques de livraison pour aciers de construction à grains fins

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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 630-3 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, which has been technically revised. It incorpoates 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*

The following parts are under preparation:

— *Part 5: Technical delivery conditions for structural steels with improved atmospheric corrosion resistance*

— *Part 6: Technical delivery conditions for seismic improved structural steels for building*

Structural steels —

Part 3:
Technical delivery conditions for fine-grain structural steels

1 Scope

This part of ISO 630 specifies requirements for flat and long products of hot-rolled weldable fine-grain structural steels in the as-rolled (for SG grades only), normalized/normalized-rolled and thermomechanical-rolled delivery conditions. It applies to steel plates rolled on a reversing mill, wide flats, hot-rolled sections and bars, which are intended for use in heavily loaded parts of welded or bolted structures.

This part of ISO 630 covers 11 grades and four qualities. Grades S275, S355, S420 and S460 are covered in Annex A. Grades SG245, SG290, SG325, SG345, SG365, SG415 and SG460 are covered in Annex B. Not all grades are available in all qualities, and some qualities have Charpy V-notch requirements.

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

ISO 643, *Steels — Micrographic determination of the apparent grain size*

3 Terms and definitions

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

3.1
as-rolled
steel without any special rolling and/or heat treatment condition

3.2
normalized-rolled
steel rolled with a 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 after normalizing

NOTE In international publications for both normalized rolling, as well as thermomechanical rolling, the expression “controlled rolling” may be found.

3.3
normalized
steel produced by heating to a suitable temperature above the transformation range and then cooling in air to a temperature substantially below the transformation range

3.4
thermomechanical processed
steel rolled with a 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

NOTE 1 Hot forming or post-weld heat treatment above 580 °C may lower the strength values and should not be performed. Flame straightening can be applied in accordance with relevant technical recommendations.

NOTE 2 Thermomechanical rolling can include processes with an increasing cooling rate with or without tempering,, including self-tempering, but excluding direct quenching and quenching and tempering.

NOTE 3 In some publications, the term “thermomechanical control process” is also used.

3.5
fine grain
steel with fine-grain structure with an equivalent index of ferritic grain size ≥6 (see 6.1)

NOTE For the determination of grain sizes see ISO 643.

4 Classification and designation

4.1 Classification

The steel grades specified in this part of ISO 630 shall be classified as non-alloy quality or alloy special steels.

4.2 Grades and qualities

This International Standard specifies 11 steel grades. Grades S275, S355, S420 and S460 are covered in Annex A. Grades SG245, SG290, SG325, SG345, SG365, SG415 and SG460 are covered in Annex B. Each grade is available in up to four qualities. These grades and qualities differ in their specified mechanical properties and impact energy requirements. All S grades require impact testing. SG grades require impact testing upon agreement at the time of ordering.

Quality A: no impact testing

Quality C: impact testing at 0 °C

Quality D: impact testing at −20 °C

Quality E: impact testing at −50 °C

4.3 Normative annexes

The requirements of Annex A or Annex B are to be regarded separately. Each annex is independent of the other without combining in any way.

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 apply. In addition, the following options apply to products according to this part of ISO 630. If the purchaser does not indicate a wish to implement any of these options at the time of the order, the products shall be supplied in accordance with the basic specification (see 5.1):

a) required delivery condition;

b) testing of impact properties in transverse direction using Charpy V-notch test pieces in accordance with ISO 630-1.

6 Requirements

See ISO 630-1.

6.1 Steelmaking process

See ISO 630-1.

If a special steelmaking process has been specified, this shall be reported in the inspection document.

The steels shall have a fine-grain practice containing sufficient amounts of nitrogen-binding elements.

6.2 Delivery condition

The products covered by this part of ISO 630 are delivered in the as-rolled (for SG grades only), normalized-rolled, normalized, or thermomechanical processed condition. The delivery condition shall be indicated in the inspection document.

6.3 Chemical composition

6.3.1 Heat analysis

The chemical composition determined by heat analysis shall comply with the specified values in Tables A.1 and A.2 in Annex A or Table B.1.

6.3.2 Product analysis

The product analysis of grades S275, S355, S420, and S460 shall comply with the values given in Tables A.3 and A.4.

The permitted deviation of product analysis of grades SG290, SG325, SG345, SG365, SG415 and SG460 shall comply with the values given in Table B.2.

6.3.3 Carbon equivalent value

The carbon equivalent value (CEV) requirements for Annex A grades are given in Tables A.5 and A.6, and for Annex B grades are given in Table B.3. For determining the CEV, the following International Institute for Welding (IIW) formula shall be used:

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

6.4 Mechanical properties

6.4.1 Tensile properties

The tensile properties at room temperature shall comply with the values specified in Tables A.7 and A.8 or Table B.4.

6.4.2 Charpy V-notch impact tests

The impact properties of Charpy V-notch test pieces shall comply with the values specified in Tables A.9, A.10, A.11 and A.12 or Table B.5. The orientation of the specimens shall be longitudinal unless a transverse orientation is agreed between the purchaser and manufacturer (see 5.2 and ISO 630-1).

6.5 Surface conditions

See ISO 630-1.

6.6 Internal soundness

See ISO 630-1.

6.7 Dimensions and tolerances on dimensions, shape and mass

See ISO 630-1.

7 Inspection

Specific inspection is required for all grades. Refer to 7.1 in ISO 630-1:2011.

8 Sampling — Frequency of testing

8.1 Verification

The verification of mechanical properties shall be by heat. Verification by lot shall be by agreement between the producer and purchaser.

8.2 Test units

8.2.1 Annex A

The test unit shall contain products of the same form, grade, quality, and delivery condition, and of the same thickness range as specified in Table A.7 for the yield strength and shall be, by heat:

— 40 tons or part thereof;
— 60 tons or part thereof for heavy sections with a mass >100 kg/m;
— 80 tons or part thereof for heavy sections with a mass >200 kg/m;
— 80 tons or part thereof for all sections if the mass of the cast exceeds 200 tons.

By agreement at the time of ordering, two tests by heat may be used.

8.2.2 Annex B

The test unit shall contain products of the same form, grade, quality, and delivery condition, and of the same thickness range as specified in Table B.4 for the yield strength and shall be 50 tons or part thereof. By agreement at the time of ordering, two tests by heat may be used.

9 Test methods

See ISO 630-1.

10 Marking

See ISO 630-1.

Annex A
(normative)

Steel grades S275, S355, S420 and S460: Chemical composition and mechanical properties

Table A.1 — Chemical composition of the heat analysis for normalized or normalized-rolled steel

Designation	Quality	C % max.	Si % max.	Mn %	P % max.[a]	S % max.[ab]	Nb % max.	V % max.	Al_{total} % min.[c]	Ti % max.	Cr % max.	Ni % max.	Mo % max.	Cu % max.[d]	N % max.
S275N	D	0,18	0,40	0,50–1,50	0,030	0,025	0,05	0,05	0,02	0,05	0,30	0,30	0,10	0,55	0,015
	E	0,16			0,025	0,020									
S355N	D	0,20	0,50	0,90–1,65	0,030	0,025	0,05	0,12	0,02	0,05	0,30	0,50	0,10	0,55	0,015
	E	0,18			0,025	0,020									
S420N	D	0,20	0,60	1,00–1,70	0,030	0,025	0,05	0,20	0,02	0,05	0,30	0,80	0,10	0,55	0,025
	E				0,025	0,020									
S460N[e]	D	0,20	0,60	1,00–1,70	0,030	0,025	0,05	0,20	0,02	0,05	0,30	0,80	0,10	0,55	0,025
	E				0,025	0,020									

[a] For long products, the P and S content can be 0,005 % higher.

[b] For some applications, e.g. railways, a maximum S content of 0,010 % may be agreed at the time of the order.

[c] If sufficient other N-binding elements are present, the minimum total Al content does not apply.

[d] Cu content above 0,40 % may cause hot shortness during hot forming.

[e] $V + Nb + Ti \leq 0{,}22$ % and $Mo + Cr \leq 0{,}30$ %.

Table A.2 — Chemical composition of the heat analysis for thermomechanical processed steel

Designation	Quality	C % max.	Si % max.	Mn % max.	P % max.[a]	S % max.[ab]	Nb % max.	V % max.	Al_{total} % min.[c]	Ti % max.	Cr % max.	Ni % max.	Mo % max.	Cu % max.[d]	N % max.
S275M	D, E	0,13 [e]	0,50	1,50	0,030	0,025	0,05	0,08	0,02	0,05	0,30	0,30	0,10	0,55	0,015
					0,025	0,020									
S355M	D, E	0,14 [e]	0,50	1,60	0,030	0,025	0,05	0,10	0,02	0,05	0,30	0,50	0,10	0,55	0,015
					0,025	0,020									
S420M	D, E	0,16 [f]	0,50	1,70	0,030	0,025	0,05	0,12	0,02	0,05	0,30	0,80	0,20	0,55	0,025
					0,025	0,020									
S460M	D, E	0,16 [f]	0,60	1,70	0,030	0,025	0,05	0,12	0,02	0,05	0,30	0,80	0,20	0,55	0,025
					0,025	0,020									

a For long products, the P and S content can be 0,005 % higher.

b For some applications, e.g. railways, a maximum S content of 0,010 % may be agreed at the time of the order.

c If sufficient other N-binding elements are present, the minimum total Al content does not apply.

d Cu content above 0,40 % may cause hot shortness during hot forming.

e For long products, a maximum C content of 0,15 % for grade S275 and a maximum C content of 0,16 % for grade S355 applies.

f For long products of the grades S420 and S460, a maximum C content of 0,18 % applies.

Table A.3 — Chemical composition of the product analysis based on Table A.1

Designation	Quality	C % max.	Si % max.	Mn %	P % max.[a]	S % max.[ab]	Nb % max.	V % max.	Al_{total} % min.[c]	Ti % max.	Cr % max.	Ni % max.	Mo % max.	Cu % max.[d]	N % max.
S275N	D	0,20	0,45	0,45–1,60	0,035	0,030	0,06	0,07	0,015	0,06	0,35	0,35	0,13	0,60	0,017
	E	0,18			0,030	0,025									
S355N	D	0,22	0,55	0,85–1,75	0,035	0,030	0,06	0,14	0,015	0,06	0,35	0,55	0,13	0,60	0,017
	E	0,20			0,030	0,025									
S420N	D	0,22	0,65	0,95–1,80	0,035	0,030	0,06	0,22	0,015	0,06	0,35	0,85	0,13	0,60	0,027
	E				0,030	0,025									
S460N[e]	D	0,22	0,65	0,95–1,80	0,035	0,030	0,06	0,22	0,015	0,06	0,35	0,85	0,13	0,60	0,027
	E				0,030	0,025									

[a] For long products, the P and S content can be 0,005 % higher.

[b] For some applications, e.g. railways, a maximum S content of 0,012 % may be agreed at the time of the order.

[c] If sufficient other N-binding elements are present, the minimum total Al content does not apply.

[d] Cu content above 0,45 % may cause hot shortness during hot forming.

[e] $V + Nb + Ti \leq 0{,}26$ % and $Mo + Cr \leq 0{,}38$ %.

Table A.4 — Chemical composition of the product analysis based on Table A.2

Designation	Quality	C % max.	Si % max.	Mn % max.	P % max.[a]	S % max.[ab]	Nb % max.	V % max.	Al_{total} % min.[c]	Ti % max.	Cr % max.	Ni % max.	Mo % max.	Cu % max.[d]	N % max.
S275M	D	0,15 [e]	0,55	1,60	0,035	0,030	0,06	0,10	0,015	0,06	0,35	0,35	0,13	0,60	0,017
	E				0,030	0,025									
S355M	D	0,16 [e]	0,55	1,70	0,035	0,030	0,06	0,12	0,015	0,06	0,35	0,55	0,13	0,60	0,017
	E				0,030	0,025									
S420M	D	0,18 [f]	0,55	1,80	0,035	0,030	0,06	0,14	0,015	0,06	0,35	0,85	0,23	0,60	0,027
	E				0,030	0,025									
S460M	D	0,18 [f]	0,65	1,80	0,035	0,030	0,06	0,14	0,015	0,06	0,35	0,85	0,23	0,60	0,027
	E				0,030	0,025									

[a] For long products, the P and S content can be 0,005 % higher.

[b] For some applications, e.g. railways, a maximum S content of 0,012 % may be agreed at the time of the order.

[c] If sufficient other N-binding elements are present, the minimum total Al content does not apply.

[d] Cu content above 0,45 % may cause hot shortness during hot forming.

[e] For long products, a maximum C content of 0,17 % for grade S275 and a maximum C content of 0,18 % for grade S355 applies.

[f] For long products of the grades S420 and S460, a maximum C content of 0,20 % applies.

Table A.5 — Maximum CEV based on the heat analysis for normalized steel

Designation	Quality	Maximum CEV in % for nominal product thickness in mm		
		≤63	>63 ≤100	>100 ≤250
S275N	D, E	0,40	0,40	0,42
S355N	D, E	0,43	0,45	0,45
S420N	D, E	0,48	0,50	0,52
S460N	D, E	0,53	0,54	0,55

Table A.6 — Maximum CEV based on the heat analysis for thermomechanical processed steel

Designation	Quality	Maximum CEV in % for nominal product thickness in mm				
		≤16	>16 ≤40	>40 ≤63	>63 ≤120	>120 ≤150 [a]
S275M	D, E	0,34	0,34	0,35	0,38	0,38
S355M	D, E	0,39	0,39	0,40	0,45	0,45
S420M	D, E	0,43	0,45	0,46	0,47	0,47
S460M	D, E	0,45	0,46	0,47	0,48	0,48

[a] The figures apply only for long products.

Table A.7 — Tensile properties at room temperature for normalized steel

Designation	Quality	Minimum yield strength R_{eH} [a] MPa [b] Nominal thickness mm								Tensile strength R_m [a] MPa [b] Nominal thickness mm			Minimum elongation after fracture [a] % $L_0 = 5{,}65\sqrt{S_0}$ Nominal thickness mm					
		≤16	>16 ≤40	>40 ≤63	>63 ≤80	>80 ≤100	>100 ≤150	>150 ≤200	>200 ≤250	≤100	>100 ≤200	>200 ≤250	≤16	>16 ≤40	>40 ≤63	>63 ≤80	>80 ≤200	>200 ≤250
S275N	D, E	275	265	255	245	235	225	215	205	370 to 510	350 to 480	350 to 480	24	24	24	23	23	23
S355N	D, E	355	345	335	325	315	295	285	275	470 to 630	450 to 600	450 to 600	22	22	22	21	21	21
S420N	D, E	420	400	390	370	360	340	330	320	520 to 680	500 to 650	500 to 650	19	19	19	18	18	18
S460N	D, E	460	440	430	410	400	380	370	370	540 to 720	530 to 710	510 to 690	17	17	17	17	17	16

[a] For plate and wide flats with widths ≥600 mm; the direction transverse to the rolling direction applies. For all other products, the values apply for the direction parallel to the rolling direction.

[b] 1 MPa = 1 N/mm^2.

Table A.8 — Tensile properties at room temperature for thermomechanical processed steel

Designation	Quality	Minimum yield strength R_{eH} [a] MPa [b] Nominal thickness mm						Tensile strength R_m [a] MPa [b] Nominal thickness mm					Minimum elongation after fracture % $L_0 = 5{,}65\sqrt{S_0}$
		≤16	>16 ≤40	>40 ≤3	>63 ≤80	>80 ≤100	>100 ≤120 [c]	≤40	>40 ≤63	>63 ≤80	>80 ≤100	>100 ≤120 [c]	
S275M	D, E	275	265	255	245	245	240	370 to 530	360 to 520	350 to 510	350 to 510	350 to 510	24
S355M	D, E	355	345	335	325	325	320	470 to 630	450 to 610	440 to 600	440 to 600	430 to 590	22
S420M	D, E	420	400	390	380	370	365	520 to 680	500 to 660	480 to 640	470 to 630	460 to 620	19
S460M	D, E	460	440	430	410	400	385	540 to 720	530 to 710	510 to 690	500 to 680	490 to 660	17

[a] For plate and wide flats with widths ≥600 mm, the direction transverse to the rolling direction applies. For all other products, the values apply for the direction parallel to the rolling direction.

[b] 1 MPa = 1 N/mm^2.

[c] For long products, a thickness ≤150 mm applies.

Table A.9 — Minimum values of impact energy for impact tests on longitudinal V-notch test pieces for normalized or normalized-rolled steel

Designation	Quality	Minimum values of impact energy in J at test temperatures, in °C						
		+20	0	−10	−20	−30	−40	−50
S275N S355N	D	55	47	43	40 [a]	—	—	—
S420N S460N	E	63	55	51	47	40	31	27

[a] This value corresponds with 27 J at −30 °C.

Table A.10 — Minimum values of impact energy for impact tests on transverse V-notch test pieces for normalized or normalized-rolled steel, when the impact test on transverse test pieces is agreed at the time of the order [a]

Designation	Quality	Minimum values of impact energy in J at test temperatures, in °C						
		+20	0	−10	−20	−30	−40	−50
S275N S355N	D	31	27	24	20	—	—	—
S420N S460N	E	40	34	30	27	23	20	16

[a] See 5.2, option b).

Table A.11 — Minimum values of impact energy for impact tests on longitudinal V-notch test pieces for thermomechanical processed steel

Designation	Quality	Minimum values of impact energy in J at test temperatures, in °C						
		+20	0	−10	−20	−30	−40	−50
S275M S355M	D	55	47	43	40 [a]	—	—	—
S420M S460M	E	63	55	51	47	40	31	27

[a] This value corresponds with 27 J at −30 °C.

Table A.12 — Minimum values of impact energy for impact tests on transverse V-notch test pieces for thermomechanical processed steel, when the impact test on transverse test pieces is agreed at the time of the order [a]

Designation	Quality	Minimum values of impact energy in J at test temperatures, in °C						
		+20	0	−10	−20	−30	−40	−50
S275M S355M	D	31	27	24	20	—	—	—
S420M S460M	E	40	34	30	27	23	20	16

[a] See 5.2, option b).

Annex B
(normative)

Steel grades SG245, SG290, SG325, SG345, SG365, SG415 and SG460: Chemical composition and mechanical properties

Table B.1 — Chemical composition (heat analysis)

Grade	C % max.	Si % max.	Mn % max.	P % max.	S % max.	Cu % max.	Ni % max.	Cr % max.	Mo % max.	V % max.	Nb % max.	V + Nb % max.	Ti % max.
SG245	0,22	0,55	1,50	0,035	0,035	[b]	[b]	[b]	[b]	[b]	[b]	[b]	[b]
SG290	0,28 [a]	0,55	1,20	0,035	0,05	[b]	[b]	[b]	[b]	[b]	[b]	[b]	[b]
SG325	0,20	0,55	1,60	0,035	0,035	[b]	[b]	[b]	[b]	[b]	[b]	[b]	[b]
SG345	0,20	0,55	1,60	0,035	0,04	[b]	[b]	[b]	[b]	[b]	[b]	[b]	[b]
SG365	0,20	0,55	1,60	0,035	0,035	[b]	[b]	[b]	[b]	[b]	[b]	[b]	[b]
SG415	0,22	0,55	1,50	0,035	0,04	[b]	[b]	[b]	[b]	[b]	[b]	[b]	[b]
SG460	0,18	0,55	1,60	0,035	0,035	[b]	[b]	[b]	[b]	[b]	[b]	[b]	[b]

[a] For each reduction of 0,01 percentage points below the specified maximum for carbon, an increase of 0,06 percentage points above the specified maximum for manganese is permitted, up to a maximum of 1,60 %.

[b] There is no requirement, but the amount of these elements shall be determined for each heat and shall be reported on the inspection document.

Table B.2 — Permitted deviation of product analysis vs. heat analysis

Element	Range of specified element %	Permissible deviation over maximum specified %
Carbon	≤0,15	0,03
	>0,15 ≤0,24	0,04
Silicon	≤0,55	0,05
Manganese	≤1,70	0,10
Phosphorus	≤0,04	0,01
Sulfur	≤0,05	0,01

Table B.3 — Maximum CEV based on the heat analysis for thermomechanical-rolled steel

Designation	Quality	Maximum CEV in % for nominal product thickness in mm	
		≤50	>50 ≤100
SG365	C, D	0,38	0,40
SG460	C, D	0,42	0,45

Table B.4 — Tensile properties

Grade	Yield strength MPa [a] min. Thickness [c] mm				Tensile strength MPa	Minimum elongation after fracture [b] % min.		
	≤16	>16 to ≤40	>40 to ≤100	>100 to ≤200		$L_0 = 5{,}65\sqrt{S_0}$	Gauge length = 50 mm	Gauge length = 200 mm
SG245	245	235	215	200	400–510	18	23	20
SG290	290	280	—	—	485–620	17	21	19
SG325	325	315	290	275	490–610	17	22	17
SG345	345	345	315	—	450–620	17	19	17
SG365	365	355	325	—	520–640	15	19	15
SG415	415	415	415	380	515–690	19	23	18
SG460	460	450	420	—	570–720	15	19	15

[a] 1 MPa = 1 N/mm^2.

[b] Only one of the three requirements is required. Unless specified on the order, the manufacturer may use either a proportional or fixed gauge length specimen. When the test value is reported, the specimen used shall be reported.

[c] The producer should be contacted for possible thickness limits.

Table B.5 — Longitudinal Charpy V-notch properties

Grade	Quality	Impact energy J		Maximum thickness mm
		0 °C	−20 °C	
SG245	A	—	—	200
	C	27	—	200
	D	—	27	100
SG290	A	—	—	40
	C	27	—	40
	D	—	27	40
SG325	A	—	—	200
	C	27	—	100
	D	—	27	100
SG345	A	—	—	150
	C	27	—	150
	D	—	27	150
SG365	A	—	—	100
	C	27	—	100
	D	—	27	100
SG415	A	—	—	150
	C	27	—	150
	D	—	27	150
SG460	A	—	—	10
	C	27	—	100
	D	—	27	100

Bibliography

Annex A

[1] EN 10025-3, *Hot rolled products of structural steels — Part 3: Technical delivery conditions for normalized/normalized rolled weldable fine grain structural steels*

[2] EN 10025-4, *Hot rolled products of structural steels — Part 4: Technical delivery conditions for thermomechanical rolled weldable fine grain structural steels*

Annex B

[3] ASTM A573M, *Structural Carbon Steel Plates of Improved Toughness*

[4] ASTM A633M, *Normalized High-Strength Low Alloy Structural Steel Plates*

[5] JIS G3106, *Rolled steels for welded structure*

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