

Structural Steel Grades: C245, C345, 09Г2С — Yield and Tensile Strength

The tables list steel grades for building steel structures to GOST 27772-88: minimum yield strength, tensile strength and elongation by rolled thickness, and how the new grades correspond to former designations such as Ст3пс5 and 09Г2С.

What the designation C245, C345 means

A grade consists of the letter C and a number. The number equals the minimum yield strength in N/mm² for the thinnest rolled product of that grade: 245 for C245, 345 for C345. The larger the number, the stronger the steel. The minimum values fall with thickness, as the tables below show.

Former designations, such as Ст3пс5 or 09Г2С, are still found in drawings and price lists. The first table shows how the new grades correspond to the old ones.

Steel grades and former designations · ГOST 27772-88

Grade	Former designation	Steel standard
C235	Ст3кп2	ГОСТ 380-88, ГОСТ 535-88
C245	Ст3пс5	ГОСТ 380-88, ГОСТ 535-88
C245	Ст3сп5	ГОСТ 380-88, ГОСТ 535-88
C255	Ст3Гпс, Ст3Гсп	ГОСТ 380-88
C275	Ст3пс	ГОСТ 380-88
C285	Ст3сп, Ст3Гпс, Ст3Гсп	ГОСТ 380-88
C345	12Г2С	—
C345	09Г2С	ГОСТ 19282-73
C345Д	12Г2СД	—
C345Д	09Г2СД	—
C345К	10ХНДП	ГОСТ 19282-73
C375	12Г2С	—
C375Д	12Г2СД	—
C390	14Г2АФ	ГОСТ 19282-73
C390Д	14Г2АФД	ГОСТ 19282-73
C390К	15Г2АФДпс	ГОСТ 19282-73
C440	16Г2АФ	ГОСТ 19282-73
C440Д	16Г2АФД	ГОСТ 19282-73
C590	12Г2СМФ	—
C590К	12ГН2МФАЮ	—

The "Steel standard" column is the standard for the former designation. A dash marks a standard not given in the text.

Shapes: I-beams, channels, angles

For sections the minimum mechanical properties are set by flange thickness. For grade C345 up to 10 mm the yield strength is at least 345 N/mm² and the tensile strength 490 N/mm²; for a flange over 10 to 20 mm they are 325 and 470, and over 20 to 40 mm 305 and 460.

Shapes: minimum mechanical properties by flange thickness · ГOST 27772-88

Grade	Thickness, mm	Yield strength σ_y , N/mm ²	Tensile strength σ_u , N/mm ²	Elongation δ_5 , %	Bend test mandrel
C235	4 to 20	235	360	26	d = a
	over 20 to 40	225	360	25	d = 2a
C245	4 to 20	245	370	25	d = a
	over 20 to 25	235	370	24	d = 2a
	over 25 to 30	235	370	24	d = 2a

Grade	Thickness, mm	Yield strength σ_y , N/mm ²	Tensile strength σ_u , N/mm ²	Elongation δ_5 , %	Bend test mandrel
C255	4 to 10	255	380	25	d = a
	over 10 to 20	245	370	25	d = a
	over 20 to 40	235	370	24	d = 2a
C275	4 to 10	275	390	24	d = a
	over 10 to 20	275	380	23	d = a
C285	4 to 10	285	400	24	d = a
	over 10 to 20	275	390	23	d = a
C345	4 to 10	345	490	21	d = 2a
	over 10 to 20	325	470	21	d = 2a
	over 20 to 40	305	460	21	d = 2a
C345K	4 to 10	345	470	20	d = 2a
C375	4 to 10	375	510	20	d = 2a
	over 10 to 20	355	490	20	d = 2a
	over 20 to 40	335	480	20	d = 2a

σ_y is the minimum yield strength, σ_u the minimum tensile strength, δ_5 the minimum elongation, bend is the mandrel diameter d, a the specimen thickness. The values are minimums, not actual figures.

Sheet and plate

For sheet the thickness range is wider: from 2 mm, and for grade C345 up to 160 mm. The yield strength of C345 falls from 345 N/mm² for sheet up to 10 mm to 265 N/mm² for sheet 80 to 160 mm thick.

Sheet and plate: minimum mechanical properties by thickness · ГОСТ 27772-88

Grade	Thickness, mm	Yield strength σ_y , N/mm ²	Tensile strength σ_u , N/mm ²	Elongation δ_5 , %	Bend test mandrel
C235	2 to 3.9	235	360	20	d = a
	4 to 20	235	360	26	d = 1.5a
	over 20 to 40	225	360	26	d = 2.0a
	over 40 to 100	215	360	24	d = 2.0a
	over 100	195	360	24	d = 2.0a
C245	2 to 3.9	245	370	20	d = a
	4 to 10	245	370	25	d = 1.5a
	over 10 to 20	245	370	25	d = 1.5a
C255	2 to 3.9	255	380	20	d = 1.5a
	4 to 10	245	380	25	d = 1.5a
	over 10 to 20	245	370	25	d = 1.5a
	over 20 to 40	235	370	25	d = 2.0a
C275	2 to 3.9	275	380	18	d = 1.5a
	4 to 10	275	380	24	d = 1.5a
	over 10 to 20	265	370	23	d = 1.5a
C285	2 to 3.9	285	390	17	d = 1.5a
	4 to 10	275	390	24	d = 1.5a
	over 10 to 20	265	380	23	d = 1.5a
C345	2 to 3.9	345	490	15	d = 2a
	4 to 10	345	490	21	d = 2a
	over 10 to 20	325	470	21	d = 2a
	over 20 to 40	305	460	21	d = 2a
	over 40 to 60	285	450	21	d = 2a
	over 60 to 80	275	440	21	d = 2a
	over 80 to 160	265	430	21	d = 2a
C345K	4 to 10	345	470	20	d = 2a

Grade	Thickness, mm	Yield strength σ_y , N/mm ²	Tensile strength σ_u , N/mm ²	Elongation δ_5 , %	Bend test mandrel
C375	2 to 3.9	375	510	14	d = 2a
	4 to 10	375	510	20	d = 2a
	over 10 to 20	355	490	20	d = 2a
	over 20 to 40	335	480	20	d = 2a
C390	4 to 50	390	540	20	d = 2a
C390K	4 to 30	390	540	19	d = 2a
C440	4 to 30	440	590	20	d = 2a
	over 30 to 50	410	570	20	d = 2a
C590	10 to 36	590	685	14	d = 3a
C590K	10 to 40	590	685	14	d = 3a

The columns are the same as in the table for shapes.

How to use the tables

Find the grade, then the row for the thickness of the rolled product. The yield and tensile strengths in the standard are guaranteed minimums: the actual values of a batch may be higher, and the design resistances for a project are taken from the current design codes for steel structures.

The mass of rolled metal does not depend on the grade: it is found from the handbook tables and the metal weight calculator. The grade of steel and its requirements for an order are given in the KM and KMD drawings.

Calculator and ordering

Other sections are collected in the rolled metal handbook. If you need a structure to your drawings with a specified steel grade, send them with the request and we will price fabrication and galvanizing.

Frequently asked questions

What does C245 mean?

Steel for building structures with a minimum yield strength of 245 N/mm². Its former designation in the equivalence table is CТ3пс5 or CТ3п5.

Which grade corresponds to 09Г2С?

To GOST 27772-88 steel 09Г2С corresponds to grade C345. For C345 the minimum yield strength is 345 N/mm² at a thickness up to 10 mm.

How does C345 differ from C245?

It has a higher minimum yield and tensile strength: for shapes up to 10 mm C345 gives 345 and 490 N/mm², while C245 for thicknesses of 4 to 20 mm gives 245 and 370 N/mm².

Why is the yield strength lower for thick rolled products?

That is how the standard sets the minimums: the guaranteed yield strength falls as thickness grows, for example for C345 from 345 to 305 N/mm² for a flange of 20 to 40 mm.

Reference information. Check the values against the current standard before using them in a project.