

جداول القطاعات القياسية للأعضاء من الفولاذ

حسب المواصفات الألمانية DIN EN 10025, 17100

Diagram illustrating the geometry of an equal angle section. The main dimensions are labeled: a (leg length), t (thickness), and r (radius of gyration). The axes are labeled: x and y (principal axes), and u and v (centroidal axes). The distance from the corner to the centroid is labeled e . The radius of gyration is given as $r = \frac{a}{2}$.

Approx. radii of gyration:

$$i_x = i_y = 0.30 a$$

$$i_u = 0.38 a$$

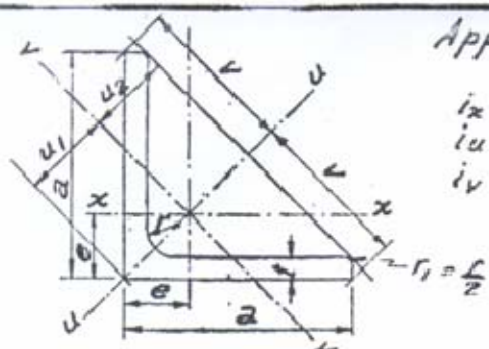
$$i_v = 0.20 a$$

Diagram illustrating the geometry of an equal angle section. The main dimensions are labeled: a (leg length), t (thickness), and r (radius of gyration). The axes are labeled: x and y (principal axes), and u and v (centroidal axes). The distance from the corner to the centroid is labeled e . The radius of gyration is given as $r = \frac{a}{2}$.

EQUAL ANGLES

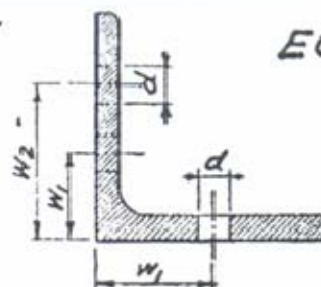
Profile No	Dimensions			Area cm ²	Weight kg/m	Distances of Axes				Properties of Section						Rivets				
	a mm	t mm	r mm			c cm	v cm	u ₁ cm	u ₂ cm	Axis x, y		Axis u		Axis v		d _{max} mm	W ₁ mm	W ₂ mm		
										I _x cm ⁴	Z _x cm ³	i _x cm	I _u cm ⁴	i _u cm	I _v cm ⁴				Z _v cm ³	i _v cm
30x30x4	30	3	5	1.74	1.36	0.84	2.12	1.18	1.04	1.41	0.65	0.90	2.24	1.14	0.57	0.48	0.57	8.5	17	—
	30	4	5	2.27	1.78	0.89	2.12	1.24	1.05	1.81	0.86	0.89	2.85	1.12	0.76	0.61	0.58			
	30	5	5	2.78	2.18	0.92	2.12	1.30	1.07	2.16	1.04	0.88	3.41	1.11	0.91	0.70	0.57			
35x35x5	35	4	5	2.67	2.10	1.00	2.47	1.41	1.24	2.96	1.18	1.05	4.68	1.33	1.24	0.88	0.68	11	20	—
	35	5	5	3.28	2.57	1.04	2.47	1.47	1.25	3.56	1.45	1.04	5.63	1.31	1.49	1.10	0.67			
	35	6	5	3.87	3.04	1.08	2.47	1.53	1.27	4.14	1.71	1.04	6.50	1.30	1.77	1.16	0.68			
40x40x5	40	4	6	3.08	2.42	1.12	2.83	1.58	1.40	4.48	1.56	1.21	7.09	1.52	1.86	1.18	0.78	11	22	—
	40	5	6	3.79	2.97	1.16	2.83	1.64	1.42	5.43	1.91	1.20	8.64	1.51	2.22	1.35	0.77			
	40	6	6	4.48	3.52	1.20	2.83	1.70	1.43	6.33	2.26	1.19	9.98	1.49	2.67	1.57	0.77			
45x45x6	45	5	7	4.30	3.38	1.28	3.18	1.81	1.58	7.83	2.43	1.35	12.4	1.70	3.25	1.50	0.87	11	25	—
	45	6	7	5.09	4.08	1.32	3.18	1.87	1.59	9.16	2.88	1.34	14.5	1.69	3.83	2.05	0.87			
	45	7	7	5.86	4.60	1.36	3.18	1.92	1.61	10.4	3.31	1.33	16.4	1.67	4.39	2.29	0.87			

50x50	5	50	5	7	4.80	3.77	1.40	3.54	1.98	1.76	11.0	3.05	1.51	17.4	1.98	4.59	2.32	0.98	13	30	—
	6	50	6	7	5.69	4.47	1.45	3.54	2.04	1.77	12.8	3.61	1.50	20.4	1.89	5.24	2.51	0.96			
	7	50	7	7	6.56	5.15	1.49	3.54	2.11	1.78	14.6	4.16	1.49	23.1	1.88	6.02	2.85	0.96			
	8	50	8	7	7.41	5.82	1.52	3.54	2.16	1.80	16.3	4.68	1.48	25.7	1.86	6.87	3.19	0.96			
55x55	5	55	5	8	5.32	4.18	1.52	3.89	2.15	1.93	14.7	3.70	1.66	23.3	2.01	6.11	2.82	1.07	17	30	—
	6	55	6	8	6.31	4.95	1.56	3.89	2.21	1.94	17.3	4.40	1.66	27.4	2.08	7.24	3.28	1.07			
	8	55	8	8	8.23	6.46	1.64	3.89	2.32	1.97	22.1	5.72	1.64	34.8	2.04	9.35	4.03	1.07			
	10	55	10	8	10.10	7.90	1.72	3.89	2.43	2.00	26.3	6.97	1.62	41.4	2.02	11.3	4.65	1.06			
60x60x8	6	60	6	8	6.91	5.42	1.69	4.24	2.39	2.11	22.8	5.29	1.82	36.1	2.29	9.43	3.95	1.17	17	35	—
	60	8	8	8	9.03	7.09	1.77	4.24	2.50	2.14	29.1	6.88	1.80	46.1	2.26	12.1	4.84	1.16			
	10	60	10	8	11.10	8.69	1.85	4.24	2.62	2.17	34.9	8.41	1.78	55.1	2.23	14.6	5.57	1.15			
65x65x8	7	65	7	9	8.70	6.83	1.85	4.60	2.62	2.29	33.4	7.18	1.96	53.0	2.47	13.8	5.27	1.26	17	35	—
	65	8	9	9	9.85	7.73	1.89	4.60	2.67	2.31	37.5	8.13	1.95	59.4	2.46	15.6	5.84	1.26			
	9	65	9	9	11.00	8.62	1.93	4.60	2.73	2.32	41.3	9.04	1.94	65.4	2.44	17.2	6.30	1.25			
70x70x10	7	70	7	10	9.40	7.38	1.97	4.95	2.79	2.47	42.4	8.43	2.12	67.1	2.67	17.6	6.31	1.37	17	40	—
	9	70	9	10	11.9	9.34	2.05	4.95	2.90	2.50	52.6	10.6	2.10	83.1	2.64	22.0	7.59	1.36			
	11	70	11	10	14.3	11.2	2.13	4.95	3.01	2.53	61.8	12.7	2.08	97.6	2.61	26.0	8.64	1.35			
75x75	7	75	7	10	10.1	7.94	2.09	5.30	2.95	2.63	52.4	9.67	2.28	83.6	2.88	21.1	7.15	1.45	17	40	—
	8	75	8	10	11.5	9.03	2.13	5.30	3.01	2.65	58.9	11.0	2.26	93.3	2.85	24.4	8.11	1.46			
	10	75	10	10	14.1	11.1	2.21	5.30	3.12	2.68	71.4	13.5	2.25	113	2.83	27.8	9.65	1.45			
	12	75	12	10	16.7	13.1	2.29	5.30	3.24	2.71	82.4	15.8	2.22	130	2.79	34.7	10.7	1.44			
80x80	8	80	8	10	12.3	9.66	2.26	5.66	3.20	2.82	72.3	12.6	2.42	115	3.06	29.6	9.25	1.55	21	45	—
	10	80	10	10	15.1	11.9	2.34	5.66	3.31	2.85	87.5	15.5	2.41	139	3.03	35.9	10.9	1.54			
	12	80	12	10	17.7	14.1	2.41	5.66	3.41	2.88	102	18.3	2.39	161	3.00	43.0	12.6	1.53			
	14	80	14	10	20.6	16.7	2.48	5.66	3.51	2.93	116	20.8	2.36	181	2.96	48.6	13.9	1.54			



Approx. radii of gyration:

$$\begin{aligned} i_x &= i_y = 0.30a \\ i_u &= 0.38a \\ i_v &= 0.20a \end{aligned}$$



EQUAL ANGLES

Profile Nº	Dimensions			Area cm ²	Weight Kg/m	Distances of Axes				Properties of Section									Rivets		
	a mm	t mm	r mm			e cm	v cm	u ₁ cm	u ₂ cm	Axes x, y			Axis u		Axis v		d _{max} mm	W ₁ mm	W ₂ mm		
										I _x cm ⁴	Z _x cm ³	i _x cm	I _u cm ⁴	i _u cm	I _v cm ⁴	Z _v cm ³				i _v cm	
90x90x	9	9	11	15.5	12.2	2.54	6.36	3.59	3.18	116	18.0	274	184	3.45	478	13.3	1.76	21	50	—	
	11	11	11	18.7	14.7	2.62	6.36	3.70	3.21	138	21.6	272	218	3.41	57.1	15.4	1.75	21			
	13	13	11	21.8	17.1	2.70	6.36	3.81	3.24	158	25.1	269	250	3.39	65.9	17.3	1.74	25			
	16	16	11	26.4	20.7	2.81	6.36	3.97	3.29	186	30.1	266	294	3.34	79.1	19.9	1.73	25			
100x100x	10	10	12	19.2	15.1	2.82	7.07	3.99	3.54	177	24.7	3.04	280	3.82	73.3	18.4	1.95	21	55	—	
	12	12	12	22.7	17.8	2.90	7.07	4.10	3.57	207	29.2	3.02	328	3.80	86.2	21.6	1.95	25			
	14	14	12	26.2	20.6	2.98	7.07	4.21	3.60	235	33.5	3.00	372	3.77	98.3	23.4	1.94	25			
	16	16	12	29.6	23.2	3.06	7.07	4.32	3.63	262	37.7	2.97	413	3.74	111	25.6	1.93	25			
110x110x	10	10	12	21.2	16.6	3.07	7.78	4.34	3.89	239	30.1	3.36	379	4.23	98.6	22.7	2.16	21	50	70	
	12	12	12	25.1	19.7	3.15	7.78	4.45	3.93	280	35.7	3.34	434	4.21	116	26.1	2.15	25			
	14	14	12	29.0	22.8	3.21	7.78	4.54	3.98	319	41.0	3.32	505	4.18	133	29.3	2.14	25			
	16	16	12	32.8	25.7	3.31	7.78	4.68	3.98	356	46.3	3.29	563	4.14	149	31.7	2.13	25			

11	120	11	13	254	199	336	849	475	421	341	395	364	541	462	140	295	235	21		
120x120x13	120	13	13	297	233	344	849	486	427	394	460	364	625	459	162	333	234	25	50	80
15	120	15	13	339	266	351	849	496	431	446	525	363	705	456	186	375	234	25		
12	130	12	14	300	236	364	919	515	460	472	504	397	750	500	194	377	254	25		
130x130x14	130	14	14	347	272	372	919	526	463	540	582	394	857	497	223	424	253	25	50	90
16	130	16	14	393	309	380	919	537	466	605	658	392	959	494	251	467	252	25		
140x140x13	140	13	15	350	275	392	990	554	496	638	633	427	1010	538	262	473	274	25		
15	140	15	15	400	314	400	990	566	499	723	723	425	1150	536	298	527	273	25	55	100
12	150	12	16	348	273	412	106	583	529	737	677	460	1170	580	303	520	295	25		
14	150	14	16	403	316	421	106	595	531	845	782	458	1340	577	347	583	294	25		
150x150x16	150	16	16	457	359	429	106	607	534	949	887	456	1510	574	391	644	293	25	55	110
18	150	18	16	510	401	436	106	617	538	1050	993	454	1670	570	438	710	293	28		
20	150	20	16	563	442	444	106	628	541	1150	109	451	1820	568	477	760	291	28		
15	160	15	17	461	362	449	113	635	567	1100	956	488	1750	615	453	713	314	25		
160x160x17	160	17	17	518	407	457	113	646	570	1230	108	486	1950	613	506	783	313	25	60	115
19	160	19	17	575	451	465	113	658	573	1350	118	466	2140	610	558	848	312	28		
16	180	16	18	554	435	502	127	711	639	1680	130	551	2690	696	679	955	350	25		
180x180x18	180	18	18	619	486	510	127	722	641	1870	145	549	2970	693	757	105	349	28	60	135
20	180	20	18	684	537	518	127	733	644	2040	160	547	3260	690	830	113	349	28		
22	180	22	18	747	586	526	127	744	647	2210	174	544	3510	686	918	123	350	28		
16	200	16	18	618	495	552	141	780	709	2340	162	615	3740	778	943	121	391	25		
18	200	18	18	691	543	560	141	792	712	2600	181	613	4150	775	1050	133	370	28		
200x200x20	200	20	18	764	599	565	141	804	715	2850	199	611	4540	772	1160	144	389	28	65	150
24	200	24	18	906	711	534	141	826	721	3330	235	606	5280	764	1380	167	390	28		
28	200	28	18	105	820	599	141	847	726	3780	270	602	5990	757	1580	186	389	28		

Diagram of an unequal angle section with dimensions a, b, t, r and centroidal axes u, v . The radius $r_1 = \frac{1}{2}$.

Diagram showing the centroidal axes $X-Y$ and X_1-Y_1 , with dimensions a_1 and b_1 .

For Dist. a_1 :
 $I_x = I_y = 2I_{x_1}$

$$r_1 = \frac{1}{2}$$

Profile No	Dimensions				Area cm^2	Weight kg/m	Distances of Axes								I_{cm}
	a mm	b mm	t mm	r mm			e_x cm	e_y cm	v_1 cm	v_2 cm	u_1 cm	u_2 cm	u cm		
$a : b$															
30x20x3	30	20	3	3.5	1.42	1.11	0.99	0.50	2.04	1.51	0.86	1.04	0.56	0.431	
30x20x4	30	20	4	3.5	1.85	1.45	1.03	0.54	2.62	1.52	0.91	1.03	0.58	0.423	
45x30x3	45	30	3	4.5	2.19	1.72	1.43	0.70	3.09	2.23	1.21	1.59	0.80	0.436	
45x30x4	45	30	4	4.5	2.87	2.25	1.48	0.74	3.97	2.26	1.27	1.58	0.83	0.436	
45x30x5	45	30	5	4.5	3.53	2.77	1.52	0.78	3.05	2.27	1.32	1.58	0.85	0.400	
60x40x5	60	40	5	6	4.79	3.76	1.96	0.97	4.08	3.01	1.68	2.09	1.10	0.437	
60x40x6	60	40	6	6	5.68	4.46	2.00	1.01	4.96	3.02	1.72	2.08	1.12	0.433	
60x40x7	60	40	7	6	6.55	5.14	2.04	1.05	4.04	3.03	1.77	2.07	1.14	0.429	
75x50x5	75	50	5	6.5	6.04	4.74	2.30	1.17	5.14	3.73	2.03	2.44	1.32	0.437	
75x50x7	75	50	7	6.5	8.30	6.51	2.48	1.25	5.10	3.77	2.13	2.63	1.38	0.433	
75x50x9	75	50	9	6.5	10.5	8.23	2.56	1.32	5.06	3.86	2.22	2.62	1.44	0.427	
90x60x6	90	60	6	7	8.69	6.82	2.89	1.41	6.14	4.50	2.44	3.16	1.60	0.442	
90x60x8	90	60	8	7	11.4	8.96	2.97	1.49	6.11	4.54	2.54	3.15	1.69	0.437	
100x65x7	100	65	7	10	11.2	8.77	3.23	1.51	6.83	4.91	2.64	3.48	1.73	0.419	
100x65x9	100	65	9	10	14.2	11.1	3.32	1.59	6.78	4.96	2.76	3.46	1.78	0.415	
110x65x11	100	65	11	10	17.1	13.4	3.40	1.67	6.74	4.97	2.85	3.45	1.83	0.410	
120x80x8	120	80	8	11	15.5	12.2	3.83	1.87	8.23	5.99	3.27	4.20	2.16	0.441	
120x80x10	120	80	10	11	19.1	15.0	3.92	1.95	8.18	6.03	3.37	4.19	2.19	0.438	
120x80x12	120	80	12	11	22.7	17.8	4.00	2.03	8.14	6.06	3.46	4.18	2.25	0.433	

UNEQUAL ANGLES:1

Approx. Radii of Gyration:

$$a:b = 1.5 \quad i_x = .20b$$

$$i_y = .31a$$

$$i_u = .33a$$

$$i_v = .22b$$

Properties of Section										Rivet Holes					Distance d mm	
Axis x		Axis y		Axis u		Axis v										
I_x cm^4	Z_x cm^3	i_x cm	I_y cm^4	Z_y cm^3	i_y cm	I_u cm^4	i_u cm	I_v cm^4	i_v cm	d_1 mm	d_2 mm	w_1 mm	w_2 mm	w_3 mm		
$a : b = 1 : 1.5$																
175	4.42	0.94	0.44	0.29	0.56	1.43	1.00	0.25	0.42	-	-	-	-	-	5.2	
159	0.81	0.93	0.53	0.38	0.55	1.81	0.99	0.33	0.42	-	-	-	-	-	4.2	
447	1.46	1.43	1.60	0.70	0.56	5.15	1.53	0.93	0.65	-	-	-	-	-	8.0	
578	1.91	1.42	2.05	0.91	0.85	6.65	1.52	1.18	0.64	8.5	11	17	25	-	7.2	
679	2.35	1.41	2.47	1.01	0.84	8.02	1.51	1.44	0.64	-	-	-	-	-	-	
172	4.25	1.09	6.11	2.02	1.13	19.8	2.03	3.50	0.86	-	-	-	-	-	11.2	
201	5.03	1.88	7.12	2.38	1.12	23.1	2.02	4.12	0.85	11	17	22	35	-	10.2	
230	5.79	1.87	8.07	2.74	1.11	26.3	2.00	4.73	0.85	-	-	-	-	-	9.2	
344	6.74	2.39	12.3	3.21	1.43	36.6	2.56	7.10	1.08	-	-	-	-	-	14.6	
464	8.23	2.36	16.5	4.39	1.41	53.3	2.53	9.56	1.07	13	17	30	40	-	13.0	
574	11.6	2.34	20.2	5.49	1.39	63.7	2.50	11.9	1.07	-	-	-	-	-	11.3	
717	11.7	2.87	25.8	5.61	1.72	82.8	3.09	14.6	1.30	17	21	35	50	-	17.6	
925	15.4	2.85	33.9	7.31	1.70	107	3.06	19.0	1.29	-	-	-	-	-	15.2	
113	14.6	3.17	37.6	7.54	1.84	128	3.39	21.6	1.39	17	17	-	-	-	21.8	
141	21.0	3.15	46.7	9.52	1.82	160	3.36	27.2	1.39	21	21	35	55	-	19.8	
167	25.3	3.13	55.1	11.4	1.80	190	3.34	32.6	1.38	21	21	-	-	-	17.8	
226	27.6	3.82	90.8	13.2	2.29	261	4.10	45.8	1.72	21	21	-	-	-	24.0	
276	34.1	3.80	98.1	16.2	2.27	318	4.07	56.1	1.71	21	21	45	50	80	22.2	
323	48.4	3.77	114	19.1	2.25	371	4.04	66.1	1.71	21	25	-	-	-	20.2	

$r_1 = \frac{r}{2}$

For Dist. a_1 :
 $I_x = I_y = 2I_a$

Profile No	Dimensions				Area cm ²	Weight kg/m	Distances of Axes								x cm
	a	b	t	r			e_x	e_y	v_1	v_2	u_1	u_2	u_3		
														a : b	
130x90x10	130	90	10	12	21.2	16.6	415	218	392	6.69	3.75	4.62	2.51	472	
130x90x12	130	90	12	12	25.1	19.7	424	226	488	6.72	3.85	4.60	2.56	468	
150x100x10	150	100	10	13	24.2	19.0	480	234	403	7.50	4.10	5.25	2.68	442	
150x100x12	150	100	12	13	28.7	22.6	489	242	402	7.53	4.19	5.24	2.73	439	
150x100x14	150	100	14	13	33.2	26.1	497	250	402	7.56	4.28	5.23	2.77	435	
														a : b	
40x20x3	40	20	3	3.5	1.72	1.35	1.43	0.44	2.61	1.77	0.79	1.19	0.46	259	
40x20x4	40	20	4	3.5	2.25	1.77	1.47	0.48	2.57	1.80	0.83	1.18	0.50	252	
60x30x5	60	30	5	6	4.29	3.37	2.15	0.68	3.90	2.67	1.20	1.77	0.72	256	
60x30x7	60	30	7	6	5.85	4.59	2.24	0.76	3.83	2.72	1.28	1.73	0.78	248	
80x40x6	80	40	6	7	6.89	5.41	2.85	0.88	5.21	3.53	1.53	2.42	0.89	259	
80x40x8	80	40	8	7	9.01	7.07	2.94	0.95	5.15	3.57	1.65	2.38	1.04	253	
100x50x6	100	50	6	9	8.73	6.85	3.49	1.04	6.50	4.39	1.91	2.98	1.15	263	
100x50x8	100	50	8	9	11.5	8.99	3.57	1.13	6.48	4.44	2.00	2.95	1.18	258	
100x50x10	100	50	10	9	14.1	11.1	3.67	1.20	6.43	4.49	2.08	2.91	1.22	252	
130x65x8	130	65	8	11	15.1	11.9	4.56	1.37	8.50	5.71	2.49	3.84	1.47	263	
130x65x10	130	65	10	11	18.6	14.6	4.65	1.45	8.43	5.76	2.58	3.82	1.54	259	
130x65x12	130	65	12	11	22.1	17.3	4.74	1.53	8.37	5.81	2.66	3.80	1.60	255	

UNEQUAL ANGLES - II

Approx. Radii of Gyration:

$$a:b=2.0 \quad i_x = .26b$$

$$i_y = .31a$$

$$i_u = .33a$$

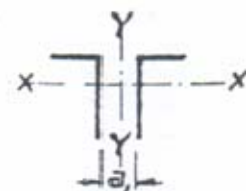
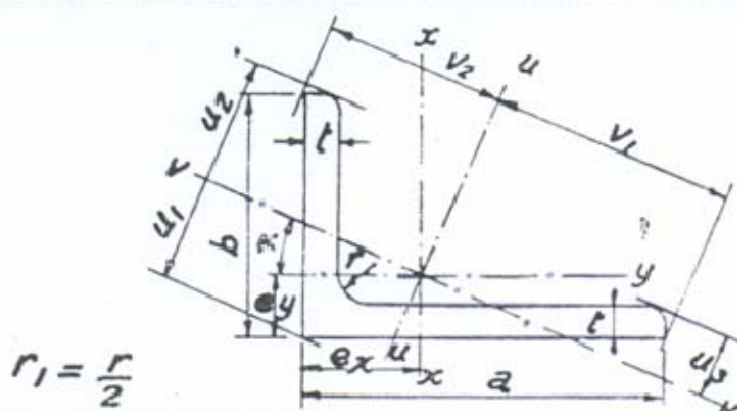
$$i_v = .21b$$

The diagram shows an L-shaped cross-section of an unequal angle. The vertical leg has a width 'a' and the horizontal leg has a width 'b'. The thickness of the legs is 't'. The radius of the corner is 'r'. The centroidal axes are labeled: 'x' and 'y' for the principal axes, and 'u' and 'v' for the axes parallel to the legs. Distances from the outer corner to the centroidal axes are labeled 'x2', 'y2', 'u2', and 'v2'.

Properties of Section

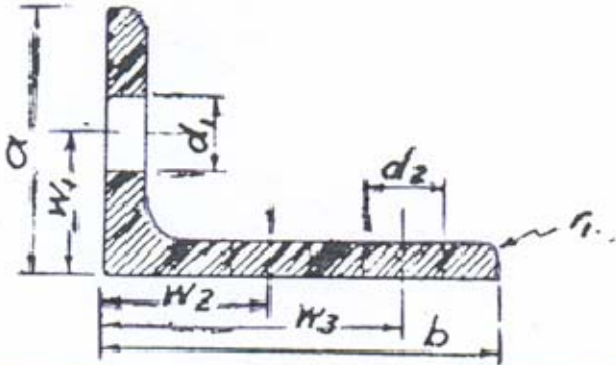
Properties of Section										Rivet Holes					Distance of Centroid from Outer Corner
Axis x		Axis y		Axis u		Axis v									
I_x cm ⁴	Z_x cm ³	i_x cm	I_y cm ⁴	Z_y cm ³	i_y cm	I_u cm ⁴	i_u cm	I_v cm ⁴	i_v cm	d_1 mm	d_2 mm	n_1 mm	n_2 mm	Distance of Centroid from Outer Corner mm	
= 1 : 1.5															
358	40.5	4.11	181	20.6	2.58	420	4.46	78.5	1.93	21	25	50	50	204	
420	48.0	4.09	165	24.9	2.56	492	4.43	92.6	1.92	21	25	50	50	175	
552	54.1	4.78	198	25.8	2.84	637	5.13	112	2.15	24	21	55	55	295	
650	64.2	4.76	232	30.6	2.84	749	5.10	132	2.15	25	25	55	55	180	
744	74.1	4.73	264	35.2	2.82	856	5.07	152	2.14	25	25	55	55	262	
= 1 : 2.0															
279	10.8	1.27	0.47	0.30	0.52	296	1.31	0.30	0.42	-	-	-	-	158	
357	14.2	1.26	0.60	0.39	0.82	379	1.30	0.31	0.42	-	-	-	-	138	
15.6	4.04	1.90	2.60	1.12	0.78	16.5	1.96	0.69	0.63	8.5	17	17	35	214	
20.7	5.50	1.88	3.41	1.52	0.76	21.8	1.93	2.0	0.62	8.5	17	17	35	185	
44.9	8.73	2.58	7.57	2.44	1.05	47.6	2.63	4.90	0.84	11	17	22	45	290	
57.6	11.4	2.53	9.68	3.18	1.04	60.9	2.60	6.41	0.84	11	21	22	45	272	
89.7	13.8	3.20	15.3	3.86	1.32	95.2	3.30	9.78	1.04	13	17	30	55	376	
116	18.0	3.18	19.5	5.04	1.31	123	3.28	12.6	1.05	13	21	30	55	354	
141	22.2	3.16	23.4	6.17	1.29	149	3.25	15.5	1.04	13	21	30	55	335	
263	31.1	4.17	44.8	8.72	1.72	280	4.31	28.6	1.38	21	21	35	50	486	
321	38.4	4.15	54.2	10.7	1.71	340	4.27	35.0	1.37	21	21	35	50	469	
376	45.5	4.12	63.0	12.7	1.69	397	4.24	41.2	1.37	21	25	35	50	446	

UNEQUAL ANGLES-iii														
Approx. Radii of Gyration:														
$a:b = 2.0 \quad i_x = .26b$														
$i_y = .31a$														
$i_u = .33a$														
$i_v = .22b$														
Properties of Section														
Axis x			Axis y			Axis u		Axis v		Rivet Holes				
I_x	Z_x	i_x	I_y	Z_y	i_y	I_u	i_u	I_v	i_v	d_1	d_2	W_1	W_2	W_3
cm ⁴	cm ³	cm	cm ⁴	cm ³	cm	cm ⁴	cm	cm ⁴	cm	mm	mm	mm	mm	mm
$b = 1:2.0$														
455	468	4.83	783	132	2.00	484	4.98	50.0	1.60	21	21	40	55	110
545	566	4.80	93.0	15.9	1.98	578	4.95	59.8	1.59	21	21			
611	58.9	5.14	104	165	2.12	648	5.29	67.0	1.70	21	21			
720	70.0	5.11	122	196	2.10	763	5.26	78.9	1.69	21	25	45	60	115
823	80.7	5.09	139	225	2.09	871	5.23	90.8	1.69	25	25			
880	75.1	5.80	151	212	2.40	934	5.97	97.4	1.93	21	25	50	60	135
1040	89.3	5.77	177	25.1	2.38	1100	5.94	114	1.92	21	25			
1220	93.2	6.46	210	26.3	2.68	1300	6.66	133	2.14	21	21			
1440	111	6.43	247	31.3	2.67	1530	6.63	158	2.13	25	25	55	60	150
1650	128	6.41	282	36.1	2.65	1760	6.60	181	2.12	25	25			
1860	145	6.38	316	40.8	2.63	1970	6.57	204	2.11	25	25			
variable														
854	247	1.57	486	1.64	1.19	10.9	1.78	2.46	0.84	11	13	22	30	—
10.4	302	1.56	589	2.01	1.18	13.3	1.76	3.02	0.84	11	13			—
23.1	5.11	2.04	11.9	3.18	1.47	28.8	2.28	6.21	1.01	—	17			36
31.0	6.99	2.02	15.8	4.31	1.44	38.4	2.25	8.37	1.05	13	17	30	35	—
38.2	8.77	2.00	19.4	5.39	1.42	47.0	2.22	10.5	1.05	13	17			—



For Dist. a_1 :
 $I_x = I_y = 2I_x$

Profile No	Dimensions				Area cm ²	Weight kg/m	Distances of Axes									tan α
	a mm	b mm	t mm	r mm			e _x cm	e _y cm	V ₁ cm	V ₂ cm	U ₁ cm	U ₂ cm	U ₃ cm			
															a :	
150x75x	9	150	75	9	19.5	153	5.28	1.57	9.79	6.62	2.90	4.46	1.72	.265		
	11	150	75	11	23.6	18.6	5.37	1.65	9.73	6.66	2.97	4.44	1.77	.261		
160x80x	10	160	80	10	23.2	18.2	5.63	1.69	10.5	7.06	3.07	4.76	1.82	.263		
	12	160	80	12	27.5	21.6	5.72	1.77	10.4	7.10	3.15	4.75	1.89	.259		
	14	160	80	14	31.8	25.0	5.81	1.85	10.3	7.16	3.23	4.72	1.95	.256		
180x90x	10	180	90	10	26.2	20.6	6.28	1.85	11.8	7.89	3.38	5.42	2.00	.262		
	12	180	90	12	31.2	24.5	6.37	1.93	11.7	7.95	3.48	5.38	2.07	.261		
200x100x	10	200	100	10	29.2	23.0	6.93	2.01	13.2	8.76	3.75	5.98	2.22	.266		
	12	200	100	12	34.8	27.3	7.03	2.10	13.1	8.82	3.84	5.95	2.26	.264		
	14	200	100	14	40.3	31.6	7.12	2.18	13.0	8.88	3.93	5.92	2.32	.262		
	16	200	100	16	45.7	35.9	7.20	2.26	12.9	8.93	4.02	5.88	2.39	.259		
															a : b	
50x40x	4	50	40	4	3.46	2.71	1.52	1.03	3.50	2.85	1.67	1.84	1.26	.629		
	5	50	40	5	4.27	3.35	1.56	1.07	3.49	2.88	1.73	1.84	1.27	.625		
65x50x	5	65	50	5	5.54	4.35	1.99	1.25	4.52	3.61	2.08	2.38	1.50	.583		
	7	65	50	7	7.60	5.97	2.07	1.33	4.50	3.62	2.19	2.37	1.52	.574		
	9	65	50	9	9.58	7.52	2.15	1.41	4.48	3.63	2.26	2.36	1.57	.567		

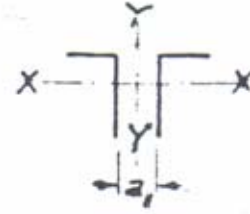
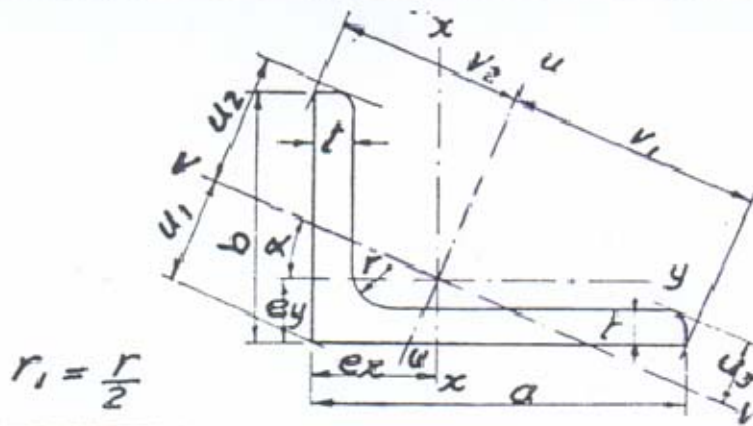


UNEQUAL ANGLES-iv

Approx. Radii of Gyration:

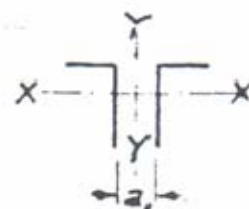
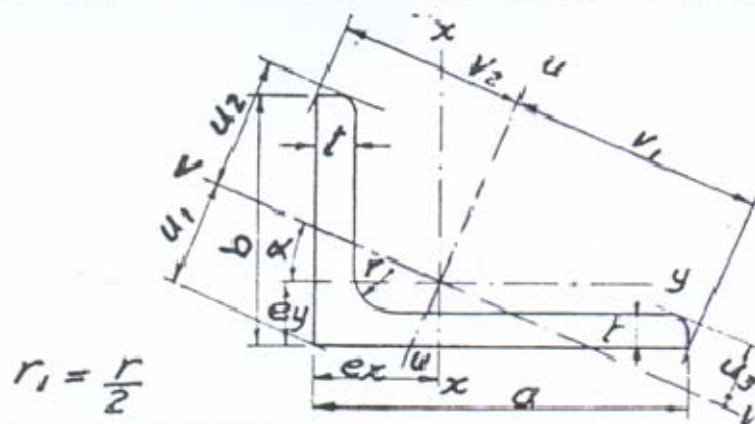
$$a:b = \text{var.} \quad \begin{aligned} i_x &= .28b \\ i_y &= .31a \\ i_u &= .33a \\ i_v &= .21b \end{aligned}$$

Properties of Section										Rivet Holes					Distance d_1
Axis x			Axis y			Axis u		Axis v							
I_x cm ⁴	Z_x cm ³	i_x cm	I_y cm ⁴	Z_y cm ³	i_y cm	I_u cm ⁴	i_u cm	I_v cm ⁴	i_v cm	d_1 mm	d_2 mm	W_1 mm	W_2 mm	W_3 mm	
35.5	6.84	2.37	16.2	3.89	1.60	43.1	2.61	8.68	1.17	17	17				8.4
47.9	9.39	2.35	21.8	5.32	1.59	57.9	2.59	11.8	1.17	17	17	30	40	-	6.6
53.8	10.6	2.34	24.3	6.00	1.57	64.6	2.57	13.4	1.17	17	17				5.8
59.4	11.8	2.33	26.8	6.66	1.57	71.3	2.55	14.8	1.16	17	21				5.0
52.8	9.41	2.51	31.2	6.44	1.93	68.5	2.85	15.6	1.36	17	23				-
68.1	12.3	2.49	40.1	8.41	1.91	88.0	2.82	20.3	1.36	21	23	35	45	-	-
82.2	15.1	2.46	48.3	10.3	1.89	106	2.79	24.8	1.35	21	23				-
118	17.0	3.15	56.9	10.0	2.19	145	3.49	30.1	1.59	17	17				8.8
148	21.5	3.13	71.0	12.7	2.17	181	3.47	37.8	1.59	21	21	40	55	-	7.0
176	25.9	3.11	84.0	15.3	2.15	214	3.44	45.4	1.58	21	21				5.2
276	31.9	4.17	68.3	11.7	2.08	303	4.37	41.3	1.61	21	25				39.4
337	39.4	4.14	82.9	14.4	2.06	369	4.34	50.6	1.61	21	25	40	50	90	37.4
395	46.6	4.12	96.5	17.0	2.04	432	4.31	59.6	1.60	21	25				35.4
532	53.1	4.79	145	20.9	2.51	589	5.05	88	1.95	21	25				41.0
626	63.1	4.77	170	24.7	2.49	693	5.02	103	1.94	21	25	50	55	110	39.2
1180	91.7	6.46	155	21.4	2.34	1230	6.60	102	1.91	21	25	50	65	150	85.3
1390	109	6.43	182	25.4	2.33	1450	6.57	121	1.89	21	25				83.1
2170	140	8.08	161	21.7	2.20	2220	8.17	112	1.84	21	28				124
2570	166	8.05	189	25.8	2.19	2630	8.14	132	1.83	25	28	50			122
2960	192	8.03	216	29.7	2.17	3020	8.11	152	1.82	25	28				120
3330	218	8.00	242	33.6	2.15	3400	8.08	171	1.81	25	28				118



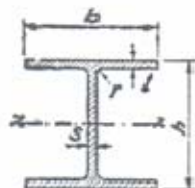
For Dist. a_1 :
 $I_x = I_y = 2I_x$

Profile No	Dimensions				Area cm ²	Weight Kg/m	Distances of Axes							tan α	
	a mm	b mm	t mm	r mm			e _x cm	e _y cm	v ₁ cm	v ₂ cm	u ₁ cm	u ₂ cm	u ₃ cm		
75x55x	5	75	55	5	7	6.30	4.95	2.31	1.33	5.19	4.00	2.27	2.71	1.56	.530
	7	75	55	7	7	8.66	6.80	2.40	1.41	5.16	4.02	2.37	2.70	1.62	.525
	8	75	55	8	7	9.81	7.70	2.43	1.45	5.16	4.03	2.40	2.72	1.64	.519
	9	75	55	9	7	10.9	8.59	2.47	1.48	5.14	4.04	2.46	2.70	1.66	.518
80x65x	6	80	65	6	8	8.41	6.60	2.39	1.65	5.61	4.63	2.69	2.94	2.01	.649
	8	80	65	8	8	11.0	8.66	2.47	1.73	5.59	4.65	2.79	2.94	2.05	.645
	10	80	65	10	8	13.6	10.7	2.55	1.81	5.56	4.68	2.90	2.95	2.11	.640
100x75x	7	100	75	7	10	11.9	9.32	3.06	1.83	6.96	5.42	3.10	3.61	2.18	.553
	9	100	75	9	10	15.1	11.8	3.15	1.91	6.91	5.45	3.22	3.63	2.22	.549
	10	100	75	10	10	18.2	14.3	3.23	1.99	6.87	5.49	3.32	3.65	2.27	.545
130x75x10	8	130	75	8	10.5	15.9	12.5	4.36	1.05	8.73	6.01	2.99	4.26	1.83	.339
	10	130	75	10	10.5	19.6	15.4	4.45	1.73	8.66	6.05	3.08	4.24	1.88	.336
	12	130	75	12	10.5	23.3	18.3	4.53	1.81	8.61	6.09	3.18	4.21	1.95	.332
150x90x	10	150	90	10	12.5	23.2	18.2	4.99	2.03	10.1	7.05	3.60	5.02	2.24	.360
	12	150	90	12	12.5	27.5	21.6	5.08	2.11	10.1	7.10	3.70	5.00	2.30	.358
200x90x	10	200	90	10	14	28.2	22.1	7.17	1.76	12.9	8.57	3.26	5.61	1.89	.221
	12	200	90	12	14	33.6	26.4	7.27	1.84	12.8	8.64	3.35	5.56	1.97	.219
250x90x	10	250	90	10	15	33.2	26.1	9.45	1.56	15.6	10.5	2.98	5.96	1.71	.154
	12	250	90	12	15	39.6	31.1	9.55	1.65	15.5	10.6	3.07	5.90	1.79	.153
	14	250	90	14	15	45.9	36.0	9.65	1.73	15.4	10.6	3.16	5.85	1.87	.152
	16	250	90	16	15	52.1	40.9	9.74	1.81	15.4	10.7	3.24	5.80	1.95	.150



For Dist. a_1 :
 $I_x = I_y = 2I_x$

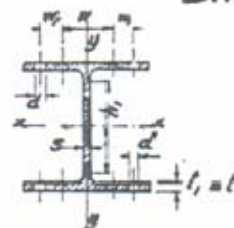
Profile No	Dimensions				Area cm ²	Weight Kg/m	Distances of Axes							tan α	
	a mm	b mm	t mm	r mm			e _x cm	e _y cm	v ₁ cm	v ₂ cm	u ₁ cm	u ₂ cm	u ₃ cm		
75x55x	5	75	55	5	7	6.30	4.95	2.31	1.33	5.19	4.00	2.27	2.71	1.56	.530
	7	75	55	7	7	8.66	6.80	2.40	1.41	5.16	4.02	2.37	2.70	1.62	.525
	8	75	55	8	7	9.81	7.70	2.43	1.45	5.16	4.03	2.40	2.72	1.64	.519
	9	75	55	9	7	10.9	8.59	2.47	1.48	5.14	4.04	2.46	2.70	1.66	.518
80x65x	6	80	65	6	8	8.41	6.60	2.39	1.65	5.61	4.63	2.69	2.94	2.01	.649
	8	80	65	8	8	11.0	8.66	2.47	1.73	5.59	4.65	2.79	2.94	2.05	.645
	10	80	65	10	8	13.6	10.7	2.55	1.81	5.56	4.68	2.90	2.95	2.11	.640
100x75x	7	100	75	7	10	11.9	9.32	3.06	1.83	6.96	5.42	3.10	3.61	2.18	.553
	9	100	75	9	10	15.1	11.8	3.15	1.91	6.91	5.45	3.22	3.63	2.22	.549
	10	100	75	10	10	18.2	14.3	3.23	1.99	6.87	5.49	3.32	3.65	2.27	.545
130x75x10	8	130	75	8	10.5	15.9	12.5	4.36	1.05	8.73	6.01	2.99	4.26	1.83	.339
	10	130	75	10	10.5	19.6	15.4	4.45	1.73	8.66	6.05	3.08	4.24	1.88	.336
	12	130	75	12	10.5	23.3	18.3	4.53	1.81	8.61	6.09	3.18	4.21	1.95	.332
150x90x	10	150	90	10	12.5	23.2	18.2	4.99	2.03	10.1	7.05	3.60	5.02	2.24	.360
	12	150	90	12	12.5	27.5	21.6	5.08	2.11	10.1	7.10	3.70	5.00	2.30	.358
200x90x	10	200	90	10	14	28.2	22.1	7.17	1.76	12.9	8.57	3.26	5.61	1.89	.221
	12	200	90	12	14	33.6	26.4	7.27	1.84	12.8	8.64	3.35	5.56	1.97	.219
250x90x	10	250	90	10	15	33.2	26.1	9.45	1.56	15.6	10.5	2.98	5.96	1.71	.154
	12	250	90	12	15	39.6	31.1	9.55	1.65	15.5	10.6	3.07	5.90	1.79	.153
	14	250	90	14	15	45.9	36.0	9.65	1.73	15.4	10.6	3.16	5.85	1.87	.152
	16	250	90	16	15	52.1	40.9	9.74	1.81	15.4	10.7	3.24	5.80	1.95	.150



Approx. Radii of Gyration:

$$i_x = 0.40 h$$

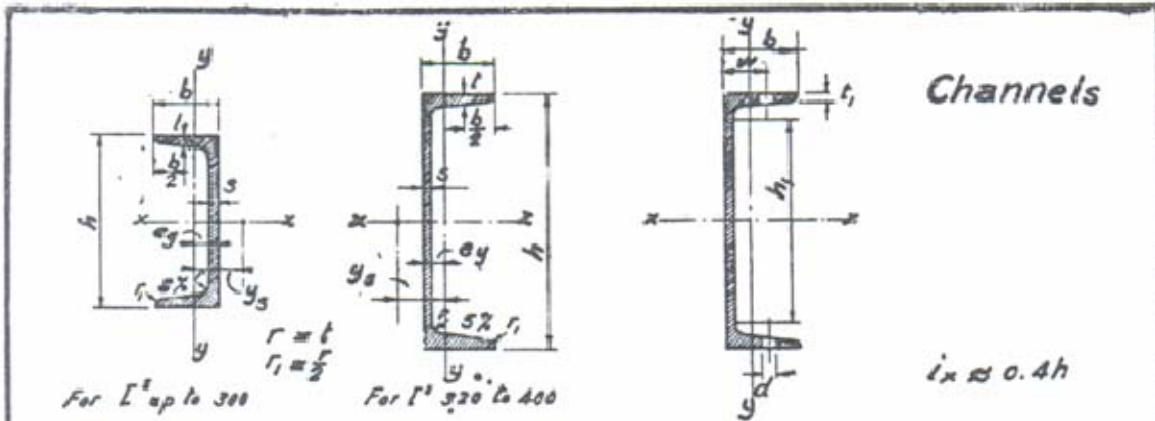
$$i_y = 0.25 b \quad (h \geq 400)$$





B.F.I.B^s

Broad Flange I-Beams

Profile No	Dimensions						Area	Weight	Surface Area	Properties of Section						Distance \bar{x}, \bar{y} for I_x, I_y	Rivet Holes		
	h	b	s	t	r	h ₁				Axis x-x			Axis y-y				d _{max}	N	W _t
										I _x	Z _x	i _x	I _y	Z _y	i _y				
	mm	mm	mm	mm	mm	mm	cm ²	kg/m	m ² /m	cm ⁴	cm ³	cm	cm ⁴	cm ³	cm	mm	mm	mm	
100	100	100	6.5	10	10	60	261	20.5	0.57	447	89.3	4.14	167	33.4	2.53	—	13	54	—
120	120	120	7	11	11	76	343	26.9	0.687	864	144	5.02	317	52.3	3.04	—	17	64	—
140	140	140	8	12	12	92	441	34.6	0.803	1520	217	5.87	550	78.6	3.53	—	21	80	—
160	160	160	9	14	14	104	584	45.8	0.918	2630	329	6.72	958	120	4.05	—	23	90	—
180	180	180	9	14	14	124	658	51.6	1.036	3830	426	7.63	1360	151	4.55	—	25	100	—
200	200	200	10	16	15	138	827	64.9	1.154	5950	595	8.48	2140	214	5.08	—	25	110	—
220	220	220	10	16	15	158	911	71.5	1.274	8050	732	9.37	2840	258	5.59	—	25	120	—
240	240	240	11	18	17	170	111	87.4	1.389	11690	974	10.2	4150	346	6.11	—	25	90	35
260	260	260	11	18	17	190	121	94.8	1.509	15050	1160	11.2	5280	406	6.61	—	25	100	40
280	280	280	12	20	18	204	144	113	1.625	20720	1480	12.0	7320	523	7.14	—	25	110	45
300	300	300	12	20	18	224	154	121	1.745	25760	1720	12.9	9010	600	7.63	—	25	120	50
320	320	300	13	22	20	236	171	135	1.780	32250	2023	13.7	9910	661	7.60	—	25	120	50
340	340	300	13	22	20	256	174	137	1.820	36940	2170	14.5	9910	661	7.55	—	25	120	50
360	360	300	14	24	21	270	192	150	1.856	45120	2510	15.3	10810	721	7.51	—	25	120	50
380	380	300	14	24	21	290	194	153	1.896	50950	2680	16.2	10810	721	7.46	—	25	120	50
400	400	300	14	26	21	306	209	164	1.936	60640	3030	17.0	11710	781	7.49	306	25	120	50
425	425	300	14	26	21	331	212	166	1.786	69480	3270	18.1	11710	781	7.43	330	25	120	50
450	450	300	15	28	23	348	232	182	2.031	84220	3740	19.0	12620	841	7.38	350	25	120	50
475	475	300	15	28	23	373	235	185	2.081	95120	4010	20.1	12620	841	7.32	376	25	120	50
500	500	300	16	30	24	392	255	200	2.127	113200	4530	21.0	13530	902	7.28	396	28	120	50
550	550	300	16	30	24	442	263	207	2.227	140300	5100	23.1	13530	902	7.17	440	28	120	50
600	600	300	17	32	26	484	289	227	2.321	180800	6030	25.0	14440	962	7.07	480	28	120	50
650	650	300	17	32	26	534	297	234	2.421	216800	6670	27.0	14440	962	6.97	522	28	120	50
700	700	300	18	34	27	578	324	254	2.577	270300	7720	28.9	15350	1020	6.88	562	28	120	50
750	750	300	18	34	27	628	333	261	2.637	316300	8430	30.8	15350	1020	6.79	602	28	120	50
800	800	300	18	34	27	678	342	268	2.717	366400	9160	32.7	15350	1020	6.70	642	28	120	50
900	900	300	19	36	30	768	381	299	2.911	506000	11250	36.4	16270	1080	6.53	718	28	120	50
1000	1000	300	19	36	30	868	400	314	3.111	648700	12900	40.1	16270	1080	6.37	794	28	120	50



Profile No	Dimensions						Area cm ²	Weight kg/m	Axis y cm	Shear Center cm	Properties of Section						Distance for I _x =I _y		Rivets		
	h mm	b mm	s mm	t mm	t ₁ mm	h ₁ mm					Axis x-x			Axis y-y			for I _x =I _y		d _{max} mm	W mm	
											I _x cm ⁴	Z _x cm ³	i _x cm	I _y cm ⁴	Z _y cm ³	i _y cm					
Non-Structural Shapes																					
30x15	30	15	4	2.5	3.9	-	2.21	1.74	0.62	0.74	253	1.69	1.07	0.38	0.39	0.42	5	-	-	-	
30	30	33	5	7	5.7	-	5.44	4.27	1.31	222	639	4.26	1.08	5.33	268	0.99	-	-	-	-	
40x20	40	20	5	5	4.2	-	3.51	2.75	0.65	0.98	726	3.63	1.44	1.06	0.78	0.55	135	-	-	-	
40	40	35	5	7	5.6	-	6.21	4.87	1.33	232	14.1	7.05	1.50	6.68	308	1.04	-	-	11	20	
50x25	50	25	6	6.5	5.5	-	5.50	4.32	0.82	1.26	18.0	7.78	1.81	2.94	1.75	0.73	18	-	-	-	
50	50	38	5	7	5.5	-	7.12	5.59	1.37	247	26.4	10.6	1.92	9.12	3.73	1.13	4	-	11	20	

60x30	60	30	6	6	4.8	-	6.46	5.07	0.91	1.50	31.6	10.5	2.21	4.51	2.16	0.84	125	-	-	-
65	65	42	5.5	7.5	5.8	-	9.63	7.09	1.42	260	57.5	17.7	2.52	14.1	5.07	1.25	16	-	11	25
Structural Shapes																				
80	80	45	6	0	6.2	46	11.0	8.64	1.46	267	106	26.5	310	19.4	6.36	1.33	28	-	13	25
100	100	50	6	8.5	6.5	64	13.5	10.6	1.55	293	206	41.2	391	29.3	8.49	1.47	42	104	13	30
120	120	55	7	9	6.8	82	17.0	13.4	1.60	303	364	60.7	462	43.2	11.1	1.59	56	120	17	30
140	140	60	7	10	7.6	98	20.4	16.0	1.75	337	605	86.4	5.45	62.7	14.8	1.75	70	140	17	35
160	160	65	7.5	10.5	7.9	115	24.0	18.8	1.84	356	925	116	6.21	85.3	18.3	1.89	82	156	21	35
180	180	70	8	11	8.2	133	28.0	22.0	1.92	375	1350	150	6.75	114	22.4	2.02	96	174	21	40
200	200	75	8.5	11.5	8.5	151	32.2	25.3	2.01	394	1910	191	7.70	148	27.0	2.14	108	190	21	40
220	220	80	9	12.5	9.3	167	37.4	29.4	2.14	420	2690	245	8.48	197	33.6	2.30	122	208	21	45
240	240	85	9.5	13	9.6	184	42.3	33.2	2.23	439	3600	300	9.22	248	39.6	2.42	134	224	25	45
260	260	90	10	14	10.4	200	48.3	37.9	2.36	466	4820	371	9.99	317	47.7	2.56	146	240	25	50
280	280	95	10	15	11.2	216	53.3	41.8	2.53	502	6280	448	10.9	399	57.2	2.74	160	262	25	50
300	300	100	10	16	12.0	232	58.8	46.2	2.70	541	8030	535	11.7	495	67.8	2.90	174	282	25	55
320	320	100	14	17.5	15.4	246	75.8	59.5	2.90	482	10870	679	12.1	597	80.6	2.81	182	286	25	55
350	350	100	14	16	13.9	282	77.3	60.6	2.40	445	12000	734	12.9	570	75.0	2.72	204	300	25	55
380	380	102	13.3	16	14.5	312	79.7	62.6	2.35	543	15730	826	14.1	613	78.4	2.78	230	324	25	55
400	400	110	14	18	15.6	320	91.5	71.8	2.68	511	20360	1020	14.9	846	102	3.04	240	346	25	60