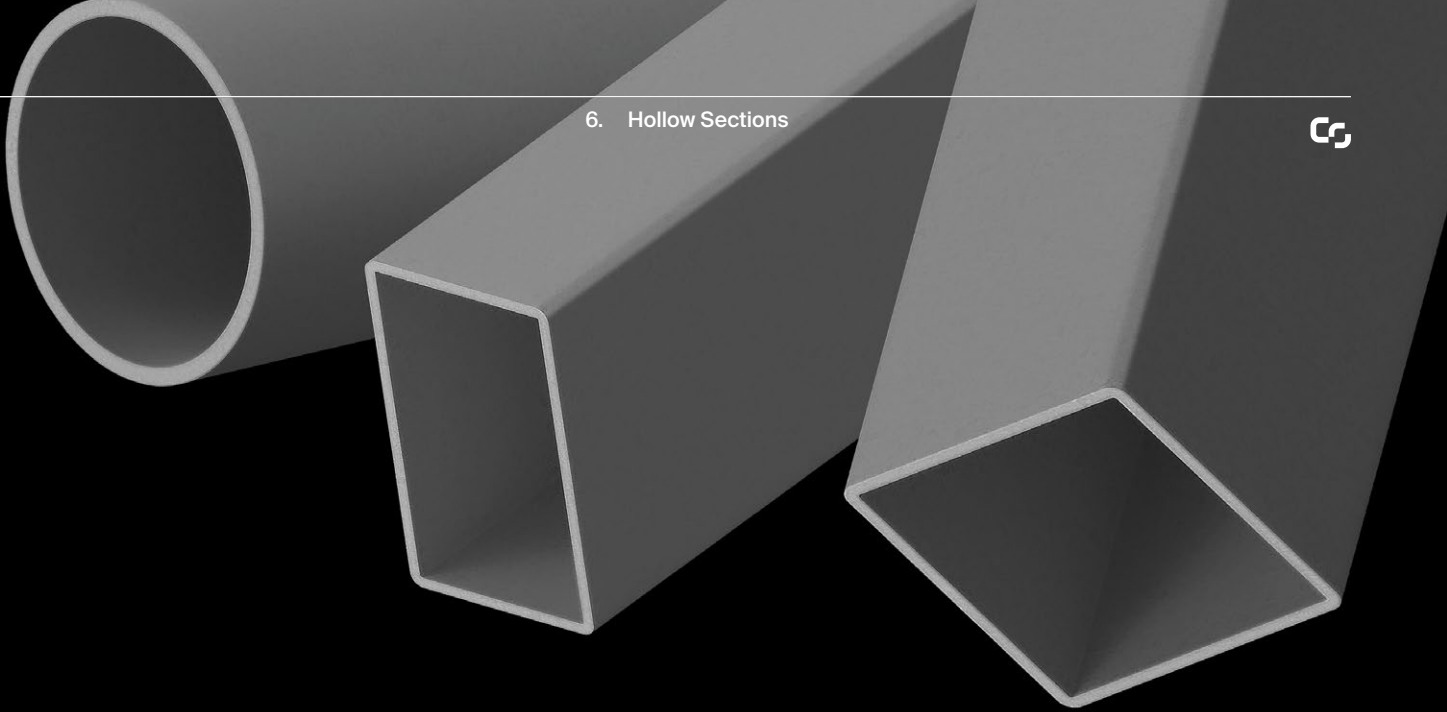




6. Hollow Sections

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)

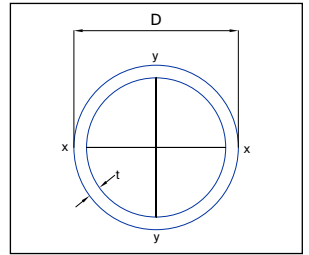
6.1 Hot Finished Hollow Sections

Standard specifications

Material	Yield strength						Tensile strength	Min. Elongation	Min. Charpy V-notch.	Dimensions & Tolerances
	N/mm ²						N/mm ²	$L_0=5.65\sqrt{S_0}$		
EN 10210	≤16mm	>16 - ≤40mm	>40 - ≤63mm	>63 - ≤80mm	>80 - ≤100mm	>100 - ≤120mm	3-100mm			EN10210
S275J0H	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	
S355J0H	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

6.1.1 Hot Finished Circular Hollow Section (CHS)



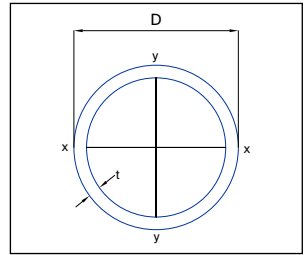
Designation		Mass per Metre	Area of Section	Second Moment of Inertia	Radius of Gyration	Elastic Modulus	Plastic Modulus	Torsional Constants		Surface Area per Metre
Outside Diameter	Thickness									
D	t		A	I	r	Z	S	J	C	
mm	mm	kg/m	cm ²	cm ⁴	cm	cm ³	cm ³	cm ⁴	cm ³	m ² /m
21.3	2.3	1.08	1.37	0.629	0.677	0.590	0.834	1.26	1.18	0.067
	3.2	1.43	1.82	0.768	0.650	0.722	1.06	1.54	1.44	0.067
26.9	2.3	1.40	1.78	1.36	0.874	1.01	1.40	2.71	2.02	0.085
	3.2	1.87	2.38	1.70	0.846	1.27	1.81	3.41	2.53	0.085
33.7	2.6	1.99	2.54	3.09	1.10	1.84	2.52	6.19	3.67	0.106
	2.9 *	2.20	2.81	3.36	1.09	1.99	2.76	6.71	3.98	0.106
	3.0 *	2.27	2.89	3.44	1.09	2.04	2.84	6.88	4.08	0.106
	3.2	2.41	3.07	3.60	1.08	2.14	2.99	7.21	4.28	0.106
	4.0	2.93	3.73	4.19	1.06	2.49	3.55	8.38	4.97	0.106
	5.0 *	3.54	4.51	4.78	1.03	2.84	4.16	9.57	5.68	0.106
42.4	2.6	2.55	3.25	6.46	1.41	3.05	4.12	12.9	6.10	0.133
	2.9 *	2.82	3.60	7.06	1.40	3.33	4.53	14.1	6.66	0.133
	3.0 *	2.91	3.71	7.25	1.40	3.42	4.67	14.5	6.84	0.133
	3.2	3.09	3.94	7.62	1.39	3.59	4.93	15.2	7.19	0.133
	3.6 *	3.44	4.39	8.33	1.38	3.93	5.44	16.7	7.86	0.133
	4.0	3.79	4.83	8.99	1.36	4.24	5.92	18.0	8.48	0.133
	5.0 *	4.61	5.87	10.5	1.33	4.93	7.04	20.9	9.86	0.133
	6.3 *	5.61	7.14	12.0	1.30	5.66	8.29	24.0	11.3	0.133
	8.0 *	6.79	8.65	13.5	1.25	6.36	9.64	27.0	12.7	0.133
48.3	2.5 *	2.82	3.60	9.46	1.62	3.92	5.25	18.9	7.83	0.152
	2.6	2.93	3.73	9.78	1.62	4.05	5.44	19.6	8.10	0.152
	2.9 *	3.25	4.14	10.7	1.61	4.43	5.99	21.4	8.86	0.152
	3.0 *	3.35	4.27	11.0	1.61	4.55	6.17	22.0	9.11	0.152
	3.2	3.56	4.53	11.6	1.60	4.80	6.52	23.2	9.59	0.152
	4.0	4.37	5.57	13.8	1.57	5.70	7.87	27.5	11.4	0.152
	5.0	5.34	6.80	16.2	1.54	6.69	9.42	32.3	13.4	0.152
	6.3 *	6.53	8.31	18.7	1.50	7.76	11.2	37.5	15.5	0.152
	8.0 *	7.95	10.1	21.4	1.45	8.85	13.2	42.7	17.7	0.152
60.3	2.5 *	3.56	4.54	19.0	2.05	6.30	8.36	38.0	12.6	0.189
	2.6	3.70	4.71	19.7	2.04	6.52	8.66	39.3	13.0	0.189
	3.0 *	4.24	5.40	22.2	2.03	7.37	9.86	44.4	14.7	0.189
	3.2	4.51	5.74	23.5	2.02	7.78	10.4	46.9	15.6	0.189
	4.0	5.55	7.07	28.2	2.00	9.34	12.7	56.3	18.7	0.189
	5.0	6.82	8.69	33.5	1.96	11.1	15.3	67.0	22.2	0.189
	6.3 *	8.39	10.7	39.5	1.92	13.1	18.5	79.0	26.2	0.189
	8.0 *	10.32	13.1	46.0	1.87	15.3	22.1	92.0	30.5	0.189
	10.0 *	12.40	15.8	52.0	1.81	17.2	25.6	104	34.5	0.189
76.1	2.5 *	4.54	5.78	39.2	2.60	10.3	13.5	78.4	20.6	0.239
	2.6	4.71	6.00	40.6	2.60	10.7	14.1	81.2	21.3	0.239
	3.0 *	5.41	6.89	46.1	2.59	12.1	16.0	92.2	24.2	0.239
	3.2	5.75	7.33	48.8	2.58	12.8	17.0	97.6	25.6	0.239
	4.0	7.11	9.06	59.1	2.55	15.5	20.8	118	31.0	0.239

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

Dimensions EN10210-2

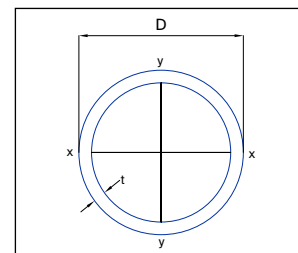
Specification EN10210-1

Size Range OD 21.3mm to 1219mm



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									
D	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
76.1	5.0	8.77	11.2	70.9	2.52	18.6	25.3	142	37.3	0.239
	6.0 *	10.37	13.2	81.8	2.49	21.5	29.6	164	43.0	0.239
	6.3 *	10.84	13.8	84.8	2.48	22.3	30.8	170	44.6	0.239
	8.0 *	13.44	17.1	101	2.42	26.4	37.3	201	52.9	0.239
	10.0 *	16.30	20.8	116	2.36	30.5	44.0	232	61.0	0.239
	12.0 *	18.97	24.2	128	2.31	33.8	49.9	257	67.5	0.239
88.9	2.5 *	5.33	6.79	63.4	3.06	14.3	18.7	127	28.5	0.279
	3.0 *	6.36	8.10	74.8	3.04	16.8	22.1	150	33.6	0.279
	3.2	6.76	8.62	79.2	3.03	17.8	23.5	158	35.6	0.279
	3.6 *	7.57	9.65	87.9	3.02	19.8	26.2	176	39.5	0.279
	4.0	8.38	10.7	96.3	3.00	21.7	28.9	193	43.3	0.279
	5.0	10.35	13.2	116	2.97	26.2	35.2	233	52.4	0.279
	6.0	12.27	15.6	135	2.94	30.4	41.3	270	60.7	0.279
	6.3	12.83	16.3	140	2.93	31.5	43.1	280	63.1	0.279
	8.0 *	15.96	20.3	168	2.87	37.8	52.5	336	75.6	0.279
	10.0 *	19.46	24.8	196	2.81	44.1	62.6	392	88.2	0.279
	12.0 *	22.76	29.0	220	2.75	49.4	71.5	439	98.8	0.279
	14.0 *	25.86	32.9	239	2.69	53.8	79.5	478	108	0.279
101.6	3.6 *	8.70	11.1	133	3.47	26.2	34.6	266	52.5	0.319
	5.0	11.91	15.2	177	3.42	34.9	46.7	355	69.9	0.319
	6.3	14.81	18.9	215	3.38	42.3	57.3	430	84.7	0.319
	8.0	18.47	23.5	260	3.32	51.1	70.3	519	102	0.319
	10.0	22.59	28.8	305	3.26	60.1	84.2	611	120	0.319
	12.0 *	26.52	33.8	345	3.20	67.9	96.9	690	136	0.319
	14.0 *	30.24	38.5	379	3.14	74.6	108	758	149	0.319
114.3	3.0 *	8.23	10.5	163	3.94	28.4	37.2	325	56.9	0.359
	3.2	8.77	11.2	172	3.93	30.2	39.5	345	60.4	0.359
	3.6 *	9.83	12.5	192	3.92	33.6	44.1	384	67.2	0.359
	4.0	10.88	13.9	211	3.90	36.9	48.7	422	73.9	0.359
	5.0	13.48	17.2	257	3.87	45.0	59.8	514	89.9	0.359
	6.0	16.03	20.4	300	3.83	52.5	70.4	600	105	0.359
	6.3	16.78	21.4	313	3.82	54.7	73.6	625	109	0.359
	8.0	20.97	26.7	379	3.77	66.4	90.6	759	133	0.359
	10.0	25.72	32.8	450	3.70	78.7	109	899	157	0.359
	12.0 *	30.27	38.6	511	3.64	89.5	126	1023	179	0.359
	14.0 *	34.63	44.1	566	3.58	99.0	142	1131	198	0.359
	16.0 *	38.79	49.4	613	3.52	107	156	1225	214	0.359
139.7	3.2 *	10.77	13.7	320	4.83	45.8	59.6	640	91.6	0.439
	3.6 *	12.08	15.4	357	4.81	51.1	66.7	713	102	0.439
	4.0	13.39	17.1	393	4.80	56.2	73.7	786	112	0.439
	5.0	16.61	21.2	481	4.77	68.8	90.8	961	138	0.439
	6.0	19.78	25.2	564	4.73	80.8	107	1129	162	0.439

6.1.1 Hot Finished Circular Hollow Section (CHS)



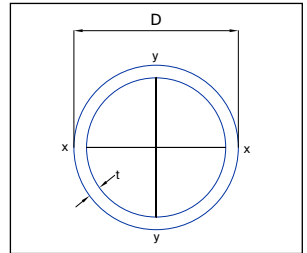
Designation		Mass per Metre	Area of Section	Second Moment of Inertia	Radius of Gyration	Elastic Modulus	Plastic Modulus	Torsional Constants		Surface Area per Metre
Outside Diameter	Thickness									
D	t		A	I	r	Z	S	J	C	
mm	mm	kg/m	cm ²	cm ⁴	cm	cm ³	cm ³	cm ⁴	cm ³	m ² /m
139.7	6.3	20.73	26.4	589	4.72	84.3	112	1177	169	0.439
	8.0	25.98	33.1	720	4.66	103	139	1441	206	0.439
	10.0	31.99	40.7	862	4.60	123	169	1724	247	0.439
	12.0	37.79	48.1	990	4.53	142	196	1980	283	0.439
	14.0 *	43.40	55.3	1105	4.47	158	222	2211	317	0.439
168.3	3.2 *	13.03	16.6	566	5.84	67.2	87.2	1131	134	0.529
	3.6 *	14.62	18.6	632	5.82	75.1	97.7	1264	150	0.529
	4.0	16.21	20.6	697	5.81	82.8	108	1394	166	0.529
	4.5 *	18.18	23.2	777	5.79	92.4	121	1554	185	0.529
	5.0	20.14	25.7	856	5.78	102	133	1712	203	0.529
	6.0	24.02	30.6	1009	5.74	120	158	2017	240	0.529
	6.3	25.17	32.1	1053	5.73	125	165	2107	250	0.529
	8.0	31.63	40.3	1297	5.67	154	206	2595	308	0.529
	10.0	39.04	49.7	1564	5.61	186	251	3128	372	0.529
	12.0	46.26	58.9	1810	5.54	215	294	3620	430	0.529
	12.5	48.03	61.2	1868	5.53	222	304	3737	444	0.529
	14.0 *	53.27	67.9	2036	5.48	242	334	4073	484	0.529
177.8	4.5 *	19.23	24.5	920	6.13	104	135	1841	207	0.559
	5.0	21.31	27.1	1014	6.11	114	149	2028	228	0.559
	6.3	26.65	33.9	1250	6.07	141	185	2499	281	0.559
	8.0	33.50	42.7	1541	6.01	173	231	3083	347	0.559
	10.0	41.38	52.7	1862	5.94	209	282	3724	419	0.559
	12.0	49.07	62.5	2159	5.88	243	330	4318	486	0.559
	14.0 *	56.55	72.0	2434	5.81	274	377	4868	548	0.559
193.7	3.6 *	16.88	21.5	972	6.72	100	130	1943	201	0.609
	5.0	23.27	29.6	1320	6.67	136	178	2640	273	0.609
	6.0	27.77	35.4	1560	6.64	161	211	3119	322	0.609
	6.3	29.12	37.1	1630	6.63	168	221	3260	337	0.609
	8.0	36.64	46.7	2016	6.57	208	276	4031	416	0.609
	10.0	45.30	57.7	2442	6.50	252	338	4883	504	0.609
	12.0	53.77	68.5	2839	6.44	293	397	5678	586	0.609
	12.5	55.86	71.2	2934	6.42	303	411	5869	606	0.609
	14.0 *	62.04	79.0	3210	6.37	331	453	6419	663	0.609
	16.0	70.12	89.3	3554	6.31	367	507	7109	734	0.609
219.1	3.6 *	19.13	24.4	1415	7.62	129	167	2830	258	0.688
	5.0	26.40	33.6	1928	7.57	176	229	3856	352	0.688
	6.0	31.53	40.2	2282	7.54	208	273	4564	417	0.688
	6.3	33.06	42.1	2386	7.53	218	285	4772	436	0.688
	8.0	41.65	53.1	2960	7.47	270	357	5919	540	0.688
	10.0	51.57	65.7	3598	7.40	328	438	7197	657	0.688
	12.0	61.29	78.1	4200	7.33	383	515	8400	767	0.688
	12.5	63.69	81.1	4345	7.32	397	534	8689	793	0.688
	14.2 *	71.75	91.4	4820	7.26	440	597	9640	880	0.688
	16.0	80.14	102	5297	7.20	483	661	10590	967	0.688
	20.0	98.20	125	6261	7.07	572	795	12520	1143	0.688

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

Dimensions EN10210-2

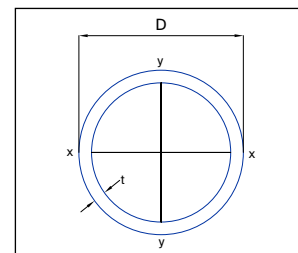
Specification EN10210-1

Size Range OD 21.3mm to 1219mm



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									
D	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
244.5	5.0	29.53	376	2699	8.47	221	287	5397	441	0.768
	6.0	35.29	45.0	3199	8.43	262	341	6397	523	0.768
	6.3	37.01	47.1	3346	8.42	274	358	6692	547	0.768
	8.0	46.66	59.4	4160	8.37	340	448	8321	681	0.768
	10.0	57.83	73.7	5073	8.30	415	550	10150	830	0.768
	12.0	68.81	87.7	5938	8.23	486	649	11880	972	0.768
	12.5	71.52	91.1	6147	8.21	503	673	12300	1006	0.768
	14.0 *	79.58	101	6758	8.16	553	745	13520	1106	0.768
	14.2 *	80.65	103	6837	8.16	559	754	13670	1119	0.768
	16.0	90.16	115	7533	8.10	616	837	15070	1232	0.768
	20.0 *	110.73	141	8957	7.97	733	1011	17910	1465	0.768
273	5.0	33.05	42.1	3781	9.48	277	359	7562	554	0.858
	6.0	39.51	50.3	4487	9.44	329	428	8974	657	0.858
	6.3	41.44	52.8	4696	9.43	344	448	9392	688	0.858
	8.0	52.28	66.6	5852	9.37	429	562	11700	857	0.858
	10.0	64.86	82.6	7154	9.31	524	692	14310	1048	0.858
	12.0	77.24	98.4	8396	9.24	615	818	16790	1230	0.858
	12.5	80.30	102	8697	9.22	637	849	17400	1274	0.858
	14.0 *	89.42	114	9580	9.17	702	940	19160	1404	0.858
	14.2 *	90.63	115	9695	9.16	710	952	19390	1421	0.858
	16.0	101.41	129	10710	9.10	784	1058	21410	1569	0.858
	20.0	124.79	159	12800	8.97	938	1283	25600	1875	0.858
	25.0	152.90	195	15130	8.81	1108	1543	30250	2216	0.858
323.9	5.0	39.32	50.1	6369	11.3	393	509	12740	787	1.02
	6.0	47.04	59.9	7572	11.2	468	606	15150	935	1.02
	6.3	49.34	62.9	7929	11.2	490	636	15860	979	1.02
	8.0	62.32	79.4	9910	11.2	612	799	19820	1224	1.02
	10.0	77.41	98.6	12160	11.1	751	986	24320	1501	1.02
	12.0	92.30	118	14320	11.0	884	1168	28640	1768	1.02
	12.5	95.99	122	14850	11.0	917	1213	29690	1833	1.02
	14.0 *	107.00	136	16400	11.0	1012	1345	32790	2025	1.02
	14.2 *	108.45	138	16600	11.0	1025	1363	33200	2050	1.02
	16.0	121.49	155	18390	10.9	1136	1518	36780	2271	1.02
	20.0	149.89	191	22140	10.8	1367	1850	44280	2734	1.02
	25.0	184.28	235	26400	10.6	1630	2239	52800	3260	1.02
355.6	6.0	51.73	65.9	10070	12.4	566	733	20140	1133	1.12
	6.3	54.27	69.1	10550	12.4	593	769	21090	1186	1.12
	8.0	68.58	87.4	13200	12.3	742	967	26400	1485	1.12
	10.0	85.23	109	16220	12.2	912	1195	32450	1825	1.12
	12.0	101.68	130	19140	12.2	1076	1417	38280	2153	1.12
	12.5	105.77	135	19850	12.1	1117	1472	39700	2233	1.12
	14.0 *	117.94	150	21950	12.1	1235	1635	43900	2469	1.12
	14.2 *	119.56	152	22230	12.1	1250	1656	44460	2500	1.12

6.1.1 Hot Finished Circular Hollow Section (CHS)



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									
D	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
355.6	16.0	134.00	171	24660	12.0	1387	1847	49330	2774	1.12
	20.0	165.53	211	29790	11.9	1676	2255	59580	3351	1.12
	25.0	203.83	260	35680	11.7	2007	2738	71350	4013	1.12
406.4	6.0	59.25	75.5	15130	14.2	745	962	30260	1489	1.28
	6.3	62.16	79.2	15850	14.1	780	1009	31700	1560	1.28
	8.0	78.60	100	19870	14.1	978	1270	39750	1956	1.28
	10.0	97.76	125	24480	14.0	1205	1572	48950	2409	1.28
	12.0	116.72	149	28940	14.0	1424	1867	57870	2848	1.28
	12.5	121.43	155	30030	13.9	1478	1940	60060	2956	1.28
	14.0 *	135.48	173	33260	13.9	1637	2157	66520	3274	1.28
	14.2 *	137.35	175	33690	13.9	1658	2185	67370	3315	1.28
	16.0	154.05	196	37450	13.8	1843	2440	74900	3686	1.28
	20.0	190.58	243	45430	13.7	2236	2989	90860	4472	1.28
	25.0	235.15	300	54700	13.5	2692	3642	109400	5384	1.28
	32.0 *	295.46	376	66430	13.3	3269	4497	132900	6539	1.28
457	6.3	70.02	89.2	22650	15.9	991	1280	45310	1983	1.44
	8.0	88.58	113	28450	15.9	1245	1613	56890	2490	1.44
	10.0	110.24	140	35090	15.8	1536	1998	70180	3071	1.44
	12.0	131.69	168	41560	15.7	1819	2377	83110	3637	1.44
	12.5	137.03	175	43150	15.7	1888	2470	86290	3776	1.44
	14.2 *	155.07	198	48460	15.7	2121	2785	96930	4242	1.44
	16.0	174.01	222	53960	15.6	2361	3113	107900	4723	1.44
	20.0	215.54	275	65680	15.5	2874	3822	131400	5749	1.44
	25.0	266.34	339	79420	15.3	3475	4671	158800	6951	1.44
	32.0 *	335.40	427	97010	15.1	4246	5791	194000	8491	1.44
	40.0	411.35	524	114900	14.8	5031	6977	229900	10060	1.44
508	6.3	77.95	99.3	31250	17.7	1230	1586	62490	2460	1.60
	8.0	98.65	126	39280	17.7	1546	2000	78560	3093	1.60
	10.0	122.81	156	48520	17.6	1910	2480	97040	3820	1.60
	12.0	146.79	187	57540	17.5	2265	2953	115100	4530	1.60
	12.5	152.75	195	59760	17.5	2353	3070	119500	4705	1.60
	14.2 *	172.93	220	67200	17.5	2646	3463	134400	5291	1.60
	16.0	194.14	247	74910	17.4	2949	3874	149800	5898	1.60
	20.0	240.70	307	91430	17.3	3600	4766	182900	7199	1.60
	25.0	297.79	379	110900	17.1	4367	5837	221800	8734	1.60
	32.0 *	375.64	479	136100	16.9	5360	7261	272300	10720	1.60
	40.0	461.66	588	162200	16.6	6385	8782	324400	12770	1.60
	50.0	564.75	719	190900	16.3	7515	10530	381800	15030	1.60

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