INTERNATIONAL STANDARD

ISO 17607-2

First edition
2023-12

Steel structures — Execution of structural steelwork —

Part 2: **Steels**

Structures en acier – Exécution des charpentes et ossatures en acier —

Partie 2: Aciers

Reference number
ISO 17607-2:2023(E)

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

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Foreword

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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 167, *Steel and aluminium structures*.

This first edition cancels and replaces ISO 10721-2:1999, which has been technically revised.

A list of all parts in the ISO 17607 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.

Introduction

Specific requirements for the achievement of structures that are optimal with respect to safety, the state of the economy, development and general values of a nation are given in the appropriate regional or national standards, if they exist.

Many nations do not have their own standards for structural steelwork. Some reference other national or regional standards. Some permit the project's standard to be selected by the owner, designer or constructor of the structure. Some do not require any standards to be followed.

The ISO 17607 series of standards on the execution of structural steelwork was developed to serve as a means to provide a set of requirements and guidance for projects that are constructed without a governing regional or national standard. The ISO 17607 series can also serve to reduce trade barriers.

Additional requirements to be addressed in the execution of structural steelwork, as structures or as fabricated components, can be found in the other parts of the series:

— ISO 17607-1 (General requirements and terms and definitions);

— ISO 17607-3 (Fabrication);

— ISO 17607-4 (Erection);

— ISO 17607-5 (Welding);

— ISO 17607-6 (Bolting).

Steel structures — Execution of structural steelwork —

Part 2:
Steels

1 Scope

This document defines the general requirements for the constituent products of steels and steel products used in the execution of structural steelwork as structures or as fabricated components in conjunction with ISO 17607-1.

Additional requirements to be addressed in the execution of structural steelwork, as structures or as fabricated components, can be found in other parts of the ISO 17607 series.

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 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 and wide flats*

ISO 630-5, *Structural steels — Part 5: Technical delivery conditions for structural steels with improved atmospheric corrosion resistance*

ISO 630-6, *Structural steels — Part 6: Technical delivery conditions for seismic-improved structural steels for building*

ISO 4990, *Steel castings — General technical delivery requirements*

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

ISO 9477, *High strength cast steels for general engineering and structural purposes*

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

ISO 10799-1, *Cold-formed welded structural hollow sections of non-alloy and fine grain steels — Part 1: Technical delivery conditions*

ISO 10799-2, *Cold-formed welded structural hollow sections of non-alloy and fine grain steels — Part 2: Dimensions and sectional properties*

ISO 12633-1, *Hot-finished structural hollow sections of non-alloy and fine grain steels — Part 1: Technical delivery conditions*

ISO 12633-2, *Hot-finished structural hollow sections of non-alloy and fine grain steels — Part 2: Dimensions and sectional properties*

ISO 17607-1, *Steel structures — Execution of structural steelwork— Part 1: General requirements and vocabulary*

ISO/TR 20172, *Welding — Grouping systems for materials — European materials*

ISO/TR 20173, *Welding — Grouping systems for materials — American materials*

ISO/TR 20174, *Welding — Grouping systems for materials — Japanese materials*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 17607-1 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 Execution specification and quality requirements

4.1 General

See ISO 17607-1.

4.2 Execution specification

National standards and documents that provide technically equivalent conditions may be used, in whole or in part, in place of referenced ISO standards or requirements of this document. In these cases, the technically equivalent national standards and documents, and deviations from the requirements of this document, shall be referenced in the execution specification.

The necessary information and technical requirements for structural steel and steel products shall be agreed upon and completed before commencement.

The execution specification shall include the following items from Annex A as relevant:

a) additional information, see A.1;

b) options, see A.2;

c) requirements related to execution levels, see A.3.

There shall be procedures for making alterations to a previously agreed execution specification.

If constituent products of steels and steel products not covered by national standards or documents are to be used, their relevant properties shall be specified.

For national standards and documents for structural steels and steel products, see Annex B (informative).

5 Constituent products

5.1 Identification, inspection documents and traceability

For steels, the inspection documents according to ISO 10474 shall be as listed in Table 1.

Type 3.2 inspection documents are also suitable if Type 3.1 documents are listed in Table 1.

Table 1 — Inspection documents for constituent products

Constituent product	Inspection documents
Structural steels Structural steel grade ≤ 275MPa Structural steel grade > 275MPa	 2.2 [a, b, c] 3.1 [b, c]
Steel castings	3.1 [d]
High strength cables	3.1
Structural bearings	3.1

[a] Inspection document 3.1 if specified minimum yield strength 275 MPa and specified impact energy tested at a temperature less than 0 °C.

[b] Elements included in the carbon equivalent value (CEV) shall be reported in the inspection document.

[c] Intentionally added elements, including Al, Nb, Ti, and B, shall be reported in the inspection document.

[d] Inspection document 2.2 may be provided if specified minimum yield strength ≤ 355 MPa and specified impact energy tested at a temperature of 20 °C.

5.2 Structural steels

For execution levels 2 to 4, designated EXL2, EXL3 and EXL4, if different grades and qualities of steel products are in circulation together, each item shall be designated with a mark that identifies its grade and quality.

NOTE 1 Within the context of this clause, see the respective part in the ISO 630 series, the ISO 10799 series or the ISO 12633 series for definitions of grades and qualities of steel.

5.3 Structural steel products

5.3.1 General

The steel grade and quality, with additional characteristics and any required options permitted by the product standard, shall be specified in the execution specification.

Structural steels shall be in accordance with Table 2, or, if applicable, the requirements of the national standard or documents.

Table 2 — Standards for structural steels

Structural steels	Product standard
Hot-rolled products	ISO 630-1
Structural steels for general purposes	ISO 630-2
Fine grain structural steels	ISO 630-3
High yield strength quenched and tempered structural steel plates	ISO 630-4
Structural steels with improved atmospheric corrosion resistance	ISO 630-5
Seismic-improved structural steels for building	ISO 630-6

Structural hollow sections shall be in accordance with Table 3, or, if applicable, the requirements of the national standard or documents.

Table 3 — Standards for structural hollow sections

Structural steels	Product standard
Cold-formed welded structural hollow sections of non-alloy and fine grain steels	ISO 10799-1 ISO 10799-2
Hot-finished structural hollow sections of non-alloy and fine grain steels	ISO 12633-1 ISO 12633-2

See Annex B for selection of national standards and documents for structural steels and structural hollow sections.

For steel materials or constituent products, information regarding the following characteristics shall be available:

— strength (yield and tensile);

— elongation;

— reduction of area requirements, if required by the execution specification;

— tolerances on dimensions and shape;

— impact strength or toughness, if required by the execution specification;

— thermal heat treatment delivery condition;

— through thickness requirements (Z), in accordance with ISO 7778, if required by the execution specification;

— limits on internal discontinuities or cracks in zones to be welded, if required by the execution specification.

In addition, if the steel is to be welded, information shall be available regarding as follows:

— classification in accordance with the grouping system defined in ISO/TR 20172, ISO/TR 20173 or ISO/TR 20174; or

— a maximum limit for the carbon equivalent of the steel; or

— its chemical composition in sufficient detail for its carbon equivalent to be calculated.

With respect to the properties listed above that are declared, the basis for the declarations shall be provided, e.g. reference standards for test methods used to establish values for declared properties; whether properties are specific to an identified lot, cast or heat; whether chemical properties are based on ladle or product analysis.

Unless otherwise stated in the execution specification, the CEV shall be based on the CE_{IIW} formula:

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

NOTE 1 ISO/TR 17844 provides additional information on the CE_{IIW} formula.

5.3.2 Thickness tolerances for plates

Thickness tolerances for structural steel plates shall be in accordance with the applicable product standard.

For product standards where more than one thickness tolerance class is given, the least restrictive class shall be used unless specified in the execution specification.

5.3.3 Surface conditions

Surface conditions for structural steel shall be in accordance with the applicable product standard.

For product standards where more than one surface condition is given, the least restrictive condition shall be used unless specified in the execution specification.

The inspection of the surface of product for defects revealed during surface preparation shall be included in the inspection and test plans.

If surface imperfections or internal imperfections in steel products revealed during surface preparation are repaired using methods that are in accordance with this document, the repaired product may be used provided that it conforms with the nominal properties specified for the original product.

5.3.4 Special properties

Special properties for structural steels, including those affected by processing prior to delivery, shall be specified in the execution specification, in accordance with the applicable product standard.

NOTE Cambering and bending are examples of processes that can affect steel properties.

5.4 Steel castings

Steel castings shall conform to the requirements ISO 4990 or ISO 9477. The technical delivery conditions (e.g. grades, qualities and, if appropriate, finishes) shall be specified in the execution specification together with any required options that are permitted in the product standards that are required.

Unless specified in the execution specification, the properties of delivered castings shall be evaluated by testing.

Unless specified in the execution specification, the testing shall include:

a) 100 % visual testing (VT),

b) the following destructive tests on items taken at random during production:

— tensile and elongation tests (one unit per melt);

— impact tests (three units per melt);

— reduction of area test (one unit per melt, if appropriate):

— chemical analysis (one unit per melt);

— microscopic examination of cross-sections (one unit per melt).

c) the following non-destructive tests on items taken at random from each manufacturing lot:

— magnetic particle testing (MT) or penetrant testing (PT) on 10 % of each manufacturing lot to detect surface-breaking discontinuities;

— ultrasonic testing (UT) or radiographic testing (RT) on 10 % of each manufacturing lot to detect sub-surface discontinuities.

5.5 High strength cables and sockets

Wires for high strength cables shall be cold-drawn or cold-rolled steel wires. The tensile strength grade and, if appropriate, coating class shall be specified.

Strands for high strength cables shall conform to the requirements of the execution specification. The designation and class of the strand shall be specified.

The minimum breaking load and diameter of the steel wire rope and, if appropriate, requirements related to corrosion protection shall be specified.

The filling material for the sockets shall be selected, taking into account service temperature and actions such that continued creeping of the loaded strand through the socket is prevented.

5.6 Structural bearings

Requirements for structural bearings shall be specified in the execution specification.

6 Documents required to claim conformity to this document

6.1 General

Constructors may claim conformity with the requirements of this document either by:

— adoption of the ISO standards referenced in Clause 2;

or

— adoption of other standards to those listed in Clause 2 that provide technically equivalent conditions (see examples in Annex B);

or

— adoption of other documents that provide technically equivalent conditions.

Unless otherwise listed in the execution specification, it is the responsibility of the constructor to demonstrate that the standards or documents selected provide technically equivalent conditions to those in the corresponding ISO standards referenced in Clause 2.

Prior to execution, adoption of other standards or documents shall be verified and approved by specifier and shall be incorporated into the execution specifications.

NOTE The contents of Annex B do not establish that the standards or documents listed are technically equivalent, which remains the responsibility of the constructor.

6.2 Declaration of conformity

A constructor claiming conformity with these requirements shall list the applicable supporting standards or documents.

Annex A
(normative)

Additional information, list of options and requirements related to the execution levels

A.1 List of required additional information

Table A.1 provides the additional information that is required in the text of this document as appropriate to fully define the requirements for execution of the work to be in accordance with this document (i.e. where the wording "shall be specified" is used).

Table A.1 — Additional information required

Clause	Additional information required
4 – Execution specification and quality requirements	
4.2	Properties of products not covered by listed standards
5 – Constituent products	
5.3.1	Grade and quality, with additional characteristics and any required options permitted by the product standard
5.3.4	Special properties for structural steels
5.4	Grades, qualities and, if appropriate, finishes for steel castings
5.5	Requirements related to the following items: — the tensile strength grade and, if appropriate, coating class; — the designation and class of the strand; — corrosion protection;
5.6	Requirements for structural bearings

A.2 List of options

Table A.2 lists the items which may be specified in the execution specification to define requirements for the execution of the work where options are given in this document.

Table A.2 — List of options to be specified

Clause	Option(s) to be specified
4 – Execution specification and quality requirements	
4.2	If a quality plan for execution of the steel, castings, cable or structural bearings is required
5 – Constituent products	
5.3.1	If the following characteristics are applicable:
	— reduction of area requirements; — impact strength or toughness; — through thickness requirements (Z); — limits on internal discontinuities or cracks in zones to be welded; — the CEV.
5.3.2	The thickness tolerance class, if not the least restrictive
5.3.3	The surface condition class, if not the least restrictive
	If repairs of surface defects are permitted
5.4	Options for steel castings
	If other evaluations than testing are required
	If other acceptance criteria are required
6 – Documents required to claim conformity to these requirements	
6.1	adoption of other standards or document

A.3 Requirements related to the execution levels

Table A.3 lists requirements specific to each of the execution levels referenced in this document.

Items identified in bold letters in Table A.3 relate to the general system of control of execution and are amenable to a common choice of execution level across the whole of the structural steelwork (or a phase of the structural steelwork). The other items generally demand the selection of the appropriate execution level on a component-by-component or a connection detail-by-detail basis.

Table A.3 — Requirements for each execution level

Clauses	EXL1	EXL2	EXL3	EXL4
4 – Execution specification and quality requirements				
4.2 Quality documentation	—	Yes	Yes	Yes
5 – Constituent products				
5.2 Identification, inspection documents and traceability				
Inspection documents	See Table 1	See Table 1	See Table 1	See Table 1
Traceability	—	see ISO/IEC 17067-1	see ISO/IEC 17067-1	see ISO/IEC 17067-1
Marking	—	Yes	Yes	Yes
Key a dash "—" means no specific requirement in the text.				

Annex B
(informative)

National standards for structural steels and steel products

B.1 General

Tables B.1 to B.16 show the national standards corresponding to the ISO standard(s) referenced in this document.

NOTE The contents of Tables B.1 to B.16 do not establish any technical equivalence between the standards listed.

B.2 Australian/New Zealand standards (AS/NZS)

B.2.1 Structural steels

Table B.1 — AS/NZS standards for structural steels and steel products

Standard	Grade	Notes
Shapes, plates and bars		
AS 1548	PT430N, PT430NR, PT430T PT460N. PT460NR, PT460T PT490N, PT490NR, PT490T PT540T	 a b
AS 3597	500, 500PV 600, 600PV 700, 700PV 900 1000	 c
AS/NZS 3678	250 300 350, WR350 400 450	 d
AS/NZS 3679.1	300, 300L0, 300L15, 300S0 350, 350L0, 350L15, 350S0	 e
Sheet and strip		
AS/NZS 1594	HA200 HA250, HU250 HA300, HA300/1, HU300, HU300/1 HA350, HW350 HA400	 f
AS/NZS 1595	CA 220 CA 260 CW300 CA 350 CA 500	

Table B.1 *(continued)*

Standard	Grade	Notes
Hollow structural sections		
AS/NZS 1163	C250, C250L0 C350, C350L0 C450, C450L0	e f g
Castings and forgings		
—		

Key
N = Normalized after rolling
NR = Normalized rolling
T = Thermo mechanical control rolling
S = Seismic grade
S0 = impact tested at 0 °C
[a] PT = Tensile strength specified pressure vessel steel
[b] Impact tested grade variants are not shown
[c] PV = Pressure Vessel
[d] WR = Weather Resistant
[e] L = Low temperature impact tested
L0 at 0 °C
L15 at -15 °C
[f] C = Cold-formed
[g] See also ISO/TR 20173

B.2.2 Dimensions and tolerances

Table B.2 — AS/NZS standards for dimensions and tolerances of structural steels

Standard		Notes
AS/NZS 1365		

B.3 Canadian standards (CSA)

B.3.1 Structural steels

Table B.3 — CSA standards for structural steels and steel products

Standard	Grade	Notes
Shapes, plates and bar		
CSA G40.21	260W, 260WT 300W, 300WT 345WM, 345WMT 350A, 350AT, 350W, 350WT, 350R 380W, 380WT 400A, 400AT, 400W, 400WT 480A, 480AT, 480W, 480WT 550A, 550AT, 550W, 550WT 700Q, 700QT	a
Sheet		
CSA G40.21	260W, 260WT 300W, 300WT 345WM, 345WMT 350A, 350AT, 350W, 350WT, 350R 380W, 380WT 400A. 400AT, 400W, 400WT 480A, 480AT, 480W, 480WT 550A, 550AT, 550W, 550WT 700Q, 700QT	a
Hollow structural sections		
CSA G40.21	300W 350A, 350AT, 350W, 350WT 380W, 380WT 400A, 400AT, 400W, 400WT 480A, 480AT, 480W, 480WT 550A, 550AT, 550W, 550WT	a
Castings and forgings		
—		
Key [a] W = Weldable T = Notch-Tough R =Atmospheric Corrosion-Resistant A =Atmospheric Corrosion-Resistant Weldable Q = Quenched and Tempered Low-Alloy (weldable) M = with composition restrictions.		

B.3.2 Dimensions and tolerances

Table B.4 — CSA standards for dimensions and tolerances of structural steels

Standard	Notes
CSA G40.20	

B.4 Chinese standards (GB)

B.4.1 Structural steels

Table B.5 — GB standards for structural steels and steel products

Standard	Grade	Notes
Shapes, plates and bars		
GB/T 700	Q195 Q235 Q275	
GB/T 714	Q345q, Q345NH Q370q, Q370NH Q420q, Q420NH Q460q, Q460NH Q500q, Q500NH Q550q, Q550NH Q620q,Q620NH Q690q, Q690NH	a
GB/T 1591	Q355N, Q355M Q390N, Q390M Q420N, Q420M Q460N, Q460M Q500M Q550M Q620M Q690M	b
GB/T 4171	Q235NH Q265GN Q295NH, Q295GNH HQ310GNH Q355NH, Q355GNH Q415NH Q460NH Q500NH Q550NH	a c
GB/T 4172	Q235NH Q295NH Q355NH Q460NH	a
GB/T 5313	Z15 Z25 Z35	

Table B.5 *(continued)*

Standard	Grade	Notes
GB/T 6725	Q195 Q215 Q235 Q345 Q390 Q420 Q460 Q500 Q550 Q620 Q690 Q750	
GB/T 19879	Q235GJ Q345GJ Q390GJ Q420GJ Q460GJ Q500GJ Q550GJ Q620GJ Q690GJ	d
GB/T 20933	Q295bz Q390bz Q420bz	e
GB/T 20934	GLG345 GLG460 GLG550 GLG650 GLG750 GLG850 GLG1100 BLG205 BLG400 BLG725 BLG835 BLG1080	
GB/T 34560.2	Q235 Q275 Q355 Q450	
GB/T 34560.3	Q275N, Q275M Q355N, Q355M Q390N, Q390M Q420N, Q420M Q460N, Q460M Q500M Q550M Q620M Q690M	b

Table B.5 *(continued)*

Standard	Grade	Notes
GB/T 34560.4	Q460Q Q500Q Q550Q Q620Q Q690Q Q800Q Q890Q Q960Q Q1030Q Q1100Q Q1200Q Q1300Q	f
GB/T 34560.5	Q235W, Q235NH Q295NH, Q295GNH Q355W, Q355WP, Q355NH, Q355GNH Q415NH Q460NH Q500NH Q550NH	a c g
GB/T 34560.6	Q235KZ Q345KZ Q390KZ Q420KZ Q460KZ	h
Sheet and strip		
GB/T 2518		

Table B.5 *(continued)*

Standard	Grade	Notes
Hollow structural sections		
GB/T 8162	Q235 Q275 Q295 Q345 Q390 Q420 Q460	
GB/T 13793	08 10 15 20 Q195 Q215A, Q215B Q235A, Q235B, Q235C Q275, Q275A, Q275B Q345A, Q345B, Q345C Q390A, Q390B, Q390C Q420A, Q420B, Q420C Q460C, Q460D	
GB/T 30063	Q235B, Q235C Q345B, Q345C Q390B, Q390C Q420B, Q420C Q460C, Q460 Q235GJB, Q235GJC Q345GJB, Q345GJC Q390GJB, Q390GJC Q420GJC	
GB/T 34201	10,20 Q195 Q215 Q235 Q345A, Q345B, Q345C, Q345D, Q345E Q390A. Q390B, Q390C, Q390D, Q390E Q420A. Q420B, Q420C, Q420D, Q420E Q460C. Q460D, Q460E	

Table B.5 *(continued)*

Standard	Grade	Notes
Castings and forgings		
GB/T 7659	ZG200-400H ZG230-450H ZG270-480H ZG300-500H ZG340-550H	
GB/T 11352	ZG200-400 ZG230-450 ZG270-500 ZG310-570 ZG340-640	
Key NH = Weathering steel M = TMCP (thermo mechanical control processed) steel WP = High Phosphorus Atmospheric Corrosion-Resistant Steel [a] q = Bridge structure steel [b] N = normalized rolling steel [c] GNH = High performance weathering steel [d] GJ = High-performance building structure steel [e] bz = steel plate [f] Q = Quenched and tempered steel [g] W = atmospheric corrosion-resistant steel [h] KZ = Aseismic steel		

B.4.2 Dimensions and tolerances

Table B.6 — GB standards for dimensions and tolerances of structural steels

Standard	Notes
GB/T 702	
GB/T 706	
GB/T 709	
GB/T 6728	
GB/T 11263	
GB/T 17395	
GB/T 21835	

B.5 European standards (EN)

B.5.1 Structural steels

Table B.7 — EN standards for structural steels and steel products

Standard	Grade	Notes
Shapes, plates and bars		
EN 10025-2	S235JR, S235JO, S235J2 S275JR, S275J0, S275J2 S355JR, S355JO, S355J2, S355K2 S450J0	a

Table B.7 *(continued)*

Standard	Grade	Notes
EN 10025-3	S275N, S275NL S355N, S355NL S420N, S420NL S460N, S460NL	b
EN 10025-4	S275M, S275ML S355M, S355ML S420M, S420ML S460M, S460ML	c
EN 10025-5	S235J0W, S235J2W S355J0WP, S355J2WP, S355J2W, S355K2W	a d
EN 10025-6	S460Q, S460QL, S460QL1 S500Q, S500QL, S500QL1 S550Q, S550QL, S550QL1 S620Q, S620QL, S620QL1 S690Q, S690QL, S690QL1	e
EN 10149-2	S315MC S355MC S420MC S460MC S500MC S550MC S600MC S650MC S700MC	f
EN 10149-3	S260NC S315NC S355NC S420NC	f
EN 10268	HC180Y, HC180B HC220Y, HC220I, HC220B HC260Y, HC260I, HC260B, HC260LA HC300I, HC300B, HC300LA HC340LA HC380LA HC420LA HC460LA HC500LA	g
EN 10346	S220GD S250GD S280GD S320GD S350GD S550GD	h
Sheet and strip		

Table B.7 *(continued)*

Standard	Grade	Notes
EN 10248-1	S240GP S270GP S320GP S355GP S390GP S430GP	
EN 10249-1	S235JR, S235JO, S235J2 S275JR, S275J0, S275J2 S355JR, S355JO, S355J2, S355K2 S450J0	a
Hollow structural sections		
EN 10210-1 EN 10210-3	S235JRH S275J0H, S275J2H S275NH, S275NLH S355J0H, S355J2H, S355K2H S355NH, S355NLH S420NH, S420NLH S460NH, S460NLH	a b
EN 10219-1 EN 10219-3	S235JRH S275J0H,S275J2H S275NH, S275NLH S275MH, S275MLH S355J0H, S355J2H, S355K2H S355NH, S355NLH S355MH, S355MLH, S420MH, S420MLH S460NH, S460NLH S460MH. S460MLH,	a b i
Castings and forgings		
—		

Key
[a] JR = Longitudinal Charpy V-notch impacts 27 J at +20 °C
J0 = Longitudinal Charpy V-notch impacts 27 J at 0 °C
J2 = Longitudinal Charpy V-notch impacts 27 J at −20 °C
K2 = Longitudinal Charpy V-notch impacts 40 J at −20 °C
+AR = Supply in as-rolled conditions
+N = Supply in normalized/normalized rolled conditions
Z Grade = Improved properties perpendicular to the surface
[b] N = Longitudinal Charpy V-notch impacts temperature not lower than −20 °C
NL = Longitudinal Charpy V-notch impacts temperature. not lower than −50 °C
Z Grade = Improved properties perpendicular to the surface
[c] M = Longitudinal Charpy V-notch impacts temperature not lower than −20 °C
ML = Longitudinal Charpy V-notch impacts temperature not lower than −50 °C
Z Grade = Improved properties perpendicular to the surface

Table B.7 *(continued)*

Standard	Grade	Notes
[d] W = Improved atmospheric corrosion resistance P = Greater phosphorus content +AR = Supply in as rolled conditions +N = Supply in normalized/normalized rolled conditions Z Grade = Improved properties perpendicular to the surface [e] Q = Longitudinal Charpy V-notch impacts temp. not lower than −20 °C QL = Longitudinal Charpy V-notch impacts temp. not lower than −40 °C QL1 = Longitudinal Charpy V-notch impacts temp. not lower than −60 °C Z Grade = Improved properties perpendicular to the surface		
[f] M = Thermomechanically rolled N = Normalized or normalized rolled C = Suitable for cold forming [g] B = Bake-hardening steel I – Isotropic steel LA – Low alloy / micro-alloyed steel Y = high strength interstitial free steel		
[h] GD identifies steel for construction [i] JR = Longitudinal Charpy V-notch impacts 27 J at +20 °C J0 = Longitudinal Charpy V-notch impacts 27 J at 0 °C J2 = Longitudinal Charpy V-notch impacts 27 J at –20 °C K2 = Longitudinal Charpy V-notch impacts 40 J at –20 °C N = Normalized or normalized rolled NL = Longitudinal Charpy V-notch impacts temp. not lower than –50 °C M = Thermomechanically rolled ML = Longitudinal Charpy V-notch impacts temp. not lower than –50 °C H = Hollow section		

B.5.2 Dimensions and tolerances

Table B.8 — EN standards for dimensions and tolerances of structural steels

Standard	Notes
EN 10017	
EN 10024	
EN 10029	
EN 10034	
EN 10051	
EN 10055	
EN 10056-2	
EN 10058	
EN 10059	
EN 10060	
EN 10210-2	
EN 10219-2	
EN 10279	

B.6 Japanese standards (JIS)

B.6.1 Structural steels

Table B.9 — JIS standards for structural steels and steel products

Standard	Grade	Notes
Shapes, plates and bars		
JIS G 3101	SS400 SS490 SS540	
JIS G 3106	SM400A, SM400B, SM400C SM490A, SM490B, SM490C SM490YA, SM490YB SM520B, SM520C SM570	a b
JIS G 3114	SMA400AW, SMA400BW, SMA400CW SMA490AW, SMA490BW, SMA490CW SMA570W	b
JIS G 3136	SN400A, SN400B, SN400C SN490B, SN490C	
JIS G 3138	SNR400A, SNR400B	
JIS G 3140	SBHS400, SBHS400W SBHS500, SBHS500W	a
JIS G 3350	SSC400	$t \leq 4,5$
JIS G 3353	SWH400, SWH400L	
Sheet and strip		
JIS G 3302	SGH400 SGH490	$t \leq 6,0$
Hollow structural sections		
JIS G 3444	STK400 STK490, SNR490B	
JIS G 3466	STKR400 STKR490	c c
JIS G 3475	STKN400W, STKN400B STKN490B	
Castings and forgings		
JIS G 5101	SC480	

Table B.9 *(continued)*

Standard	Grade	Notes
JIS G 5102	SCW410 SCW480	
JIS G 5201	SCW410CF SCW480CF SCW490CF	
Key [a] SM570, SMA570W, SBHS400, SBHS400W, SBHS500, SBHS400W are permitted for bridges but not permitted for buildings. All other steels are permitted for use in buildings. [b] Steels permitted for bridges are, in addition to those mentioned in footnote [a], SM400A, SM400B, SM400C, SM490A, SM490B, SM490C, SM490YA, SM490YB, SM520C, SMA400AW, SMA400BW, SMA400CW, SMA490AW, SMA490BW and SMA490CW. [c] In addition to the steels listed above, structural steels that are not included in JIS but approved by the Minister of Land, Infrastructure, Transport and Tourism are permitted for use in buildings. For example, the Minister-approved steel "cold-formed formed rectangular hollow section columns" BCR295, BCP235 and BCP325, which are regulated by the Standard of Japanese Society of Steel Construction, JSS II 10, are used more commonly than the STKR400 or STKR490 for columns in building structures.		

B.6.2 Dimensions and tolerances

Table B.10 — JIS standards for dimensions and tolerances of structural steels

Standard	Notes
JIS G 3191	
JIS G 3192	
JIS G 3193	
JIS G 3194	

B.7 Russian standards (GOST)

B.7.1 Structural steels

Table B.11 — GOST standards for structural steels and steel products

Standard	Grade	Notes
Shapes, plates and bars		
GOST 380	Ст0 Ст1кп, Ст1пс, Ст1сп Ст2кп, Ст2пс, Ст2сп Ст3кп, Ст3пс, Ст3сп Ст3Гпс, Ст3Гсп Ст4кп, Ст4пс, Ст4сп Ст5пс, Ст5сп Ст5Гпс Ст6пс. Ст6сп	a d
GOST 535	Ст0, Ст1кп, Ст1пс, Ст1сп Ст2кп, Ст2пс, Ст2сп, Ст3кп, Ст3пс, Ст3сп, Ст3Гпс, Ст3Гсп, Ст4кп, Ст4пс, Ст4сп, Ст5пс, Ст5сп, Ст5Гпс,	

Table B.11 *(continued)*

Standard	Grade	Notes
	Ст6пс, Ст6сп E 185 (Fe 310) E 235 (Fe 360) E 275 (Fe 430) E 355 (Fe 510) Fe 490 Fe 590 Fe 690	
GOST 1050	05кп 08кп, 08пс, 08 10кп, 10пс, 10 11кп 15кп, 15пс, 15 18кп 20кп, 20пс, 20 25 30 35 40 45 50, 50А 55 58 (55пп) 60, 60пп, 60 пп «селект»	a b
GOST 6713	16Д 15ХСНД 10ХСНД	c d
GOST 19281	07ГФБ, 07ГФБ-1 08ХМФчЮА 09ГСФЮ 09Г2, 09Г2-1 09Г2Д, 09Г2Д-1 09Г2С, 09Г2С-1, 09Г2СД, 09Г2СД-1 09Г2ФБ, 09Г2ФБ-1 10Г2Б, 10Г2БД 10Г2С-1, 10Г2С1, 10Г2С1Д 10Г2ФБЮ, 10Г2ФБЮ-1 10ХСНД 10ХНДП 12Г2С, 12Г2С-1 12Г2СД, 12Г2СД-1 12Г2Ф, 12Г2Ф-1, 12Г2ФД, 12Г2ФД-1 12ГСБЮ, 12ГСБЮ-1 13ХФЮ 14Г2, 14Г2-1 15Г2СФ, 15Г2СФ-1, 15Г2СФД, 15Г2СФД-1	c d

Table B.11 *(continued)*

Standard	Grade	Notes
	15ГФ, 15ГФ-1, 15ГФД, 15ГФД-1 15ХСНД 17Г1С-У, 17Г1С-У-1 20ФЮ or 265; 295; 315; 325; 345; 355; 375; 390; 440; 460; 500; 550; 600; 620; 650; 700 and S235; S275; S355 by EN 10025-2	
GOST 27772	С235 С245 С255 С345, С345К С355, С355-1, С355К, С355П С375 С390, С390-1 С440 С550 С590	e
GOST R 55374	09Г2СД 10ХСНД 14ХГНДЦ 15ХСНД	c d
Sheet and strip		
GOST 14637	Ст0 Ст2кп, Ст2пс, Ст2сп Ст3кп, Ст3пс, Ст3сп Ст3Гпс, Ст3Гсп Ст4сп Ст5пс, Ст5сп Ст5Гпс	a d
GOST 17066	С295 С315 С345 С355 С390 09Г2, 09Г2Д, 09Г2С, 09Г2СД 10Г2Б, 10Г2БД, 10Г2С1, 10Г2С1Д 10ХСНД, 10ХНДП 12ГС 14Г2 15ГФ, 15ХСНД 16ГС 17ГС	
Hollow structural sections		

Table B.11 *(continued)*

Standard	Grade	Notes
GOST 30245	C235 C245 C255 C345, C345K C355, C355-1, C355K, C355П C375 C390, C390-1 C440 C550 C590	e
GOST R 52664	09Г2С 09ГСФ 17Г1С 17Г1СУ С 245 С345 С540	c d
GOST R 54864	С235 С245 С255 С275 С285 С345 С375 С390 С440	e
GOST R 58064	С245 С255 С345, С345К С355, С355-1, С355К, С355П С375 С390, С390-1 С440 С550 С590 С690	e
Castings and forgings		
GOST 977	**structural unalloyed:** 15Л 20Л 25Л 30Л 35Л 40Л 45Л 50Л	c f

Table B.11 *(continued)*

Standard	Grade	Notes
	structural alloyed: 20ГЛ 35ГЛ 20ГСЛ 30ГСЛ 20Г1ФЛ 20ФЛ 30ХГСФЛ 45ФЛ 32Х06Л 40ХЛ 20ХМЛ, 20ХМФЛ 20ГНМФЛ 35ХМЛ 30ХНМЛ 35ХГСЛ 35НГМЛ 20ДХЛ 08ГДНФЛ 13ХНДФТЛ 12ДН2ФЛ, 12ДХН1МФЛ 23ХГС2МФЛ 12Х7Г3СЛ 25Х2ГНМФЛ 27Х5ГСМЛ 30Х3С3ГМЛ, 03Н12Х5М3ТЮЛ, 03Н12Х5М3ТЮЛ	c d f
	structural alloy used in legal relations between the CMEA member countries: 15ГЛ 30ГЛ 45ГЛ 70ГЛ 55СЛ 40Г1 5ФЛ 15ФЛ 30ХЛ 25ХГЛ 35ХГЛ 50ХГЛ 60ХГЛ 70Х2ГЛ	c d f

Table B.11 *(continued)*

Standard	Grade	Notes
	35ХГФЛ 40ХФЛ 30ХМЛ 40ХМЛ 40ХНЛ, 40ХН2Л 30ХГ1 5МФРЛ 75ХНМФЛ 40ГТЛ 20ГНМЮЛ	
	alloyed with special properties: **martensitic class** 20Х13Л, 08Х14НДЛ 09Х16Н4БЛ 09Х17Н3СЛ 10Х12НДЛ 20Х5МЛ 20Х8ВЛ 40Х9С2Л 20Х12ВНМФЛ 85Х4М5Ф2В6Л (Р6М5Л) 90Х4М4Ф2В6Л (Р6М4Ф2Л)	c d f
	alloyed with special properties: **martensite-ferritic class** 15Х13Л — corrosion resistant	c d f
	alloyed with special properties: **ferritic grade** 15Х25ТЛ	c d f
	alloyed with special properties: **austenitic-martensitic class** 08Х15Н4ДМЛ 08Х14Н7МЛ 14Х18Н4Г4Л	c d f
	alloyed with special properties: **austenitic-ferritic class** 12Х25Н5ТМФЛ I6Х18Н12С4ТЮЛ 10Х18Н3Г3Д2Л 35Х23Н7СЛ 40Х24Н12СЛ 20Х20Н14С2Л	c d f
	alloyed with special properties: **austenitic class** 10Х18Н9Л 12Х18Н9ТЛ 10Х18Н11БЛ 07Х17Н16ТЛ	c d f

Table B.11 *(continued)*

Standard	Grade	Notes
	12Х18Н12М3ТЛ 55Х18Г14С2ТЛ 15Х23Н18Л 20Х25Н19С2Л 18Х25Н19СЛ 45Х17Г13Н3ЮЛ	
Key [a] The letters «Ст» denote «Steel». The numbers — the conditional number of the brand depending on the chemical composition (one digit indicates its average content in the alloy in tenths of a percent). The letters «кп», «пс», «сп» — the degree of deoxidation of steel: «кп» - boiling, «пс» - semi-calm, «сп» - calm. If the marking does not contain such letters, then the steel corresponds to the «calm» category.		
[b] Letter «А» placed at the end of the marking — high quality steel with a low content of harmful impurities and non-metallic inclusions. The letters «пп» — steel of reduced hardenability. The word «селект» — a sample of metal lots with the smallest scatter of parameters.		
[c] The numbers — the conditional number of the brand depending on the carbon content (two numbers indicate its average content in the alloy in hundredths of a percent).		
[d] Letter «А» placed in the middle of the marking — N (nitrogenium). Letter «А» placed at the end of the marking — high quality steel with a low content of harmful impurities and non-metallic inclusions. Letter «Б» — Nb (niobium) Letter «Г» — Mn (manganum), manganese with its mass fraction in steel 0,80% or more. Letter «Д» — Cu (cuprum) Letter «М» — Mo (molybdenum) Letter «Н» — Ni (niccolum) Letter «П» — P (phosphorus) Letter «Р» — B (boron) Letter «С» — Si (silicium) Letter «Т» — Ti (titanium) Letter «У» — reinforced Letter «Ф» — V (vanadium) Letter «Х» — Cr (chromium) Letter «ч» — the alloy contains rare earth metals such as: cerium, lanthanum, neodymium and others Letter «Ю» — Al (aluminium) The numbers after the letters indicate the approximate mass fraction of the alloying element in whole units. The absence of a figure means that the steel contains up to 1,5 % of this alloying element.		
[e] Letter «Р» – construction steel, after the letter «С» the minimum yield strength of the steel is indicated. Letter «К» – quality carbon steel. For С355П steel, the yield strength σT at a temperature of 600 °C must be at least 200 N/mm^2, the temporary resistance σB must be at least 240 N/mm^2.		
[f] Letter «Л» at the end of the marking — structural casting steel (used in the manufacture of cast products).		

B.7.2 Dimensions and tolerances

Table B.12 — GOST standards for dimensions and tolerances of structural steels

Standard	Notes
GOST 82	
GOST 103	
GOST 535	
GOST 1051	
GOST 1577	
GOST 2590	
GOST 2591	
GOST 2879	
GOST 3241	
GOST 4543	
GOST 4781	
GOST 8239	
GOST 8240	
GOST 8278	
GOST 8281	
GOST 8282	
GOST 8283	
GOST 8509	
GOST 8510	
GOST 8731	
GOST 9034	
GOST 9045	
GOST 10551	
GOST 10705	
GOST 10706	
GOST 11269	
GOST 13229	
GOST 14918	
GOST 16523	
GOST 17066	
GOST 18662	
GOST 19425	
GOST 19771	
GOST 19772	
GOST 19903	
GOST 19904	
GOST 23118	
GOST 26429	
GOST 30245	
GOST R 52664	
GOST R 54864	
GOST R 57837	

Table B.12 *(continued)*

Standard	Notes
GOST R 58064	
GOST R 58384	
GOST R 58385	

B.8 North American standards (ASTM)

B.8.1 Structural steels

Table B.13 — ASTM standards for structural steels and steel products

Standard	Grade	Notes
Shapes, plates and bars		
ASTM A36/A36M	36 [250]	
ASTM A283/A283M	C D	
ASTM A514/A514M		
ASTM A529/A529M	50 [345] 55 [380]	
ASTM A572/A572M	42 [290] 50 [345] 55 [380] 60 [415] 65 [450]	Type 1, 2, or 3
ASTM A588/A588M	A B K	
ASTM A709/A709M	36 [250] 50 [345], Types 1, 2 and 3 50S [345S] 50W [345W], Types A and B QST 50 [QST345] QST 50S QST345S] QST 65 [QST450] QST 70 [QST485] HPS 50W [HPS 345W] HPS 70W [HPS 485W] HPS 100W [HPS 690W]	 a b
ASTM A913/A913M	50 [345] 60 [415] 65 [450] 70 [485] 80 [550]	
ASTM A992/A992M		
ASTM A1043/A1043M	36 [250] 50 [345]	

Table B.13 *(continued)*

Standard	Grade	Notes
ASTM A1066/A1066M	50 [345] 60 [415] 65 [450] 70 [485] 80 [550]	
Sheet and strip		
ASTM A606/A606M	45 [310] 50 [345]	Types 2, 4, and 5
ASTM A1011/A1011M	SS Grade 30 [205] SS Grade 33 [230] SS Grade 36 [250], Types 1 and 2 SS Grade 40 [275] SS Grade 45 [310], Types 1 and 2 SS Grade 50 [340] SS Grade 55 [380] SS Grade 60 [410] SS Grade 70 [480] SS Grade 80 [550] HSLAS Grade 45 [310], Classes 1 and 2 HSLAS Grade 50 [340], Classes 1 and 2 HSLAS Grade 55 [380], Classes 1 and 2 HSLAS Grade 60 [410], Classes 1 and 2 HSLAS Grade 65 [450], Classes 1 and 2 HSLAS Grade 70 [480], Classes 1 and 2 HSLAS-F Grade 50 [340], Class 1 HSLAS-F Grade 60 [410], Class 1 HSLAS-F Grade 70 [480], Class 1 HSLAS-F Grade 80 [550], Class 1	
Hollow structural sections		
ASTM A53/A53M	B	
ASTM A500/A500M	B C D	
ASTM A501/A501M	B	ERW and seamless
ASTM A618/A618M	Ia Ib II III	ERW and seamless
ASTM A847/A847M	50 [345] 50W [345W]	
ASTM 1065/A1065M	50 [350] 50W [350W]	
ASTM 1085/A1085M	A	
Castings and forgings		
ASTM A216/A216M		
ASTM A668/A668M		