

Design Guide

Dynaform® Fiberglass Structural Shapes

Corrosion Resistant

Fire Retardant

Low Maintenance

Light Weight

Long Service Life

Fibergrate

Composite Structures

High Performance Composite Solutions

Coupon Properties - Structural Shapes

The values listed below are test results from coupon tests performed in accordance with the noted ASTM Test.

MECHANICAL PROPERTIES	ASTM	UNITS	VALUE
Tensile Stress, LW	D-638	psi	30,000
Tensile Stress, CW	D-638	psi	7,000
Tensile Modulus, LW	D-638	10 ⁶ psi	2.5
Tensile Modulus, CW	D-638	10 ⁶ psi	0.8
Compressive Stress, LW	D-695	psi	30,000
Compressive Stress, CW	D-695	psi	15,000
Compressive Modulus, LW	D-695	10 ⁶ psi	2.5
Compressive Modulus, CW	D-695	10 ⁶ psi	1.0
Flexural Stress, LW	D-790	psi	30,000
Flexural Stress, CW	D-790	psi	10,000
Flexural Modulus, LW	D-790	10 ⁶ psi	1.8
Flexural Modulus, CW	D-790	10 ⁶ psi	0.8
Modulus of Elasticity, E	Full Section	10 ⁶ psi	2.8
Shear Modulus	---	10 ⁶ psi	0.450
Short Beam Shear	D-2344	psi	4,500
Punch Shear	D-732	psi	10,000
Bearing Stress, LW	D-953	psi	30,000
Notched Izod Impact, LW	D-256	ft-lbs/in	25
Notched Izod Impact, CW	D-256	ft-lbs/in	4

PHYSICAL PROPERTIES	ASTM	UNITS	VALUE
Barcol Hardness	D-2583	---	45
24 Hour Water Absorption	D-570	% max	0.45
Density	D-792	lbs/in ³	.062-.070
Coefficient of Thermal Expansion, LW	D-696	10 ⁻⁶ in/in/°C	8

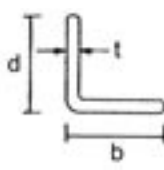
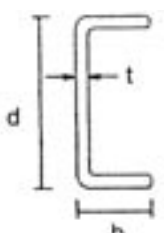
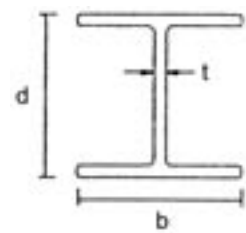
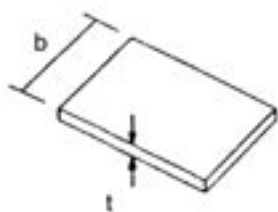
ELECTRICAL PROPERTIES	ASTM	UNITS	VALUE
Arc Resistance, LW	D-495	seconds	120
Dielectric Strength, LW	D-149	kv/in	35
Dielectric Strength, PF	D-149	volts/mil	200
Dielectric Constant, PF	D-150	@60hz	5

ISOFR and VEFR Fire Retardant Structural Profiles:

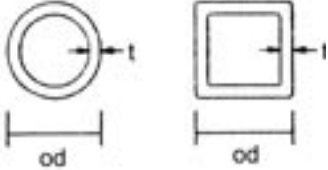

FLAMMABILITY PROPERTIES	ASTM	UNITS	VALUE
Tunnel Test	E-84	Flame Spread	25 max
Flammability	D-635	---	Nonburning

LW = Lengthwise CW = Crosswise PF = Perpendicular to Laminate Face

Cross Sectional Tolerances



SHAPE	DIMENSION	TOLERANCE	MAXIMUM OR MINIMUM TOLERANCES
ANGLES 	t = thickness	$\pm 10\%$	± 0.010 " minimum
	b = flange width	$\pm 5\%$	± 0.094 " maximum
	d = depth	$\pm 5\%$	± 0.094 " maximum
CHANNELS 	t = thickness	$\pm 10\%$	± 0.010 " minimum
	b = flange width	$\pm 5\%$	± 0.094 " maximum
	d = depth	$\pm 5\%$	± 0.094 " maximum
WIDE FLANGE, I SHAPES 	t = thickness	$\pm 10\%$	± 0.010 " minimum
	b = flange width	$\pm 5\%$	± 0.094 " maximum
	d = depth	$\pm 5\%$	± 0.094 " maximum
FLAT SHEET 	t = thickness	$\pm 10\%$	± 0.040 " maximum
	b = width	$\pm 3\%$	± 0.094 " maximum

Cross Sectional Tolerances

SHAPE	DIMENSION	OUTSIDE DIMENSION CONDITION	TOLERANCES
ROUND & SQUARE TUBE 	t = thickness	Under 1"	± 20%
		1" and up	± 15 %
	od = outside dimension	Under 2"	± 0.020"
		2" and up	± 0.040"
ROUND ROD & SQUARE BAR 	od = outside dimension	Up to 3"	± 0.010"

FLATNESS

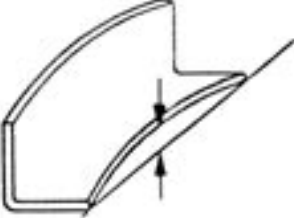
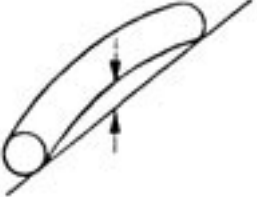

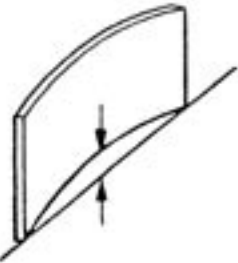
Flatness is measured in the center with the weight of the profile minimizing the deviation by contact with a flat surface.

STRUCTURAL SHAPES RODS, BARS, & SHEET 	Allowable deviation from flat		
	Width	All Thicknesses	
	Up to 1"	0.008"	
	Over 1"	0.008"/inch	
HOLLOW SHAPES 	Allowable deviation from flat		
	Width	Thickness 0.125" to 0.188"	Thickness 0.189" and over
	Up to 1"	0.012"	0.008"
	Over 1"	0.012"/inch	0.008"/inch

Cross Sectional Tolerances

STRAIGHTNESS

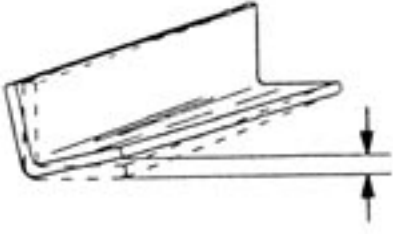
Straightness is measured in the center with the weight of the pultrusion minimizing the deviation by contact with a flat surface.

<p>ANGLE, BEAM AND CHANNEL</p> 	<p>Allowable deviation from straight</p>	
	<p>All widths</p>	<p>0.050"/foot</p>
<p>RODS AND BARS</p> 	<p>Allowable deviation from straight</p>	
	<p>Diameter/Depth</p>	<p>Per Foot</p>
	<p>Up to 1"</p>	<p>0.020"</p>
	<p>Over 1"</p>	<p>0.040"</p>
<p>ROUND, SQUARE, AND RECTANGULAR TUBE</p> 	<p>Allowable deviation from straight</p>	
	<p>Diameter/Depth</p>	<p>Per Foot</p>
	<p>Up to 2"</p>	<p>0.020"</p>
	<p>Over 2"</p>	<p>0.030"</p>
<p>SHEET AND PLATE</p> 	<p>Allowable deviation from straight</p>	
	<p>All thicknesses and widths</p>	<p>0.025"/foot</p>

Cross Sectional Tolerances

TWIST

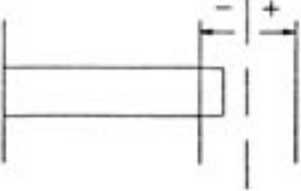
Twist is measured with the weight of the pultrusion minimizing the twist.

	ALL PROFILES		
	Allowable twist		
	Width/Depth	Per Foot	Per Piece Max
	Up to 1.499"	$\tan 1^\circ \times \text{width}$	$\tan 7^\circ \times \text{width}$
	1.500" to 2.999"	$\tan 1/2^\circ \times \text{width}$	$\tan 5^\circ \times \text{width}$
3.000" and over	$\tan 1/3^\circ \times \text{width}$	$\tan 3^\circ \times \text{width}$	

ANGULARITY

ALL PROFILES	Allowable deviation from specific angle	
	thickness up to 3/4"	$\tan 1\ 1/2^\circ \times \text{width of flange in inches}$

CUT LENGTHS

	ALL PROFILES	
	Allowable deviation from specific length	
	Up to 20'	-0", + 1/2"
Over 20' to 50'	-0", + 1"	

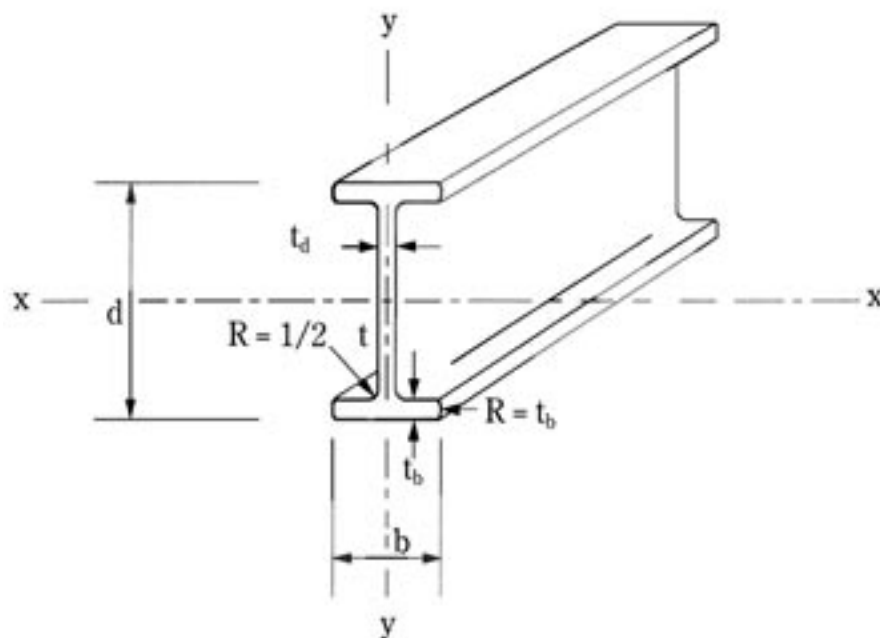
SQUARENESS OF ENDCUT

ALL PROFILES	Allowable deviation from square	
	All thicknesses	$\tan 1^\circ \times \text{width in inches}$

Section Properties

I SHAPES

SECTION DIMENSIONS					SECTION PROPERTIES					
					X - X			Y - Y		
d	b	t	A	Wt.	I	S	r	I	S	r
in.	in.	in.	in. ²	lb./ft.	in. ⁴	in. ³	in.	in. ⁴	in. ³	in.
3	1 1/2	1/4	1.38	1.10	1.75	1.17	1.13	0.14	0.19	0.32
4	2	1/4	1.88	1.50	4.41	2.21	1.53	0.34	0.34	0.43
6	3	1/4	2.88	2.20	16.99	5.66	2.43	1.13	0.75	0.63
6	3	3/8	4.23	3.20	22.35	7.45	2.30	1.71	1.14	0.64
8	4	3/8	5.73	4.30	55.55	13.89	3.11	4.03	2.02	0.84
8	4	1/2	7.51	5.70	70.62	17.66	3.07	5.40	2.70	0.85
10	5	3/8	7.22	5.78	111.63	22.33	3.93	7.85	3.14	1.04
10	5	1/2	9.51	7.20	143.29	28.66	3.88	10.51	4.21	1.05
12	6	1/2	11.51	8.70	253.96	42.33	4.70	18.11	6.04	1.26
18	4 1/2	3/8-1/2	10.92	8.70	498.15	55.35	6.75	7.66	3.40	0.84
24	7 1/2	3/8-3/4	19.90	15.20	1877.00	156.42	9.76	52.83	14.09	1.64



Beams - Allowable Uniform Load Tables

TABLE NOTATION

- A_w - Area of web (in²)
- Δ - Deflection (in)
- E - Modulus of Elasticity (psi)
- F_b - Maximum Allowable Flexural Stress
for Laterally Supported Beam (psi)
- F_v - Maximum Allowable Shear Stress
for Laterally Supported Beam (psi)
- G - Shear Modulus (psi)
- I - Moment of Inertia (in⁴)
- L - Span Length (in)
- S - Section Modulus (in³)
- V - Vertical Shear (lbs)
- w - Uniform Load (lbs/in)
- M - Maximum Moment (in-lb)

Beams - Allowable Uniform Load Tables

TABLE NOTATION

The allowable uniform load tables were generated using the results from tests and the following formulas, properties and assumptions. The deflection formula reflects that the deflection is the result of both flexural and shear stresses.

$$\Delta = \frac{5wL^4}{384EI} + \frac{wL^2}{4A_w G}$$

$$F_v = \frac{V}{A_w}$$

$$F_b = \frac{M}{S}$$

$$E = 2.8 \times 10^6 \text{ psi}$$

$$G = 450,000 \text{ psi}$$

$$F_b = 10,000 \text{ psi}$$

$$F_v = 1,500 \text{ psi}$$

Adequate lateral support is provided (full lateral support for channels).

LATERAL SUPPORT REQUIREMENTS - FRP STRUCTURAL SHAPES			
MEMBER	LATERAL SUPPORT SPACING	MEMBER	LATERAL SUPPORT SPACING
C6" x 1/4"	48"	W4" x 1/4"	60"
C8 x 3/8"	60"	W6 x 1/4"	84"
C10" x 1/2"	60"	W6" x 3/8"	96"
14" x 1/4"	24"	W8" x 3/8"	108"
16" x 1/4"	36"	W10" x 3/8"	156"
18" x 3/8"	48"	W12" x 1/2"	168"
I10" x 3/8"	60"		
I12" x 1/2"	84"		

Load is applied perpendicular to major axis.

Beam simply supported at both ends.

The part weight has been deducted in the following tables.

Beams - Allowable Uniform Load Tables (lbs/ft)

3 x 1 1/2 x 1/4 I BEAM

Laterally Supported

$$A_w = 0.625 \text{ in}^2$$

$$I_x = 1.75 \text{ in}^4$$

$$S_x = 1.17 \text{ in}^3$$

$$\text{Wt.} = 1.10 \text{ lbs./ft.}$$

SPAN FEET	MAXIMUM LOAD		DEFLECTION				
			L/100	L/150	L/180	L/240	L/360
3	623	F_v	---	511	425	319	212
4	467	F_v	355	236	196	147	97
5	310	F_b	189	126	104	78	51
6	215	F_b	112	74	61	45	30
7	157	F_b	71	46	38	28	18
8	120	F_b	47	31	25	19	12
9	94	F_b	33	21	17	13	8
10	76	F_b	24	15	12	9	5

The part weight has been deducted in the above table.

4 x 2 x 1/4 I BEAM

Laterally Supported

$$A_w = 0.875 \text{ in}^2$$

$$I_x = 4.41 \text{ in}^4$$

$$S_x = 2.21 \text{ in}^3$$

$$\text{Wt.} = 1.50 \text{ lbs./ft.}$$

SPAN FEET	MAXIMUM LOAD		DEFLECTION				
			L/100	L/150	L/180	L/240	L/360
3	873	F_v	---	---	---	692	461
4	654	F_v	---	542	451	338	225
5	523	F_v	449	299	249	186	123
6	407	F_b	271	180	150	112	74
7	299	F_b	175	116	96	72	47
8	228	F_b	119	78	65	48	32
9	180	F_b	84	55	46	34	22
10	145	F_b	61	40	33	24	16
11	120	F_b	46	30	25	18	11
12	100	F_b	35	23	19	13	8

The part weight has been deducted in the above table.

Beams - Allowable Uniform Load Tables (lbs/ft)

6 x 3 x 1/4 I BEAM

Laterally Supported

$$A_w = 1.375 \text{ in}^2$$

$$I_x = 16.99 \text{ in}^4$$

$$S_x = 5.66 \text{ in}^3$$

$$\text{Wt.} = 2.20 \text{ lbs./ft.}$$

SPAN FEET	MAXIMUM LOAD		DEFLECTION				
			L/100	L/150	L/180	L/240	L/360
5	822	F _v	---	---	797	597	397
6	685	F _v	---	607	505	378	251
7	586	F _v	---	405	337	252	167
8	513	F _v	424	282	234	175	116
9	455	F _v	306	203	169	126	83
10	374	F _b	227	150	125	93	61
11	309	F _b	173	114	95	70	46
12	259	F _b	134	88	73	54	35
13	220	F _b	106	70	57	42	27
14	189	F _b	85	56	46	34	21
15	165	F _b	69	45	37	27	17

The part weight has been deducted in the above table.

6 x 3 x 3/8 I BEAM

Laterally Supported

$$A_w = 1.969 \text{ in}^2$$

$$I_x = 22.35 \text{ in}^4$$

$$S_x = 7.45 \text{ in}^3$$

$$\text{Wt.} = 3.20 \text{ lbs./ft.}$$

SPAN FEET	MAXIMUM LOAD		DEFLECTION				
			L/100	L/150	L/180	L/240	L/360
6	981	F _v	---	813	676	506	336
7	840	F _v	812	540	449	336	223
8	734	F _v	564	375	312	233	154
9	609	F _b	406	269	224	167	110
10	493	F _b	301	199	165	123	81
11	406	F _b	229	151	125	93	61
12	341	F _b	177	117	97	72	46
13	290	F _b	140	92	76	56	36
14	249	F _b	112	73	60	44	28
15	217	F _b	91	59	49	36	22
16	190	F _b	75	48	40	29	18
17	168	F _b	62	40	33	23	14
18	149	F _b	52	33	27	19	11

The part weight has been deducted in the above table.

Beams - Allowable Uniform Load Tables (lbs/ft)

8 x 4 x 3/8 I BEAM

Laterally Supported

$$A_w = 2.719 \text{ in}^2$$

$$I_x = 55.55 \text{ in}^4$$

$$S_x = 13.89 \text{ in}^3$$

$$\text{Wt.} = 4.30 \text{ lbs./ft.}$$

SPAN FEET	MAXIMUM LOAD		DEFLECTION				
			L/100	L/150	L/180	L/240	L/360
6	1355	F_v	---	---	---	1083	720
7	1160	F_v	---	---	993	744	494
8	1015	F_v	---	849	707	529	351
9	901	F_v	---	622	518	387	256
10	811	F_v	704	468	389	291	192
11	737	F_v	542	359	299	223	147
12	638	F_b	425	281	234	174	114
13	543	F_b	338	224	186	138	90
14	467	F_b	273	181	150	111	72
15	407	F_b	224	147	122	90	58
16	357	F_b	185	122	101	74	48
17	315	F_b	154	101	84	61	39
18	281	F_b	130	85	70	51	33
19	251	F_b	111	72	59	43	27
20	226	F_b	94	61	50	36	23

The part weight has been deducted in the above table.

Beams - Allowable Uniform Load Tables (lbs/ft)

8 x 4 x 1/2 I BEAM

Laterally Supported

$A_w = 3.50 \text{ in}^2$

$I_x = 70.62 \text{ in}^4$

$S_x = 17.66 \text{ in}^3$

Wt. = 5.70 lbs./ft.

SPAN FEET	MAXIMUM LOAD		DEFLECTION				
			L/100	L/150	L/180	L/240	L/360
6	1744	F_v	---	---	---	1383	920
7	1494	F_v	---	---	1267	949	631
8	1307	F_v	---	1082	901	674	448
9	1161	F_v	---	793	660	494	327
10	1044	F_v	897	596	496	370	245
11	949	F_v	690	458	381	284	187
12	812	F_b	541	358	298	222	146
13	691	F_b	431	285	237	176	115
14	595	F_b	348	230	191	142	92
15	517	F_b	285	188	156	115	75
16	454	F_b	236	155	128	95	61
17	401	F_b	197	129	107	79	50
18	357	F_b	166	109	90	66	42
19	320	F_b	141	92	76	55	35
20	288	F_b	121	78	64	47	29

The part weight has been deducted in the above table.

Beams - Allowable Uniform Load Tables (lbs/ft)

10 x 5 x 3/8 I BEAM

Laterally Supported

$$A_w = 3.469 \text{ in}^2$$

$$I_x = 111.63 \text{ in}^4$$

$$S_x = 22.33 \text{ in}^3$$

$$\text{Wt.} = 5.78 \text{ lbs./ft.}$$

SPAN FEET	MAXIMUM LOAD		DEFLECTION				
			L/100	L/150	L/180	L/240	L/360
6	1728	F_v	---	---	---	---	1225
7	1481	F_v	---	---	---	1305	868
8	1295	F_v	---	---	1270	951	632
9	1150	F_v	---	1141	949	711	472
10	1035	F_v	---	871	725	542	359
11	940	F_v	---	678	564	422	279
12	861	F_v	808	537	446	333	220
13	794	F_v	649	431	358	267	176
14	737	F_v	529	350	291	217	143
15	656	F_b	436	288	239	178	117
16	575	F_b	363	240	199	148	96
17	509	F_b	305	201	167	123	80
18	453	F_b	258	170	141	104	67
19	406	F_b	220	145	120	88	57
20	366	F_b	189	124	103	75	48
21	332	F_b	164	107	88	65	41
22	302	F_b	142	93	76	56	35
23	275	F_b	124	81	66	48	30
24	252	F_b	109	71	58	42	26
25	232	F_b	96	62	51	37	22

The part weight has been deducted in the above table.

Beams - Allowable Uniform Load Tables (lbs/ft)

10 x 5 x 1/2 I BEAM

Laterally Supported

$$A_w = 4.50 \text{ in}^2$$

$$I_x = 143.29 \text{ in}^4$$

$$S_x = 28.66 \text{ in}^3$$

$$\text{Wt.} = 7.20 \text{ lbs./ft.}$$

SPAN FEET	MAXIMUM LOAD		DEFLECTION				
			L/100	L/150	L/180	L/240	L/360
6	2242	F _v	---	---	---	---	1579
7	1921	F _v	---	---	---	1681	1118
8	1680	F _v	---	---	1635	1225	814
9	1492	F _v	---	1468	1222	914	607
10	1342	F _v	---	1120	932	697	462
11	1219	F _v	---	872	725	542	359
12	1117	F _v	1038	690	573	428	283
13	1030	F _v	834	554	460	343	226
14	956	F _v	679	450	374	278	183
15	841	F _b	559	370	307	228	150
16	738	F _b	466	308	255	189	124
17	653	F _b	391	258	214	158	103
18	582	F _b	331	218	180	133	86
19	521	F _b	283	186	153	113	73
20	470	F _b	243	159	131	97	62
21	425	F _b	210	137	113	83	53
22	387	F _b	183	119	98	71	45
23	353	F _b	160	104	85	62	39
24	324	F _b	140	91	74	54	33
25	298	F _b	123	80	65	47	28

The part weight has been deducted in the above table.

Beams - Allowable Uniform Load Tables (lbs/ft)

12 x 6 x 1/2 I BEAM

Laterally Supported

$$A_w = 5.50 \text{ in}^2$$

$$I_x = 253.96 \text{ in}^4$$

$$S_x = 42.33 \text{ in}^3$$

$$\text{Wt.} = 8.70 \text{ lbs./ft.}$$

SPAN FEET	MAXIMUM LOAD		DEFLECTION				
			L/100	L/150	L/180	L/240	L/360
6	2741	F _v	---	---	---	---	2354
7	2348	F _v	---	---	---	---	1715
8	2054	F _v	---	---	---	1922	1278
9	1824	F _v	---	---	---	1463	972
10	1641	F _v	---	---	1514	1134	753
11	1491	F _v	---	1434	1193	893	592
12	1366	F _v	---	1147	954	713	473
13	1260	F _v	---	929	773	577	382
14	1170	F _v	1147	762	633	473	312
15	1091	F _v	951	631	524	391	258
16	1022	F _v	796	528	438	327	215
17	962	F _v	673	445	370	275	180
18	862	F _b	573	379	314	122	153
19	773	F _b	491	324	269	199	130
20	696	F _b	424	279	231	171	111
21	631	F _b	368	242	200	148	96
22	574	F _b	321	211	174	129	83
23	524	F _b	282	185	152	112	72
24	481	F _b	248	162	134	98	62
25	442	F _b	220	143	118	86	55
26	408	F _b	195	127	104	76	48
27	378	F _b	174	113	93	67	42
28	351	F _b	156	101	83	60	37
29	327	F _b	140	90	74	53	32
30	305	F _b	126	81	66	74	28

The part weight has been deducted in the above table.

Beams - Allowable Uniform Load Tables (lbs/ft)

18 x 3/8 x 4 1/2 x 1/2 I BEAM

Laterally Supported

$A_w = 6.375 \text{ in}^2$

$I_x = 498.15 \text{ in}^4$

$S_x = 55.35 \text{ in}^3$

Wt. = 8.70 lbs./ft.

SPAN FEET	MAXIMUM LOAD		DEFLECTION				
			L/100	L/150	L/180	L/240	L/360
8	2382	F_v	---	---	---	---	1996
9	2116	F_v	---	---	---	---	1565
10	1904	F_v	---	---	---	1872	1245
11	1730	F_v	---	---	---	1507	1002
12	1585	F_v	---	---	---	1228	816
13	1462	F_v	---	---	1351	1011	671
14	1357	F_v	---	1349	1123	840	557
15	1266	F_v	---	1132	942	704	466
16	1186	F_v	---	957	796	595	394
17	1116	F_v	---	815	678	506	335
18	1054	F_v	---	700	581	434	286
19	998	F_v	910	604	502	374	246
20	913	F_b	791	524	436	324	213
21	828	F_b	691	458	380	283	186
22	753	F_b	607	402	333	248	162
23	688	F_b	536	354	294	218	142
24	632	F_b	475	313	260	193	125
25	581	F_b	422	279	231	171	111
26	537	F_b	377	248	206	152	98
27	497	F_b	338	222	184	136	87
28	462	F_b	304	200	165	121	78
29	430	F_b	274	180	148	109	70
30	401	F_b	248	162	134	98	62

The part weight has been deducted in the above table.

Beams - Allowable Uniform Load Tables (lbs/ft)

24 x 3/8 x 7 1/2 x 3/4 I BEAM

Laterally Supported

$$A_w = 8.44 \text{ in}^2$$

$$I_x = 1877.00 \text{ in}^4$$

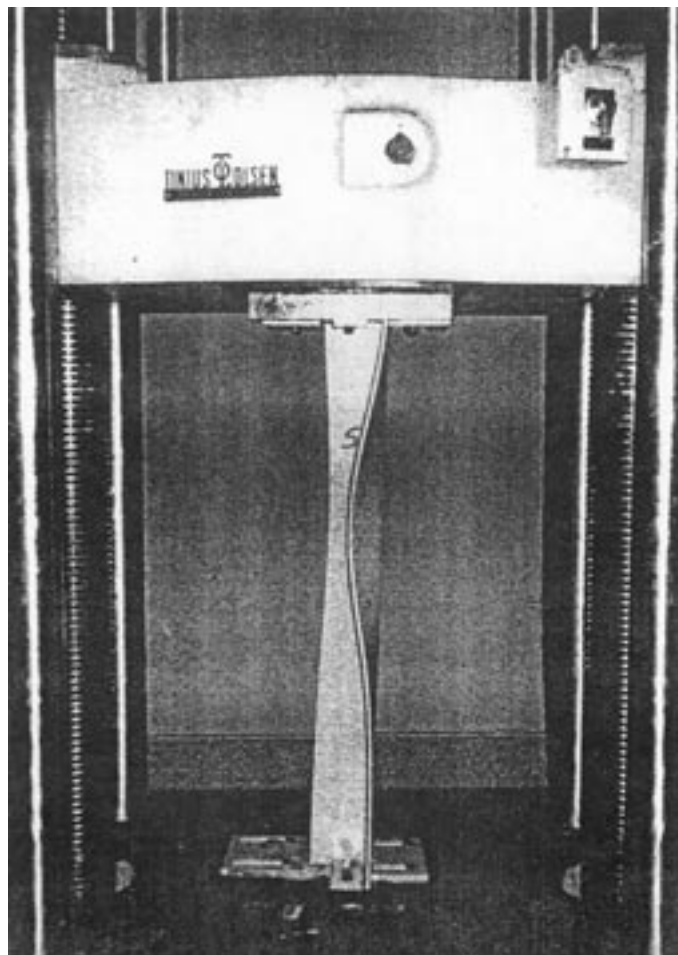
$$S_x = 156.42 \text{ in}^3$$

$$\text{Wt.} = 15.20 \text{ lbs./ft.}$$

SPAN FEET	MAXIMUM LOAD		DEFLECTION				
			L/100	L/150	L/180	L/240	L/360
35	707	F _v	552	363	300	221	142
36	687	F _v	510	335	276	203	130
37	668	F _v	472	309	255	187	119
38	650	F _v	437	286	236	173	110
39	633	F _v	405	265	218	160	101
40	617	F _v	377	246	202	148	93
41	602	F _v	350	228	188	137	86
42	575	F _b	327	212	174	127	79
43	548	F _b	305	198	162	118	73
44	523	F _b	284	184	151	109	67
45	499	F _b	266	172	141	101	62
46	477	F _b	249	161	131	94	58
47	456	F _b	233	150	122	88	53
48	437	F _b	219	140	114	82	49
49	418	F _b	205	131	107	76	45
50	401	F _b	193	123	100	71	42
51	385	F _b	181	116	94	66	39
52	370	F _b	171	108	88	62	36
53	355	F _b	161	102	82	58	33
54	342	F _b	151	96	77	54	31
55	329	F _b	143	90	72	50	28
56	316	F _b	135	84	68	47	26
57	305	F _b	127	79	64	44	24

The part weight has been deducted in the above table.

Columns - Allowable Axial Load Tables



8' long - 6" x 6" x 1/2" Angle

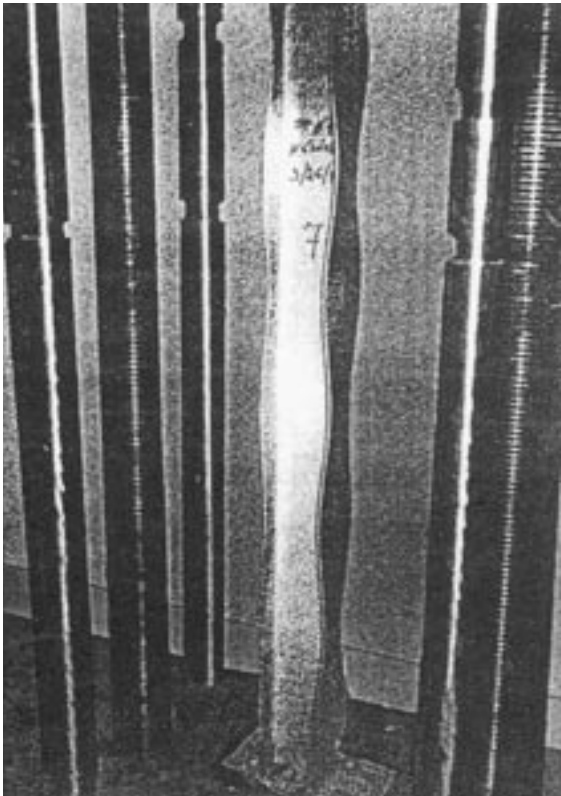
Full section column testing was conducted on equal leg angles, I and Wide Flange Shapes and Square Tubes. Ultimate values were generated through testing of elements with square cut ends placed between the table and the upper, moving platen of a universal testing machine. This test procedure closely simulates how FRP columns will generally be used in practice.

Comparison of test data versus theoretical Euler buckling capacity suggests that the "K" value as tested is approximately 0.70, representing a fixed-pinned condition. The values in the tables represent a FS = 3.0 for the tested condition. Should you feel, however, that your column end conditions closely approximate a pinned-pinned condition ("rounded" column ends are somewhat difficult to achieve in practice) we recommend you multiply the allowable values shown in the tables by the following values:

SHAPE	To Obtain FS = 2.0 multiply by:	To Obtain FS = 3.0 multiply by:
I, W or Angle	0.75	0.50
Square Tube	0.50	0.33

Columns - Allowable Axial Load Tables

Allowable Concentric Axial Stresses and Loads



NOTATION

A	area (in ²)
b	width of flange/leg/wall (in)
t	thickness of flange (in)
r	minimum radius gyration (in)
l	length (in)
K	effective column length factor
F_a	allowable column concentric axial stress (psi)
P_a	allowable column centric axial load (lbs)

8' long - 6" x 3/8" WIDE FLANGE SHAPE



ANGLE

Maximum allowable stress:

b/t [8	4,862 psi
b/t = 10.7	4,194 psi
b/t = 12	3,620 psi
b/t = 16	2,758 psi



SQUARE TUBE (1/4" wall)

Maximum allowable stress:

b/t [10	10,000 psi
b/t = 12	8,880 psi
b/t = 16	6,595 psi



WIDE FLANGE & I SHAPES

Maximum allowable stress:

b/t [12	10,000 psi	
b/t = 13.3	8,747 psi	
t = 1/4"	b/t = 16	7,208 psi
t > 1/4"	b/t = 16	6,233 psi
	b/t = 20	4,920 psi
	b/t = 21.3	4,483 psi
t = 1/4"	b/t = 24	4,167 psi
t > 1/4"	b/t = 24	3,608 psi
	b/t = 26.7	2,732 psi

Columns - Allowable Axial Load Tables

3 x 1 1/2 x 1/4 I SHAPE

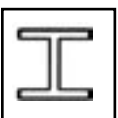
Allowable Concentric Axial Stresses and Loads

$A = 1.38 \text{ in.}^2$ $r = .32 \text{ in.}$ $b/t = 6$

True Length (ft)	F_a (psi)	P_a (lbs)
0.5	10,000	13,800
1.0	8,121	11,207
1.5	5,155	7,114
2.0	3,583	4,945
2.5	2,462	3,398
3.0	1,683	2,323
3.5	1,278	1,764
4.0	1,027	1,417
4.5	843	1,163
5.0	652	900

The effective "K" value is 0.70.

See page 52 for additional information.



Columns - Allowable Axial Load Tables

4 x 2 x 1/4 I SHAPE

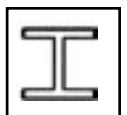
Allowable Concentric Axial Stresses and Loads

$A = 1.88 \text{ in.}^2$ $r = 0.43 \text{ in.}$ $b/t = 8$

True Length (ft)	F_a (psi)	P_a (lbs)
0.5	10,000	18,800
1.0	10,000	18,800
1.5	7,107	13,361
2.0	5,206	9,787
2.5	4,061	7,635
3.0	3,017	5,672
3.5	2,248	4,226
4.0	1,717	3,228
4.5	1,373	2,581
5.0	1,147	2,156
5.5	992	1,865
6.0	854	1,606
6.5	713	1,340
7.0	567	1,066

The effective "K" value is 0.70.

See page 52 for additional information.



Columns - Allowable Axial Load Tables

6 x 3 x 1/4 I SHAPE

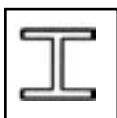
Allowable Concentric Axial Stresses and Loads

$A = 2.88 \text{ in.}^2$ $r = 0.63 \text{ in.}$ $b/t = 12$

True Length (ft)	F_a (psi)	P_a (lbs)
0.5	10,000	28,800
1.0	10,000	28,800
1.5	10,000	28,800
2.0	7,944	22,879
2.5	6,127	17,646
3.0	5,083	14,639
3.5	4,255	12,254
4.0	3,486	10,040
4.5	2,886	8,312
5.0	2,380	6,854
5.5	1,974	5,685
6.0	1,623	4,674
6.5	1,403	4,041
7.0	1,245	3,586
7.5	1,105	3,182
8.0	1,003	2,889
8.5	908	2,615
9.0	817	2,353
9.5	717	2,065
10.0	615	1,771
10.5	520	1,498

The effective "K" value is 0.70.

See page 52 for additional information.



Columns - Allowable Axial Load Tables

6 x 3 x 3/8 I SHAPE

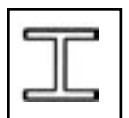
Allowable Concentric Axial Stresses and Loads

$A = 4.23 \text{ in.}^2$ $r = 0.64 \text{ in.}$ $b/t = 8$

True Length (ft)	F_a (psi)	P_a (lbs)
0.5	10,000	42,300
1.0	10,000	42,300
1.5	10,000	42,300
2.0	7,700	32,571
2.5	5,415	22,905
3.0	4,237	17,923
3.5	3,450	14,594
4.0	2,833	11,984
4.5	2,297	9,716
5.0	1,843	7,796
5.5	1,563	6,611
6.0	1,347	5,698
6.5	1,169	4,945
7.0	1,050	4,442
7.5	923	3,904
8.0	800	3,384
8.5	721	3,050
9.0	647	2,737
9.5	586	2,479
10.0	525	2,221
10.5	479	2,026

The effective "K" value is 0.70.

See page 52 for additional information.



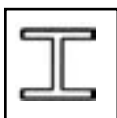
Columns - Allowable Axial Load Tables

8 x 4 x 3/8 I SHAPE

Allowable Concentric Axial Stresses and Loads

$A = 5.73 \text{ in.}^2$ $r = 0.84 \text{ in.}$ $b/t = 10.7$

True Length (ft)	F_a (psi)	P_a (lbs)
0.5	10,000	57,300
1.0	10,000	57,300
1.5	10,000	57,300
2.0	10,000	57,300
2.5	8,370	47,960
3.0	6,182	35,423
3.5	4,917	28,174
4.0	4,157	23,820
4.5	3,558	20,387
5.0	3,063	17,551
5.5	2,598	14,887
6.0	2,232	12,789
6.5	1,888	10,818
7.0	1,667	9,552
7.5	1,461	8,372
8.0	1,311	7,512
8.5	1,176	6,738
9.0	1,085	6,217
9.5	997	5,713
10.0	888	5,088
10.5	800	4,584
11.0	741	4,246
11.5	680	3,896
12.0	630	3,610
12.5	582	3,335
13.0	535	3,066
13.5	498	2,854
14.0	467	2,676



The effective "K" value is 0.70. See page 52 for additional information.

Columns - Allowable Axial Load Tables

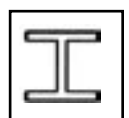
8 x 4 x 1/2 I SHAPE

Allowable Concentric Axial Stresses and Loads

$A = 7.51 \text{ in.}^2$ $r = 0.85 \text{ in.}$ $b/t = 8$

True Length (ft)	F_a (psi)	P_a (lbs)
0.5	10,000	75,100
1.0	10,000	75,100
1.5	10,000	75,100
2.0	10,000	75,100
2.5	8,597	64,563
3.0	6,303	47,336
3.5	5,016	37,670
4.0	4,217	31,670
4.5	3,620	27,186
5.0	3,103	23,304
5.5	2,660	19,977
6.0	2,282	17,138
6.5	1,943	14,592
7.0	1,697	12,744
7.5	1,485	11,152
8.0	1,340	10,063
8.5	1,200	9,012
9.0	1,102	8,276
9.5	1,015	7,623
10.0	914	6,864
10.5	822	6,173
11.0	755	5,670
11.5	697	5,234
12.0	644	4,836
12.5	596	4,476
13.0	549	4,123
13.5	510	3,830
14.0	476	3,575

The effective "K" value is 0.70. See page 52 for additional information.



Columns - Allowable Axial Load Tables

10 x 5 x 3/8 I SHAPE

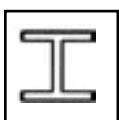
Allowable Concentric Axial Stresses and Loads

$A = 7.22 \text{ in.}^2$ $r = 1.04 \text{ in.}$ $b/t = 13.3$

True Length (ft)	F_a (psi)	P_a (lbs)
0.5	8,747	63,153
1.0	8,747	63,153
1.5	8,747	63,153
2.0	8,747	63,153
2.5	8,747	63,153
3.0	8,747	63,153
3.5	6,814	49,197
4.0	5,520	39,854
4.5	4,711	34,013
5.0	4,097	29,580
5.5	3,620	26,136
6.0	3,186	23,003
6.5	2,833	20,454
7.0	2,470	17,833
7.5	2,188	15,797
8.0	1,918	13,848
8.5	1,714	12,375

True Length (ft)	F_a (psi)	P_a (lbs)
9.0	1,540	11,119
9.5	1,404	10,137
10.0	1,288	9,299
10.5	1,179	8,512
11.0	1,103	7,964
11.5	1,033	7,458
12.0	954	6,888
12.5	869	6,274
13.0	800	5,776
13.5	751	5,422
14.0	704	5,083
14.5	658	4,751
15.0	619	4,469
15.5	581	4,195
16.0	543	3,920
16.5	511	3,689
17.0	482	3,480

The effective "K" value is 0.70. See page 52 for additional information.



Columns - Allowable Axial Load Tables

10 x 5 x 1/2 I SHAPE

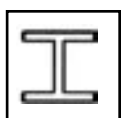
Allowable Concentric Axial Stresses and Loads

$A = 9.51 \text{ in.}^2$ $r = 1.05 \text{ in.}$ $b/t = 10$

True Length (ft)	F_a (psi)	P_a (lbs)
0.5	10,000	95,100
1.0	10,000	95,100
1.5	10,000	95,100
2.0	10,000	95,100
2.5	10,000	95,100
3.0	9,163	87,140
3.5	6,917	65,781
4.0	5,605	53,304
4.5	4,765	45,315
5.0	4,157	39,533
5.5	3,666	34,864
6.0	3,227	30,689
6.5	2,880	27,389
7.0	2,517	23,937
7.5	2,232	21,226
8.0	1,963	18,668
8.5	1,739	16,538
9.0	1,564	14,874

True Length (ft)	F_a (psi)	P_a (lbs)
9.5	1,429	13,590
10.0	1,311	12,468
10.5	1,200	11,412
11.0	1,120	10,651
11.5	1,049	9,976
12.0	975	9,272
12.5	889	8,484
13.0	818	7,779
13.5	764	7,266
14.0	717	6,819
14.5	669	6,362
15.0	630	5,991
15.5	592	5,630
16.0	554	5,269
16.5	520	4,945
17.0	491	4,669
17.5	467	4,441

The effective "K" value is 0.70. See page 52 for additional information.



Columns - Allowable Axial Load Tables

12 x 6 x 1/2 I SHAPE

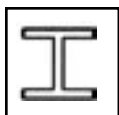
Allowable Concentric Axial Stresses and Loads

A = 11.51 in.² r = 1.26 in. b/t = 12

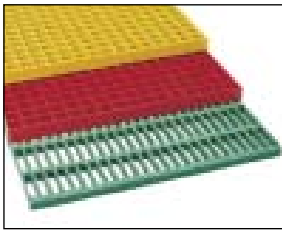
True Length (ft)	F _a (psi)	P _a (lbs)
0.5	10,000	115,100
1.0	10,000	115,100
1.5	10,000	115,100
2.0	10,000	115,100
2.5	10,000	115,100
3.0	10,000	115,100
3.5	9,800	112,798
4.0	7,512	86,348
4.5	6,182	71,155
5.0	5,310	61,118
5.5	4,653	53,556
6.0	4,157	47,847
6.5	3,741	43,059
7.0	3,364	38,720
7.5	3,063	35,255
8.0	2,753	31,687
8.5	2,458	28,292
9.0	2,232	25,690
9.5	2,008	23,112
10.0	1,793	20,637

True Length (ft)	F _a (psi)	P _a (lbs)
10.5	1,667	19,187
11.0	1,513	17,415
11.5	1,411	16,241
12.0	1,311	15,090
12.5	1,217	14,008
13.0	1,144	13,167
13.5	1,084	12,477
14.0	1,025	11,798
14.5	960	11,050
15.0	888	10,221
15.5	828	9,530
16.0	780	8,978
16.5	741	8,529
17.0	701	8,069
17.5	662	7,620
18.0	630	7,251
18.5	598	6,883
19.0	567	6,526
19.5	535	6,158
20.0	510	5,870

The effective "K" value is 0.70. See page 52 for additional information.



Fibergrate Products & Services

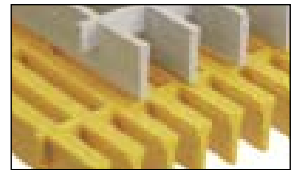


Fibergrate® Molded Grating

Fibergrate molded gratings are designed to provide the ultimate in reliable performance, even in the most demanding conditions. Fibergrate offers the widest selection in the market with more than ten resins including Chemgrate CP-84 and more than twenty grating configurations available in many panel sizes and surfaces.

RIGIDEX® Moltruded® Grating

RIGIDEX Moltruded gratings are the first fiberglass gratings to combine the corrosion resistance of molded grating with the longer span capacity of pultruded grating, all at the low cost of metal gratings.

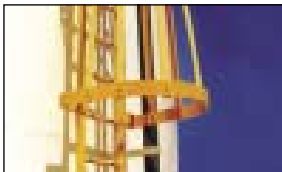
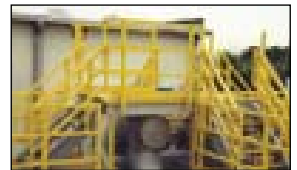


Safe-T-Span® Pultruded Industrial and Pedestrian Gratings

Combining corrosion resistance, long-life and low-maintenance designs, Safe-T-Span provides unidirectional strength for industrial and pedestrian pultruded grating applications.

Dynarail® Handrail

Easily assembled from durable prefabricated components or engineered to your specifications, Dynarail handrail meets or exceeds OSHA and strict building code requirements for safety and design.



Dynarail® Safety Ladder System

Easily assembled on site, Dynarail safety ladder systems meet or exceed OSHA requirements. Though less costly than prefabricated ladder systems, these safety ladders provide a custom fit to the supporting structure.

Dynaform® Structural Shapes

Fibergrate offers a wide range of pultruded structural components for industrial use, including bars, rods, tubes, beams, channels, leg angles and plates.

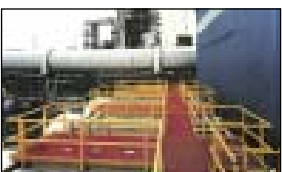


Stair Solutions

Fibergrate offers a wide range of slip-resistant products to meet your stair safety needs. These durable products which include treads, tread covers and covered stair treads are a long-term, cost-efficient solution for your facility.

Grating Pedestals

Uniquely designed adjustable single and quad head pedestals for square mesh molded grating are manufactured to provide safe and economical support for elevated flooring.



Fabrication Services

Combining engineering expertise with an understanding of fiberglass applications, Fibergrate provides turnkey design and fabrication of fiberglass structures, including platforms, catwalks, stairways and test racks.