

6. Hollow Sections

Structural steel tubes that can be circular, hollow or rectangular, each with its own attributes, used for a wide range of construction and industrial applications.

6.1 Hot Finished

- 6.1.1 Circular Hollow Section (CHS)
- 6.1.2 Rectangular Hollow Section (RHS)
- 6.1.3 Square Hollow Section (SHS)

6.2 Cold Formed

- 6.2.1 Circular Hollow Section (CHS)
- 6.2.2 Rectangular Hollow Section (RHS)
- 6.2.3 Square Hollow Section (SHS)

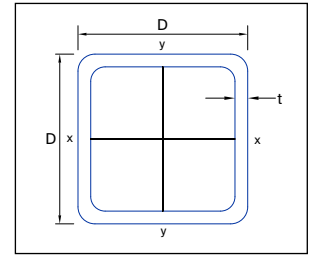
6.1 Hot Finished Hollow Sections

Standard specifications

Material	Yield strength						Tensile strength N/mm ²	Min. Elongation L ₀ =5.65√S ₀	Min. Charpy V-notch.	Dimensions & Tolerances
	N/mm ²									
	≤16mm	>16 - ≤40mm	>40 - ≤63mm	>63 - ≤80mm	>80 - ≤100mm	>100 - ≤120mm	3-100mm			EN10210
S275JOH	275	265	255	245	235	225	410-560	19-23 %	27J @ 0°C	
S275J2H	275	265	255	245	235	225	410-560	19-23 %	27J @ -20°C	
S355JOH	355	345	335	325	315	295	470-630	18-22 %	27J @ 0°C	
S355J2H	355	345	335	325	315	295	470-630	18-22 %	27J @ -20°C	
S355NH	355	345	335	-	-	-	470-630	22%	40J @ -20°C	
S420NH	420	400	390	-	-	-	520-680	19%	40J @ -20°C	
S460NH	460	440	430	-	-	-	540-720	17%	40J @ -20°C	

* S460NH only available up to 16mm thickness

6.1.3 Hot Finished Square Hollow Section (SHS)

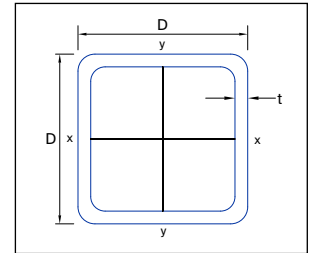


Designation		Mass per Metre	Area of Section	Second Moment of Area	Radius of Gyration	Elastic Modulus	Plastic Modulus	Torsional Constants		Surface Area per Metre
Size	Thickness							J	C	
DxD	t		A	I	r	Z	S	J	C	
mm	mm	kg/m	cm ²	cm ⁴	cm	cm ³	cm ³	cm ⁴	cm ³	m ² /m
20x20	2	1.12	1.40	0.739	0.727	0.739	0.930	1.22	1.07	0.0748
	2.5	1.35	1.68	0.835	0.705	0.835	1.08	1.41	1.20	0.0736
25x25	2	1.41	1.80	1.56	0.932	1.25	1.53	2.52	1.81	0.0948
	2.5	1.74	2.18	1.81	0.909	1.44	1.82	2.97	2.08	0.0936
	3	2.00	2.54	2.00	0.886	1.60	2.06	3.35	2.30	0.0923
	3.2 *	2.15	2.68	2.06	0.877	1.65	2.15	3.48	2.37	0.0918
30x30	2.5	2.14	2.68	3.33	1.11	2.22	2.74	5.40	3.22	0.114
	3	2.47	3.14	3.74	1.09	2.50	3.14	6.16	3.60	0.112
	3.2 *	2.65	3.32	3.89	1.08	2.59	3.29	6.44	3.74	0.112
35x35	4 *	3.76	4.79	7.48	1.25	4.28	5.47	12.5	6.16	0.130
	6 *	5.16	6.57	8.81	1.16	5.03	6.91	15.4	7.19	0.125
40x40	2.5	2.92	3.68	8.54	1.52	4.27	5.14	13.6	6.22	0.154
	3	3.45	4.34	9.78	1.50	4.89	5.97	15.7	7.10	0.152
	3.2 *	3.66	4.60	10.2	1.49	5.11	6.28	16.5	7.42	0.152
	4	4.46	5.59	11.8	1.45	5.91	7.44	19.5	8.54	0.150
	5	5.40	6.73	13.4	1.41	6.68	8.66	22.5	9.60	0.147
45x45	4 *	5.01	6.39	17.6	1.66	7.82	9.71	28.7	11.3	0.170
	5 *	6.07	7.73	20.1	1.61	8.95	11.41	33.5	12.9	0.167
50x50	2.5	3.71	4.68	17.5	1.93	6.99	8.29	27.5	10.2	0.194
	3	4.39	5.54	20.2	1.91	8.08	9.70	32.1	11.8	0.192
	3.2 *	4.66	5.88	21.2	1.90	8.49	10.2	33.8	12.4	0.192
	4	5.72	7.19	25.0	1.86	9.99	12.3	40.4	14.5	0.190
	5	6.97	8.73	28.9	1.82	11.6	14.5	47.6	16.7	0.187
	6	8.15	10.2	32.0	1.77	12.8	16.5	53.6	18.4	0.185
	6.3	8.49	10.6	32.8	1.76	13.1	17.0	55.2	18.8	0.184
60x60	3	5.39	6.74	36.2	2.32	12.1	14.3	56.9	17.7	0.232
	3.2 *	5.67	7.16	38.2	2.31	12.7	15.2	60.2	18.6	0.232
	4	6.97	8.79	45.4	2.27	15.1	18.3	72.5	22.0	0.230
	5	8.54	10.7	53.3	2.23	17.8	21.9	86.4	25.7	0.227
	6	10.00	12.6	59.9	2.18	20.0	25.1	98.6	28.8	0.225
	6.3	10.50	13.1	61.6	2.17	20.5	26.0	102	29.6	0.224
	8	12.80	16.0	69.7	2.09	23.2	30.4	118	33.4	0.219
	10 *	14.90	18.9	75.5	2.00	25.2	34.4	131	36.0	0.214
70x70	3	6.28	7.94	59.0	2.73	16.9	19.9	92	24.8	0.272
	3.6 *	7.46	9.42	68.6	2.70	19.6	23.3	108	28.7	0.271
	5	10.10	12.7	88.5	2.64	25.3	30.8	142	36.8	0.267
	6	11.90	15.0	101	2.59	28.7	35.5	163	41.6	0.265
	6.3	12.50	15.6	104	2.58	29.7	36.9	169	42.9	0.264
	8	15.30	19.2	120	2.50	34.2	43.8	200	49.2	0.259
75x75	3.2 *	7.25	9.08	77.5	2.92	20.7	24.3	121	30.3	0.292
	4 *	8.93	11.2	93.2	2.89	24.8	29.6	147	36.3	0.290
	5 *	11.00	13.7	111	2.84	29.6	35.8	177	43.0	0.287
	6 *	12.90	16.2	126	2.80	33.7	41.4	204	48.9	0.285
	6.3 *	13.50	16.9	131	2.78	34.9	43.0	212	50.5	0.284
	8 *	16.60	20.8	152	2.71	40.5	51.3	252	58.4	0.279

* Sizes not included in EN 10210 Part 2 (1997)

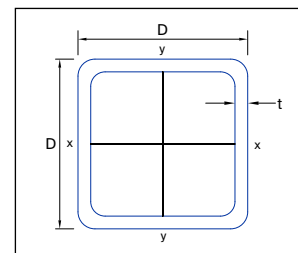
+ Seamless process

Dimensions	EN10210-2
Specification	EN10210-1
Size Range	40mm x 40mm to 400mm x 400mm



Designation		Mass per Metre	Area of Section	Second Moment of Area	Radius of Gyration	Elastic Modulus	Plastic Modulus	Torsional Constants		Surface Area per Metre
Size	Thickness							J	C	
DxD	t		A	I	r	Z	S	J	C	
mm	mm	kg/m	cm ²	cm ⁴	cm	cm ³	cm ³	cm ⁴	cm ³	m ² /m
80x80	3	7.18	9.14	89.8	3.13	22.5	26.3	140	33.0	0.312
	3.6 *	8.59	10.9	105	3.11	26.2	31.0	164	38.5	0.311
	5	11.70	14.7	137	3.05	34.2	41.1	217	49.8	0.307
	6	13.80	17.4	156	3.00	39.1	47.8	252	56.8	0.305
	6.3	14.40	18.1	162	2.99	40.5	49.7	262	58.7	0.304
	8	17.80	22.4	189	2.91	47.3	59.5	312	68.3	0.299
90x90	3.6 *	9.72	12.3	152	3.52	33.8	39.7	237	49.7	0.351
	5	13.30	16.7	200	3.45	44.4	53.0	316	64.8	0.347
	6	15.70	19.8	230	3.41	51.1	61.8	367	74.3	0.345
	6.3	16.40	20.7	238	3.40	53.0	64.3	382	77.0	0.344
	8	20.40	25.6	281	3.32	62.6	77.6	459	90.5	0.339
100x100	4	12.00	15.2	232	3.91	46.4	54.4	361	68.2	0.390
	5	14.80	18.7	279	3.86	55.9	66.4	439	81.8	0.387
	6	17.60	22.2	323	3.82	64.6	77.6	513	94.3	0.385
	6.3	18.40	23.2	336	3.80	67.1	80.9	534	97.8	0.384
	8	22.90	28.8	400	3.73	79.9	98.2	646	116	0.379
	10	27.90	34.9	462	3.64	92.4	116	761	133	0.374
120x120	5	18.00	22.7	498	4.68	83.0	97.6	777	122	0.467
	6	21.30	27.0	579	4.63	96.6	115	911	141	0.465
	6.3	22.30	28.2	603	4.62	100	120	950	147	0.464
	8	27.90	35.2	726	4.55	121	146	1160	176	0.459
	10	34.20	42.9	852	4.46	142	175	1382	206	0.454
	12.5	41.60	52.1	982	4.34	164	207	1623	236	0.448
140x140	5	21.10	26.7	807	5.50	115	135	1253	170	0.547
	6	25.10	31.8	944	5.45	135	159	1475	198	0.545
	8	32.90	41.6	1195	5.36	171	204	1892	249	0.539
	10	40.40	50.9	1416	5.27	202	246	2272	294	0.534
	12.5	49.50	62.1	1653	5.16	236	293	2696	342	0.528
150x150	5	22.70	28.7	1002	5.90	134	156	1550	197	0.587
	6	27.00	34.2	1174	5.86	156	184	1828	230	0.585
	6.3	28.30	35.8	1223	5.85	163	192	1909	240	0.584
	8	35.40	44.8	1491	5.77	199	237	2351	291	0.579
	10	43.60	54.9	1773	5.68	236	286	2832	344	0.574
	12.5	52.40	67.1	2080	5.57	277	342	3375	402	0.568
	16 +	66.40	83.0	2430	5.41	324	411	4026	467	0.559
160x160	12.5	57.30	72.1	2576	5.98	322	395	4158	467	0.608
	16	70.20	89.4	3028	5.82	379	476	4988	546	0.599
180x180	6	32.60	41.4	2077	7.09	231	269	3215	340	0.705
	6.3	34.20	43.3	2168	7.07	241	281	3361	355	0.704
	8	43.00	54.4	2661	7.00	296	349	4162	434	0.699
	10	53.00	66.9	3193	6.91	355	424	5048	518	0.694
	12.5	65.20	82.1	3790	6.80	421	511	6070	613	0.688
	16	81.40	102	4504	6.64	500	621	7343	724	0.679

6.1.3 Hot Finished Square Hollow Section (SHS)



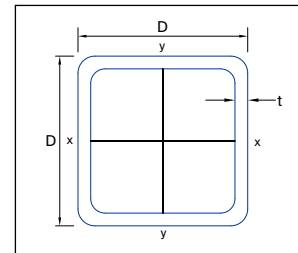
Designation		Mass per Metre	Area of Section	Second Moment of Area	Radius of Gyration	Elastic Modulus	Plastic Modulus	Torsional Constants		Surface Area per Metre
Size	Thickness							J	C	
DxD	t		A	I	r	Z	S	J	C	
mm	mm	kg/m	cm ²	cm ⁴	cm	cm ³	cm ³	cm ⁴	cm ³	m ² /m
200x200	5	30.50	38.7	2445	7.95	245	283	3756	362	0.787
	6	36.40	46.2	2883	7.90	288	335	4449	426	0.785
	6.3	38.20	48.4	3011	7.89	301	350	4653	444	0.784
	8	48.00	60.8	3709	7.81	371	436	5778	545	0.779
	10	59.30	74.9	4471	7.72	447	531	7031	655	0.774
	12.5	73.00	92.1	5336	7.61	534	643	8491	778	0.768
	16	91.50	115	6394	7.46	639	785	10340	927	0.759
220x220	5 *	33.50	42.7	3281	8.76	298	344	5028	442	0.867
	6	40.00	51.0	3875	8.72	352	408	5963	521	0.865
	8	52.70	67.2	5002	8.63	455	532	7765	669	0.859
	10	65.10	82.9	6050	8.54	550	650	9473	807	0.854
	12	77.20	98.3	7023	8.45	638	762	11090	933	0.849
	14 *	88.90	113	7922	8.36	720	868	12620	1049	0.844
250x250	6	45.80	58.2	5752	9.94	460	531	8825	681	0.985
	6.3	48.10	61.0	6014	9.93	481	556	9238	712	0.984
	8	60.50	76.8	7455	9.86	596	694	11530	880	0.979
	10	75.00	94.9	9055	9.77	724	851	14110	1065	0.974
	12.5	92.60	117	10920	9.66	873	1037	17160	1279	0.968
	16	117.00	147	13270	9.50	1061	1280	21140	1546	0.959
260x260	6	47.60	60.6	6491	10.4	499	576	9951	740	1.02
	6.3	49.90	63.5	6788	10.3	522	603	10420	773	1.02
	8	62.80	80.0	8423	10.3	648	753	13010	956	1.02
	10	77.70	98.9	10240	10.2	788	924	15930	1159	1.01
	12	92.20	117	11950	10.1	920	1087	18730	1348	1.01
	12.5	95.80	122	12370	10.1	951	1127	19410	1394	1.01
	14 *	106.00	136	13560	10.0	1043	1244	21400	1525	1.00
	14.2 *	108.00	137	13710	9.99	1055	1259	21660	1542	1.00
	16	120.00	153	15060	9.91	1159	1394	23940	1689	1.00
300x300	6.3	57.95	73.6	10550	12.0	703	809	16140	1043	1.18
	8	73.10	92.8	13130	11.9	875	1013	20190	1294	1.18
	9 *	81.93	104	14600	11.9	973	1130	22520	1437	1.18
	10	90.70	115	16030	11.8	1068	1246	24810	1575	1.17
	12	107.97	137	18780	11.7	1252	1470	29250	1840	1.17
	12.5	112.00	142	19440	11.7	1296	1525	30330	1904	1.17
	16	142.00	179	23850	11.5	1590	1895	37620	2325	1.16
350x350	6 *	64.50	82.2	16170	14.0	924	1058	24650	1373	1.38
	8	85.70	109	21130	13.9	1207	1392	32380	1789	1.38
	10	106.00	135	25880	13.9	1479	1715	39890	2185	1.37
	12	127.00	161	30440	13.8	1739	2030	47150	2563	1.37
	12.5	132.00	167	31540	13.7	1802	2107	48930	2654	1.37
	14 *	146.00	186	34790	13.7	1988	2334	54190	2922	1.36
	14.2 *	148.00	189	35210	13.7	2012	2364	54880	2957	1.36
	16	167.00	211	38940	13.6	2225	2630	60990	3264	1.36
	19 *	190.00	248	44820	13.5	2561	3055	70760	3744	1.35
	22 *	217.00	283	50270	13.3	2873	3460	80010	4187	1.34
	25 *	242.00	318	55320	13.2	3161	3845	88750	4595	1.34

* Sizes not included in EN 10210 Part 2 (1997)

+ Seamless process

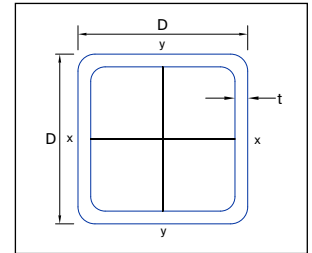
Δ S.A.W process

Dimensions	EN10210-2
Specification	EN10210-1
Size Range	40mm x 40mm to 400mm x 400mm



Designation		Mass per Metre	Area of Section	Second Moment of Area	Radius of Gyration	Elastic Modulus	Plastic Modulus	Torsional Constants		Surface Area per Metre
Size	Thickness							J	C	
DxD	t	kg/m	cm ²	cm ⁴	cm	cm ³	cm ³	cm ⁴	cm ³	m ² /m
mm	mm									
350x350	6 *	64.50	82.2	16170	14.0	924	1058	24650	1373	1.38
	8	85.70	109	21130	13.9	1207	1392	32380	1789	1.38
	10	106.00	135	25880	13.9	1479	1715	39890	2185	1.37
	12	127.00	161	30440	13.8	1739	2030	47150	2563	1.37
	12.5	132.00	167	31540	13.7	1802	2107	48930	2654	1.37
	14 *	146.00	186	34790	13.7	1988	2334	54190	2922	1.36
	14.2 *	148.00	189	35210	13.7	2012	2364	54880	2957	1.36
	16	167.00	211	38940	13.6	2225	2630	60990	3264	1.36
	19 *	190.00	248	44820	13.5	2561	3055	70760	3744	1.35
	22 *	217.00	283	50270	13.3	2873	3460	80010	4187	1.34
25 *	242.00	318	55320	13.2	3161	3845	88750	4595	1.34	
400x400	8 *	97.90	125	31860	16.0	1593	1830	48700	2363	1.58
	10	122.00	155	39130	15.9	1956	2260	60090	2895	1.57
	12	145.00	185	46130	15.8	2306	2679	71180	3405	1.57
	12.5	152.00	192	47840	15.8	2392	2782	73910	3530	1.57
	14 *	168.00	214	52870	15.7	2643	3087	81960	3894	1.56
	14.2 *	170.00	217	53530	15.7	2676	3127	83030	3942	1.56
	16	192.00	243	59340	15.6	2967	3484	92440	4362	1.56
	20 #	237.00	300	71540	15.4	3577	4247	112500	5237	1.55
	22 *	251.00	327	77260	15.4	3863	4612	122100	5646	1.54
	25 *	282.00	368	85380	15.2	4269	5141	135900	6223	1.54
450x450	12 *	162.00	209	66460	17.8	2954	3419	102200	4368	1.77
	16 *	213.00	275	85860	17.7	3816	4459	133200	5620	1.76
	19 *	250.00	324	99540	17.5	4424	5208	155400	6497	1.75
	22 *	286.00	371	112500	17.4	5000	5929	176700	7324	1.74
	25 *	321.00	418	124700	17.3	5544	6624	197200	8101	1.74
	28 Δ*	355.00	464	136300	17.1	6058	7292	216800	8832	1.73
	32 Δ*	399.00	524	150700	17.0	6696	8143	241700	9735	1.72
500x500	12 *	181.00	233	92030	19.89	3681	4248	141200	5451	1.97
	16 *	238.00	307	119300	19.71	4771	5554	184400	7038	1.96
	19 *	280.00	362	138600	19.58	5545	6498	215500	8159	1.95
	22 *	320.00	415	157100	19.44	6283	7411	245600	9222	1.94
	25 *	360.00	468	174600	19.31	6986	8295	274600	10230	1.94
	28 Δ*	399.00	520	191300	19.18	7653	9149	302600	11180	1.93
	32 Δ*	450.00	588	212300	19.00	8491	10242	338200	12370	1.92
	36 Δ*	498.00	654	231700	18.82	9269	11283	372000	13470	1.91
550x550	16 *	263.00	339	160400	21.75	5833	6769	247300	8616	2.16
	19 *	309.00	400	186800	21.62	6793	7930	289500	10010	2.15
	22 *	355.00	459	212100	21.49	7714	9058	330400	11340	2.14
	25 *	399.00	518	236300	21.35	8594	10150	370100	12610	2.14
	28 Δ*	443.00	576	259500	21.22	9436	11220	408400	13810	2.13
	32 Δ*	500.00	652	288700	21.04	10500	12580	457500	15330	2.12
	36 Δ*	555.00	726	316100	20.86	11500	13890	504400	16740	2.11
	40 Δ*	608.00	799	341800	20.68	12430	15140	549000	18060	2.10

6.1.3 Hot Finished Square Hollow Section (SHS)



Designation		Mass per Metre	Area of Section	Second Moment of Inertia	Radius of Gyration	Elastic Modulus	Plastic Modulus	Torsional Constants		Surface Area per Metre
Outside Diameter	Thickness							J	C	
D	t	kg/m	cm ²	cm ⁴	cm	cm ³	cm ³	cm ⁴	cm ³	m ² /m
600x600	25 Δ*	439.00	568	311100	23.40	10370	12200	485300	15230	2.34
	28 Δ*	487.00	632	342100	23.26	11410	13490	536300	16720	2.33
	32 Δ*	550.00	716	381600	23.08	12720	15160	601900	18600	2.32
	36 Δ*	611.00	798	418800	22.91	13960	16770	664900	20370	2.31
	40 Δ*	671.00	879	453900	22.73	15130	18310	725100	22030	2.30
700x700	25 Δ*	517.00	668	504700	27.48	14420	16850	782900	21240	2.74
	28 Δ*	575.00	744	556600	27.35	15900	18670	867000	23380	2.73
	32 Δ*	651.00	844	623100	27.17	17800	21040	975800	26110	2.72
	36 Δ*	724.00	942	686500	26.99	19610	23330	1081000	28700	2.71
	40 Δ*	797.00	1039	746900	26.81	21340	25540	1182000	31160	2.70