INTERNATIONAL STANDARD

ISO

657-14

Hot-rolled steel sections —

Part 14:
Hot-finished structural hollow sections — Dimensions and sectional properties

Profilés en acier laminés à chaud —

Partie 14: Profils creux pour la construction finis à chaud — Dimensions et caractéristiques du profil

Contents

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 3.

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 part of ISO 657 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 657-14 was prepared by Technical Committee ISO/TC 5, *Ferrous metal pipes and metallic fittings*, Subcommittee SC 1, *Steel tubes,* and ISO/TC 17, *Steel.*

This third edition cancels and replaces the second edition (ISO 657-14:1982), which has been technically revised.

ISO 657 consists of the following parts, under the general title *Hot-rolled steel sections*:

— *Part 1: Equal-leg angles — Dimensions*

— *Part 2: Unequal-leg angles — Dimensions*

— *Part 5: Equal-leg angles and unequal-leg angles — Tolerances for metric and inch series*

— *Part 11: Sloping flange channel sections (Metric series) — Dimensions and sectional properties*

— *Part 13: Tolerances on sloping flange beam, column and channel sections*

— *Part 14: Hot-finished structural hollow sections — Dimensions and sectional properties*

— *Part 15: Sloping flange beam sections (Metric series) — Dimensions and sectional properties*

— *Part 16: Sloping flange column sections (metric series) — Dimensions and sectional properties*

— *Part 18: L sections for shipbuilding (metric series) — Dimensions, sectional properties and tolerances*

— *Part 19: Bulb flats (metric series) — Dimensions, sectional properties and tolerances*

— *Part 21: T-sections with equal depth and flange width — Dimensions*

Hot-rolled steel sections —

Part 14:
Hot-finished structural hollow sections — Dimensions and sectional properties

1   Scope

This part of ISO 657 specifies the tolerances for hot-finished circular, square and rectangular structural hollow sections and gives the dimensions and sectional properties for a range of standard sizes.

NOTE   For the technical delivery requirements, see ISO 630-2.

2   Normative reference

The following normative document contains provisions which, through reference in this text, constitute provisions of this part of ISO 657. For dated references, subsequent amendments to, or revisions of, this publication do not apply. However, parties to agreements based on this part of ISO 657 are encouraged to investigate the possibility of applying the most recent edition of the normative document indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 630-2, *Structural steels — Part 2: Technical delivery requirements for hot-formed hollow sections.*

3   Terms and definitions

For the purposes of this part of ISO 657, the terms and definitions given in ISO 630-2 apply.

4   Symbols

Symbols used in this part of ISO 657 are given in Table 1.

5   Information to be supplied by the purchaser

5.1   Mandatory information

The following information from this part of ISO 657 shall be supplied by the purchaser at the time of enquiry and order.

a)   the type of length, and the length or the length range (see Table 3);

b)   the dimensions (see clause 8).

NOTE   This information is included in the list of information to be supplied by the purchaser contained in subclause 5.1 of ISO 630-2:1999.

Table 1 — Symbols

Symbol	Unit	Definition
A	cm^2	Cross-sectional area
A_s	m^2/m	Surface area per unit length
B	mm	Nominal length of side of a square hollow section Nominal length of the shorter side of a rectangular hollow section
C_1; C_2	mm	Length of external corner profile of a square or rectangular hollow section
C_t	cm^3	Torsional-modulus constant
D	mm	Nominal outside diameter of a circular hollow section
D_{max}; D_{min}	mm	Maximum and minimum outside diameter of a circular hollow section, measured in the same plane
e	mm	Deviation from straightness
H	mm	Nominal length of the longer side of a rectangular hollow section
I	cm^4	Second moment of area
I_t	cm^4	Torsional-inertia constant (polar moment of inertia for circular hollow sections only)
i	cm	Radius of gyration
L	mm	Length
M	kg/m	Mass per unit length
O	%	Out-of-roundness
R	mm	External corner radius of a square or rectangular hollow section
T	mm	Nominal thickness
V	mm	Total twist
V_1	mm	Twist measured at one end of a section
W_{el}	cm^3	Elastic section modulus
W_{pl}	cm^3	Plastic section modulus
x_1	mm	Concavity of a side of a square or rectangular hollow section
x_2	mm	Convexity of a side of a square or rectangular hollow section
XX	—	Axis of cross-section: major axis of a rectangular hollow section
YY	—	Axis of cross-section: minor axis of a rectangular hollow section
θ	Degrees	Angle between adjacent sides of a square or rectangular hollow section

5.2 Options

One option is specified in this part of ISO 657. In the event that the purchaser does not indicate his wish to implement this option at the time of enquiry or order, the products shall be supplied in accordance with the basic specification (see 5.1).

Option 1   The tolerance on approximate length shall be $^{+150}_{0}$ mm (see Table 3).

6 Tolerances

6.1 Tolerances on the dimensions and mass of hot-finished hollow sections shall not exceed the values given in Table 2 for shape and mass, Table 3 for length and, in the case of submerged-arc-welded hollow sections, Table 4 for the height of the internal and external weld bead.

6.2 The internal corners of square and rectangular hollow sections shall be rounded.

NOTE   The internal corner profile is not specified.

7 Measurement of size and shape

7.1 General

All external dimensions, including out-of-roundness, shall be measured at a distance from the end of the hollow section of not less than D for circular sections, B for square sections or H for rectangular sections, with a minimum of 100 mm.

7.2 Outside dimensions

For circular hollow sections, the diameter D shall be measured. A calliper gauge, circumference tape or other suitable device may be used at the discretion of the manufacturer.

Dimensions B and H shall be measured at a position within 5 mm from the start of the external corner profile as shown in Figure 1.

7.3 Thickness

The thickness T of welded hollow sections shall be measured at a position not less than $2T$ from the weld.

The limiting cross-sectional positions for measuring the thickness of square and rectangular hollow sections are shown in Figure 1.

NOTE   Thickness is normally measured within a distance of half the outside diameter or half the longer side length from the end of the section.

7.4 Out-of-roundness

The percentage out-of-roundness O of a circular hollow section shall be calculated from the following equation:

$$O = \frac{D_{max} - D_{min}}{D} \times 100$$

7.5 Concavity and convexity

The concavity x_1 or the convexity x_2 of the sides of a square or rectangular hollow section shall be measured as shown in Figure 2.

The percentage concavity or convexity shall be calculated as follows:

$$\frac{x_1}{B} \times 100 \ ; \quad \frac{x_2}{B} \times 100 \ ; \quad \frac{x_1}{H} \times 100 \ ; \quad \frac{x_2}{H} \times 100$$

where B and H are the lengths of the sides containing the concavity x_1 or the convexity x_2.

7.6 Squareness of sides

The deviation from squareness of the sides of a square or rectangular hollow section is defined as the difference between 90° and θ as shown in Figure 3.

7.7 External corner profile

7.7.1 The external corner profile of a square or rectangular hollow section shall be measured in accordance with 7.7.2 or 7.7.3 at the discretion of the manufacturer.

7.7.2 Measure the external corner radius R. Use a radius gauge or other suitable device.

7.7.3 Measure the length of the external corner profile (C_1 and C_2 in Figure 4).

7.8 Twist

7.8.1 The total twist V in a square or rectangular hollow section shall be determined in accordance with 7.8.2 or 7.8.3 at the discretion of the manufacturer.

7.8.2 Place the hollow section on a horizontal surface with one side at one end pressed flat against the surface. At the opposite end of the hollow section, determine the difference V in the height of the two lower corners from a horizontal surface (see Figure 5).

7.8.3 Measure the total twist V with a spirit level and micrometer (screw) gauge or other suitable device. The reference length of the spirit level shall be the distance between the intersection of the flat sides and the external corner profile (see Figure 6). The total twist V is the difference between the values V_1 (see Figure 6) measured at each end of the hollow section.

7.9 Straightness

The deviation from straightness e of the total length of a hollow section shall be measured at the point of maximum departure of the hollow section from a straight line connecting its two ends as shown in Figure 7. The percentage deviation from straightness shall be calculated as follows:

$$\frac{e}{L} \times 100 \ \%$$

8 Dimensions and sectional properties

The nominal section dimensions and sectional properties for a range of sizes of hot-finished structural hollow sections are given in Table 5 for circular sections, Table 6 for square sections and Table 7 for rectangular sections. The sectional properties were calculated from the formulae given in annex A. Other sizes and thicknesses may be available.

Table 2 — Tolerances

Characteristic	Circular hollow sections	Square and rectangular hollow sections
Outside dimensions (D, B, H)	$\pm$ 1 %, with a minimum of $\pm$ 0,5 mm and a maximum of $\pm$ 10 mm	$\pm$ 1 %, with a minimum of $\pm$ 0,5 mm
Thickness T	$-$ 10 % [a,b]	
Out-of-roundness O	2 % for hollow sections having a diameter to thickness ratio not exceeding 100 [c]	—
Concavity/convexity [d]	—	1 %
Squareness of sides	—	90° $\pm$ 1°
External corner profile (C_1, C_2 or R) [e]	—	$3T$ maximum at each corner
Twist V	—	2 mm plus 0,5 mm/m length
Straightness	0,2 % of total length	
Mass per unit length M	$\pm$ 6 % on individual lengths [f]	

[a] The positive deviation is limited by the tolerance on mass.

[b] For seamless sections, thicknesses 10 % less than, but not more than 12,5 % less than, the nominal thickness may occur in smooth transition areas, but not over more than 25 % of the circumference.

[c] Where the diameter to thickness ratio exceeds 100, the tolerance on out-of-roundness shall be agreed.

[d] The tolerance on convexity and concavity is independent of the tolerance on outside dimensions.

[e] The sides need not be tangential to the corner arcs.

[f] The positive tolerance on the mass per unit length of seamless hollow sections shall be 8 %.

Table 3 — Tolerances on length [a]

Type of length	Range mm	Tolerance
Random length	4 000 to 16 000 with a range of 2 000 per order item	10 % of sections supplied may be below the minimum for the ordered range but not less than 75 % of the minimum of the range
Approximate length	4 000 to 16 000	$\pm$ 500 mm [b]
Exact length	$\geqslant$ 2 000 to 6 000	$^{+10}_{0}$ mm
	$\geqslant$ 6 000	$^{+15}_{0}$ mm

[a] The purchaser shall indicate in the enquiry and order the type of length required and the length range or length as appropriate.

[b] Option 1 (see 5.2): The tolerance on the approximate length shall be $^{+150}_{0}$ mm.

Table 4 — Tolerance on height of internal and external weld bead for submerged-arc-welded hollow sections

Thickness T mm	Maximum weld bead height mm
$\leqslant 14{,}2$	3,5
$> 14{,}2$	4,8

Dimensions in millimetres
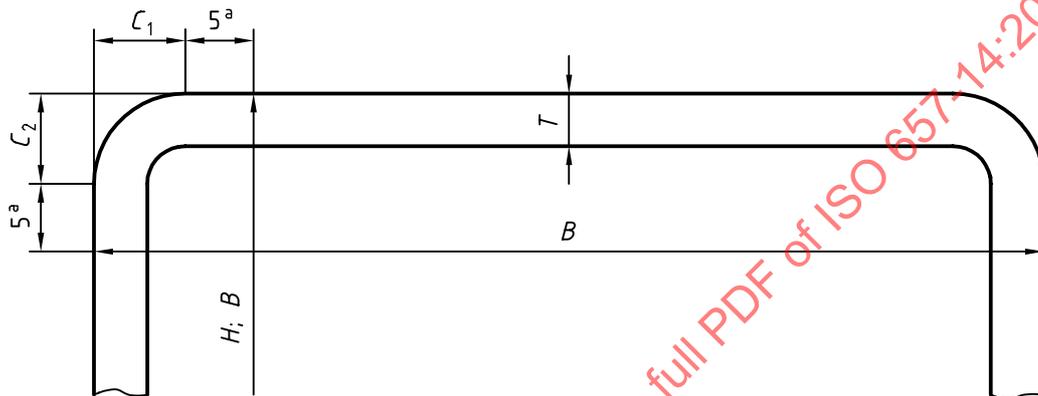
a   This dimension is a maximum when measuring B or H and a minimum when measuring T.

Figure 1 — Limiting cross-sectional positions for measuring the dimensions B, H and T for square or rectangular hollow sections
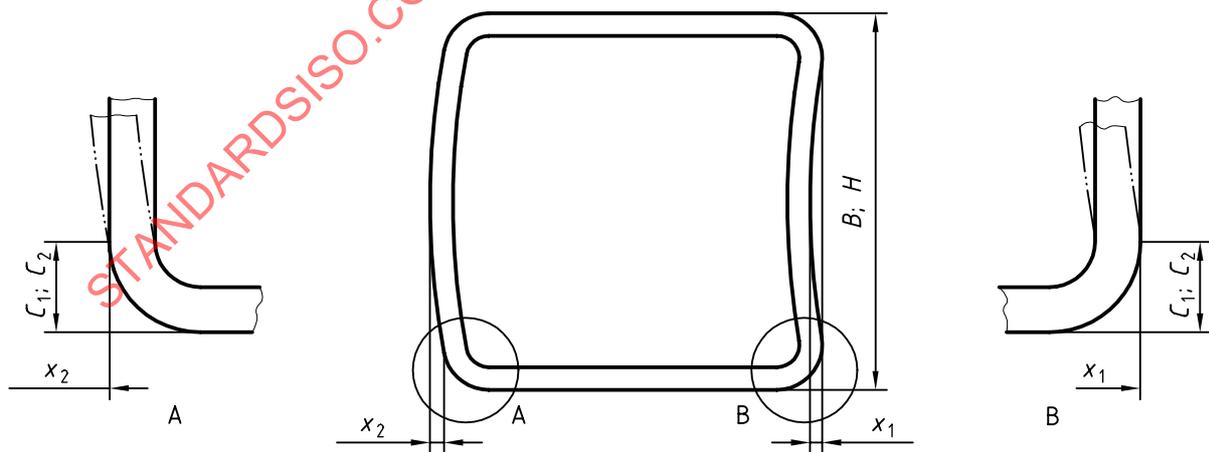
Figure 2 — Measurement of concavity/convexity of square or rectangular hollow sections
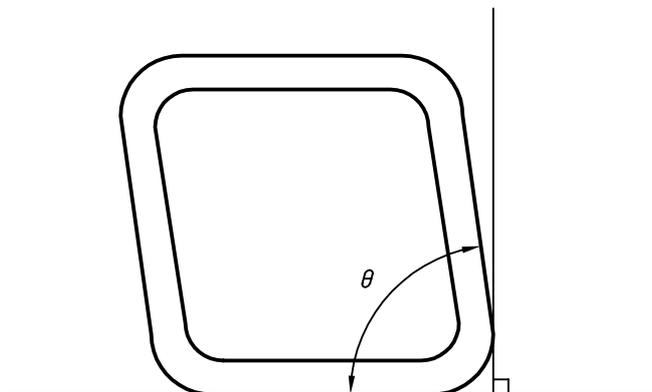
Deviation from squareness = 90° − θ

Figure 3 — Squareness of sides of square or rectangular hollow sections
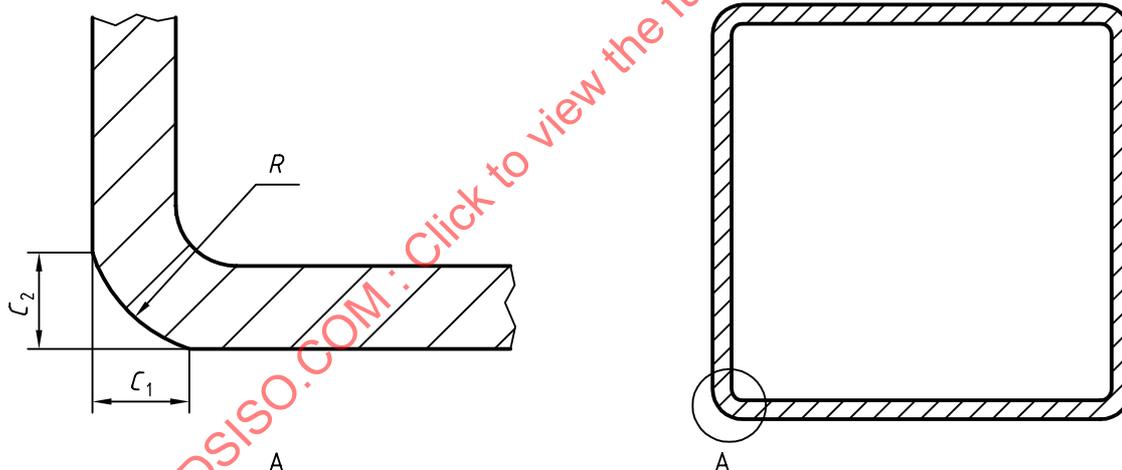
Figure 4 — External corner profile of square or rectangular hollow sections
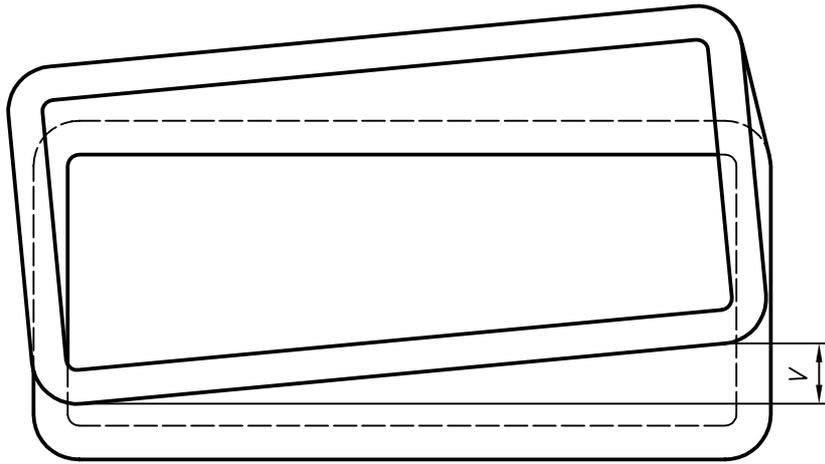
Figure 5 — Total twist of square or rectangular hollow sections
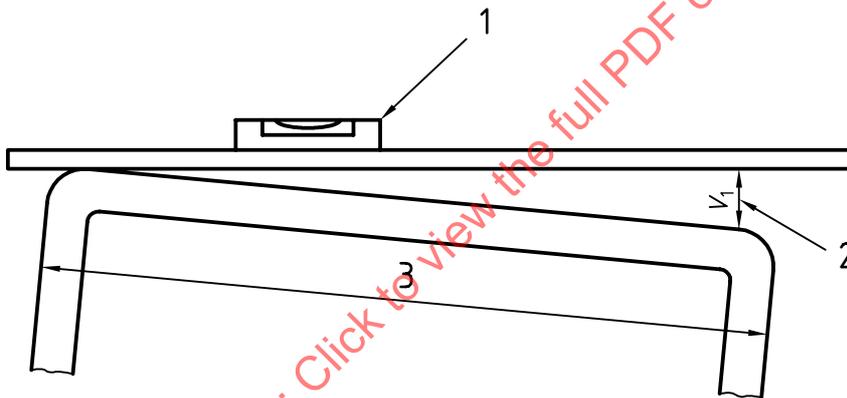
Key

1   Spirit level
2   Micrometer gauge
3   H for rectangular sections, B for square sections

Figure 6 — Measurement of twist
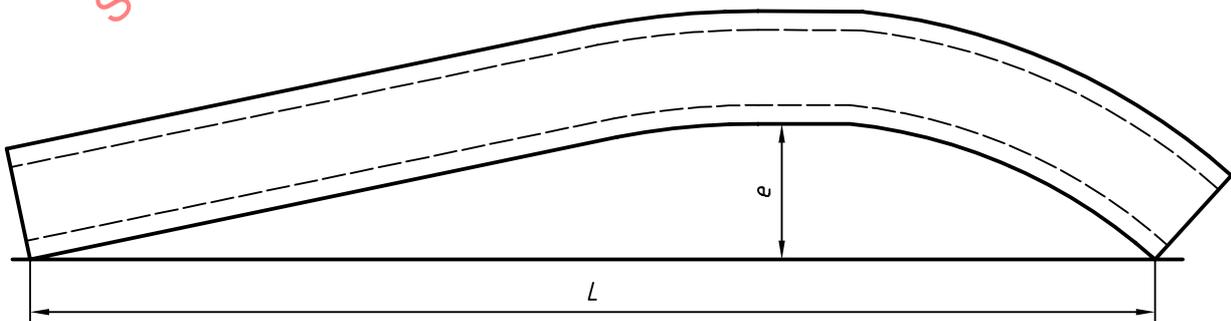
Figure 7 — Measurement of deviation from straightness
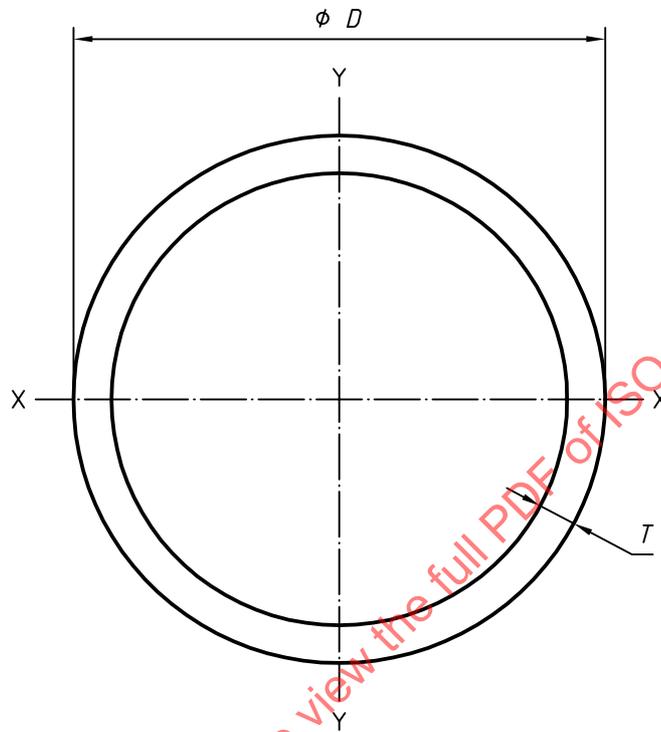
Figure 8 — Circular hollow section (see Table 5)

Table 5 — Nominal dimensions and sectional properties of circular hollow sections (see Figure 8)

Outside diameter	Thickness	Mass per unit length	Cross-sectional area	Second moment of area	Radius of gyration	Elastic section modulus	Plastic section modulus	Torsional-inertia constant	Torsional-modulus constant	Surface area per unit length	Nominal length per tonne
D	T	M	A	I	i	W_{el}	W_{pl}	I_t	C_t	A_s	
mm	mm	kg/m	cm^2	cm^4	cm	cm^3	cm^3	cm^4	cm^3	m^2/m	m
21,3	2,3	1,08	1,37	0,629	0,677	0,590	0,834	1,26	1,18	0,066 9	928
21,3	2,6	1,20	1,53	0,681	0,668	0,639	0,915	1,36	1,28	0,066 9	834
21,3	3,2	1,43	1,82	0,768	0,650	0,722	1,06	1,54	1,44	0,066 9	700
26,9	2,3	1,40	1,78	1,36	0,874	1,01	1,40	2,71	2,02	0,084 5	717
26,9	2,6	1,56	1,98	1,48	0,864	1,10	1,54	2,96	2,20	0,084 5	642
26,9	3,2	1,87	2,38	1,70	0,846	1,27	1,81	3,41	2,53	0,084 5	535
33,7	2,6	1,99	2,54	3,09	1,10	1,84	2,52	6,19	3,67	0,106	501
33,7	3,2	2,41	3,07	3,60	1,08	2,14	2,99	7,21	4,28	0,106	415
33,7	4,0	2,93	3,73	4,19	1,06	2,49	3,55	8,38	4,97	0,106	341
42,4	2,6	2,55	3,25	6,46	1,41	3,05	4,12	12,9	6,10	0,133	392
42,4	3,2	3,09	3,94	7,62	1,39	3,59	4,93	15,2	7,19	0,133	323
42,4	4,0	3,79	4,83	8,99	1,36	4,24	5,92	18,0	8,48	0,133	264
48,3	2,6	2,93	3,73	9,78	1,62	4,05	5,44	19,6	8,10	0,152	341
48,3	3,2	3,56	4,53	11,6	1,60	4,80	6,52	23,2	9,59	0,152	281
48,3	4,0	4,37	5,57	13,8	1,57	5,70	7,87	27,5	11,4	0,152	229
48,3	5,0	5,34	6,80	16,2	1,54	6,69	9,42	32,3	13,4	0,152	187
60,3	2,6	3,70	4,71	19,7	2,04	6,52	8,66	39,3	13,0	0,189	270
60,3	3,2	4,51	5,74	23,5	2,02	7,78	10,4	46,9	15,6	0,189	222
60,3	4,0	5,55	7,07	28,2	2,00	9,34	12,7	56,3	18,7	0,189	180
60,3	5,0	6,82	8,69	33,5	1,96	11,1	15,3	67,0	22,2	0,189	147
76,1	2,6	4,71	6,00	40,6	2,60	10,7	14,1	81,2	21,3	0,239	212
76,1	3,2	5,75	7,33	48,8	2,58	12,8	17,0	97,6	25,6	0,239	174
76,1	4,0	7,11	9,06	59,1	2,55	15,5	20,8	118	31,0	0,239	141
76,1	5,0	8,77	11,2	70,9	2,52	18,6	25,3	142	37,3	0,239	114
88,9	3,2	6,76	8,62	79,2	3,03	17,8	23,5	158	35,6	0,279	148
88,9	4,0	8,38	10,7	96,3	3,00	21,7	28,9	193	43,3	0,279	119
88,9	5,0	10,3	13,2	116	2,97	26,2	35,2	233	52,4	0,279	96,7
88,9	6,0	12,3	15,6	135	2,94	30,4	41,3	270	60,7	0,279	81,5
88,9	6,3	12,8	16,3	140	2,93	31,5	43,1	280	63,1	0,279	77,9
101,6	3,2	7,77	9,89	120	3,48	23,6	31,0	240	47,2	0,319	129
101,6	4,0	9,63	12,3	146	3,45	28,8	38,1	293	57,6	0,319	104

Table 5 *(continued)*

Outside diameter D mm	Thickness T mm	Mass per unit length M kg/m	Cross-sectional area A cm^2	Second moment of area I cm^4	Radius of gyration i cm	Elastic section modulus W_{el} cm^3	Plastic section modulus W_{pl} cm^3	Torsional-inertia constant I_t cm^4	Torsional-modulus constant C_t cm^3	Surface area per unit length A_s m^2/m	Nominal length per tonne m
101,6	5,0	11,9	15,2	177	3,42	34,9	46,7	355	69,9	0,319	84,0
101,6	6,0	14,1	18,0	207	3,39	40,7	54,9	413	81,4	0,319	70,7
101,6	6,3	14,8	18,9	215	3,38	42,3	57,3	430	84,7	0,319	67,5
101,6	8,0	18,5	23,5	260	3,32	51,1	70,3	519	102	0,319	54,2
101,6	10,0	22,6	28,8	305	3,26	60,1	84,2	611	120	0,319	44,3
114,3	3,2	8,77	11,2	172	3,93	30,2	39,5	345	60,4	0,359	114
114,3	4,0	10,9	13,9	211	3,90	36,9	48,7	422	73,9	0,359	91,9
114,3	5,0	13,5	17,2	257	3,87	45,0	59,8	514	89,9	0,359	74,2
114,3	6,0	16,0	20,4	300	3,83	52,5	70,4	600	105	0,359	62,4
114,3	6,3	16,8	21,4	313	3,82	54,7	73,6	625	109	0,359	59,6
114,3	8,0	21,0	26,7	379	3,77	66,4	90,6	759	133	0,359	47,7
114,3	10,0	25,7	32,8	450	3,70	78,7	109	899	157	0,359	38,9
139,7	4,0	13,4	17,1	393	4,80	56,2	73,7	786	112	0,439	74,7
139,7	5,0	16,6	21,2	481	4,77	68,8	90,8	961	138	0,439	60,2
139,7	6,0	19,8	25,2	564	4,73	80,8	107	1 129	162	0,439	50,5
139,7	6,3	20,7	26,4	589	4,72	84,3	112	1 177	169	0,439	48,2
139,7	8,0	26,0	33,1	720	4,66	103	139	1 441	206	0,439	38,5
139,7	10,0	32,0	40,7	862	4,60	123	169	1 724	247	0,439	31,3
139,7	12,0	37,8	48,1	990	4,53	142	196	1 980	283	0,439	26,5
139,7	12,5	39,2	50,0	1 020	4,52	146	203	2 040	292	0,439	25,5
168,3	4,0	16,2	20,6	697	5,81	82,8	108	1 394	166	0,529	61,7
168,3	5,0	20,1	25,7	856	5,78	102	133	1 712	203	0,529	49,7
168,3	6,0	24,0	30,6	1 009	5,74	120	158	2 017	240	0,529	41,6
168,3	6,3	25,2	32,1	1 053	5,73	125	165	2 107	250	0,529	39,7
168,3	8,0	31,6	40,3	1 297	5,67	154	206	2 595	308	0,529	31,6
168,3	10,0	39,0	49,7	1 564	5,61	186	251	3 128	372	0,529	25,6
168,3	12,0	46,3	58,9	1 810	5,54	215	294	3 620	430	0,529	21,6
168,3	12,5	48,0	61,2	1 868	5,53	222	304	3 737	444	0,529	20,8
177,8	5,0	21,3	27,1	1 014	6,11	114	149	2 028	228	0,559	46,9
177,8	6,0	25,4	32,4	1 196	6,08	135	177	2 392	269	0,559	39,3
177,8	6,3	26,6	33,9	1 250	6,07	141	185	2 499	281	0,559	37,5
177,8	8,0	33,5	42,7	1 541	6,01	173	231	3 083	347	0,559	29,9

Table 5 *(continued)*

Outside diameter D mm	Thickness T mm	Mass per unit length M kg/m	Cross-sectional area A cm^2	Second moment of area I cm^4	Radius of gyration i cm	Elastic section modulus W_{el} cm^3	Plastic section modulus W_{pl} cm^3	Torsional-inertia constant I_t cm^4	Torsional-modulus constant C_t cm^3	Surface area per unit length A_s m^2/m	Nominal length per tonne m
177,8	10,0	41,4	52,7	1 862	5,94	209	282	3 724	419	0,559	24,2
177,8	12,0	49,1	62,5	2 159	5,88	243	330	4 318	486	0,559	20,4
177,8	12,5	51,0	64,9	2 230	5,86	251	342	4 460	502	0,559	19,6
193,7	5,0	23,3	29,6	1 320	6,67	136	178	2 640	273	0,609	43,0
193,7	6,0	27,8	35,4	1 560	6,64	161	211	3 119	322	0,609	36,0
193,7	6,3	29,1	37,1	1 630	6,63	168	221	3 260	337	0,609	34,3
193,7	8,0	36,6	46,7	2 016	6,57	208	276	4 031	416	0,609	27,3
193,7	10,0	45,3	57,7	2 442	6,50	252	338	4 883	504	0,609	22,1
193,7	12,0	53,8	68,5	2 839	6,44	293	397	5 678	586	0,609	18,6
193,7	12,5	55,9	71,2	2 934	6,42	303	411	5 869	606	0,609	17,9
193,7	16,0	70,1	89,3	3 554	6,31	367	507	7 109	734	0,609	14,3
219,1	5,0	26,4	33,6	1 928	7,57	176	229	3 856	352	0,688	37,9
219,1	6,0	31,5	40,2	2 282	7,54	208	273	4 564	417	0,688	31,7
219,1	6,3	33,1	42,1	2 386	7,53	218	285	4 772	436	0,688	30,2
219,1	8,0	41,6	53,1	2 960	7,47	270	357	5 919	540	0,688	24,0
219,1	10,0	51,6	65,7	3 598	7,40	328	438	7 197	657	0,688	19,4
219,1	12,0	61,3	78,1	4 200	7,33	383	515	8 400	767	0,688	16,3
219,1	12,5	63,7	81,1	4 345	7,32	397	534	8 689	793	0,688	15,7
219,1	16,0	80,1	102	5 297	7,20	483	661	10 590	967	0,688	12,5
219,1	20,0	98,2	125	6 261	7,07	572	795	12 520	1 143	0,688	10,2
244,5	5,0	29,5	37,6	2 699	8,47	221	287	5 397	441	0,768	33,9
244,5	6,0	35,3	45,0	3 199	8,43	262	341	6 397	523	0,768	28,3
244,5	6,3	37,0	47,1	3 346	8,42	274	358	6 692	547	0,768	27,0
244,5	8,0	46,7	59,4	4 160	8,37	340	448	8 321	681	0,768	21,4
244,5	10,0	57,8	73,7	5 073	8,30	415	550	10 146	830	0,768	17,3
244,5	12,0	68,8	87,7	5 938	8,23	486	649	11 877	972	0,768	14,5
244,5	12,5	71,5	91,1	6 147	8,21	503	673	12 295	1 006	0,768	14,0
244,5	16,0	90,2	115	7 533	8,10	616	837	15 066	1 232	0,768	11,1
244,5	20,0	111	141	8 957	7,97	733	1 011	17 914	1 465	0,768	9,03
244,5	25,0	135	172	10 517	7,81	860	1 210	21 034	1 721	0,768	7,39

Table 5 *(continued)*

Outside diameter D mm	Thickness T mm	Mass per unit length M kg/m	Cross-sectional area A cm^2	Second moment of area I cm^4	Radius of gyration i cm	Elastic section modulus W_{el} cm^3	Plastic section modulus W_{pl} cm^3	Torsional-inertia constant I_t cm^4	Torsional-modulus constant C_t cm^3	Surface area per unit length A_s m^2/m	Nominal length per tonne m
273,0	5,0	33,0	42,1	3 781	9,48	277	359	7 562	554	0,858	30,3
273,0	6,0	39,5	50,3	4 487	9,44	329	428	8 974	657	0,858	25,3
273,0	6,3	41,4	52,8	4 696	9,43	344	448	9 392	688	0,858	24,1
273,0	8,0	52,3	66,6	5 852	9,37	429	562	11 703	857	0,858	19,1
273,0	10,0	64,9	82,6	7 154	9,31	524	692	14 308	1 048	0,858	15,4
273,0	12,0	77,2	98,4	8 396	9,24	615	818	16 792	1 230	0,858	12,9
273,0	12,5	80,3	102	8 697	9,22	637	849	17 395	1 274	0,858	12,5
273,0	16,0	101	129	10 707	9,10	784	1 058	21 414	1 569	0,858	9,86
273,0	20,0	125	159	12 798	8,97	938	1 283	25 597	1 875	0,858	8,01
273,0	25,0	153	195	15 127	8,81	1 108	1 543	30 254	2 216	0,858	6,54
323,9	5,0	39,3	50,1	6 369	11,3	393	509	12 739	787	1,02	25,4
323,9	6,0	47,0	59,9	7 572	11,2	468	606	15 145	935	1,02	21,3
323,9	6,3	49,3	62,9	7 929	11,2	490	636	15 858	979	1,02	20,3
323,9	8,0	62,3	79,4	9 910	11,2	612	799	19 820	1 224	1,02	16,0
323,9	10,0	77,4	98,6	12 158	11,1	751	986	24 317	1 501	1,02	12,9
323,9	12,0	92,3	118	14 320	11,0	884	1 168	28 639	1 768	1,02	10,8
323,9	12,5	96,0	122	14 847	11,0	917	1 213	29 693	1 833	1,02	10,4
323,9	16,0	121	155	18 390	10,9	1 136	1 518	36 780	2 271	1,02	8,23
323,9	20,0	150	191	22 139	10,8	1 367	1 850	44 278	2 734	1,02	6,67
323,9	25,0	184	235	26 400	10,6	1 630	2 239	52 800	3 260	1,02	5,43
355,6	6,0	51,7	65,9	10 071	12,4	566	733	20 141	1 133	1,12	19,3
355,6	6,3	54,3	69,1	10 547	12,4	593	769	21 094	1 186	1,12	18,4
355,6	8,0	68,6	87,4	13 201	12,3	742	967	26 403	1 485	1,12	14,6
355,6	10,0	85,2	109	16 223	12,2	912	1 195	32 447	1 825	1,12	11,7
355,6	12,0	102	130	19 139	12,2	1 076	1 417	38 279	2 153	1,12	9,83
355,6	12,5	106	135	19 852	12,1	1 117	1 472	39 704	2 233	1,12	9,45
355,6	16,0	134	171	24 663	12,0	1 387	1 847	49 326	2 774	1,12	7,46
355,6	20,0	166	211	29 792	11,9	1 676	2 255	59 583	3 351	1,12	6,04
355,6	25,0	204	260	35 677	11,7	2 007	2 738	71 353	4 013	1,12	4,91
406,4	6,0	59,2	75,5	15 128	14,2	745	962	30 257	1 489	1,28	16,9
406,4	6,3	62,2	79,2	15 849	14,1	780	1 009	31 699	1 560	1,28	16,1

Table 5 (continued)

Outside diameter	Thickness	Mass per unit length	Cross-sectional area	Second moment of area	Radius of gyration	Elastic section modulus	Plastic section modulus	Torsional-inertia constant	Torsional-modulus constant	Surface area per unit length	Nominal length per tonne
D	T	M	A	I	i	W_{el}	W_{pl}	I_t	C_t	A_s	
mm	mm	kg/m	cm^2	cm^4	cm	cm^3	cm^3	cm^4	cm^3	m^2/m	m
406,4	8,0	78,6	100	19 874	14,1	978	1 270	39 748	1 956	1,28	12,7
406,4	10,0	97,8	125	24 476	14,0	1 205	1 572	48 952	2 409	1,28	10,2
406,4	12,0	117	149	28 937	14,0	1 424	1 867	57 874	2 848	1,28	8,57
406,4	12,5	121	155	30 031	13,9	1 478	1 940	60 061	2 956	1,28	8,24
406,4	16,0	154	196	37 449	13,8	1 843	2 440	74 898	3 686	1,28	6,49
406,4	20,0	191	243	45 432	13,7	2 236	2 989	90 864	4 472	1,28	5,25
406,4	25,0	235	300	54 702	13,5	2 692	3 642	109 404	5 384	1,28	4,25
406,4	30,0	278	355	63 224	13,3	3 111	4 259	126 447	6 223	1,28	3,59
406,4	40,0	361	460	78 186	13,0	3 848	5 391	156 373	7 696	1,28	2,77
457,0	6,0	66,7	85,0	21 618	15,9	946	1 220	43 236	1 892	1,44	15,0
457,0	6,3	70,0	89,2	22 654	15,9	991	1 280	45 308	1 983	1,44	14,3
457,0	8,0	88,6	113	28 446	15,9	1 245	1 613	56 893	2 490	1,44	11,3
457,0	10,0	110	140	35 091	15,8	1 536	1 998	70 183	3 071	1,44	9,07
457,0	12,0	132	168	41 556	15,7	1 819	2 377	83 113	3 637	1,44	7,59
457,0	12,5	137	175	43 145	15,7	1 888	2 470	86 290	3 776	1,44	7,30
457,0	16,0	174	222	53 959	15,6	2 361	3 113	107 919	4 723	1,44	5,75
457,0	20,0	216	275	65 681	15,5	2 874	3 822	131 363	5 749	1,44	4,64
457,0	25,0	266	339	79 415	15,3	3 475	4 671	158 830	6 951	1,44	3,75
457,0	30,0	316	402	92 173	15,1	4 034	5 479	184 346	8 068	1,44	3,17
457,0	40,0	411	524	114 949	14,8	5 031	6 977	229 898	10 061	1,44	2,43
508,0	6,0	74,3	94,6	29 812	17,7	1 174	1 512	59 623	2 347	1,60	13,5
508,0	6,3	77,9	99,3	31 246	17,7	1 230	1 586	62 493	2 460	1,60	12,8
508,0	8,0	98,6	126	39 280	17,7	1 546	2 000	78 560	3 093	1,60	10,1
508,0	10,0	123	156	48 520	17,6	1 910	2 480	97 040	3 820	1,60	8,14
508,0	12,0	147	187	57 536	17,5	2 265	2 953	115 072	4 530	1,60	6,81
508,0	12,5	153	195	59 755	17,5	2 353	3 070	119 511	4 705	1,60	6,55
508,0	16,0	194	247	74 909	17,4	2 949	3 874	149 818	5 898	1,60	5,15
508,0	20,0	241	307	91 428	17,3	3 600	4 766	182 856	7 199	1,60	4,15
508,0	25,0	298	379	110 918	17,1	4 367	5 837	221 837	8 734	1,60	3,36

Table 5 *(continued)*

Outside diameter	Thickness	Mass per unit length	Cross-sectional area	Second moment of area	Radius of gyration	Elastic section modulus	Plastic section modulus	Torsional-inertia constant	Torsional-modulus constant	Surface area per unit length	Nominal length per tonne
D	T	M	A	I	i	W_{el}	W_{pl}	I_t	C_t	A_s	
mm	mm	kg/m	cm^2	cm^4	cm	cm^3	cm^3	cm^4	cm^3	m^2/m	m
508,0	30,0	354	451	129 173	16,9	5 086	6 864	258 346	10 171	1,60	2,83
508,0	40,0	462	588	162 188	16,6	6 385	8 782	324 376	12 771	1,60	2,17
508,0	50,0	565	719	190 885	16,3	7 515	10 530	381 770	15 030	1,60	1,77
610,0	6,0	89,4	114	51 924	21,4	1 702	2 189	103 847	3 405	1,92	11,2
610,0	6,3	93,8	119	54 439	21,3	1 785	2 296	108 878	3 570	1,92	10,7
610,0	8,0	119	151	68 551	21,3	2 248	2 899	137 103	4 495	1,92	8,42
610,0	10,0	148	188	84 847	21,2	2 782	3 600	169 693	5 564	1,92	6,76
610,0	12,0	177	225	100 814	21,1	3 305	4 292	201 627	6 611	1,92	5,65
610,0	12,5	184	235	104 755	21,1	3 435	4 463	209 509	6 869	1,92	5,43
610,0	16,0	234	299	131 781	21,0	4 321	5 647	263 563	8 641	1,92	4,27
610,0	20,0	291	371	161 490	20,9	5 295	6 965	322 979	10 589	1,92	3,44
610,0	25,0	361	459	196 906	20,7	6 456	8 561	393 813	12 912	1,92	2,77
610,0	30,0	429	547	230 476	20,5	7 557	10 101	460 952	15 113	1,92	2,33
610,0	40,0	562	716	292 333	20,2	9 585	13 017	584 666	19 169	1,92	1,78
610,0	50,0	691	880	347 570	19,9	11 396	15 722	695 140	22 791	1,92	1,45
711,0	6,0	104	133	82 568	24,9	2 323	2 982	165 135	4 645	2,23	9,59
711,0	6,3	109	139	86 586	24,9	2 436	3 129	173 172	4 871	2,23	9,13
711,0	8,0	139	177	109 162	24,9	3 071	3 954	218 324	6 141	2,23	7,21
711,0	10,0	173	220	135 301	24,8	3 806	4 914	270 603	7 612	2,23	5,78
711,0	12,0	207	264	160 991	24,7	4 529	5 864	321 981	9 057	2,23	4,83
711,0	12,5	215	274	167 343	24,7	4 707	6 099	334 686	9 415	2,23	4,64
711,0	16,0	274	349	211 040	24,6	5 936	7 730	422 080	11 873	2,23	3,65
711,0	20,0	341	434	259 351	24,4	7 295	9 552	518 702	14 591	2,23	2,93
711,0	25,0	423	539	317 357	24,3	8 927	11 770	634 715	17 854	2,23	2,36
711,0	30,0	504	642	372 790	24,1	10 486	13 922	745 580	20 973	2,23	1,98
711,0	40,0	662	843	476 242	23,8	13 396	18 031	952 485	26 793	2,23	1,51
711,0	50,0	815	1038	570 312	23,4	16 043	21 888	1 140 623	32 085	2,23	1,23
711,0	60,0	963	1227	655 583	23,1	18 441	25 500	1 311 166	36 882	2,23	1,04
762,0	6,0	112	143	101 813	26,7	2 672	3 429	203 626	5 345	2,39	8,94
762,0	6,3	117	150	106 777	26,7	2 803	3 598	213 555	5 605	2,39	8,52
762,0	8,0	149	190	134 683	26,7	3 535	4 548	269 366	7 070	2,39	6,72

Table 5 *(continued)*

Outside diameter	Thickness	Mass per unit length	Cross-sectional area	Second moment of area	Radius of gyration	Elastic section modulus	Plastic section modulus	Torsional-inertia constant	Torsional-modulus constant	Surface area per unit length	Nominal length per tonne
D	T	M	A	I	i	W_{el}	W_{pl}	I_t	C_t	A_s	
mm	mm	kg/m	cm^2	cm^4	cm	cm^3	cm^3	cm^4	cm^3	m^2/m	m
762,0	10,0	185	236	167 028	26,6	4 384	5 655	334 057	8 768	2,39	5,39
762,0	12,0	222	283	198 855	26,5	5 219	6 751	397 710	10 439	2,39	4,51
762,0	12,5	231	294	206 731	26,5	5 426	7 023	413 462	10 852	2,39	4,33
762,0	16,0	294	375	260 973	26,4	6 850	8 906	521 947	13 699	2,39	3,40
762,0	20,0	366	466	321 083	26,2	8 427	11 014	642 166	16 855	2,39	2,73
762,0	25,0	454	579	393 461	26,1	10 327	13 584	786 922	20 654	2,39	2,20
762,0	30,0	542	690	462 853	25,9	12 148	16 084	925 706	24 297	2,39	1,85
762,0	40,0	712	907	593 011	25,6	15 565	20 873	1 186 021	31 129	2,39	1,40
762,0	50,0	878	1 118	712 207	25,2	18 693	25 389	1 424 414	37 386	2,39	1,14
813,0	8,0	159	202	163 901	28,5	4 032	5 184	327 801	8 064	2,55	6,30
813,0	10,0	198	252	203 364	28,4	5 003	6 448	406 728	10 006	2,55	5,05
813,0	12,0	237	302	242 235	28,3	5 959	7 700	484 469	11 918	2,55	4,22
813,0	12,5	247	314	251 860	28,3	6 196	8 011	503 721	12 392	2,55	4,05
813,0	16,0	314	401	318 222	28,2	7 828	10 165	636 443	15 657	2,55	3,18
813,0	20,0	391	498	391 909	28,0	9 641	12 580	783 819	19 282	2,55	2,56
813,0	25,0	486	619	480 856	27,9	11 829	15 529	961 713	23 658	2,55	2,06
813,0	30,0	579	738	566 374	27,7	13 933	18 402	1 132 748	27 866	2,55	1,73
914,0	8,0	179	228	233 651	32,0	5 113	6 567	467 303	10 225	2,87	5,59
914,0	10,0	223	284	290 147	32,0	6 349	8 172	580 294	12 698	2,87	4,49
914,0	12,0	267	340	345 890	31,9	7 569	9 764	691 779	15 137	2,87	3,75
914,0	12,5	278	354	359 708	31,9	7 871	10 159	719 417	15 742	2,87	3,60
914,0	16,0	354	451	455 142	31,8	9 959	12 904	910 284	19 919	2,87	2,82
914,0	20,0	441	562	561 461	31,6	12 286	15 987	1 122 922	24 572	2,87	2,27
914,0	25,0	548	698	690 317	31,4	15 105	19 763	1 380 634	30 211	2,87	1,82
914,0	30,0	654	833	814 775	31,3	17 829	23 453	1 629 550	35 658	2,87	1,53
1 016,0	8,0	199	253	321 780	35,6	6 334	8 129	643 560	12 668	3,19	5,03
1 016,0	10,0	248	316	399 850	35,6	7 871	10 121	799 699	15 742	3,19	4,03
1 016,0	12,0	297	378	476 985	35,5	9 389	12 097	953 969	18 779	3,19	3,37
1 016,0	12,5	309	394	496 123	35,5	9 766	12 588	992 246	19 532	3,19	3,23
1 016,0	16,0	395	503	628 479	35,4	12 372	16 001	1 256 959	24 743	3,19	2,53

Table 5 *(concluded)*

Outside diameter	Thickness	Mass per unit length	Cross-sectional area	Second moment of area	Radius of gyration	Elastic section modulus	Plastic section modulus	Torsional-inertia constant	Torsional-modulus constant	Surface area per unit length	Nominal length per tonne
D	T	M	A	I	i	W_{el}	W_{pl}	I_t	C_t	A_s	
mm	mm	kg/m	cm^2	cm^4	cm	cm^3	cm^3	cm^4	cm^3	m^2/m	m
1 016,0	20,0	491	626	776 324	35,2	15 282	19 843	1 552 648	30 564	3,19	2,04
1 016,0	25,0	611	778	956 086	35,0	18 821	24 557	1 912 173	37 641	3,19	1,64
1 016,0	30,0	729	929	1 130 352	34,9	22 251	29 175	2 260 704	44 502	3,19	1,37
1 067,0	10,0	261	332	463 792	37,4	8 693	11 173	927 585	17 387	3,35	3,84
1 067,0	12,0	312	398	553 420	37,3	10 373	13 357	1 106 840	20 747	3,35	3,20
1 067,0	12,5	325	414	575 666	37,3	10 790	13 900	1 151 332	21 581	3,35	3,08
1 067,0	16,0	415	528	729 606	37,2	13 676	17 675	1 459 213	27 352	3,35	2,41
1 067,0	20,0	516	658	901 755	37,0	16 903	21 927	1 803 509	33 805	3,35	1,94
1 067,0	25,0	642	818	1 111 355	36,9	20 831	27 149	2 222 711	41 663	3,35	1,56
1 067,0	30,0	767	977	1 314 864	36,7	24 646	32 270	2 629 727	49 292	3,35	1,30
1 168,0	10,0	286	364	609 843	40,9	10 443	13 410	1 219 686	20 885	3,67	3,50
1 168,0	12,0	342	436	728 050	40,9	12 467	16 037	1 456 101	24 933	3,67	2,92
1 168,0	12,5	356	454	757 409	40,9	12 969	16 690	1 514 818	25 939	3,67	2,81
1 168,0	16,0	455	579	960 774	40,7	16 452	21 235	1 921 547	32 903	3,67	2,20
1 168,0	20,0	566	721	1 188 632	40,6	20 353	26 361	2 377 264	40 707	3,67	1,77
1 168,0	25,0	705	898	1 466 717	40,4	25 115	32 666	2 933 434	50 230	3,67	1,42
1 219,0	10,0	298	380	694 014	42,7	11 387	14 617	1 388 029	22 773	3,83	3,35
1 219,0	12,0	357	455	828 716	42,7	13 597	17 483	1 657 433	27 193	3,83	2,80
1 219,0	12,5	372	474	862 181	42,7	14 146	18 196	1 724 362	28 291	3,83	2,69
1 219,0	16,0	475	605	1 094 091	42,5	17 951	23 157	2 188 183	35 901	3,83	2,11
1 219,0	20,0	591	753	1 354 155	42,4	22 217	28 755	2 708 309	44 435	3,83	1,69
1 219,0	25,0	736	938	1 671 873	42,2	27 430	35 646	3 343 746	54 860	3,83	1,36
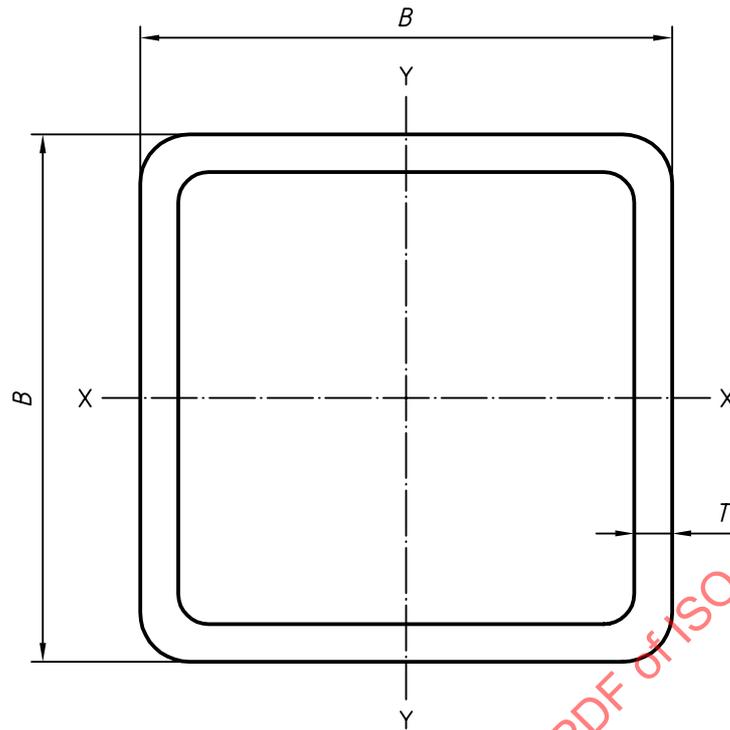
Figure 9 — Square hollow section (see Table 6)

Table 6 — Nominal dimensions and sectional properties of square hollow sections (see Figure 9)

Size	Thickness	Mass per unit length	Cross-sectional area	Second moment of area	Radius of gyration	Elastic section modulus	Plastic section modulus	Torsional-inertia constant	Torsional-modulus constant	Surface area per unit length	Nominal length per tonne
B	T	M	A	I	i	W_{el}	W_{pl}	I_t	C_t	A_s	
mm	mm	kg/m	cm^2	cm^4	cm	cm^3	cm^3	cm^4	cm^3	m^2/m	m
20	2,0	1,10	1,40	0,739	0,727	0,739	0,930	1,22	1,07	0,074 8	912
20	2,5	1,32	1,68	0,835	0,705	0,835	1,08	1,41	1,20	0,073 6	757
25	2,0	1,41	1,80	1,56	0,932	1,25	1,53	2,52	1,81	0,094 8	709
25	2,5	1,71	2,18	1,81	0,909	1,44	1,82	2,97	2,08	0,093 6	584
25	3,0	2,00	2,54	2,00	0,886	1,60	2,06	3,35	2,30	0,092 3	501
30	2,0	1,72	2,20	2,84	1,14	1,89	2,29	4,53	2,75	0,115	580
30	2,5	2,11	2,68	3,33	1,11	2,22	2,74	5,40	3,22	0,114	475
30	3,0	2,47	3,14	3,74	1,09	2,50	3,14	6,16	3,60	0,112	405
40	2,5	2,89	3,68	8,54	1,52	4,27	5,14	13,6	6,22	0,154	346
40	3,0	3,41	4,34	9,78	1,50	4,89	5,97	15,7	7,10	0,152	293
40	4,0	4,39	5,59	11,8	1,45	5,91	7,44	19,5	8,54	0,150	228
40	5,0	5,28	6,73	13,4	1,41	6,68	8,66	22,5	9,60	0,147	189
50	2,5	3,68	4,68	17,5	1,93	6,99	8,29	27,5	10,2	0,194	272
50	3,0	4,35	5,54	20,2	1,91	8,08	9,70	32,1	11,8	0,192	230
50	4,0	5,64	7,19	25,0	1,86	9,99	12,3	40,4	14,5	0,190	177
50	5,0	6,85	8,73	28,9	1,82	11,6	14,5	47,6	16,7	0,187	146
50	6,0	7,99	10,2	32,0	1,77	12,8	16,5	53,6	18,4	0,185	125
50	6,3	8,31	10,6	32,8	1,76	13,1	17,0	55,2	18,8	0,184	120
60	2,5	4,46	5,68	31,1	2,34	10,4	12,2	48,5	15,2	0,234	224
60	3,0	5,29	6,74	36,2	2,32	12,1	14,3	56,9	17,7	0,232	189
60	4,0	6,90	8,79	45,4	2,27	15,1	18,3	72,5	22,0	0,230	145
60	5,0	8,42	10,7	53,3	2,23	17,8	21,9	86,4	25,7	0,227	119
60	6,0	9,87	12,6	59,9	2,18	20,0	25,1	98,6	28,8	0,225	101
60	6,3	10,3	13,1	61,6	2,17	20,5	26,0	102	29,6	0,224	97,2
60	8,0	12,5	16,0	69,7	2,09	23,2	30,4	118	33,4	0,219	79,9
70	3,0	6,24	7,94	59,0	2,73	16,9	19,9	92,2	24,8	0,272	160
70	4,0	8,15	10,4	74,7	2,68	21,3	25,5	118	31,2	0,270	123
70	5,0	9,99	12,7	88,5	2,64	25,3	30,8	142	36,8	0,267	100
70	6,0	11,8	15,0	101	2,59	28,7	35,5	163	41,6	0,265	85,1
70	6,3	12,3	15,6	104	2,58	29,7	36,9	169	42,9	0,264	81,5

Table 6 (continued)

Size	Thickness	Mass per unit length	Cross-sectional area	Second moment of area	Radius of gyration	Elastic section modulus	Plastic section modulus	Torsional-inertia constant	Torsional-modulus constant	Surface area per unit length	Nominal length per tonne
B	T	M	A	I	i	W_{el}	W_{pl}	I_t	C_t	A_s	
mm	mm	kg/m	cm^2	cm^4	cm	cm^3	cm^3	cm^4	cm^3	m^2/m	m
70	8,0	15,0	19,2	120	2,50	34,2	43,8	200	49,2	0,259	66,5
80	3,0	7,18	9,14	89,8	3,13	22,5	26,3	140	33,0	0,312	139
80	4,0	9,41	12,0	114	3,09	28,6	34,0	180	41,9	0,310	106
80	5,0	11,6	14,7	137	3,05	34,2	41,1	217	49,8	0,307	86,5
80	6,0	13,6	17,4	156	3,00	39,1	47,8	252	56,8	0,305	73,3
80	6,3	14,2	18,1	162	2,99	40,5	49,7	262	58,7	0,304	70,2
80	8,0	17,5	22,4	189	2,91	47,3	59,5	312	68,3	0,299	57,0
90	4,0	10,7	13,6	166	3,50	37,0	43,6	260	54,2	0,350	93,7
90	5,0	13,1	16,7	200	3,45	44,4	53,0	316	64,8	0,347	76,1
90	6,0	15,5	19,8	230	3,41	51,1	61,8	367	74,3	0,345	64,4
90	6,3	16,2	20,7	238	3,40	53,0	64,3	382	77,0	0,344	61,6
90	8,0	20,1	25,6	281	3,32	62,6	77,6	459	90,5	0,339	49,9
100	4,0	11,9	15,2	232	3,91	46,4	54,4	361	68,2	0,390	83,9
100	5,0	14,7	18,7	279	3,86	55,9	66,4	439	81,8	0,387	68,0
100	6,0	17,4	22,2	323	3,82	64,6	77,6	513	94,3	0,385	57,5
100	6,3	18,2	23,2	336	3,80	67,1	80,9	534	97,8	0,384	54,9
100	8,0	22,6	28,8	400	3,73	79,9	98,2	646	116	0,379	44,3
100	10,0	27,4	34,9	462	3,64	92,4	116	761	133	0,374	36,5
120	5,0	17,8	22,7	498	4,68	83,0	97,6	777	122	0,467	56,0
120	6,0	21,2	27,0	579	4,63	96,6	115	911	141	0,465	47,2
120	6,3	22,2	28,2	603	4,62	100	120	950	147	0,464	45,1
120	8,0	27,6	35,2	726	4,55	121	146	1 160	176	0,459	36,2
120	10,0	33,7	42,9	852	4,46	142	175	1 382	206	0,454	29,7
120	12,0	39,5	50,3	958	4,36	160	201	1 578	230	0,449	25,3
120	12,5	40,9	52,1	982	4,34	164	207	1 623	236	0,448	24,5
140	5,0	21,0	26,7	807	5,50	115	135	1 253	170	0,547	47,7
140	6,0	24,9	31,8	944	5,45	135	159	1 475	198	0,545	40,1
140	6,3	26,1	33,3	984	5,44	141	166	1 540	206	0,544	38,3
140	8,0	32,6	41,6	1 195	5,36	171	204	1 892	249	0,539	30,7

Table 6 *(continued)*

Size	Thickness	Mass per unit length	Cross-sectional area	Second moment of area	Radius of gyration	Elastic section modulus	Plastic section modulus	Torsional-inertia constant	Torsional-modulus constant	Surface area per unit length	Nominal length per tonne
B	T	M	A	I	i	W_{el}	W_{pl}	I_t	C_t	A_s	
mm	mm	kg/m	cm^2	cm^4	cm	cm^3	cm^3	cm^4	cm^3	m^2/m	m
140	10,0	40,0	50,9	1 416	5,27	202	246	2 272	294	0,534	25,0
140	12,0	47,0	59,9	1 609	5,18	230	284	2 616	333	0,529	21,3
140	12,5	48,7	62,1	1 653	5,16	236	293	2 696	342	0,528	20,5
150	5,0	22,6	28,7	1 002	5,90	134	156	1 550	197	0,587	44,3
150	6,0	26,8	34,2	1 174	5,86	156	184	1 828	230	0,585	37,3
150	6,3	28,1	35,8	1 223	5,85	163	192	1 909	240	0,584	35,6
150	8,0	35,1	44,8	1 491	5,77	199	237	2 351	291	0,579	28,5
150	10,0	43,1	54,9	1 773	5,68	236	286	2 832	344	0,574	23,2
150	12,0	50,8	64,7	2 023	5,59	270	331	3 272	391	0,569	19,7
150	12,5	52,7	67,1	2 080	5,57	277	342	3 375	402	0,568	19,0
150	16,0	65,2	83,0	2 430	5,41	324	411	4 026	467	0,559	15,3
160	5,0	24,1	30,7	1 225	6,31	153	178	1 892	226	0,627	41,5
160	6,0	28,7	36,6	1 437	6,27	180	210	2 233	264	0,625	34,8
160	6,3	30,1	38,3	1 499	6,26	187	220	2 333	275	0,624	33,3
160	8,0	37,6	48,0	1 831	6,18	229	272	2 880	335	0,619	26,6
160	10,0	46,3	58,9	2 186	6,09	273	329	3 478	398	0,614	21,6
160	12,0	54,6	69,5	2 502	6,00	313	382	4 028	454	0,609	18,3
160	12,5	56,6	72,1	2 576	5,98	322	395	4 158	467	0,608	17,7
160	16,0	70,2	89,4	3 028	5,82	379	476	4 988	546	0,599	14,2
180	5,0	27,3	34,7	1 765	7,13	196	227	2 718	290	0,707	36,7
180	6,0	32,5	41,4	2 077	7,09	231	269	3 215	340	0,705	30,8
180	6,3	34,0	43,3	2 168	7,07	241	281	3 361	355	0,704	29,4
180	8,0	42,7	54,4	2 661	7,00	296	349	4 162	434	0,699	23,4
180	10,0	52,5	66,9	3 193	6,91	355	424	5 048	518	0,694	19,0
180	12,0	62,1	79,1	3 677	6,82	409	494	5 873	595	0,689	16,1
180	12,5	64,4	82,1	3 790	6,80	421	511	6 070	613	0,688	15,5
180	16,0	80,2	102	4 504	6,64	500	621	7 343	724	0,679	12,5
200	5,0	30,4	38,7	2 445	7,95	245	283	3 756	362	0,787	32,9
200	6,0	36,2	46,2	2 883	7,90	288	335	4 449	426	0,785	27,6

Table 6 *(continued)*

Size	Thickness	Mass per unit length	Cross-sectional area	Second moment of area	Radius of gyration	Elastic section modulus	Plastic section modulus	Torsional-inertia constant	Torsional-modulus constant	Surface area per unit length	Nominal length per tonne
B	T	M	A	I	i	W_{el}	W_{pl}	I_t	C_t	A_s	
mm	mm	kg/m	cm^2	cm^4	cm	cm^3	cm^3	cm^4	cm^3	m^2/m	m
200	6,3	38,0	48,4	3 011	7,89	301	350	4 653	444	0,784	26,3
200	8,0	47,7	60,8	3 709	7,81	371	436	5 778	545	0,779	21,0
200	10,0	58,8	74,9	4 471	7,72	447	531	7 031	655	0,774	17,0
200	12,0	69,6	88,7	5 171	7,64	517	621	8 208	754	0,769	14,4
200	12,5	72,3	92,1	5 336	7,61	534	643	8 491	778	0,768	13,8
200	16,0	90,3	115	6 394	7,46	639	785	10 340	927	0,759	11,1
220	6,0	40,0	51,0	3 875	8,72	352	408	5 963	521	0,865	25,0
220	6,3	41,9	53,4	4 049	8,71	368	427	6 240	544	0,864	23,8
220	8,0	52,7	67,2	5 002	8,63	455	532	7 765	669	0,859	19,0
220	10,0	65,1	82,9	6 050	8,54	550	650	9 473	807	0,854	15,4
220	12,0	77,2	98,3	7 023	8,45	638	762	11 091	933	0,849	13,0
220	12,5	80,1	102	7 254	8,43	659	789	11 481	963	0,848	12,5
220	16,0	100	128	8 749	8,27	795	969	14 054	1 156	0,839	10,0
250	6,0	45,7	58,2	5 752	9,94	460	531	8 825	681	0,985	21,9
250	6,3	47,9	61,0	6 014	9,93	481	556	9 238	712	0,984	20,9
250	8,0	60,3	76,8	7 455	9,86	596	694	11 525	880	0,979	16,6
250	10,0	74,5	94,9	9 055	9,77	724	851	14 106	1 065	0,974	13,4
250	12,0	88,5	113	10 556	9,68	844	1 000	16 567	1 237	0,969	11,3
250	12,5	91,9	117	10 915	9,66	873	1 037	17 164	1 279	0,968	10,9
250	16,0	115	147	13 267	9,50	1061	1280	21 138	1 546	0,959	8,67
260	6,0	47,6	60,6	6 491	10,4	499	576	9 951	740	1,02	21,0
260	6,3	49,9	63,5	6 788	10,3	522	603	10 417	773	1,02	20,1
260	8,0	62,8	80,0	8 423	10,3	648	753	13 006	956	1,02	15,9
260	10,0	77,7	98,9	10 242	10,2	788	924	15 932	1 159	1,01	12,9
260	12,0	92,2	117	11 954	10,1	920	1 087	18 729	1 348	1,01	10,8
260	12,5	95,8	122	12 365	10,1	951	1 127	19 409	1 394	1,01	10,4
260	16,0	120	153	15 061	9,91	1159	1394	23 942	1 689	0,999	8,30
300	6,0	55,1	70,2	10 080	12,0	672	772	15 407	997	1,18	18,2
300	6,3	57,8	73,6	10 547	12,0	703	809	16 136	1 043	1,18	17,3
300	8,0	72,8	92,8	13 128	11,9	875	1 013	20 194	1 294	1,18	13,7

Table 6 *(concluded)*

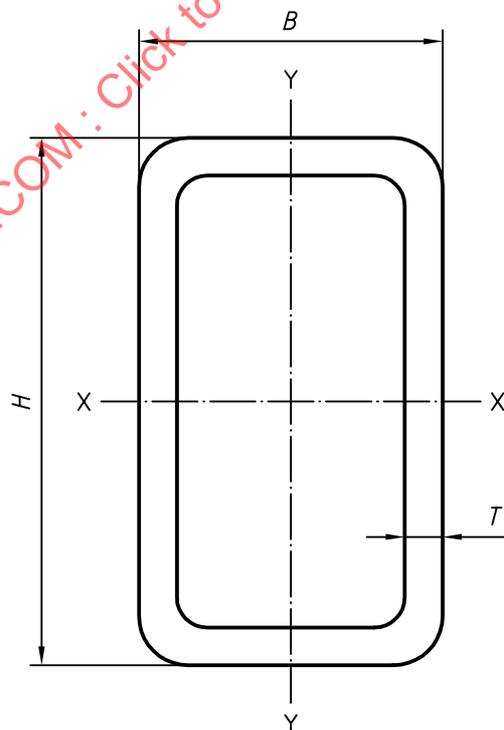| Size	Thickness	Mass per unit length	Cross-sectional area	Second moment of area	Radius of gyration	Elastic section modulus	Plastic section modulus	Torsional-inertia constant	Torsional-modulus constant	Surface area per unit length	Nominal length per tonne
B	T	M	A	I	i	W_{el}	W_{pl}	I_t	C_t	A_s	
mm	mm	kg/m	cm^2	cm^4	cm	cm^3	cm^3	cm^4	cm^3	m^2/m	m
300	10,0	90,2	115	16 026	11,8	1 068	1 246	24 807	1 575	1,17	11,1
300	12,0	107	137	18 777	11,7	1 252	1 470	29 249	1 840	1,17	9,32
300	12,5	112	142	19 442	11,7	1 296	1 525	30 333	1 904	1,17	8,97
300	16,0	141	179	23 850	11,5	1 590	1 895	37 622	2 325	1,16	7,12
350	8,0	85,4	109	21 129	13,9	1 207	1 392	32 384	1 789	1,38	11,7
350	10,0	106	135	25 884	13,9	1 479	1 715	39 886	2 185	1,37	9,44
350	12,0	126	161	30 435	13,8	1 739	2 030	47 154	2 563	1,37	7,93
350	12,5	131	167	31 541	13,7	1 802	2 107	48 934	2 654	1,37	7,62
350	16,0	166	211	38 942	13,6	2 225	2 630	60 990	3 264	1,36	6,04
400	10,0	122	155	39 128	15,9	1 956	2 260	60 092	2 895	1,57	8,22
400	12,0	145	185	46 130	15,8	2 306	2 679	71 181	3 405	1,57	6,90
400	12,5	151	192	47 839	15,8	2 392	2 782	73 906	3 530	1,57	6,63
400	16,0	191	243	59 344	15,6	2 967	3 484	92 442	4 362	1,56	5,24
400	20,0	235	300	71 535	15,4	3 577	4 247	112 489	5 237	1,55	4,25

Figure 10 — Rectangular hollow section (see Table 7)

Table 7 — Nominal dimensions and sectional properties of rectangular hollow sections (see Figure 10)

Size		Thick-ness	Mass per unit length	Cross-sectional area	Second moment of area		Radius of gyration		Elastic section modulus		Plastic section modulus		Torsional-inertia constant	Torsional-modulus constant	Surface area per unit length	Nominal length per tonne
$H \times B$		T	M	A	I_{XX}	I_{YY}	i_{XX}	i_{YY}	$W_{el,XX}$	$W_{el,YY}$	$W_{pl,XX}$	$W_{pl,YY}$	I_t	C_t	A_s	
mm	mm	mm	kg/m	cm²	cm⁴	cm⁴	cm	cm	cm³	cm³	cm³	cm³	cm⁴	cm³	m²/m	m
50	25	2,5	2,69	3,43	10,4	3,39	1,74	0,994	4,16	2,71	5,33	3,22	8,42	4,61	0,144	371
50	25	3,0	3,17	4,04	11,9	3,83	1,72	0,973	4,76	3,06	6,18	3,71	9,64	5,20	0,142	315
50	30	2,5	2,89	3,68	11,8	5,22	1,79	1,19	4,73	3,48	5,92	4,11	11,7	5,73	0,154	346
50	30	3,0	3,41	4,34	13,6	5,94	1,77	1,17	5,43	3,96	6,88	4,76	13,5	6,51	0,152	293
50	30	4,0	4,39	5,59	16,5	7,08	1,72	1,13	6,60	4,72	8,59	5,88	16,6	7,77	0,150	228
50	30	5,0	5,28	6,73	18,7	7,89	1,67	1,08	7,49	5,26	10,0	6,80	19,0	8,67	0,147	189
60	40	2,5	3,68	4,68	22,8	12,1	2,21	1,60	7,61	6,03	9,32	7,02	25,1	9,73	0,194	272
60	40	3,0	4,35	5,54	26,5	13,9	2,18	1,58	8,82	6,95	10,9	8,19	29,2	11,2	0,192	230
60	40	4,0	5,64	7,19	32,8	17,0	2,14	1,54	10,9	8,52	13,8	10,3	36,7	13,7	0,190	177
60	40	5,0	6,85	8,73	38,1	19,5	2,09	1,50	12,7	9,77	16,4	12,2	43,0	15,7	0,187	146
60	40	6,0	7,99	10,2	42,3	21,4	2,04	1,45	14,1	10,7	18,6	13,7	48,2	17,3	0,185	125
60	40	6,3	8,31	10,6	43,4	21,9	2,02	1,44	14,5	11,0	19,2	14,2	49,5	17,,6	0,184	120
80	40	3,0	5,29	6,74	54,2	18,0	2,84	1,63	13,6	9,00	17,1	10,4	43,8	15,3	0,232	189
80	40	4,0	6,90	8,79	68,2	22,2	2,79	1,59	17,1	11,1	21,8	13,2	55,2	18,9	0,230	145
80	40	5,0	8,42	10,7	80,3	25,7	2,74	1,55	20,1	12,9	26,1	15,7	65,1	21,9	0,227	119
80	40	6,0	9,87	12,6	90,5	28,5	2,68	1,50	22,6	14,2	30,0	17,8	73,4	24,2	0,225	101
80	40	6,3	10,3	13,1	93,3	29,2	2,67	1,49	23,3	14,6	31,1	18,4	75,6	24,8	0,224	97,2
80	40	8,0	12,5	16,0	106	32,1	2,58	1,42	26,5	16,1	36,5	21,2	85,8	27,4	0,219	79,9
90	50	3,0	6,24	7,94	84,4	33,5	3,26	2,05	18,8	13,4	23,2	15,3	76,5	22,4	0,272	160
90	50	4,0	8,15	10,4	107	41,9	3,21	2,01	23,8	16,8	29,8	19,6	97,5	28,0	0,270	123
90	50	5,0	9,99	12,7	127	49,2	3,16	1,97	28,3	19,7	36,0	23,5	116	32,9	0,267	100
90	50	6,0	11,8	15,0	145	55,4	3,11	1,92	32,2	22,1	41,6	27,0	133	37,0	0,265	85,1
90	50	6,3	12,3	15,6	150	57,0	3,10	1,91	33,3	22,8	43,2	28,0	138	38,1	0,264	81,5
90	50	8,0	15,0	19,2	174	64,6	3,01	1,84	38,6	25,8	51,4	32,9	160	43,2	0,259	66,5
100	50	3,0	6,71	8,54	110	36,8	3,58	2,08	21,9	14,7	27,3	16,8	88,4	25,0	0,292	149
100	50	4,0	8,78	11,2	140	46,2	3,53	2,03	27,9	18,5	35,2	21,5	113	31,4	0,290	114
100	50	5,0	10,8	13,7	167	54,3	3,48	1,99	33,3	21,7	42,6	25,8	135	36,9	0,287	92,8
100	50	6,0	12,7	16,2	190	61,2	3,43	1,95	38,1	24,5	49,4	29,7	154	41,6	0,285	78,8
100	50	6,3	13,3	16,9	197	63,0	3,42	1,93	39,4	25,2	51,3	30,8	160	42,9	0,284	75,4
100	50	8,0	16,3	20,8	230	71,7	3,33	1,86	46,0	28,7	61,4	36,3	186	48,9	0,279	61,4
100	60	3,0	7,18	9,14	124	55,7	3,68	2,47	24,7	18,6	30,2	21,2	121	30,7	0,312	139
100	60	4,0	9,41	12,0	158	70,5	3,63	2,43	31,6	23,5	39,1	27,3	156	38,7	0,310	106
100	60	5,0	11,6	14,7	189	83,6	3,58	2,38	37,8	27,9	47,4	32,9	188	45,9	0,307	86,5
100	60	6,0	13,6	17,4	217	95,0	3,53	2,34	43,4	31,7	55,1	38,1	216	52,1	0,305	73,3
100	60	6,3	14,2	18,1	225	98,1	3,52	2,33	45,0	32,7	57,3	39,5	224	53,8	0,304	70,2
100	60	8,0	17,5	22,4	264	113	3,44	2,25	52,8	37,8	68,7	47,1	265	62,2	0,299	57,0
120	60	4,0	10,7	13,6	249	83,1	4,28	2,47	41,5	27,7	51,9	31,7	201	47,1	0,350	93,7
120	60	5,0	13,1	16,7	299	98,8	4,23	2,43	49,9	32,9	63,1	38,4	242	56,0	0,347	76,1
120	60	6,0	15,5	19,8	345	113	4,18	2,39	57,5	37,5	73,6	44,5	279	63,8	0,345	64,4
120	60	6,3	16,2	20,7	358	116	4,16	2,37	59,7	38,8	76,7	46,3	290	65,9	0,344	61,6
120	60	8,0	20,1	25,6	425	135	4,08	2,30	70,8	45,0	92,7	55,4	344	76,6	0,339	49,9
120	60	10,0	24,3	30,9	488	152	3,97	2,21	81,4	50,5	109	64,4	396	86,1	0,334	41,2