Design Tables For PermaStruct® FRP Profile Types

Modulus of Elasticity (Instantaneous)	14500 MPa
Tensile strength	207 MPa
Compressive strength	207 MPa
Flexural Tensile and Compressive strength	207 MPa
Shear Strength	31 MPa
Allowable Shear at WLL	10.3 Mpa with FOS 3
Density	1938 kg/m3
Creep Factor	1.2

To Use Tables below;

1. Guess a section for the Span length required.
2. Decide maximum tolerable deflection, d.max.
3. Determine proportion of load (including self weight of FRP section) which is Long Term, kr
4. Determine instantaneous deflection, d.inst, which including Long Term load will produce maximum tolerable deflection in the Long Term - **d.inst = d.max/(1 + kr x Creep Factor)**
5. For the section selected, from the Table below, determine the design UDL, w*, which includes the section self weight and which produces d.inst. - **w* = UDL from Table x {d.inst/(Span/1000)}**
6. **If w* x Span < max allow WLL the section is acceptable**, although you may try to find a smaller acceptable section.
7. If the Table gives a " - " solution you have a short stiff section which has less than Span/1000 instantaneous deflection at max WLL. You may use any w* x Span < max allow WLL, but if you need to know the deflection more precisely than "less than instantaneous Span/1000" you need to do engineering calculations, or choose a less stiff section.

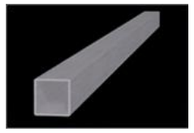
If the Table gives a blank solution, you have quite a flexible section for that Span, such that the self weight of the section alone gives instantaneous deflections exceeding Span/1000.
Either choose a stiffer section, or do engineering calculations, which are likely to show large deflections.

[1] max allow WLL is the maximum allowable Working Live Load, which in this case includes all transient and permanent loads, including the section weight. **max allow WLL > w* x Span**

Note: These calculations assume that the section is supported transversely with sufficient continuity such that compression flange buckling does not occur and that channels and equal angles bend about their horizontal Neutral Axis parallel to the flange.

PROFILE TYPE	dimensions (mm)			Weight	Area	I value	Neutral Axis	Z modulus	Max Allow	Span (m)																					
	Width	0	0	kg/m	mm2	mm4 x 1E-3	mm	mm3 (min) x 1E-3	WLL[1] kg	1.00	1.25	1.50	1.75	2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50	4.75	5.00	5.25	5.50	5.75	6.00
										Uniformly Distributed Load (UDL) to Produce Short Term Deflection = Span/250, kg/m																					
PARALLEL FLANGE CHANNEL	**38**	**32**	**2.4**	0.48	248	44	16.0	2.8	49	5.0	2.6	1.5	0.9	0.6																	
	14	**50**	**3.2**	0.44	229	71	25.0	2.8	101	8.1	4.1	2.4	1.5	1.0	0.7	0.5															
	30	**50**	**4**	0.79	408	152	25.0	6.1	126	17.3	8.8	5.1	3.2	2.2	1.5	1.1	0.8														
	25	**59**	**4**	0.78	404	196	29.5	6.6	149	22.2	11.4	6.6	4.1	2.8	2.0	1.4	1.1	0.8													
	19	**64**	**2.6**	0.49	252	137	32.0	4.3	105	15.6	8.0	4.6	2.9	1.9	1.4	1.0	0.7	0.6													
	25	**67**	**4**	0.84	436	267	33.5	8.0	169	30.3	15.5	9.0	5.7	3.8	2.7	1.9	1.5	1.1	0.9												
	25	**71**	**3.2**	0.71	367	256	35.5	7.2	144	29.0	14.9	8.6	5.4	3.6	2.6	1.9	1.4	1.1	0.8												
	22	**76**	**6.4**	1.33	686	477	38.0	12.5	307	54.1	27.7	16.0	10.1	6.8	4.7	3.5	2.6	2.0	1.6												
	25	**76**	**6.35**	1.39	719	520	38.0	13.7	305	59.1	30.2	17.5	11.0	7.4	5.2	3.8	2.8	2.2	1.7												
	25.4	**76**	**6.36**	1.41	726	527	38.0	13.9	305	59.8	30.6	17.7	11.2	7.5	5.3	3.8	2.9	2.2	1.7												
	38	**76**	**6.4**	1.73	891	725	38.0	19.1	307	82.3	42.2	24.4	15.4	10.3	7.2	5.3	4.0	3.0	2.4	1.9											
	50	**100**	**6**	2.19	1128	1668	50.0	33.4	379	189.3	96.9	56.1	35.3	23.7	16.6	12.1	9.1	7.0	5.5	4.4	3.6	3.0	2.5								
	27	**102**	**3.2**	0.93	479	655	51.0	12.8	206	74.3	38.1	22.0	13.9	9.3	6.5	4.8	3.6	2.8	2.2	1.7	1.4	1.2	1.0								
	44	**102**	**4.8**	1.68	866	1314	51.0	25.8	309	149.2	76.4	44.2	27.8	18.6	13.1	9.5	7.2	5.5	4.3	3.5	2.8	2.3	1.9								
	35	**127**	**6.4**	2.28	1179	2425	63.5	38.2	514	275.3	140.9	81.6	51.4	34.4	24.2	17.6	13.2	10.2	8.0	6.4	5.2	4.3	3.6	3.0	2.6						
	50	**150**	**6**	2.77	1428	4426	75.0	59.0	569	502.5	257.3	148.9	93.8	62.8	44.1	32.2	24.2	18.6	14.6	11.7	9.5	7.9	6.5	5.5	4.7	4.0	3.5	3.0			
	41	**152**	**6.4**	2.74	1416	4222	76.0	55.5	615	479.2	245.4	142.0	89.4	59.9	42.1	30.7	23.0	17.7	14.0	11.2	9.1	7.5	6.2	5.3	4.5	3.8	3.3	2.9			
	43	**152**	**9.5**	4.03	2081	6016	76.0	79.2	913	682.9	349.7	202.4	127.4	85.4	60.0	43.7	32.8	25.3	19.9	15.9	13.0	10.7	8.9	7.5	6.4	5.5	4.7	4.1			
	44	**178**	**4.8**	2.39	1231	5079	89.0	57.1	540	-	295.2	170.8	107.6	72.1	50.6	36.9	27.7	21.4	16.8	13.4	10.9	9.0	7.5	6.3	5.4	4.6	4.0	3.5	3.0	2.7
	50	**178**	**6.4**	3.29	1697	7118	89.0	80.0	720	-	413.7	239.4	150.8	101.0	70.9	51.7	38.9	29.9	23.5	18.8	15.3	12.6	10.5	8.9	7.5	6.5	5.6	4.9	4.3	3.7
	56	**203**	**6.4**	3.75	1934	10599	101.5	104.4	821	-	616.0	356.5	224.5	150.4	105.6	77.0	57.9	44.6	35.0	28.1	22.8	18.8	15.7	13.2	11.2	9.6	8.3	7.2	6.3	5.6
	56	**203**	**9.5**	5.45	2812	14899	101.5	146.8	1219	-	866.0	501.1	315.6	211.4	148.5	108.2	81.3	62.6	49.3	39.4	32.1	26.4	22.0	18.6	15.8	13.5	11.7	10.2	8.9	7.8
	57	**254**	**2.4**	1.69	872	7425	127.0	58.5	385	-	-	249.7	157.3	105.4	74.0	53.9	40.5	31.2	24.6	19.7	16.0	13.2	11.0	9.2	7.9	6.7	5.8	5.1	4.4	3.9
	70	**254**	**3.2**	2.40	1240	11093	127.0	87.3	514	-	-	-	235.0	157.4	110.6	80.6	60.5	46.6	36.7	29.4	23.9	19.7	16.4	13.8	11.7	10.1	8.7	7.6	6.6	5.8
	70	**254**	**12.7**	9.07	4681	38548	127.0	303.5	2039	-	-	1296.6	816.5	547.0	384.2	280.1	210.4	162.1	127.5	102.1	83.0	68.4	57.0	48.0	40.8	35.0	30.2	26.3	23.0	20.3
	76	**610**	**6.4**	9.29	4795	202204	305.0	663.0	2467	-	-	-	-	-	-	-	-	-	668.7	535.4	435.3	358.6	299.0	251.9	214.2	183.6	158.6	138.0	120.7	106.3
	102	**610**	**12.7**	19.41	10015	442559	305.0	1451.0	4896	-	-	-	-	-	-	-	-	-	1463.5	1171.7	952.7	785.0	654.4	551.3	468.8	401.9	347.2	302.0	264.3	232.6

PROFILE TYPE	dimensions (mm)			Weight	Area	I value	Neutral Axis	Z modulus	Max Allow	Span (m)																					
	Width	0	0	kg/m	mm2	mm4 x 1E-3	mm	mm3 (min) x 1E-3	WLL[1] kg	1.00	1.25	1.50	1.75	2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50	4.75	5.00	5.25	5.50	5.75	6.00
										Uniformly Distributed Load (UDL) to Produce Short Term Deflection = Span/250, kg/m																					
EQUAL ANGLE	**25**	**25**	**3.2**	0.29	150	8.7	7.4	1.2	51	1.0	0.5	0.3																		
	25	**25**	**6.4**	0.54	279	15	8.5	1.7	101	1.7	0.9																			
	38	**38**	**3.2**	0.45	233	32	10.7	3.0	77	3.7	1.9	1.1	0.7	0.5																
	38	**38**	**4.8**	0.66	342	46	11.3	4.1	115	5.2	2.7	1.5	1.0																	
	38	**38**	**6.4**	0.86	445	58	11.8	4.9	154	6.5	3.3	1.9	1.2																	
	50	**50**	**3**	0.56	291	71	13.6	5.3	95	8.1	4.2	2.4	1.5	1.0	0.7															
	50	**50**	**3.2**	0.60	310	76	13.7	5.5	101	8.6	4.4	2.6	1.6	1.1	0.8															
	50	**50**	**5**	0.92	475	113	14.3	7.8	158	12.8	6.5	3.8	2.4	1.6	1.1															
	50	**50**	**6**	1.09	564	131	14.7	8.9	190	14.9	7.6	4.4	2.8	1.9	1.3															
	50	**50**	**6.4**	1.16	599	138	14.8	9.3	202	15.7	8.0	4.7	2.9	2.0	1.4															
	50	**50**	**9.5**	1.67	860	189	15.9	11.9	300	21.5	11.0	6.4	4.0	2.7	1.9															
	60	**60**	**8**	1.74	896	297	17.9	16.6	303	33.7	17.3	10.0	6.3	4.2	3.0	2.2														
	75	**75**	**10**	2.71	1400	725	22.4	32.3	474	82.3	42.1	24.4	15.4	10.3	7.2	5.3	4.0	3.0												
	76	**76**	**3.2**	0.92	476	275	20.2	13.6	154	31.2	16.0	9.2	5.8	3.9	2.7	2.0	1.5	1.2												
	76	**76**	**4.8**	1.37	707	400	20.8	19.2	231	45.4	23.2	13.4	8.5	5.7	4.0	2.9	2.2	1.7												
	76	**76**	**6.4**	1.81	932	517	21.4	24.2	307	58.7	30.1	17.4	11.0	7.3	5.2	3.8	2.8	2.2												
	76	**76**	**9.5**	2.62	1354	725	22.5	32.2	456	82.3	42.1	24.4	15.4	10.3	7.2	5.3	4.0	3.0												
	100	**100**	**6.4**	2.40	1239	1213	27.4	44.3	404	137.7	70.5	40.8	25.7	17.2	12.1	8.8	6.6	5.1	4.0	3.2	2.6									
	100	**100**	**8**	2.98	1536	1482	28.0	53.0	506	168.2	86.1	49.8	31.4	21.0	14.8	10.8	8.1	6.2	4.9	3.9	3.2									
	102	**102**	**12.7**	4.71	2430	2344	30.2	77.7	819	266.1	136.2	78.8	49.6	33.3	23.4	17.0	12.8	9.9	7.8	6.2	5.0									
	152	**152**	**6.4**	3.69	1905	4399	40.4	108.9	615	499.3	255.6	147.9	93.2	62.4	43.8	32.0	24.0	18.5	14.5	11.6	9.5	7.8	6.5	5.5	4.7	4.0				
	152	**152**	**9.5**	5.42	2798	6337	41.5	152.6	913	719.4	368.3	213.2	134.2	89.9	63.2	46.0	34.6	26.6	21.0	16.8	13.6	11.2	9.4	7.9	6.7	5.8				
	152	**152**	**12.7**	7.17	3700	8219	42.7	192.5	1220	933.0	477.7	276.4	174.1	116.6	81.9	59.7	44.9	34.6	27.2	21.8	17.7	14.6	12.2	10.2	8.7	7.5				

PROFILE TYPE	dimensions (mm)			Weight	Area	I value	Neutral Axis	Z modulus	Max Allow	Span (m)																				
	Width	0	0	kg/m	mm2	mm4 x 1E-3	mm	mm3 (min) x 1E-3	WLL[1] kg	1.00	1.25	1.50	1.75	2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50	4.75	5.00	5.25	5.50	5.75	6.00
										Uniformly Distributed Load (UDL) to Produce Short Term Deflection = Span/250, kg/m																				
SQUARE HOLLOW SECTION	25	25	3	0.51	264	22	12.5	1.7	95	2.5	1.3	0.7																		
	25	25	3	0.51	264	22	12.5	1.7	95	2.5	1.3	0.7																		
	25	25	3.2	0.54	279	23	12.5	1.8	101	2.6	1.3	0.8																		
	32	32	6.4	1.27	655	76	16.0	4.8	259	8.6	4.4	2.6	1.6																	
	38	38	3.2	0.86	445	91	19.0	4.8	154	10.3	5.3	3.0	1.9	1.3	0.9															
	38	38	5	1.28	660	123	19.0	6.4	240	13.9	7.1	4.1	2.6	1.7																
	38	38	6.4	1.57	809	140	19.0	7.4	307	15.9	8.1	4.7	3.0	2.0																
	44	44	3.2	1.01	522	146	22.0	6.6	178	16.5	8.5	4.9	3.1	2.1	1.5	1.1														
	44	44	6.4	1.87	963	233	22.0	10.6	356	26.5	13.6	7.8	4.9	3.3	2.3															
	50	50	3.2	1.16	599	220	25.0	8.8	202	24.9	12.8	7.4	4.7	3.1	2.2	1.6	1.2													
	50	50	6.4	2.16	1116	361	25.0	14.4	404	41.0	21.0	12.2	7.7	5.1	3.6	2.6														
	51	51	3.2	1.19	612	234	25.5	9.2	206	26.6	13.6	7.9	5.0	3.3	2.3	1.7	1.3													
	51	51	6.35	2.20	1134	384	25.5	15.1	409	43.6	22.3	12.9	8.1	5.5	3.8	2.8														
	54	54	4.8	1.83	945	385	27.0	14.2	328	43.7	22.4	12.9	8.1	5.5	3.8	2.8	2.1													
	60	60	4.5	1.94	999	516	30.0	17.2	341	58.6	30.0	17.4	10.9	7.3	5.1	3.8	2.8	2.2												
	64	64	6.4	2.86	1475	825	32.0	25.8	518	93.7	48.0	27.8	17.5	11.7	8.2	6.0	4.5	3.5												
	76	76	6.4	3.45	1782	1451	38.0	38.2	615	164.7	84.3	48.8	30.7	20.6	14.5	10.5	7.9	6.1	4.8	3.8										
	102	102	6.4	4.74	2447	3745	51.0	73.4	825	425.1	217.6	125.9	79.3	53.1	37.3	27.2	20.4	15.7	12.4	9.9	8.1	6.6	5.5							

PROFILE TYPE	dimensions (mm)			Weight	Area	I value	Neutral Axis	Z modulus	Max Allow	Span (m)																				
	Width	0	0	kg/m	mm2	mm4 x 1E-3	mm	mm3 (min) x 1E-3	WLL[1] kg	1.00	1.25	1.50	1.75	2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50	4.75	5.00	5.25	5.50	5.75	6.00
										Uniformly Distributed Load (UDL) to Produce Short Term Deflection = Span/250, kg/m																				
CIRCULAR HOLLOW SECTION	7.9	OD	2.3	0.08	40	0.19	3.95	0.0	16																					
	16.2	OD	2	0.17	89	2.3	8.1	0.3	35	0.3																				
	17	OD	1.9	0.17	90	2.6	8.5	0.3	35	0.3																				
	19	OD	3.2	0.31	159	5.2	9.5	0.5	62	0.6																				
	22	OD	2.5	0.30	153	7.4	11.0	0.7	59	0.8	0.4																			
	23	OD	1.5	0.20	101	5.9	11.5	0.5	39	0.7	0.3	0.2																		
	25	OD	1.5	0.21	111	7.7	12.5	0.6	43	0.9	0.4	0.3																		
	25	OD	3.25	0.43	222	13	12.5	1.1	86	1.5	0.8	0.5																		
	32	OD	3	0.53	273	29	16.0	1.8	106	3.3	1.7	1.0	0.6																	
	37	OD	2	0.43	220	34	18.5	1.8	85	3.8	2.0	1.1	0.7	0.5																
	38	OD	6.5	1.25	643	83	19.0	4.4	249	9.4	4.8	2.8	1.8																	
	44	OD	2	0.51	264	58	22.0	2.7	102	6.6	3.4	2.0	1.2	0.8	0.6															
	48.3	OD	6.65	1.69	870	193	24.2	8.0	337	22.0	11.2	6.5	4.1	2.7	1.9															
	50	OD	6	1.61	829	204	25.0	8.2	321	23.2	11.9	6.9	4.3	2.9	2.0															
	51	OD	2	0.60	308	93	25.5	3.6	119	10.5	5.4	3.1	2.0	1.3	0.9	0.7														
	58	OD	2	0.68	352	138	29.0	4.8	136	15.7	8.0	4.6	2.9	2.0	1.4	1.0	0.8													
	76	OD	2.4	1.08	555	376	38.0	9.9	215	42.7	21.9	12.7	8.0	5.3	3.7	2.7	2.1	1.6	1.2											

PROFILE TYPE	dimensions (mm)			Weight	Area	I value	Neutral Axis	Z modulus	Max Allow	Span (m)																				
	Width	Depth	Thickness	kg/m	mm2	mm4 x 1E-3	mm	mm3 (min) x 1E-3	WLL[1] kg	1.00	1.25	1.50	1.75	2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50	4.75	5.00	5.25	5.50	5.75	6.00
										Uniformly Distributed Load (UDL) to Produce Short Term Deflection = Span/250, kg/m																				
I-BEAM	38	76	6.4	1.73	891	725	38.0	19.1	307	82.3	42.2	24.4	15.4	10.3	7.2	5.3	4.0	3.0	2.4	1.9										
	51	102	6.4	2.37	1224	1872	51.0	36.7	413	212.5	108.8	63.0	39.7	26.6	18.7	13.6	10.2	7.9	6.2	5.0	4.0	3.3	2.8							
	70	120	8	3.78	1952	4268	60.0	71.1	607	484.5	248.1	143.6	90.4	60.6	42.5	31.0	23.3	17.9	14.1	11.3	9.2	7.6	6.3	5.3	4.5	3.9				
	76	152	6.4	3.61	1864	6598	76.0	86.8	615	-	383.5	221.9	139.7	93.6	65.7	47.9	36.0	27.7	21.8	17.5	14.2	11.7	9.8	8.2	7.0	6.0	5.2	4.5	3.9	
	76	152	9.5	5.25	2708	9204	76.0	121.1	913	-	534.9	309.6	194.9	130.6	91.7	66.9	50.2	38.7	30.4	24.4	19.8	16.3	13.6	11.5	9.7	8.4	7.2	6.3	5.5	
	101.5	203	9.5	7.13	3677	22998	101.5	226.6	1219	-	-	773.5	487.1	326.3	229.2	167.1	125.5	96.7	76.1	60.9	49.5	40.8	34.0	28.6	24.4	20.9	18.0	15.7	13.7	12.1
	102.5	203	9.5	7.16	3696	23176	101.5	228.3	1219	-	-	779.5	490.9	328.9	231.0	168.4	126.5	97.4	76.6	61.4	49.9	41.1	34.3	28.9	24.5	21.0	18.2	15.8	13.8	12.2
	127	254	9.5	9.00	4646	46355	127.0	365.0	1525	-	-	-	-	657.8	462.0	336.8	253.0	194.9	153.3	122.7	99.8	82.2	68.5	57.7	49.1	42.1	36.4	31.6	27.7	24.4
	127	254	12.7	11.88	6129	59642	127.0	469.6	2039	-	-	-	-	846.3	594.4	433.3	325.6	250.8	197.2	157.9	128.4	105.8	88.2	74.3	63.2	54.2	46.8	40.7	35.6	31.3
	152.5	305	12.7	14.39	7424	105922	152.5	694.6	2448	-	-	-	-	-	1055.6	769.5	578.2	445.3	350.3	280.4	228.0	187.9	156.6	132.0	112.2	96.2	83.1	72.3	63.2	55.7

PROFILE TYPE	dimensions (mm)			Weight	Area	I value	Neutral Axis	Z modulus	Max Allow
	Width	0	0	kg/m	mm2	mm4 x 1E-3	mm	mm3 (min) x 1E-3	WLL[1] kg
WIDE FLANGE I-BEAM	**76**	**76**	**6.4**	2.67	1377	1316	38.0	34.6	307
	102	**102**	**6.4**	3.64	1876	3366	51.0	66.0	413
	152	**152**	**6.4**	5.50	2836	11757	76.0	154.7	615
	152	**152**	**9.5**	8.05	4152	16545	76.0	217.7	913
	203	**203**	**9.5**	10.86	5605	41064	101.5	404.6	1219
	203	**203**	**12.7**	14.36	7412	52680	101.5	519.0	1629
	254	**254**	**9.5**	13.68	7059	82435	127.0	649.1	1525
	254	**254**	**12.7**	18.13	9355	106642	127.0	839.7	2039
	305	**305**	**12.7**	21.90	11298	188712	152.5	1237.5	2448

Span (m)																				
1.00	**1.25**	**1.50**	**1.75**	**2.00**	**2.25**	**2.50**	**2.75**	**3.00**	**3.25**	**3.50**	**3.75**	**4.00**	**4.25**	**4.50**	**4.75**	**5.00**	**5.25**	**5.50**	**5.75**	**6.00**
Uniformly Distributed Load (UDL) to Produce Short Term Deflection = Span/250, kg/m																				
149.4	76.5	44.3	27.9	18.7	13.1	9.6	7.2	5.5	4.4	3.5	2.8									
382.1	195.6	113.2	71.3	47.8	33.5	24.5	18.4	14.2	11.1	8.9	7.2	6.0	5.0	4.2						
-	-	395.4	249.0	166.8	117.2	85.4	64.2	49.4	38.9	31.1	25.3	20.9	17.4	14.6	12.5	10.7	9.2	8.0	7.0	6.2
-	-	556.5	350.4	234.8	164.9	120.2	90.3	69.6	54.7	43.8	35.6	29.3	24.5	20.6	17.5	15.0	13.0	11.3	9.9	8.7
-	-	-	-	582.7	409.2	298.3	224.1	172.6	135.8	108.7	88.4	72.8	60.7	51.2	43.5	37.3	32.2	28.0	24.5	21.6
-	-	-	-	747.5	525.0	382.7	287.5	221.5	174.2	139.5	113.4	93.4	77.9	65.6	55.8	47.8	41.3	35.9	31.5	27.7
-	-	-	-	-	-	598.9	450.0	346.6	272.6	218.3	177.5	146.2	121.9	102.7	87.3	74.9	64.7	56.2	49.2	43.3
-	-	-	-	-	-	774.8	582.1	448.4	352.6	282.3	229.6	189.2	157.7	132.8	113.0	96.8	83.7	72.8	63.7	56.0
-	-	-	-	-	-	-	-	793.4	624.0	499.6	406.2	334.7	279.1	235.1	199.9	171.4	148.0	128.8	112.7	99.2