TTF Scaffolding Inc.

PRODUCT GUIDE

ALUMINUM BEAMS

Structural properties, design data and load charts for TTF aluminum beams and strongbacks.



BM140P · BM165P · BM184S · BM190P · BM152S

TTF Scaffolding Inc. · Surrey, BC · ttfscaffolding.com

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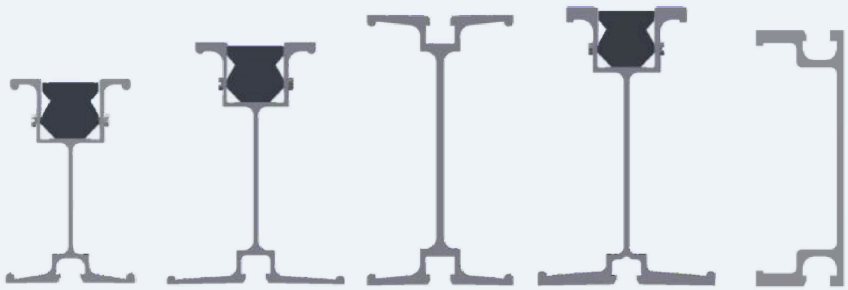
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IMPORTANT

Local authorities and/or a locally registered Professional Engineer should approve all drawings for construction purposes.

THE MOST VERSATILE ELEMENT IN SHORING

The aluminum beam is the most versatile and widely used element in all shoring and formwork applications.

In shoring, it is used as the joists and stringers on top of our various frame systems, as well as the joists for our fly form systems. For wall forming, the beams are used as joists in either a vertical or horizontal configuration, while our strongbacks complete the system by providing the backbone of the formwork and allowing tie-rod connections to be made.

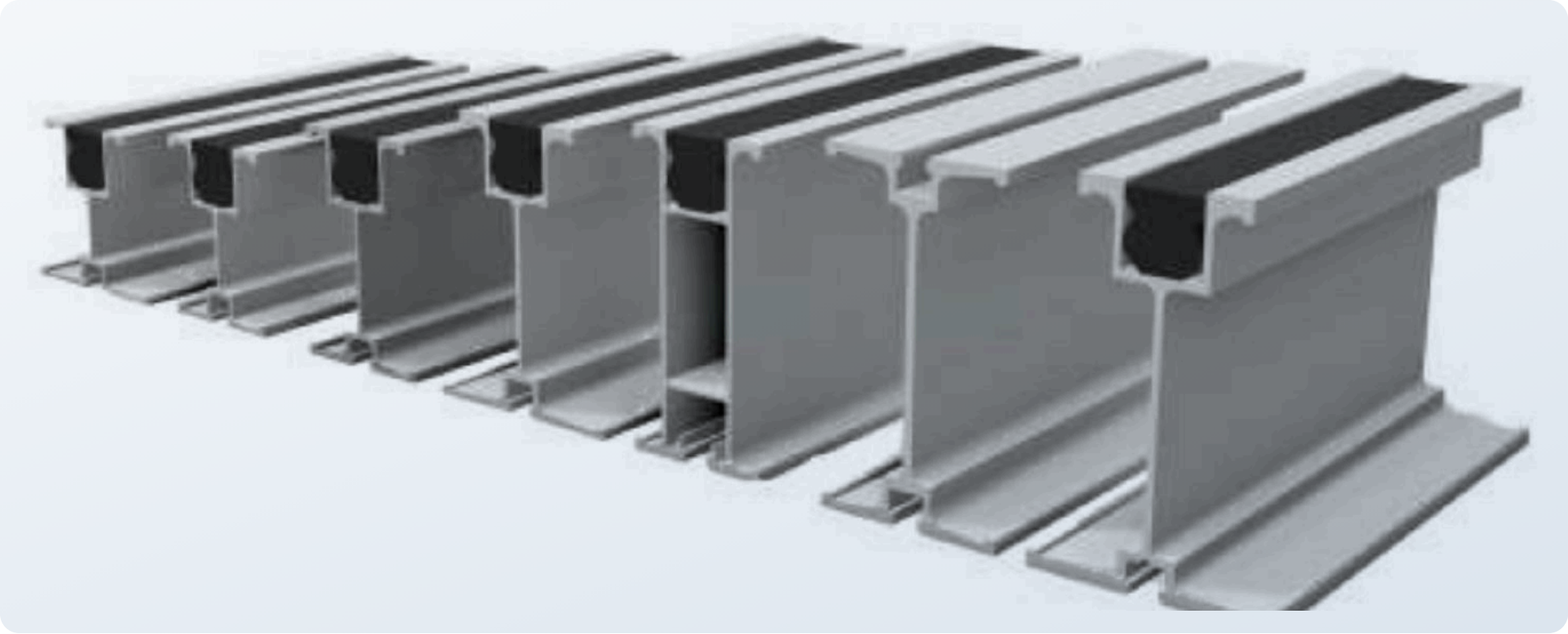
The purpose of this manual is to make the system easy to understand and use. The features and benefits of TTF's aluminum beams are explained in detail, and key points are linked to the components they apply to.

IMPORTANT

Local authorities and/or a locally registered Professional Engineer should approve all drawings for construction purposes.

TECHNICAL HELP

If you are in doubt or need technical assistance or advice, contact TTF Engineering.



WHY ALUMINUM?

RECYCLABLE · SUSTAINABLE · VERSATILE

What does it mean to be green?

For a material or product to be considered green, it should have a low impact on the environment and support environmentalism: the practice of protecting and conserving the natural environment and its resources. Aluminum is one such material.

What makes aluminum a green material?

Aluminum is recyclable, sustainable and versatile, three key qualities for any material used to build a green building. Historically, aluminum has proven to be one of the most important materials in successful recycling programs. It has high scrap value and wide consumer acceptance, and aluminum recycling has significant industry support.

Naturally abundant

Aluminum, one of the most abundant elements in the earth's crust, is an ideal natural material for sustainable construction products.

Big energy savings

Using recycled building materials saves a great deal of the energy otherwise used to produce new material. Producing recycled aluminum reduces pollution and energy use, taking only five percent of the energy needed to produce raw aluminum from bauxite. As Jerry Powell, Editor of *Resource Recycling*, says: "Many construction materials are hard, if not impossible, to recycle, and this is a negative factor when wishing to undertake a sustainable construction project. This is not the case, however, for aluminum as a building product. The sizable energy savings attained when scrap aluminum is re-melted makes the recovered metal very valuable."

Long, economical life

From a green design perspective, aluminum's lower cost over a longer life cycle makes it a viable, economical choice for builders. Aluminum resists the effects of time, temperature, corrosion, humidity and warping, adding to its very long life cycle.

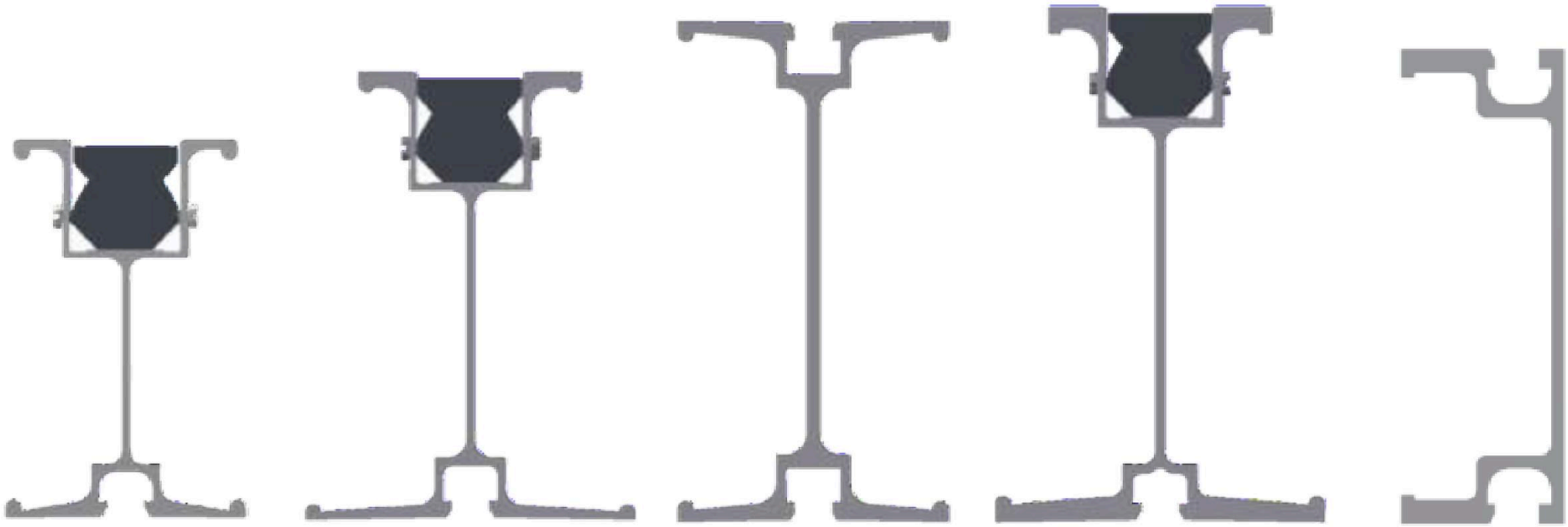
SAFETY GUIDELINES

GENERAL GUIDELINES FOR SAFE USE

These guidelines help designers address critical issues when designing any forming or shoring application, or otherwise using TTF aluminum beams.

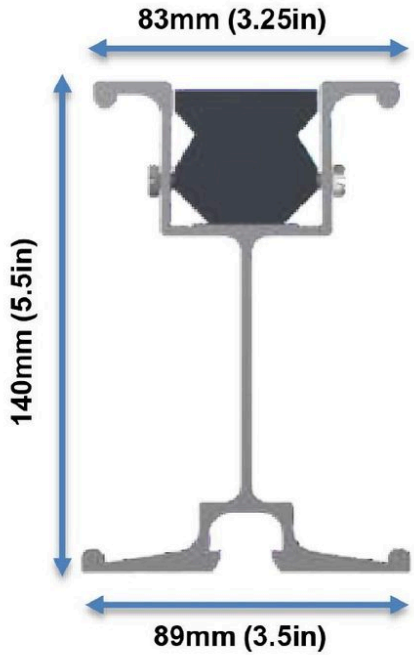
If you are in doubt or need technical assistance or advice, you must contact TTF Engineering.

1. **Never** exceed the loads shown on the load charts for any application unless approved in advance by TTF's engineer.
2. Whenever TTF's aluminum beams are used to support sloping slabs, carefully consider the effects of sideways and lateral loads. Connections between plywood and beams are especially important to maintain stability whenever sloping concrete is supported.
3. Whenever wood packing is used on TTF's beams, carefully consider the effect of the packing on the stability and load capacity of the beams.
4. **Never** use TTF's aluminum beams that are deformed or beyond the limits set out in TTF's inspection and maintenance guidelines.
5. Always design the forming or shoring layout for the specific application. Never rely on a layout from previous construction or another application. Relying on prior layouts may result in an improper design that may cause serious bodily injury or property damage.
6. The stability of TTF's aluminum beams is highly dependent on the stability of the structure supporting them. Always make sure the shoring system is done according to national, state, provincial or local codes.
7. During erection, follow all safety codes and tie-off regulations. Experienced personnel should supervise this process using the approved drawings and layout for the forming and shoring system. Make sure the safety of the erectors is assured at all times.
8. Whenever TTF's aluminum beams are subjected to dynamic loads during construction from motorized equipment, such as screed machines and concrete pumps, carefully consider the effects of these loads.
9. Carefully account for the thermal movement of long concrete decks. Loads from thermal movement and post-tensioning can be significant and require careful allowance in the construction sequence and in the forming and shoring design.
10. TTF engineering manuals have comprehensive data on all TTF products. When designing applications involving TTF equipment, **be sure to use the latest design data.**



BM140	BM165	BM184	BM190	BM152S
5-1/2"	6-1/2"	7-1/4"	7-1/2"	6"
140 mm	165 mm	184 mm	190 mm	152 mm

Detailed structural properties, design data and load charts for each profile follow on the next pages.



STANDARD LENGTH		WEIGHT	
ft	m	lb	kg
9	2.74	30.6	14.0
10.6	3.20	35.7	16.3
12	3.66	40.8	18.7
14	4.27	47.6	21.8
16	4.88	54.4	24.9
18	5.49	61.2	28.0
21	6.40	71.4	32.6

BM140P – STRUCTURAL PROPERTIES

SECTION PROPERTI		METRIC	IMPERIAL
Overall Height		140.00 mm	5.50 in
Base Width		88.90 mm	3.50 in
Top Width		82.55 mm	3.25 in
Cross Section Area	excluding nailer	1165 mm2	1.81 In2
Nominal Weight	excluding nailer	3.17 kg/m	2.13 lb/ft
	including nailer	4.29 kg/m	2.88 lb/ft
Distance of Neutral Axis from Top		71.02 mm	2.80 in
Moment of Inertia	Ix-x	3.35 E6 mm 4	8.05 in4
	Iy-y	0.54 E6 mm4	1.29 in4
Section Modulus	Sxt	47.19 E3 mm3	2.88 in3
	Sxb	48.83 E3 mm3	2.98 in3
	Sy	12.95 E3 mm3	0.79 in3
Radius of Gyration	rx	53.59 mm	2.11 in
	ry	21.59 mm	0.85 in
Modulus of Elasticity	E	7.03 E4 kN/mm2	10.2 E6 psi

ALLOY PROPERTIES

Ultimate Tensile Stress	Fu	290 E3 kN/m2	42 ksi
Yield Stress	Fy	255 E3 kN/m2	37 ksi
Shear Yield Stress	Fsy	155 E3 kN/m2	22 ksi
Ultimate Bearing Stress	Fb	560 E3 kN/m2	84 ksi

LOCAL BUCKLING OF BOTTOM CHORD

Ultimate Bending Moment	12.46 kN m	9.19 k ft
Allowable Bending Moment	5.66 kN m	4.18 k ft

LOCAL BUCKLING OF TOP FLANGE

Ultimate Bending Moment	12.01 kN m	8.86 k ft
Allowable Bending Moment	5.46 kN m	4.03 k ft

ALLOWABLE REACTION AND SHEARS
(Calculated Values – to be confirmed by test)

Interior Reaction (Full Bearing)	42.98 kN	9.66 kips
Exterior Reaction (Full Bearing)	21.49 kN	4.83 kips
Concentrated Load	42.96 kN	9.66 kips
Shear	15.81 kN	3.55 kips

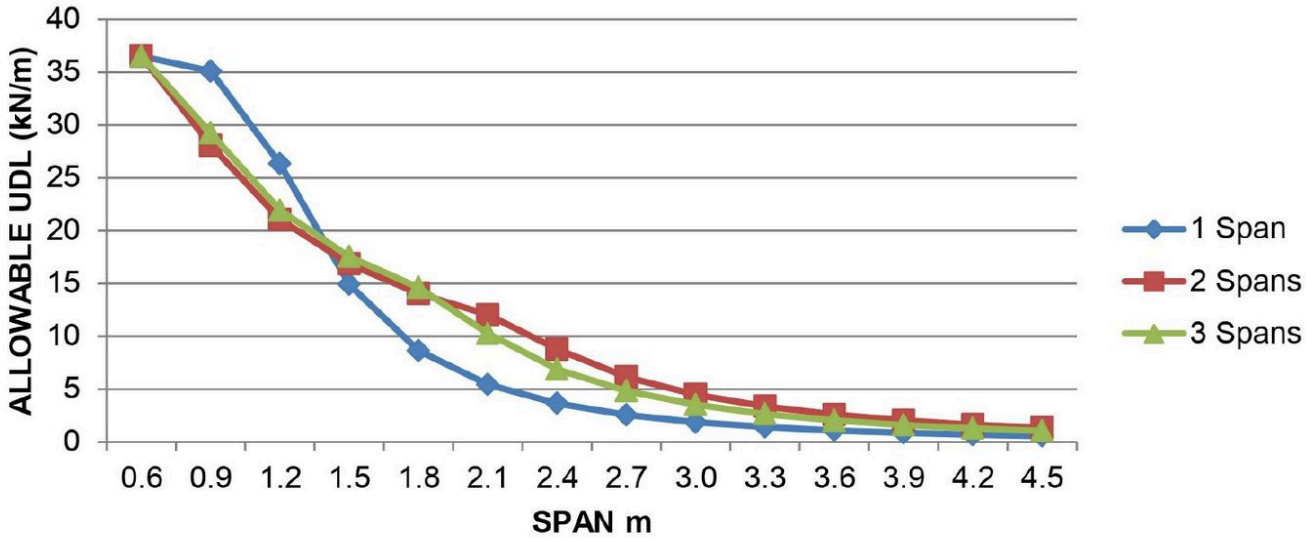
NOTE:

- ALLOWABLE DESIGN VALUES ARE BASED ON A 2.2:1 FACTOR OF SAFETY
- ALLOWABLE REACTION AND SHEAR VALUES ARE BASED ON ALCAN'S STRENGTH OF ALUMINUM. 4TH EDITION.
- INTERIOR REACTION LENGTH OF BEARING: 127MM (5IN).
- EXTERIOR REACTION LENGTH OF BEARING: 64MM (2.5IN).

BM140P – L/360 Load Chart

NOTE:

1. Deflection limited to L/360
2. Factor of Safety 2.2:1 included
3. Design Load = Dead Load + Live Load
4. Cantilevers are not to exceed 30% of adjacent span and not more than 915mm (3ft)
5. Consult TTF Engineering for other stringer configurations.



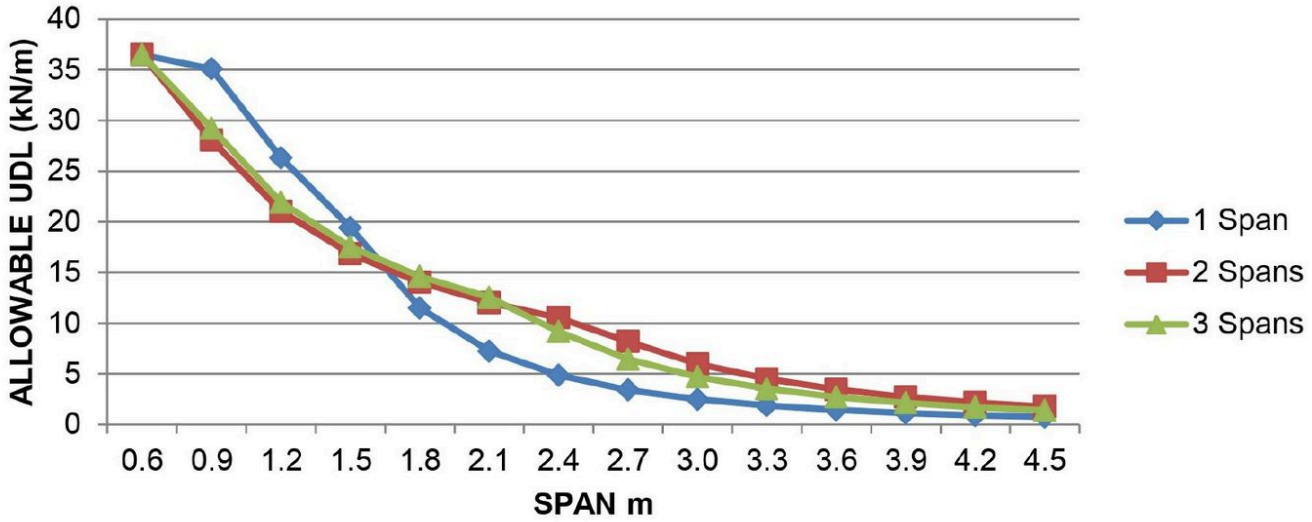
Allowable UDL. (kN/m)			
Span m	1 Span	2 Spans	3 Spans
0.6	36.50	36.50	36.50
0.9	35.09	28.07	29.24
1.2	26.32	21.05	21.93
1.5	14.89	16.84	17.54
1.8	8.62	14.04	14.62
2.1	5.43	12.03	10.26
2.4	3.64	8.76	6.87
2.7	2.55	6.15	4.83
3.0	1.86	4.48	3.52
3.3	1.40	3.37	2.64
3.6	1.08	2.59	2.04
3.9	0.85	2.04	1.60
4.2	0.68	1.63	1.28
4.5	0.55	1.33	1.04

Allowable UDL. (plf)			
Span ft	1 Span	2 Spans	3 Spans
2	2500	2500	2500
3	2367	1893	1972
4	1775	1420	1479
5	973	1136	1183
6	563	947	986
7	355	811	671
8	238	572	449
9	167	402	316
10	122	293	230
11	91	220	173
12	70	170	133
13	55	133	105
14	44	107	84
15	36	87	68

BM140P – L/270 Load Chart

NOTE:

1. Deflection limited to L/270
2. Factor of Safety 2.2:1 included
3. Design Load = Dead Load + Live Load
4. Cantilevers are not to exceed 30% of adjacent span and not more than 915mm (3ft)
5. Consult TTF Engineering for other stringer configurations.



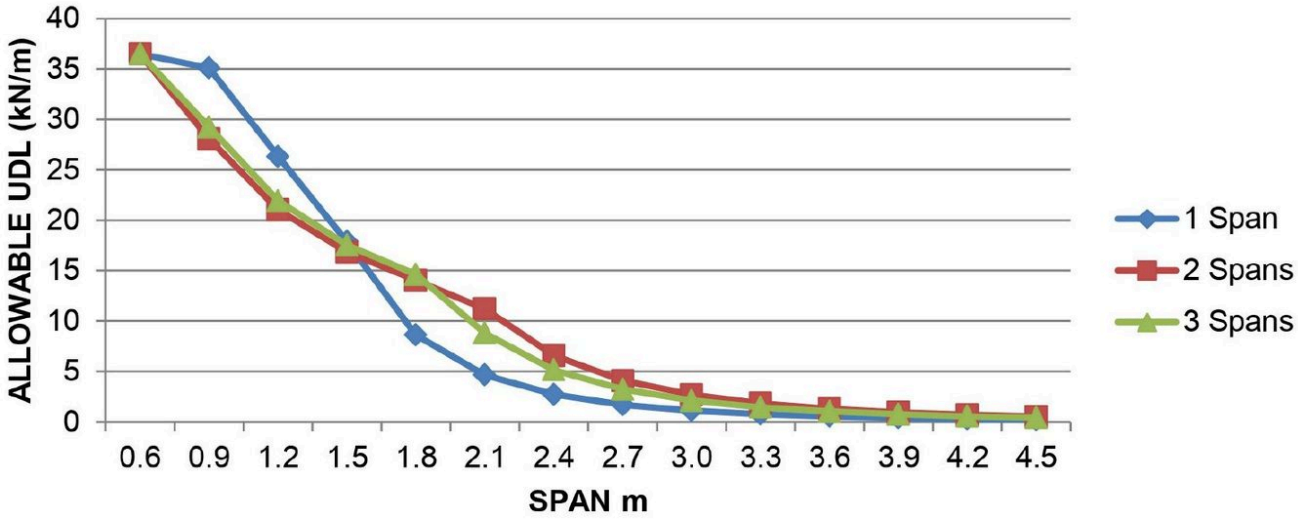
Allowable UDL. (kN/m)			
Span m	1 Span	2 Spans	3 Spans
0.6	36.50	36.50	36.50
0.9	35.09	28.07	29.24
1.2	26.32	21.05	21.93
1.5	19.43	16.84	17.54
1.8	11.49	14.04	14.62
2.1	7.23	12.03	12.53
2.4	4.85	10.53	9.17
2.7	3.40	8.20	6.44
3.0	2.48	5.98	4.69
3.3	1.86	4.49	3.53
3.6	1.44	3.46	2.72
3.9	1.13	2.72	2.14
4.2	0.90	2.18	1.71
4.5	0.74	1.77	1.39

Allowable UDL. (plf)			
Span ft	1 Span	2 Spans	3 Spans
2	2500	2500	2500
3	2367	1893	1972
4	1775	1420	1479
5	1290	1136	1183
6	751	947	986
7	473	811	845
8	317	710	599
9	222	536	421
10	162	391	307
11	122	294	230
12	94	226	178
13	74	178	140
14	59	142	112
15	48	116	91

BM140P – 5mm Load Chart

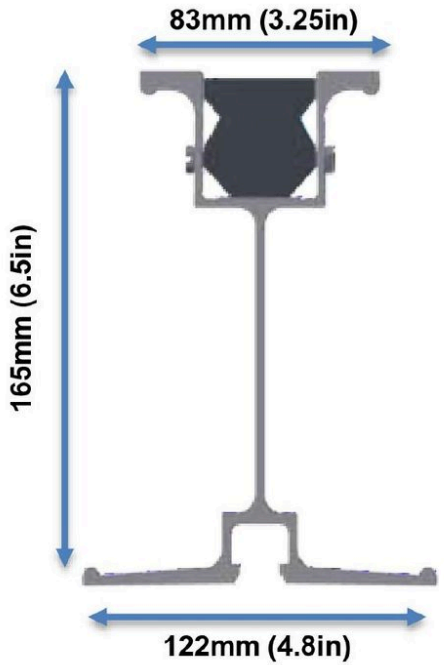
NOTE:

1. Deflection limited to 5mm
2. Factor of Safety 2.2:1 included
3. Design Load = Dead Load + Live Load
4. Cantilevers are not to exceed 30% of adjacent span and not more than 915mm (3ft)
5. Consult TTF Engineering for other stringer configurations.



Allowable UDL. (kN/m)			
Span m	1 Span	2 Spans	3 Spans
0.6	36.50	36.50	36.50
0.9	35.09	28.07	29.24
1.2	26.32	21.05	21.93
1.5	17.87	16.84	17.54
1.8	8.62	14.04	14.62
2.1	4.65	11.20	8.80
2.4	2.73	6.57	5.16
2.7	1.70	4.10	3.22
3.0	1.12	2.69	2.11
3.3	0.76	1.84	1.44
3.6	0.54	1.30	1.02
3.9	0.39	0.94	0.74
4.2	0.29	0.70	0.55
4.5	0.22	0.53	0.42

Allowable UDL. (plf)			
Span ft	1 Span	2 Spans	3 Spans
2	2500	2500	2500
3	2367	1893	1972
4	1775	1420	1479
5	1290	1136	1183
6	704	947	986
7	380	811	719
8	223	537	421
9	139	335	263
10	91	220	173
11	62	150	118
12	44	106	83
13	32	77	60
14	24	57	45
15	18	43	34



STANDARD LENGTH		WEIGHT	
ft	m	lb	kg
9	2.74	38.7	17.3
10.6	3.20	45.2	20.2
12	3.66	51.6	23.0
14	4.27	60.2	26.9
16	4.88	68.8	30.7
18	5.49	77.4	34.6
21	6.40	90.3	40.3

BM165P – STRUCTURAL PROPERTIES

SECTION PROPERTI		METRIC	IMPERIAL
Overall Height		165.00 mm	6.50 in
Base Width		121.92 mm	4.8 in
Top Width		82.55 mm	3.25 in
Cross Section Area	excluding nailer	1781 mm2	2.76 In2
Nominal Weight	excluding nailer	4.84 kg/m	3.25 lb/ft
	including nailer	6 kg/m	4 lb/ft
Distance of Neutral Axis from Top		89 mm	3.52 in
Moment of Inertia	Ix-x	7.43 E6 mm 4	17.84 in4
	Iy-y	1.13 E6 mm4	2.71 in4
Section Modulus	Sxt	8.31 E4 mm3	5.07 in3
	Sxb	9.70 E4 mm3	5.92 in3
	Sy	1.85 E4 mm3	1.13 in3
Radius of Gyration	rx	65 mm	2.54 in
	ry	25 mm	0.99 in
Modulus of Elasticity	E	7.03 E4 kN/mm2	10.2 E6 psi

ALLOY PROPERTIES

Ultimate Tensile Stress	Fu	290 E3 kN/m2	42 ksi
Yield Stress	Fy	255 E3 kN/m2	37 ksi
Shear Yield Stress	Fsy	155 E3 kN/m2	22 ksi
Ultimate Bearing Stress	Fb	560 E3 kN/m2	84 ksi

LOCAL BUCKLING OF BOTTOM CHORD

Ultimate Bending Moment	24.74 kN m	18.25 k ft
Allowable Bending Moment	11.30 kN m	8.30 k ft

LOCAL BUCKLING OF TOP FLANGE

Ultimate Bending Moment	21.20 kN m	15.63 k ft
Allowable Bending Moment	9.64 kN m	7.11 k ft

ALLOWABLE REACTION AND SHEARS
(Calculated Values – to be confirmed by test)

Interior Reaction (Full Bearing)	69.97 kN	15.73 kips
Exterior Reaction (Full Bearing)	34.96 kN	7.86 kips
Concentrated Load	69.97 kN	15.73 kips
Shear	43.73 kN	9.83 kips

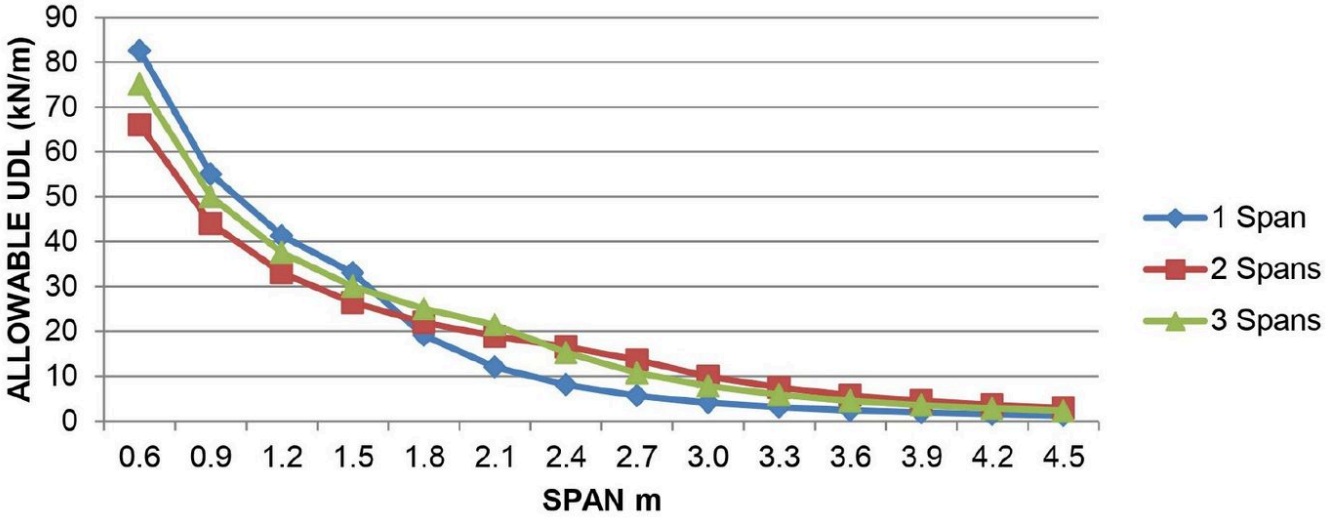
NOTE:

- ALLOWABLE DESIGN VALUES ARE BASED ON A 2.2:1 FACTOR OF SAFETY
- ALLOWABLE REACTION AND SHEAR VALUES ARE BASED ON ALCAN'S STRENGTH OF ALUMINUM. 4TH EDITION.
- INTERIOR REACTION LENGTH OF BEARING: 127MM (5IN).
- EXTERIOR REACTION LENGTH OF BEARING: 64MM (2.5IN).

BM165P – L/360 Load Chart

NOTE:

1. Deflection limited to L/360
2. Factor of Safety 2.2:1 included
3. Design Load = Dead Load + Live Load
4. Cantilevers are not to exceed 30% of adjacent span and not more than 915mm (3ft)
5. Consult TTF Engineering for other stringer configurations.



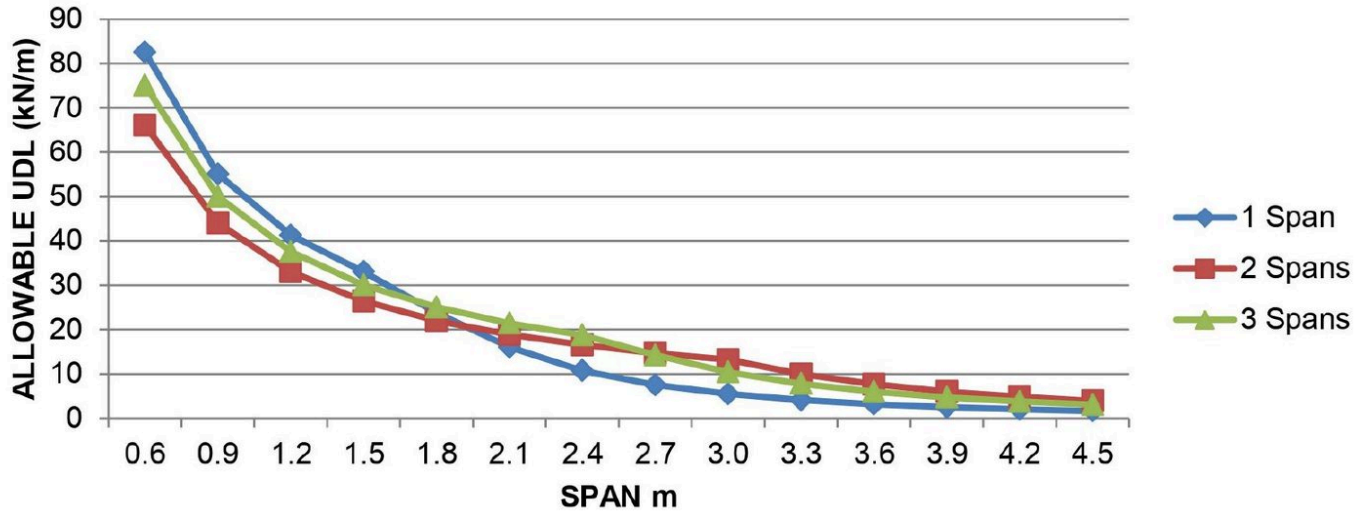
Allowable UDL. (kN/m)			
Span m	1 Span	2 Spans	3 Spans
0.6	82.58	66.07	75.08
0.9	55.06	44.05	50.05
1.2	41.29	33.03	37.54
1.5	33.00	26.43	30.03
1.8	19.10	22.02	25.03
2.1	12.03	18.88	21.45
2.4	8.06	16.52	15.24
2.7	5.66	13.63	10.70
3.0	4.12	9.94	7.80
3.3	3.10	7.46	5.86
3.6	2.39	5.75	4.51
3.9	1.88	4.52	3.55
4.2	1.50	3.62	2.84
4.5	1.22	2.94	2.31

Allowable UDL. (plf)			
Span ft	1 Span	2 Spans	3 Spans
2	5570	4456	5064
3	3713	2971	3376
4	2785	2228	2532
5	2157	1782	2025
6	1248	1485	1688
7	786	1273	1447
8	527	1114	996
9	370	891	699
10	270	649	510
11	203	488	383
12	156	376	295
13	123	296	232
14	98	237	186
15	80	192	151

BM165P – L/270 Load Chart

NOTE:

1. Deflection limited to L/270
2. Factor of Safety 2.2:1 included
3. Design Load = Dead Load + Live Load
4. Cantilevers are not to exceed 30% of adjacent span and not more than 915mm (3ft)
5. Consult TTF Engineering for other stringer configurations.



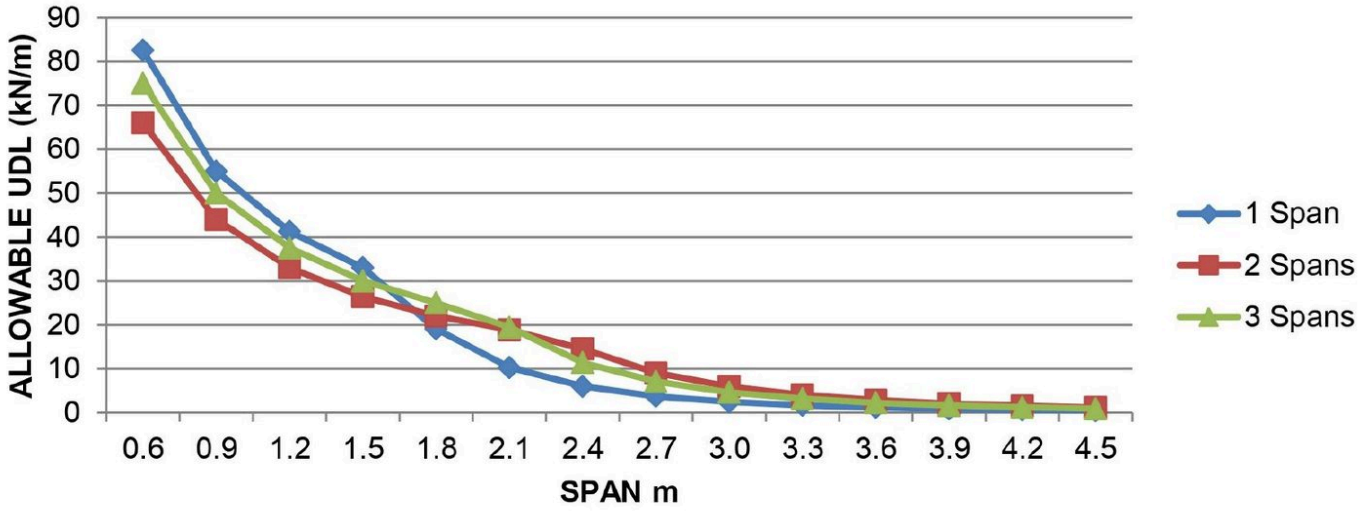
Allowable UDL. (kN/m)			
Span m	1 Span	2 Spans	3 Spans
0.6	82.58	66.07	75.08
0.9	55.06	44.05	50.05
1.2	41.29	33.03	37.54
1.5	33.03	26.43	30.03
1.8	23.80	22.02	25.03
2.1	16.03	18.88	21.45
2.4	10.74	16.52	18.77
2.7	7.54	14.68	14.27
3.0	5.5	13.21	10.40
3.3	4.13	9.95	7.81
3.6	3.18	7.67	6.02
3.9	2.50	6.03	4.73
4.2	2.00	4.83	3.79
4.5	1.63	3.93	3.08

Allowable UDL. (plf)			
Span ft	1 Span	2 Spans	3 Spans
2	5570	4456	5064
3	3713	2971	3376
4	2785	2228	2532
5	2228	1782	2025
6	1580	1485	1688
7	1048	1273	1447
8	702	1114	1266
9	493	990	933
10	359	866	680
11	270	651	511
12	208	501	393
13	164	394	309
14	131	316	248
15	107	257	201

BM165P – 5mm Load Chart

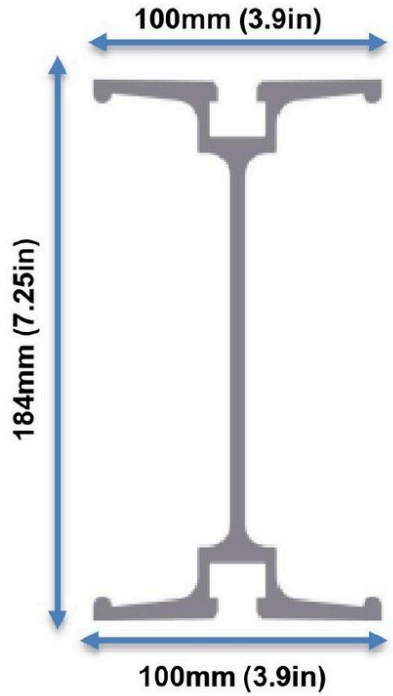
NOTE:

1. Deflection limited to 5mm
2. Factor of Safety 2.2:1 included
3. Design Load = Dead Load + Live Load
4. Cantilevers are not to exceed 30% of adjacent span and not more than 915mm (3ft)
5. Consult TTF Engineering for other stringer configurations.



Allowable UDL. (kN/m)			
Span m	1 Span	2 Spans	3 Spans
0.6	82.58	66.07	75.08
0.9	55.06	44.05	50.05
1.2	41.29	33.03	37.54
1.5	33.03	26.43	30.03
1.8	19.10	22.02	25.03
2.1	10.31	18.88	19.49
2.4	6.04	14.55	11.43
2.7	3.77	9.09	7.13
3.0	2.47	5.96	4.68
3.3	1.69	4.07	3.20
3.6	1.19	2.87	2.26
3.9	0.87	2.09	1.64
4.2	0.64	1.55	1.22
4.5	0.49	1.18	0.92

Allowable UDL. (plf)			
Span ft	1 Span	2 Spans	3 Spans
2	5570	4456	5064
3	3713	2971	3376
4	2785	2228	2532
5	2228	1782	2025
6	1560	1485	1688
7	842	1273	1447
8	494	1114	934
9	308	742	583
10	202	487	382
11	138	333	261
12	98	235	184
13	71	171	134
14	53	127	100
15	40	96	76



STANDARD LENGTH		WEIGHT	
ft	m	lb	kg
9	2.74	39.6	18.1
10.6	3.20	46.2	21.1
12	3.66	52.8	24.1
14	4.27	61.6	28.2
16	4.88	70.4	32.2
18	5.49	79.2	36.2
21	6.40	92.4	42.2

BM184S – STRUCTURAL PROPERTIES

SECTION PROPERTI		METRIC	IMPERIAL
Overall Height		184.00 mm	7.25 in
Base Width		100.00 mm	3.94 in
Top Width		100.00 mm	3.94 in
Cross Section Area		2216 mm2	3.59 In2
Nominal Weight		6.16 kg/m	4.14 lb/ft
Distance of Neutral Axis from Top		92 mm	3.63in
Moment of Inertia	Ix-x	12.62 E6 mm 4	30.32 in4
	Iy-y	1.05 E6 mm4	2.52 in4
Section Modulus	Sxt	13.60 E4 mm3	8.31 in3
	Sxb	E4 mm3	in3
	Sy	2.10 E4 mm3	1.28 in3
Radius of Gyration	rx	74 mm	2.91 in
	ry	21 mm	0.84 in
Modulus of Elasticity	E	7.03 E4 kN/mm2	10.2 E6 psi

ALLOY PROPERTIES

Ultimate Tensile Stress	Fu	290 E3 kN/m2	42 ksi
Yield Stress	Fy	255 E3 kN/m2	37 ksi
Shear Yield Stress	Fsy	155 E3 kN/m2	22 ksi
Ultimate Bearing Stress	Fb	560 E3 kN/m2	84 ksi

LOCAL BUCKLING OF FLANGE

Ultimate Bending Moment	43.79 kN m	32.30 k ft
Allowable Bending Moment	19.91 kN m	14.68 k ft

ALLOWABLE REACTION AND SHEARS
(Calculated Values – to be confirmed by test)

Interior Reaction (Full Bearing)	97.86 kN	22.00 kips
Exterior Reaction (Full Bearing)	40.43 kN	9.09 kips
Concentrated Load	97.86 kN	22.00 kips
Shear	48.93 kN	11.00 kips

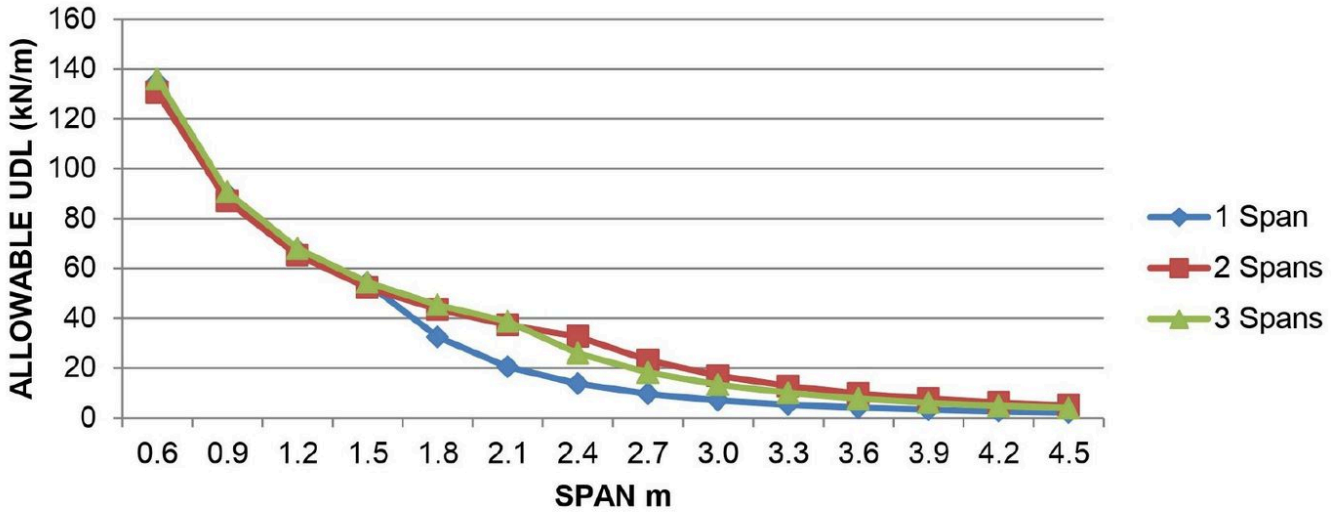
NOTE:

- ALLOWABLE DESIGN VALUES ARE BASED ON A 2.2:1 FACTOR OF SAFETY
- ALLOWABLE REACTION AND SHEAR VALUES ARE BASED ON ALCAN'S STRENGTH OF ALUMINUM. 4TH EDITION.
- INTERIOR REACTION LENGTH OF BEARING: 127MM (5IN).
- EXTERIOR REACTION LENGTH OF BEARING: 64MM (2.5IN).

BM184S – L/360 Load Chart

NOTE:

1. Deflection limited to L/360
2. Factor of Safety 2.2:1 included
3. Design Load = Dead Load + Live Load
4. Cantilevers are not to exceed 30% of adjacent span and not more than 915mm (3ft)
5. Consult TTF Engineering for other stringer configurations.



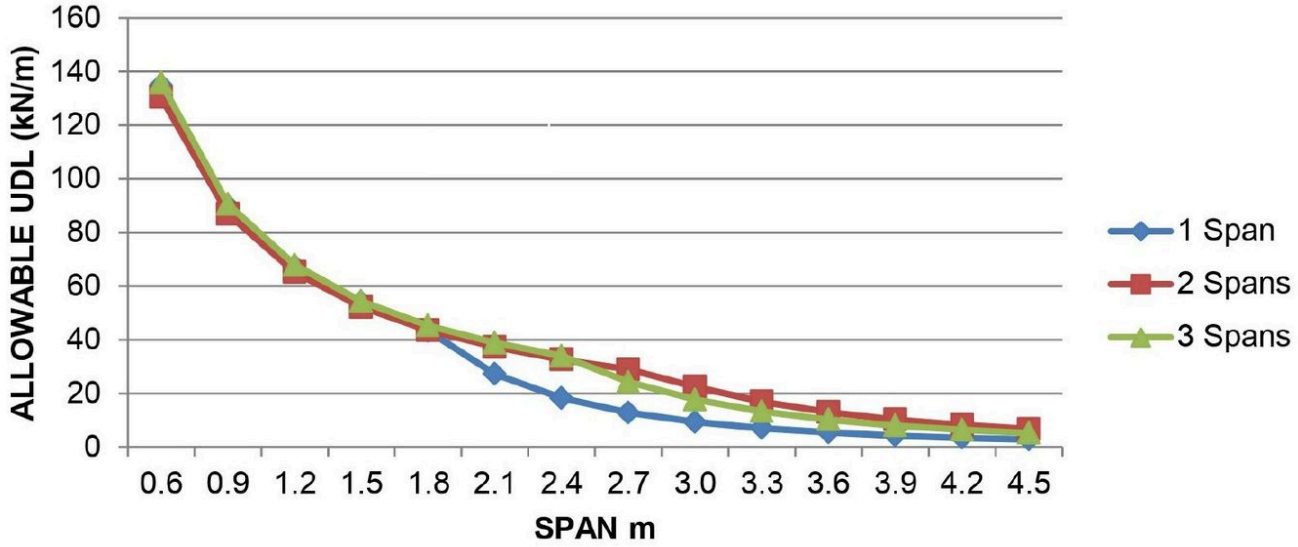
Allowable UDL. (kN/m)			
Span m	1 Span	2 Spans	3 Spans
0.6	134.77	130.47	135.91
0.9	89.85	86.98	90.61
1.2	67.39	65.24	67.96
1.5	53.91	52.19	54.36
1.8	32.45	43.49	45.30
2.1	20.44	37.28	38.65
2.4	13.69	32.62	25.89
2.7	9.62	23.16	18.19
3.0	7.01	16.89	13.26
3.3	5.27	12.69	9.96
3.6	4.06	9.77	7.67
3.9	3.19	7.69	6.03
4.2	2.55	6.15	4.83
4.5	2.08	5.00	3.93

Allowable UDL. (plf)			
Span ft	1 Span	2 Spans	3 Spans
2	9090	8800	9167
3	6060	5867	6111
4	4545	4400	4583
5	3636	3520	3667
6	2121	2933	3056
7	1336	2514	2526
8	895	2156	1692
9	628	1514	1189
10	458	1104	867
11	344	829	651
12	265	639	501
13	209	502	394
14	167	402	316
15	136	327	257

BM184S – L/270 Load Chart

NOTE:

1. Deflection limited to L/270
2. Factor of Safety 2.2:1 included
3. Design Load = Dead Load + Live Load
4. Cantilevers are not to exceed 30% of adjacent span and not more than 915mm (3ft)
5. Consult TTF Engineering for other stringer configurations.



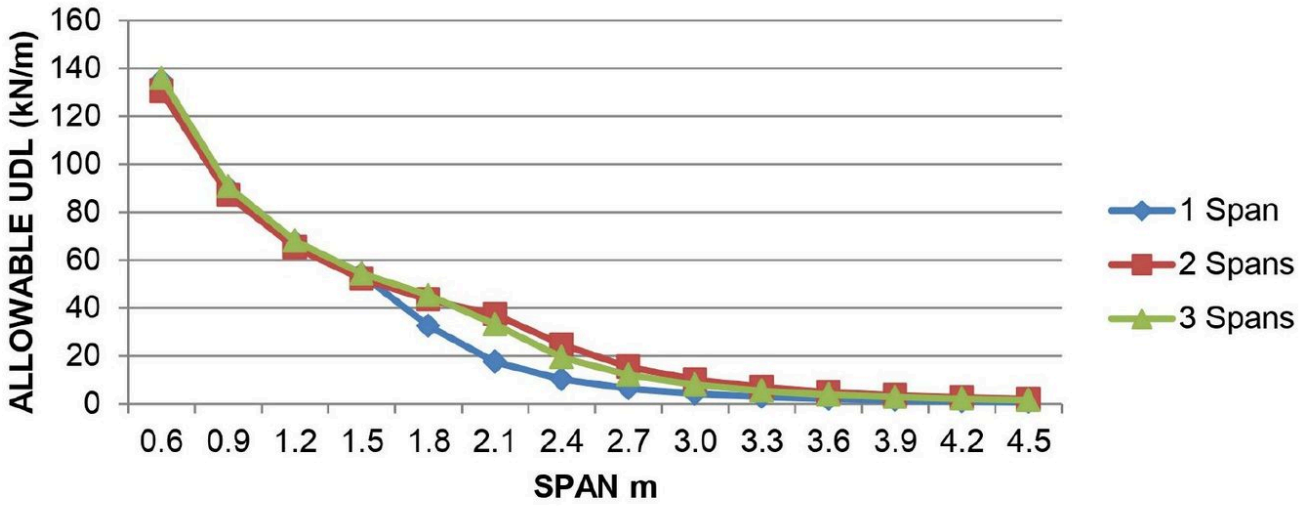
Allowable UDL. (kN/m)			
Span m	1 Span	2 Spans	3 Spans
0.6	134.77	130.47	135.91
0.9	89.85	86.98	90.61
1.2	67.39	65.24	67.96
1.5	53.91	52.19	54.36
1.8	43.27	43.49	45.30
2.1	27.25	37.28	38.83
2.4	18.26	32.62	33.98
2.7	12.82	28.99	24.25
3.0	9.35	22.51	17.68
3.3	7.02	16.92	13.28
3.6	5.41	13.03	10.23
3.9	4.25	10.25	8.05
4.2	3.41	8.21	6.44
4.5	2.77	6.67	5.24

Allowable UDL. (plf)			
Span ft	1 Span	2 Spans	3 Spans
2	9090	8800	9167
3	6060	5867	6111
4	4545	4400	4583
5	3636	3520	3667
6	2828	2933	3056
7	1781	2514	2619
8	1193	2200	2257
9	838	1956	1585
10	611	1472	1155
11	459	1106	868
12	354	852	669
13	278	670	526
14	223	536	421
15	181	436	342

BM184S – 5mm Load Chart

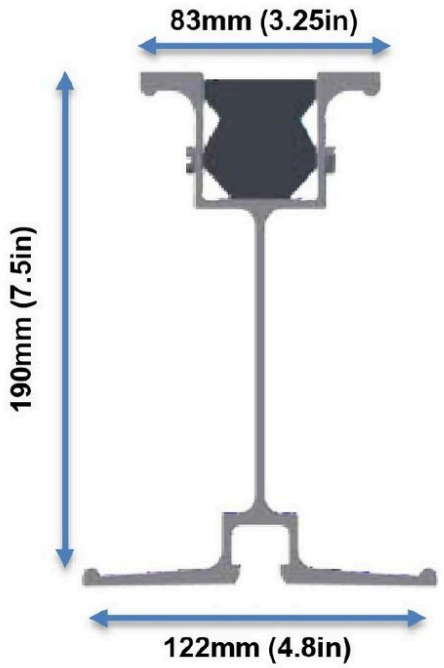
NOTE:

1. Deflection limited to 5mm
2. Factor of Safety 2.2:1 included
3. Design Load = Dead Load + Live Load
4. Cantilevers are not to exceed 30% of adjacent span and not more than 915mm (3ft)
5. Consult TTF Engineering for other stringer configurations.



Allowable UDL. (kN/m)			
Span m	1 Span	2 Spans	3 Spans
0.6	134.77	130.47	135.91
0.9	89.85	86.98	90.61
1.2	67.39	65.24	67.96
1.5	53.91	52.19	54.36
1.8	32.45	43.49	45.30
2.1	17.52	37.28	33.13
2.4	10.27	24.74	19.42
2.7	6.41	15.44	12.12
3.0	4.21	10.13	7.95
3.3	2.87	6.92	5.43
3.6	2.03	4.89	3.84
3.9	1.47	3.55	2.79
4.2	1.09	2.64	2.07
4.5	0.83	2.00	1.57

Allowable UDL. (plf)			
Span ft	1 Span	2 Spans	3 Spans
2	9090	8800	9167
3	6060	5867	6111
4	4545	4400	4583
5	3636	3520	3667
6	2651	2933	3056
7	1431	2514	2619
8	839	2021	1587
9	524	1262	991
10	344	828	650
11	235	565	444
12	166	399	313
13	120	290	228
14	89	215	169
15	68	164	128



STANDARD LENGTH		WEIGHT	
ft	m	lb	kg
9	2.74	43.2	19.5
10.6	3.20	50.4	22.7
12	3.66	57.6	26.0
14	4.27	67.2	30.3
16	4.88	76.8	34.6
18	5.49	86.4	39.0
21	6.40	100.8	45.4

BM190P – STRUCTURAL PROPERTIES

SECTION PROPERTI		METRIC	IMPERIAL
Overall Height		190.00 mm	7.48 in
Base Width		121.92 mm	4.8 in
Top Width		82.55 mm	3.25 in
Cross Section Area	excluding nailer	2374 mm2	3.68 In2
Nominal Weight	excluding nailer	6.46 kg/m	4.34 lb/ft
	including nailer	7.44 kg/m	5 lb/ft
Distance of Neutral Axis from Top		102 mm	4.03 in
Moment of Inertia	Ix-x	13.61 E6 mm 4	32.71 in4
	Iy-y	1.64 E6 mm4	3.94 in4
Section Modulus	Sxt	13.31 E4 mm3	8.12 in3
	Sxb	15.19 E4 mm3	9.27 in3
	Sy	2.69 E4 mm3	1.64 in3
Radius of Gyration	rx	65 mm	2.54 in
	ry	25 mm	0.99 in
Modulus of Elasticity	E	7.03 E4 kN/mm2	10.2 E6 psi

ALLOY PROPERTIES

Ultimate Tensile Stress	Fu	290 E3 kN/m2	42 ksi
Yield Stress	Fy	255 E3 kN/m2	37 ksi
Shear Yield Stress	Fsy	155 E3 kN/m2	22 ksi
Ultimate Bearing Stress	Fb	560 E3 kN/m2	84 ksi

LOCAL BUCKLING OF BOTTOM CHORD

Ultimate Bending Moment	38.75 kN m	28.58 k ft
Allowable Bending Moment	17.61 kN m	12.99 k ft

LOCAL BUCKLING OF TOP FLANGE

Ultimate Bending Moment	33.95 kN m	25.04 k ft
Allowable Bending Moment	15.43 kN m	11.30 k ft

ALLOWABLE REACTION AND SHEARS
(Calculated Values – to be confirmed by test)

Interior Reaction (Full Bearing)	72.06 kN	16.20 kips
Exterior Reaction (Full Bearing)	36.03 kN	8.10 kips
Concentrated Load	72.06 kN	16.20 kips
Shear	45.06 kN	10.13 kips

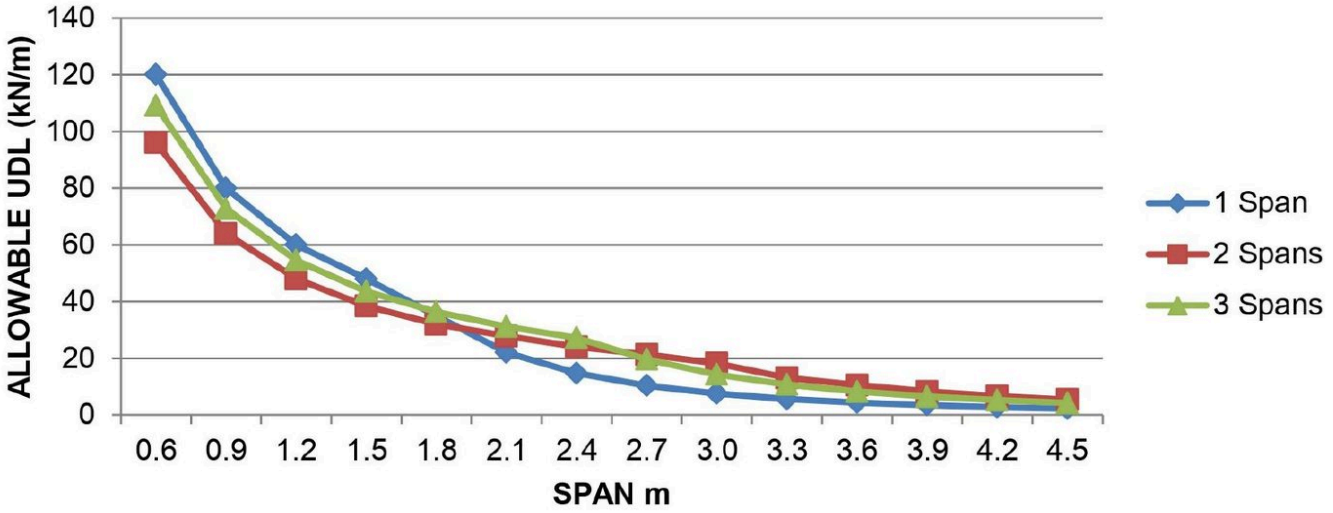
NOTE:

- ALLOWABLE DESIGN VALUES ARE BASED ON A 2.2:1 FACTOR OF SAFETY
- ALLOWABLE REACTION AND SHEAR VALUES ARE BASED ON ALCAN'S STRENGTH OF ALUMINUM. 4TH EDITION.
- INTERIOR REACTION LENGTH OF BEARING: 127MM (5IN).
- EXTERIOR REACTION LENGTH OF BEARING: 64MM (2.5IN).

BM190P – L/360 Load Chart

NOTE:

1. Deflection limited to L/360
2. Factor of Safety 2.2:1 included
3. Design Load = Dead Load + Live Load
4. Cantilevers are not to exceed 30% of adjacent span and not more than 915mm (3ft)
5. Consult TTF Engineering for other stringer configurations.



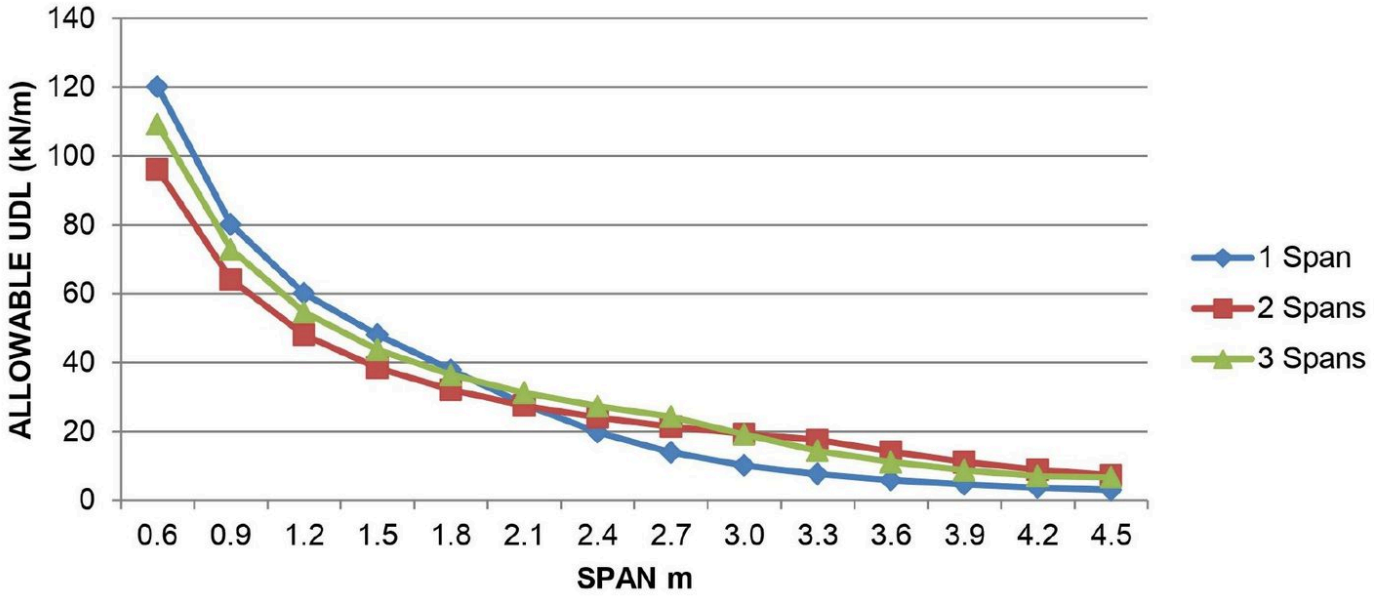
Allowable UDL. (kN/m)			
Span m	1 Span	2 Spans	3 Spans
0.6	120.1	96.08	109.18
0.9	80.06	64.05	72.79
1.2	60.05	48.04	54.59
1.5	48.04	38.43	43.67
1.8	35.01	32.03	36.39
2.1	22.05	27.85	31.19
2.4	14.77	24.02	27.29
2.7	10.37	21.35	19.62
3.0	7.56	18.22	14.30
3.3	5.63	13.09	10.75
3.6	4.38	10.54	8.28
3.9	3.49	8.28	6.51
4.2	2.76	6.64	5.21
4.5	2.24	5.40	4.24

Allowable UDL. (plf)			
Span ft	1 Span	2 Spans	3 Spans
2	8100	6480	7364
3	5400	4320	4909
4	4050	3240	3682
5	3240	2592	2945
6	2288	2160	2455
7	1441	1857	2104
8	965	1620	1826
9	678	1440	1282
10	494	1191	935
11	371	895	702
12	289	689	541
13	225	542	426
14	180	434	341
15	146	353	277

BM190P – L/270 Load Chart

NOTE:

1. Deflection limited to L/270
2. Factor of Safety 2.2:1 included
3. Design Load = Dead Load + Live Load
4. Cantilevers are not to exceed 30% of adjacent span and not more than 915mm (3ft)
5. Consult TTF Engineering for other stringer configurations.



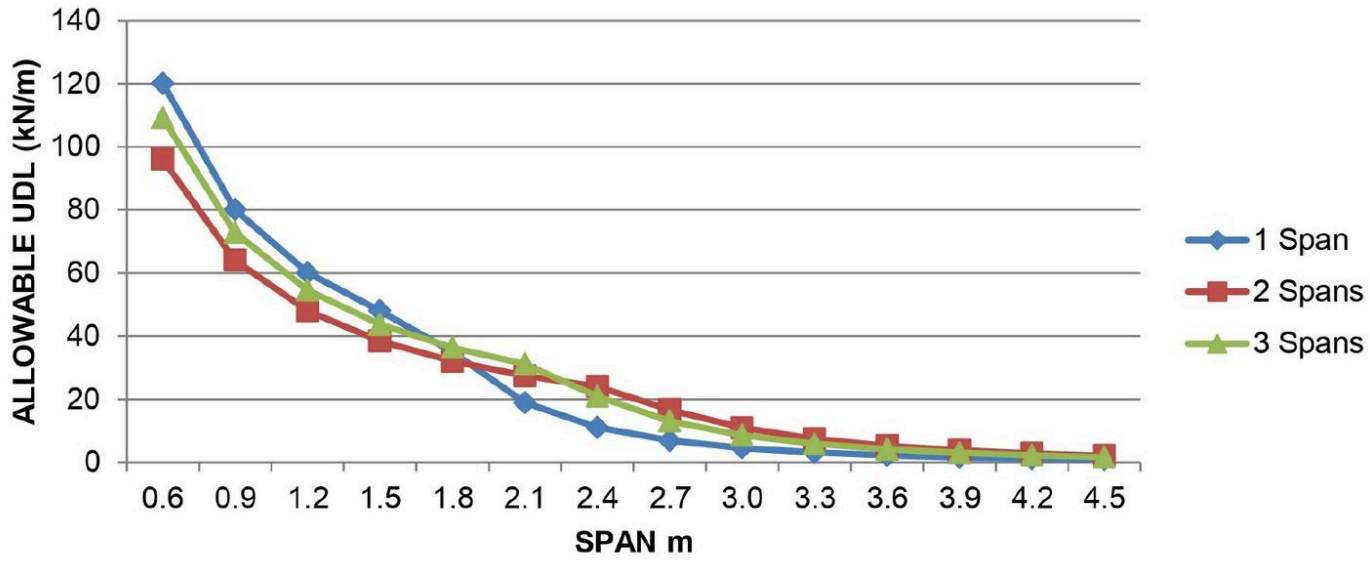
Allowable UDL. (kN/m)			
Span m	1 Span	2 Spans	3 Spans
0.6	120.1	96.08	109.18
0.9	80.06	64.05	72.79
1.2	60.05	48.04	54.59
1.5	48.04	38.43	43.67
1.8	37.83	32.03	36.39
2.1	27.79	27.45	31.19
2.4	19.69	24.02	27.29
2.7	13.83	21.35	24.26
3.0	10.08	19.22	19.07
3.3	7.58	17.47	14.33
3.6	5.84	14.06	11.04
3.9	4.59	11.06	8.68
4.2	3.67	8.85	6.95
4.5	2.99	7.2	6.65

Allowable UDL. (plf)			
Span ft	1 Span	2 Spans	3 Spans
2	8100	6480	7364
3	5400	4320	4909
4	4050	3240	3682
5	3240	2592	2945
6	2511	2160	2455
7	1845	1851	2104
8	1287	1620	1841
9	904	1440	1636
10	659	1296	1246
11	495	1178	936
12	381	919	721
13	300	723	567
14	240	579	454
15	195	470	369

BM190P – 5mm Load Chart

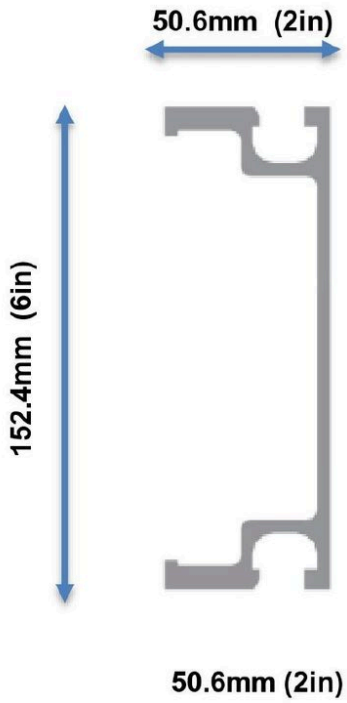
NOTE:

1. Deflection limited to 5mm
2. Factor of Safety 2.2:1 included
3. Design Load = Dead Load + Live Load
4. Cantilevers are not to exceed 30% of adjacent span and not more than 915mm (3ft)
5. Consult TTF Engineering for other stringer configurations.



Allowable UDL. (kN/m)			
Span m	1 Span	2 Spans	3 Spans
0.6	120.1	96.08	109.18
0.9	80.06	64.05	72.79
1.2	60.05	48.04	54.59
1.5	48.04	38.43	43.67
1.8	35.01	32.03	36.39
2.1	18.90	27.45	31.19
2.4	11.08	24.02	20.95
2.7	6.92	16.66	13.08
3.0	4.54	10.93	8.58
3.3	3.10	7.47	5.86
3.6	2.19	5.27	4.14
3.9	1.59	3.83	3.00
4.2	1.18	2.85	2.23
4.5	0.90	2.16	1.70

Allowable UDL. (plf)			
Span ft	1 Span	2 Spans	3 Spans
2	8100	6480	7364
3	5400	4320	4909
4	4050	3240	3682
5	3240	2592	2945
6	2511	2160	2455
7	1544	1851	2104
8	905	1620	1712
9	565	1361	1069
10	371	893	701
11	253	610	479
12	179	431	338
13	130	313	245
14	96	232	183
15	73	176	138



STANDARD LENGTH		WEIGHT	
ft	m	lb	kg
10.6	3.20	16.8	7.62
12	3.66	19.2	8.71
14	4.27	22.4	10.2
16	4.88	25.6	11.6
18	5.49	28.8	13.1
21	6.40	33.6	15.2

152 STRONGBACK – STRUCTURAL PROPERTIES

SECTION PROPERTI		METRIC	IMPERIAL
Overall Height		152.4 mm	6.0 in
Base Width		50.6 mm	2.0 in
Top Width		50.6 mm	2.0 in
Cross Section Area		1389 mm2	2.15 In2
Nominal Weight		3.77 kg/m	2.53 lb/ft
Distance of Neutral Axis from Top		76.2 mm	3.0 in
Moment of Inertia	Ix-x	4.68 E6 mm 4	11.2 in4
	Iy-y	0.36 E6 mm4	0.85 in4
Section Modulus	Sx	6.14 E4 mm3	3.75 in3
	Sy	1.02 E4 mm3	0.62 in3
Radius of Gyration	rx	58.04 mm	2.29 in
	ry	15.98 mm	0.63 in
Modulus of Elasticity	E	7.03 E4 kN/mm2	10.2 E6 psi

ALLOY PROPERTIES

Ultimate Tensile Stress	Fu	290 E3 kN/m2	42 ksi
Yield Stress	Fy	255 E3 kN/m2	37 ksi
Shear Yield Stress	Fsy	155 E3 kN/m2	22 ksi
Ultimate Bearing Stress	Fb	560 E3 kN/m2	84 ksi

LOCAL BUCKLING OF FLANGE

Ultimate Bending Moment	14.12 kN m	10.43 k ft
Allowable Bending Moment	6.42 kN m	4.74 k ft

SHEARS
(Calculated Values – to be confirmed by test)

Ultimate Shear	96.57 kN	21.71 kips
Allowable Shear	43.86 kN	9.86 kips

NOTE:

- ALLOWABLE DESIGN VALUES ARE BASED ON A 2.2:1 FACTOR OF SAFETY
- ALLOWABLE REACTION AND SHEAR VALUES ARE BASED ON ALCAN'S STRENGTH OF ALUMINUM. 4TH EDITION

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This guide is for general information only. All shoring must be designed and approved by a qualified engineer in line with local regulations.

