INTERNATIONAL STANDARD

ISO 630-5

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Structural steels —

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

Aciers de construction —

Partie 5: Conditions techniques de livraison pour aciers de construction à résistance améliorée à la corrosion atmosphérique

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Contents

Page

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 documents 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).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 17, *Steel*, Subcommittee SC 3, *Steels for structural purposes*.

This first edition of ISO 630-5 cancels and replaces ISO 4952:2006, of which it constitutes a technical revision.

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 non alloy 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 steels plates*

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

1 Scope

This part of ISO 630 specifies qualities for steels with improved atmospheric corrosion resistance for general structural use. It applies to steel plates rolled on a reversing mill, wide flats, hot-rolled sections and bars, which are used in the usual delivery conditions as given in 6.3, and normally intended for welded or bolted structures.

This part of ISO 630 covers nine (9) grades and four (4) qualities. Grades S235 and S355 are covered in Annex A. Grades SG245, SG345, SG365, SG400, SG460, SG500, and SG700 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, certain 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”.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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*

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 10474, *Steel and steel products — Inspection documents*

3 Terms and definitions

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

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

3.2
fine grain
steel with fine grain structure with an equivalent index of grain size ≥6

Note 1 to entry: See 6.2.

Note 2 to entry: For the determination of grain size, see ISO 643.

3.3
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 1 to entry: In international publications for both the normalized rolling, as well as the thermomechanical rolling, the expression “controlled rolling” can be found.

3.4
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

3.5
quenching
operation which consists of cooling a ferrous product more rapidly than in still air from a high temperature above Ac_1

Note 1 to entry: Ac_1 is the temperature at which austenite begins to form during heating.

3.6
steel with improved atmospheric corrosion resistance
steel in which a certain number of alloying elements, such as P, Cu, Cr, Ni, etc., have intentionally been added in order to increase its resistance to atmospheric corrosion, by forming an auto-protective oxide layer on the base metal; these steels are commonly known as “weathering steels”

3.7
tempering
heat treatment applied to a ferrous product, generally after quench hardening, or another heat treatment to bring the properties to the required level, and consisting of heating to specific temperatures ($<Ac_1$) and soaking one or more times, followed by cooling at an appropriate rate

Note 1 to entry: Additionally, the processes of direct quenching plus tempering may apply.

3.8
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 to entry: Hot forming or post weld heat treatment above 580 °C can lower the strength values and should not be performed. Flame straightening can be applied in accordance with relevant technical recommendations.

Note 2 to entry: 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 to entry: In some publications, the term “Thermomechanical Control Process” is also used.

4 Classification and designation

4.1 Classification

Steel grades specified in this part of ISO 630 shall be classified as alloy steels according to ISO 4948-2.

4.2 Grades and qualities

This part of ISO 630 specifies nine (9) steel grades; grades S235 and S355 are specified in Annex A. Grades SG245, SG345, SG365, SG400, SG460, SG500, and SG700 are specified in Annex B. Each grade is available in up to four (4) qualities. These grades and qualities differ in their specified mechanical properties and

impact energy requirements. Grades S355 and SG345 are subdivided into classes W and WP which differ primarily in their phosphorus contents; grades SG245, SG365, and SG460 are subdivided into classes W1 and W2 which differ primarily in alloying element requirements for Si, Cr, Cu, and Ni (see Table B.1). Class W denotes weathering steel; class WP denotes weathering steel with higher levels of phosphorus.

— Quality A: no impact testing

— Quality B: impact testing at +20 °C

— Quality C: impact testing at 0 °C

— Quality D and D1: impact testing at –20 °C

NOTE Quality D1 specifies a higher minimum impact energy than D.

4.3 Normative annexes

The requirements of Annex A or Annex B are to be regarded separately. Each 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 ISO 630-5. If the purchaser does not indicate a wish to implement any of these options at the time of order, the products shall be supplied in accordance with the basic specification (see 5.1).

— required delivery condition;

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

6 Requirements

6.1 General

See ISO 630-1.

6.2 Steelmaking process

See ISO 630-1.

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

6.3 Delivery condition

At the manufacturer's discretion, the products covered by this specification are delivered in the as-rolled, normalized rolled, normalized, thermomechanical processed, or quenched and tempered condition. If an inspection document is required, the delivery condition shall be indicated therein.

6.4 Chemical composition

6.4.1 Heat analysis

The chemical composition determined by heat analysis shall comply with the specified values of Table A.1 or Table B.1.

6.4.2 Product analysis

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

The product analysis of grades S235 and S355 shall comply with the values given in Table A.2.

The permitted deviation of product analysis of SG245, SG345, SG365, SG400, SG460, SG500, and SG700 shall comply with the values given in Table B.2.

6.4.3 Carbon equivalent value

For steel grade S235, a maximum carbon equivalent value of 0,44 %, and for steel grade S355, a maximum carbon equivalent value of 0,52 % based on heat analysis shall apply for all thicknesses.

For the carbon equivalent value formula, see ISO 630-1.

6.4.4 Deoxidation

The method of deoxidation shall be as given in Table A.1 and A.2.

The deoxidation methods are designated as follows:

— FN - Rimming steel not permitted;

— FF - Fully killed steel containing nitrogen binding elements in amounts sufficient to bind the available nitrogen (for example, minimum of 0,020 % total aluminium). The usual guideline is a minimum aluminium to nitrogen ratio of 2:1, when no other nitrogen binding elements are present. Such other elements shall be reported in the inspection document.

6.5 Mechanical properties

6.5.1 Tensile properties

The tensile properties at room temperature shall comply with the values given in Table A.3 or Table B.3.

6.5.2 Impact properties

The impact properties of Charpy V-notch test pieces shall comply with the values specified in Table A.4 or Table B.4. The orientation of the specimens shall be longitudinal unless transverse orientation is agreed between purchaser and manufacturer (see 5.2 and ISO 630-1).

The impact values for grade S355WP shall be verified if agreed at the time of the order (see Table A.4).

For grades of quality C and D contained in Table A.4 with nominal thickness <6 mm, the ferritic grain size shall be ≥ 6, verified by the method as described in ISO 643, if specified at the time of the order.

6.6 Surface conditions

See ISO 630-1.

6.7 Internal soundness

See ISO 630-1.

6.8 Dimensions and tolerances on dimensions, shape, and mass

See ISO 630-1.

7 Inspection

The type of inspection (specific or non-specific) and the type of inspection document according to ISO 10474 shall be specified at the time of the order. Refer to ISO 630-1.

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 manufacturer and purchaser.

8.2 Test units

8.2.1 Annex A

The test unit shall contain products of the same form, grade, and quality, delivery condition and the same thickness range as specified in Table A.3 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, and

— 80 tons or part thereof for all sections if the mass of the heat exceeds 200 tons.

By agreement at time of order, two tests by heat can be used.

8.2.2 Annex B

The test unit shall contain products of the same form, grade, and quality, delivery condition and the same thickness range as specified in Table B.3 for the yield strength, and shall be 50 tons or part thereof. By agreement at time of ordering, two tests by heat can be used.

9 Test methods

See ISO 630-1.

10 Marking

See ISO 630-1.

Annex A
(normative)

Steel grades S235W, S355W, S355WP: Chemical composition and mechanical properties

Table A.1 — Chemical composition (heat analysis)

Grade	Quality	Method of Deoxidation[a]	C % max	Si % max	Mn %	P % max[b]	S % max[b]	N % max	Addition of nitrogen binding elements[c]	Cr %	Cu %	Others
S235W	C	FN	0,13	0,40	0,20 to 0,60	0,035	0,035	0,009[d g]	-	0,40 to 0,80	0,25 to 0,55	e
	D	FF	0,13	0,40	0,20 to 0,60	0,035	0,030	-	yes	0,40 to 0,80	0,25 to 0,55	e
S355W	C	FN	0,16	0,50	0,50 to 1,50	0,035	0,035	0,009[d g]	-	0,40 to 0,80	0,25 to 0,55	e f
	D	FF	0,16	0,50	0,50 to 1,50	0,030	0,030	-	yes	0,40 to 0,80	0,25 to 0,55	e f
	D1	FF	0,16	0,50	0,50 to 1,50	0,030	0,030	-	yes	0,40 to 0,80	0,25 to 0,55	e f
S355WP	C	FN	0,12	0,75	1,0 max	0,06 to 0,15	0,035	0,009[g]	-	0,30 to 1,25	0,25 to 0,55	e
	D	FF	0,12	0,75	1,0 max	0,06 to 0,15	0,030	-	yes	0,30 to 1,25	0,25 to 0,55	e

[a] FN = rimming steels not permitted; FF = fully killed steel (see 6.4.4).

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

[c] The steels shall contain at least one of the following elements: Al total ≥0,020 %, Nb: 0,015 % to 0,060 %, V: 0,02 % to 0,12 %, Ti: 0,02 % to 0,10 %. If these elements are used in combination, at least one of them shall be present with the minimum content indicated.

[d] It is permissible to exceed the specified values provided that for each increase of 0,001 % N, the maximum P content shall be reduced by 0,005 %; the N content of the ladle analysis, however, shall not be more than 0,012 %.

[e] The steels can show a Ni content of max. 0,65 %.

[f] The steels can contain max. 0,30 % Mo and max. 0,15 % Zr.

[g] The maximum value for nitrogen does not apply if the chemical composition shows a minimum total Al content of 0,020 %, or if sufficient, other N binding elements are present. The N binding elements shall be mentioned in the inspection document.

Table A.2 — Chemical composition of product analysis

Grade	Quality	Method of Deoxidation[a]	C % max	Si % max	Mn %	P % max[b]	S % max[b]	N % max	Addition of nitrogen binding elements[c]	Cr %	Cu %	Others
S235W	C	FN	0,16	0,45	0,15 to 0,70	0,040	0,040	0,010[d g]	-	0,35 to 0,85	0,20 to 0,60	e
	D	FF	0,16	0,45	0,15 to 0,70	0,040	0,035	-	yes	0,35 to 0,85	0,20 to 0,60	e
S355W	C	FN	0,19	0,55	0,45 to 1,60	0,040	0,040	0,010[d g]	-	0,35 to 0,85	0,20 to 0,60	e f
	D	FF	0,19	0,55	0,45 to 1,60	0,035	0,035	-	yes	0,35 to 0,85	0,20 to 0,60	e f
	D1	FF	0,19	0,55	0,45 to 1,60	0,035	0,035	-	yes	0,35 to 0,85	0,20 to 0,60	e f
S355WP	C	FN	0,15	0,80	1,1 max	0,05 to 0,16	0,040	0,010[g]	-	0,25 to 1,35	0,20 to 0,60	e
	D	FF	0,15	0,80	1,1 max	0,05 to 0,16	0,035	-	yes	0,25 to 1,35	0,20 to 0,60	e

[a] FN = rimming steels not permitted; FF = fully killed steel (6.4.4).

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

[c] The steels shall contain at least one of the following elements: Al total ≥0,020 %, Nb: 0,010 % to 0,065 %, V: 0,01 % to 0,14 %, Ti: 0,01 % to 0,12 %. If these elements are used in combination, at least one of them shall be present with the minimum content indicated.

[d] It is permissible to exceed the specified values provided that for each increase of 0,001 % N, the maximum P content shall be reduced by 0,005 %; the N content of the product analysis, however, shall not be more than 0,013 %.

[e] The steels can show a Ni content of max. 0,70 %.

[f] The steels can contain max. 0,35 % Mo and max. 0,17 % Zr.

[g] The maximum value for nitrogen does not apply if the chemical composition shows a minimum total Al content of 0,020 %, or if sufficient, other N binding elements are present. The N binding elements shall be mentioned in the inspection document.

Table A.3 — Tensile properties at room temperature

Grade	Quality	**Minimum yield strength, R_{eH}**[a] MPa[b]						**Tensile strength, R_m**[a] MPa[b]			**Position of test pieces**[a]	**Minimum percentage elongation after fracture**[a] %						
		Nominal thickness mm						Nominal thickness mm				$L_o = 80$ mm Nominal thickness mm			$L_o = 5{,}65\sqrt{S_o}$ Nominal thickness mm			
		≤16	>16 ≤40	>40 ≤63	>63 ≤80	>80 ≤100	>100 ≤150	<3	≥3 ≤100	>100 ≤150		>1,5 ≤2	>2 ≤2,5	>2,5 <3	≥3 ≤40	>40 ≤63	>63 ≤100	>100 ≤150
S235W	C	235	225	215	215	215	195	360 to 510	360 to 510	350 to 500	l	19	20	21	26	25	24	22
S235W	D										t	17	18	19	24	23	22	22
S355W	C	355	345	335	325	315	295	510 to 680	470 to 630	450 to 600	l	16	17	18	22	21	20	18
S355W	D																	
S355W	D1										t	14	15	16	20	19	18	18
S355WP	C	355	345	-	-	-	-	510 to 680	470 to 630[c]	-	l	16	17	18	22[c]	-	-	-
S355WP	D										t	14	15	16	20	-	-	-

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

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

[c] For plate, applicable up to 12 mm; for wide flats, bars, and sections, applicable up to 40 mm.

Table A.4 — Longitudinal Charpy V-notch properties[a]

Grade	Quality	Temperature °C	Minimum energy[a] J
S235W	C	0	27
	D	–20	27
S355W	C	0	27
	D	–20	27
	D1[d]	–20	40[c]
S355WP[b]	C	0	27
	D	–20	27

[a] For nominal thicknesses ≤12 mm, see ISO 630-1.

[b] The impact values shall be verified if agreed at the time of the order.

[c] This value corresponds to 27 J at –30 °C.

[d] See 4.2.

Annex B
(normative)

Steel grades SG245, SG345, SG365, SG400, SG460, SG500, AND SG700: Chemical composition and mechanical properties

Table B.1 — Chemical composition (heat analysis)[a]

Grade	Quality	C % max	Si %	Mn %	P % max	S % max	Cr %	Cu %	Ni %	Mo %	V %	N % max	B % max
SG245W1	A to C	0,18	0,15 to 0,65	1,25 max	0,035	0,035	0,45 to 0,75	0,30 to 0,50	0,05 to 0,30	-	-	-	-
SG245W2	A to C	0,18	0,55 max	1,25 max	0,035	0,035	0,30 to 0,55	0,20 to 0,35	-	-	-	-	-
SG345W	A to D	0,20	0,15 to 0,65	0,75 to 1,35	0,04	0,05	0,40 to 0,70	0,20 to 0,40	0,50 max	-	0,01 to 0,10	-	-
SG345WP[b]	A to D	0,15	-	1,00 max	0,15	0,05	-	0,20 min		-	-	-	-
SG365W1	A to C	0,18	0,15 to 0,65	1,40 max	0,035	0,035	0,45 to 0,75	0,30 to 0,50	0,05 to 0,30	-	-	-	-
SG365W2	A to C	0,18	0,55 max	1,40 max	0,035	0,035	0,30 to 0,55	0,20 to 0,35		-	-	-	-
SG400W	B	0,15	0,15 to 0,55	2,00 max	0,020	0,006	0,45 to 0,75	0,30 to 0,50	0,05 to 0,30	-	-	0,006	-
SG460W1	C	0,18	0,15 to 0,65	1,40 max	0,035	0,035	0,45 to 0,75	0,30 to 0,50	0,05 to 0,30	-	-	-	-
SG460W2	C	0,18	0,55 max	1,40 max	0,035	0,035	0,30 to 0,55	0,20 to 0,35	-	-	-	-	-
SG500W	C	0,11	0,15 to 0,55	2,00 max	0,020	0,006	0,45 to 0,75	0,30 to 0,50	0.05 to 0,30	-	-	0,006	-
SG700W	D	0,11	0,15 to 0,55	2,00 max	0.015	0,006	0,45 to 1,20	0,30 to 1,50	0,05 to 2,00	0,60 max	0,05 max	0,006	0,005

Any element other than those listed in this table, which is added intentionally, shall be indicated to the purchaser.

[a] These steels shall contain at least one of the following grain-refining elements in the proportions indicated below:

— $Al_{total} \geq 0{,}020$ % or $Al_{sol} \geq 0{,}015$ %;

— Nb = 0,015 % to 0,060 %;

— V = 0,02 % to 0,15 %;

— Ti = 0,02 % to 0,10 %.

If these elements are used in combination, at least one of them shall be present in the steel in the minimum specified quantity.

[b] The atmospheric corrosion-resistance index, calculated on the basis of the heat analysis of the steel, as described in ASTM Guide G 101–Predictive Method Based on the Data of Larabee and Coburn, shall be 6.0 or higher.

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 ≤ 0,21	0,04
Silicon	≤ 0,75	0,06
Manganese	≤ 2,00	0,10
Phosphorus	≤ 0,04	0,01
	Over 0,04 to 0,15	[a]
Sulfur	≤ 0,05	0,01
Vanadium	≤ 0,10	0,01
Niobium	≤ 0,05	0,01
Vanadium + Niobium	≤ 0,15	0,01
Titanium	≤ 0,15	0,01
Copper	≤ 1,00	0,03
	Over 1,00 to 1,20	0,05
Nickel	≤ 1,00	0,03
	Over 1,00 to 1,50	0,05
Chromium	≤ 0,90	0,04
	Over 0,90 to 2,00	0,06
Molybdenum	≤ 0,20	0,01
	Over 0,20 to 0,40	0,03
	Over 0,40 to 0,65	0,04
Nitrogen	≤ 0,030	0,005
Boron	any	[a]

[a] Product analysis not applicable.

Table B.3 — Tensile properties

Grade	Quality	Yield strength MPa, min						Tensile strength MPa						Minimum elongation after fracture[a] %		
		Thickness[b] mm						Thickness[b] mm						$L_0 = 5.65\sqrt{S_0}$	Gauge length = 50 mm	Gauge length = 200 mm
		≤ 16	> 16 to ≤ 40	> 40 to ≤ 65	> 65 to ≤ 100	> 100 to ≤ 125	> 125 to ≤ 200	≤ 16	> 16 to ≤ 40	> 40 to ≤ 65	> 65 to ≤ 100	> 100 to ≤ 125	> 125 to ≤ 200			
SG245W1	A to C	245	235	215	215	205	195	400 to 540	400 to 540	400 to 540	400 to 540	400 to 540	400 to 540	18	23	17
SG245W2	A to C	245	235	215	215	205	195	400 to 540	400 to 540	400 to 540	400 to 540	400 to 540	400 to 540	18	23	17
SG345W	A to D	345	345	345	345	315	290	485 min[c]	485 min[c]	485 min[c]	485 min[c]	460 min	435 min	17	21[d]	18
SG345WP	A to D	345	315	290	290	-	-	480 min	460 min	435 min	435 min	-	-	15	18	21
SG365W1	A to C	365	355	335	325	305	295	490 to 610	490 to 610	490 to 610	490 to 610	490 to 610	490 to 610	17	21	15
SG365W2	A to C	365	355	335	325	305	295	490 to 610	490 to 610	490 to 610	490 to 610	490 to 610	490 to 610	17	21	15
SG400W	B	400	400	400	400	-	-	490 to 640	490 to 640	490 to 640	490 to 640	-	-	17	21	15
SG460W1	C	460	450	430	420	-	-	570 to 720	570 to 720	570 to 720	570 to 720	-	-	16	20	-
SG460W2	C	460	450	430	420	-	-	570 to 720	570 to 720	570 to 720	570 to 720	-	-	16	20	-
SG500W	C	500	500	500	500	-	-	570 to 720	570 to 720	570 to 720	570 to 720	-	-	16	20	-
SG700W	D	700	700	700	-	-	-	780 to 930	780 to 930	780 to 930	-	-	-	14	16	

1 MPa = 1 N/mm^2.

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

[b] Manufacturer should be contacted for possible thickness limits.

[c] For all thicknesses of sections.

[d] For sections with flange thickness over 75 mm, elongation in 50 mm of 18 % minimum applies.

Table B.4 — Longitudinal Charpy V-notch properties

Grade	Quality	Minimum impact absorption energy J		
		–20 °C	0 °C	+20 °C
SG245W1	A	-	-	-
SG245W2	B	-	-	27
SG345W	C	-	27	-
SG345WP SG365W1 SG365W2 SG400W SG460W1 SG460W2 SG500W SG700W	D	27	-	-

Annex C
(informative)

Notes on weldability

The steels specified in this International Standard do not have unlimited suitability for the various welding processes, since the behaviour of a steel during and after welding depends not only on the material but also on the dimensions and shape, as well as on the manufacture and service conditions of the components.

The weldability increases for each grade from quality A to D.

Special precautions should be taken when welding grades S355WPB, S355WPC, or SG345WPA to SG345WPD with a high phosphorous content.

With increasing product thickness and increasing strength level, the occurrence of cold cracking in the welded zone forms the main risk. Cold cracking is caused by the following factors in combination:

— the amount of diffusible hydrogen in the weld metal;

— a brittle structure of the heat-affected zone;

— a significant tensile-stress concentration in the welded joint.

Annex D
(informative)

Additional information for the use of steel with improved atmospheric corrosion resistance

The corrosion-inhibiting effect of the auto-protective oxide layer relates to the nature of its constituents and to the particular distribution and concentration of alloying elements in it. The resistance to atmospheric corrosion depends on weather conditions being successively dry and wet for the forming of the auto-protective oxide layer of the base metal. The protection afforded depends on the environmental and other conditions prevailing at the site of the structure.

Provisions should be made in the design and in the fabrication structure for the auto-protective oxide layer on the surface to form and regenerate itself unimpeded. It is the responsibility of the designer to include corrosion of unprotected steels in his/her calculation and, as far as is necessary, to compensate for this by increasing the thickness of the product.

A conventional surface protection is recommended when the content of particular chemical substances in the air is significant and absolutely necessary where the structure is in contact with water for long periods, is permanently exposed to moisture, or is to be used in a marine atmosphere. Before painting, the products should be descaled. Under comparable conditions, the susceptibility to corrosion of steel with improved atmospheric corrosion resistance under painting is less than that for conventional structural steels.

The surfaces of structures which are not exposed to the elements, but which can be subject to the build-up of condensation, should be appropriately ventilated. Otherwise, a suitable surface protection is necessary. The extent to which these factors depend on the prevailing climatic conditions in the widest sense, and on the details of the structure, do not permit any generally valid statements on the corrosion process. The user should therefore consult the manufacturer of the steel regarding the suitability of the products for each individual application.

Bibliography

[1] EN 10025-5, *Hot Rolled Products of Structural Steels — Part 5: Technical Delivery Conditions for Structural Steels with Improved Atmospheric Corrosion Resistance*

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[3] ASTM A588M, *High-Strength Low-Alloy Structural Steel, up to 345 MPa Minimum Yield Point, with Atmospheric Corrosion Resistance*

[4] ASTM A709M, *Structural Steel for Bridges*

[5] ASTM G101, *Standard Guide for Estimating the Atmospheric Corrosion Resistance of Low-Alloy Steels*

[6] JIS G 3114, *Hot Rolled Steels Atmospheric Corrosion Resisting Steels for Welded Structures*

[7] JIS G 3140, *Higher Yield Strength Steel Plates for Bridges*

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