Engineering Data - Beams and Columns

Notes to Table

Note 1: Loads are governed by shear or web crippling.
Note 2: For uniform beam working loads asymmetric sections are required to be adequately braced to prevent rotation and twist.

Beam Loads

The loads and deflections shown are based on simply supported beams uniformly loaded. For other loading configurations refer to Reference Tables (Table 1) in this Tab Section.

Structural Data

1. Section Properties

Section properties have been derived from 'as formed' shapes and are based on nominal dimensions and nominal base steel thickness. Nominal masses are calculated from the tabulated areas based on a steel density of 7850 kg per cu.m. For dead load calculations the tabulated masses should be increased by 10% to allow for rolling tolerances, and the result multiplied by 0.0098 to give corresponding dead load (self weight) in kN per m. run of section. Also note the beam and column loads do not make allowance for self weight of the section. When designing a structure in which the section forms an integral part, the self weight should be determined using the method described above and subtracted from the tabulated load.

2. Beam and Column Load Tables

Ultimate load values have been calculated from the section properties as permitted by AS/NZS 4600 Cold Formed Steel Structures code. The guaranteed minimum yield stress Fy has been taken as 210MPa for plain channels, and the increase allowed resulting from cold forming has been determined in accordance with the code. The listed working loads have been derived from the ultimate load divided by 1.5.

2.1 Span or Column Length

Listed value is to be taken as the distance between centres of supports.

2.2 Beam Load at Maximum Permissible Stresses

In order to establish the table of working loads that can be carried by the corresponding section, the ultimate limit state loads that could be permitted by the code were first determined. These were divided by 1.5 to provide 'conservative' working loads. The load is considered to be uniformly distributed along the span and orientated with respect to the section, as defined by the diagrams to cause bending about X-X axis only. The webs of the beams are assumed to be unstiffened and have been checked for end bearing in accordance with clause 3.3.6 of AS/NZS4600:1996. Where this is critical the working loads have been appropriately reduced. This assessment has been based on a rigid support with the beam bearing on each support for a length equal to at least the straight length of web-depth of the basic section.

2.3 Deflection

Deflections are calculated for the corresponding beam working load, using standard formulae. Deflections or uniformly distributed loads for conditions other than those tabulated may be calculated from the following:-

$$\delta_2 = \frac{W_2}{W_1} \left[\frac{L_2}{L_1}\right]^3 \delta_1$$

where:

W_1	tabulated load in kN
δ_1	corresponding tabulated deflection in mm
L_1	corresponding tabulated length in mm
W_2	new load
L_2	new length
δ_2	deflection corresponding to new length and new load

It is recommended that beam deflections generally be limited to the smaller of span/180 or 10mm and loads restricted accordingly. These limitations are based on 'visual straightness' with the latter value subject to variation to suit particular visual or other physical requirements.

2.4 Maximum Column Load

Listed values of column load capacity are derived on the basis of a concentric axial load applied to the section, acting as a column with an effective length corresponding to the listed value, i.e. translational and torsional restraint available at the centres of supports. For other conditions of loading and/or restraint, reference should be made to the appropriate sections of AS/NZS 4600 Cold Formed Steel Structures.

3. Recommended Bearing & Connection Loads

Listed values are based on extensive testing of components by Unistrut Australia Pty Limited using a factor of safety of 2.5 against failure of the connection.

4. Point Loads

For point loads at midspan, the allowable loads are half the values shown in the tables. The deflection for the point load is obtained from: $\delta_2 = 0.80\ \delta_1$
where δ_1 is the deflection for a uniform load which is double the value of the point load.

Beams and Columns

Beam Span or Column Unsupported Height mm	Section Number	Uniform Beam Working Load kN	Deflection at Uniform Working Load mm	Max. Loading of Column kN
250	P1000	14.83	0.22	45.51
	P1001	25.64	0.08	97.71
	P1001-3	27.90	0.02	146.48
	P1001C3	25.64	0.05	145.92
	P1001C41	25.64	0.04	195.70
	P1003	17.46	0.15	78.01
	P1004A	26.33	0.02	157.31
500	P1000	7.42	0.87	36.84
	P1001	19.58	0.50	94.09
	P1001-3	27.90	0.19	141.13
	P1001C3	25.64	0.39	138.70
	P1001C41	25.64	0.30	188.76
	P1003	8.73	0.59	74.48
	P1004A	26.33	0.14	153.24
750	P1000	4.94	1.97	28.22
	P1001	13.06	1.13	88.35
	P1001-3	27.90	0.65	132.53
	P1001C3	18.61	0.96	128.60
	P1001C41	25.64	1.02	178.34
	P1003	5.82	1.33	68.94
	P1004A	26.33	0.47	146.68
1000	P1000	3.71	3.50	21.44
	P1001	9.79	2.00	80.90
	P1001-3	23.76	1.31	121.36
	P1001C3	13.96	1.72	117.29
	P1001C41	21.16	2.00	165.65
	P1003	4.36	2.37	61.87
	P1004A	26.33	1.12	137.97
1250	P1000	2.97	5.46	16.42
	P1001	7.83	3.13	72.23
	P1001-3	19.01	2.05	108.36
	P1001C3	11.17	2.68	105.77
	P1001C41	16.93	3.13	151.78
	P1003	3.49	3.70	53.84
	P1004A	22.82	1.90	127.53
1500	P1000	2.47	7.87	13.20
	P1001	6.53	4.50	62.89
	P1001-3	15.84	2.95	94.35
	P1001C3	9.31	3.86	94.42
	P1001C41	14.11	4.50	137.52
	P1003	2.91	5.33	45.43
	P1004A	19.02	2.73	115.84

Beam Span or Column Unsupported Height mm	Section Number	Uniform Beam Working Load kN	Deflection at Uniform Working Load mm	Max. Loading of Column kN
1750	P1000	2.12	10.71	11.00
	P1001	5.60	6.13	53.40
	P1001-3	13.58	4.02	80.11
	P1001C3	7.98	5.25	83.31
	P1001C41	12.09	6.13	123.36
	P1003	2.49	7.25	37.16
	P1004A	16.30	3.72	103.39
2000	P1000	1.85	13.99	9.35
	P1001	4.90	8.01	44.21
	P1001-3	11.88	5.25	66.33
	P1001C3	6.98	6.86	72.48
	P1001C41	10.58	8.01	109.59
	P1003	2.18	9.48	29.41
	P1004A	14.26	4.86	90.69
2250	P1000	1.65	17.70	8.05
	P1001	4.35	10.13	35.62
	P1001-3	10.56	6.65	53.44
	P1001C3	6.20	8.68	62.04
	P1001C41	9.41	10.13	96.41
	P1003	1.94	11.99	23.24
	P1004A	12.68	6.15	78.16
2500	P1000	1.48	21.85	7.01
	P1001	3.92	12.51	28.85
	P1001-3	9.50	8.21	43.29
	P1001C3	5.58	10.72	52.11
	P1001C41	8.47	12.51	83.93
	P1003	1.75	14.81	18.82
	P1004A	11.41	7.59	66.20
2750	P1000	1.35	26.44	6.14
	P1001	3.56	15.14	23.85
	P1001-3	8.64	9.93	35.78
	P1001C3	5.08	12.97	44.05
	P1001C41	7.70	15.13	72.11
	P1003	3.56	15.14	23.85
	P1004A	10.37	9.19	55.06
3000	P1000	1.24	31.47	0.00
	P1001	3.26	18.02	20.04
	P1001-3	7.92	11.82	30.07
	P1001C3	4.65	15.44	37.67
	P1001C41	7.05	18.01	62.18
	P1003	1.45	21.32	0.00
	P1004A	9.51	10.93	46.27

Note:
The table should be read in conjunction with 'Notes on Derivation of Structural Data' and 'How to use Load Tables' in this Tab Section.

Elements of Section

Part No.	Mass kg/m	Area of Section mm^2	Axis XX I 10^6mm^4	Axis XX Z 10^3mm^3	Axis XX r mm	Axis YY I 10^6mm^4	Axis YY Z 10^3mm^3	Axis YY r mm
P1000	2.59	330	0.069	2.920	14.5	0.092	4.451	16.7
P1001	5.18	660	0.318	7.711	22.0	0.184	8.902	16.7
P1001-3	7.78	991	1.178	18.713	34.5	0.276	13.365	16.7
P1001C3	7.78	991	0.530	10.995	23.1	0.576	13.945	24.1
P1001D3	7.77	991	0.481	10.203	22.0	0.557	13.491	23.7
P1001C41	10.38	1322	0.688	16.670	22.8	0.931	22.546	26.5
P1003	4.55	580	0.120	3.771	14.4	0.300	6.007	22.8
P1004A	9.12	1162	1.529	24.660	36.3	0.424	18.336	19.1

Note:
I *- Moment of Inertia*
Z *- Section Modulus*
r *- Radius of Gyration*

For Slip and Pullout Performance details refer to this Tab Section.

Beam and Columns

Beam Span or Column Unsupported Height mm	Section Number	Uniform Beam Working Load kN	Deflection at Uniform Working Load mm	Max. Loading of Column kN
250	P2000	10.30	0.20	32.92
	P2001	11.78	0.05	70.84
	P2001C3	11.77	0.03	106.31
500	P2000	6.06	0.94	26.55
	P2001	11.78	0.37	68.18
	P2001C3	11.77	0.24	101.69
750	P2000	4.04	2.12	19.21
	P2001	11.09	1.17	63.96
	P2001C3	11.77	0.24	94.74
1000	P2000	3.03	3.77	12.91
	P2001	8.32	2.07	58.50
	P2001C3	10.91	1.80	86.31
1250	P2000	2.42	5.89	9.03
	P2001	6.65	3.24	52.15
	P2001C3	8.73	2.82	77.21
1500	P2000	2.02	8.48	6.89
	P2001	5.54	4.67	45.32
	P2001C3	7.28	4.06	68.03
1750	P2000	1.73	11.54	5.56
	P2001	4.75	6.35	38.39
	P2001C3	6.24	5.53	59.16
2000	P2000	1.27 (2)	8.41	5.46
	P2001	3.48 (2)	4.63	31.77
	P2001C3	4.01 (2)	3.97	58.18
2250	P2000	1.35	19.07	4.02
	P2001	3.70	10.50	25.48
	P2001C3	4.85	9.13	43.10
2500	P2000	1.21	23.55	3.53
	P2001	3.33	12.96	20.64
	P2001C3	4.37	11.28	36.13
2750	P2000	1.10	28.49	3.14
	P2001	3.02	15.68	17.06
	P2001C3	3.97	13.64	30.72
3000	P2000	1.01	33.91	2.82
	P2001	2.77	18.66	14.33
	P2001C3	3.64	16.24	26.44

Note:
The table should be read in conjunction with 'Notes on Derivation of Structural Data' and 'How to use Load Tables' in this Tab Section.

Elements of Section

Part No.	Mass kg/m	Area of Section mm^2	Axis XX I $10^6 mm^4$	Axis XX Z $10^3 mm^3$	Axis XX r mm	Axis YY I $10^6 mm^4$	Axis YY Z $10^3 mm^3$	Axis YY r mm
P2000	1.79	228	0.052	2.297	15.2	0.065	3.143	16.9
P2001	3.63	462	0.261	6.321	23.8	0.131	6.367	16.9
P2001C3	5.46	695	0.394	8.302	23.8	0.418	8.410	24.5

Note:
I *- Moment of Inertia*
Z *- Section Modulus*
r *- Radius of Gyration*

For Slip and Pullout Performance details, refer to this Tab Section.

Beams and Columns

Beam Span or Column Unsupported Height mm	Section Number	Uniform Beam Working Load kN	Deflection at Uniform Working Load mm	Max. Loading of Column kN
250	P3300	5.52	0.42	34.88
	P3301	15.58	0.25	73.20
500	P3300	2.76	1.68	27.76
	P3301	7.79	1.01	67.32
750	P3300	1.84	3.79	19.42
	P3301	5.19	2.26	58.55
1000	P3300	1.38	6.74	12.08
	P3301	3.90	4.02	48.16
1250	P3300	1.10	10.53	7.90
	P3301	3.12	6.28	37.47
1500	P3300	0.92	15.16	5.56
	P3301	2.60	9.05	27.50
1750	P3300	0.79	20.63	0.00
	P3301	2.23	12.32	20.21
2000	P3300	0.69	26.95	0.00
	P3301	1.95	16.09	15.47
2250	P3300	0.61	34.11	0.00
	P3301	1.73	20.36	12.22
2500	P3300	0.55	42.11	0.00
	P3301	1.56	25.13	0.00
2750	P3300	0.50	50.95	0.00
	P3301	1.42	30.41	0.00
3000	P3300	0.46	60.63	0.00
	P3301	1.30	36.19	0.00

Note:
The table should be read in conjunction with 'Notes on Derivation of Structural Data' and 'How to use Load Tables' in this Tab Section.

Elements of section

			Axis XX			Axis YY		
Part No.	Mass kg/m	Area of Section mm^2	I $10^6 mm^4$	Z $10^3 mm^3$	r mm	I $10^4 mm^4$	Z $10^3 mm^3$	r mm
P3300	1.82	232	0.013	0.999	7.6	0.055	2.661	15.4
P3301	3.65	465	0.063	2.841	11.6	0.110	5.329	15.4

Note:
I *- Moment of Inertia*
Z *- Section Modulus*
r *- Radius of Gyration*

For Slip and Pullout Performance details, refer to this Tab Section.

Beams and Columns

Beam Span or Column Unsupported Height mm	Section Number	Uniform Beam Working Load kN	Deflection at Uniform Working Load mm	Max. Loading of Column kN
250	P4000	4.20	0.44	22.36
	P4001	10.39	0.24	49.05
	P4003	11.16	0.06	73.53
	P4002-1	4.71	0.25	51.41
500	P4000	2.10	1.77	16.30
	P4001	5.55	1.03	45.24
	P4003	11.16	0.51	68.80
	P4002-1	2.35	0.99	42.12
750	P4000	1.40	3.98	10.46
	P4001	3.70	2.33	39.54
	P4003	10.02	1.53	62.23
	P4002-1	2.35	0.99	42.12
1000	P4000	1.05	7.08	6.54
	P4001	2.78	4.14	32.74
	P4003	7.52	2.73	53.62
	P4002-1	1.18	3.95	18.99
1250	P4000	0.84	11.07	4.54
	P4001	2.22	6.46	25.69
	P4003	6.01	4.26	44.23
	P4002-1	0.94	6.18	12.16
1500	P4000	0.70	15.94	3.35
	P4001	1.85	9.31	19.06
	P4003	5.01	6.13	34.96
	P4002-1	0.78	8.89	0.00

Beam Span or Column Unsupported Height mm	Section Number	Uniform Beam Working Load kN	Deflection at Uniform Working Load mm	Max. Loading of Column kN
1750	P4000	0.60	21.69	0.00
	P4001	1.59	12.67	14.00
	P4003	4.30	8.35	26.45
	P4002-1	0.67	12.10	0.00
2000	P4000	0.52	28.33	0.00
	P4001	1.39	16.54	10.72
	P4003	3.76	10.90	20.25
	P4002-1	0.59	15.81	0.00
2250	P4000	0.47	35.86	0.00
	P4001	1.23	20.94	8.47
	P4003	3.34	13.80	16.01
	P4002-1	0.52	20.01	0.00
2500	P4000	0.42	44.27	0.00
	P4001	1.11	25.85	0.00
	P4003	3.01	17.04	12.97
	P4002-1	0.47	24.70	0.00
2750	P4000	0.38	53.57	0.00
	P4001	1.01	31.28	0.00
	P4003	2.73	20.61	0.00
	P4002-1	0.43	29.89	0.00
3000	P4000	0.35	63.57	0.00
	P4001	0.93	37.22	0.00
	P4003	2.51	24.53	0.00
	P4002-1	0.39	35.57	0.00

Note:
The table should be read in conjunction with 'Notes on Derivation of Structural Data' and 'How to use Load Tables' in this Tab Section.

Elements of Section

Part No.	Mass kg/m	Area of Section mm^2	Axis XX I 10^6mm^4	Axis XX Z 10^3mm^3	Axis XX r mm	Axis YY I 10^6mm^4	Axis YY Z 10^3mm^3	Axis YY r mm
P4000	1.26	160	0.010	0.786	7.8	0.039	1.880	15.6
P4001	2.51	320	0.044	2.082	11.7	0.078	3.764	15.6
P4002-1	3.22	410	0.019	1.036	6.9	0.247	4.946	24.6
P4003	3.77	480	0.180	5.636	19.3	0.083	4.002	13.1

Note:
I *- Moment of Inertia*
Z *- Section Modulus*
r *- Radius of Gyration*

For Slip and Pullout Performance details, refer to this Tab Section.

Beams and Columns

Beam Span or Column Unsupported Height mm	Section Number	Uniform Beam Working Load kN	Deflection at Uniform Working Load mm	Max. Loading of Column kN
250	P5500	27.04	0.14	57.03
	P5501	27.04	0.03	122.16
500	P5500	13.84	0.57	45.91
	P5501	27.04	0.21	118.17
750	P5500	9.23	1.29	33.78
	P5501	27.04	0.71	111.82
1000	P5500	6.92	2.29	23.85
	P5501	20.50	1.27	103.50
1250	P5500	5.54	3.58	17.38
	P5501	16.40	1.98	93.71
1500	P5500	4.61	5.15	13.76
	P5501	13.67	2.86	82.98
1750	P5500	3.95	7.01	11.48
	P5501	11.72	3.89	71.88
2000	P5500	3.46	9.16	9.89
	P5501	10.25	5.08	60.91

Beam Span or Column Unsupported Height mm	Section Number	Uniform Beam Working Load kN	Deflection at Uniform Working Load mm	Max. Loading of Column kN
2250	P5500	3.08	11.59	8.72
	P5501	9.11	6.43	50.48
2500	P5500	2.77	14.31	7.81
	P5501	8.20	7.93	41.04
2750	P5500	2.52	17.31	7.06
	P5501	7.46	9.60	33.92
3000	P5500	2.31	20.61	6.43
	P5501	6.83	11.42	28.50
3250	P5500	2.13	24.18	5.89
	P5501	6.31	13.41	24.28
3500	P5500	1.98	28.05	0.00
	P5501	5.86	15.55	0.00
3750	P5500	1.85	32.20	0.00
	P5501	5.47	17.85	0.00
4000	P5500	1.73	36.63	0.00
	P5501	5.13	20.31	0.00

Note:
The table should be read in conjunction with 'Notes on Derivation of Structural Data' and 'How to use Load Tables' in this Tab Section.

Elements of Section

Part No.	Mass kg/m	Area of Section mm2	Axis XX I $10^6 mm^4$	Axis XX Z $10^3 mm^3$	Axis XX r mm	Axis YY I $10^6 mm^4$	Axis YY Z $10^3 mm^3$	Axis YY r mm
P5500	3.40	433	0.197	5.730	21.3	0.131	6.328	17.4
P5501	6.81	867	1.052	16.990	34.8	0.261	12.662	17.4

Note:
I *- Moment of Inertia*
Z *- Section Modulus*
r *- Radius of Gyration*

For Slip and Pullout Performance details, refer to this Tab Section.

Beams & Columns - A1000

Beam Span or Column Unsupported Height mm	Section Number	Uniform Beam Working Load kN	Deflection at Uniform Working Load mm	Max. Loading of Column kN
250	A1000	7.36	0.29	26.98
	A1001	16.17	0.12	59.99
500	A1000	3.68	1.14	20.05
	A1001	10.47	0.64	56.28
750	A1000	2.54	2.57	14.26
	A1001	6.98	1.44	50.60
1000	A1000	1.84	4.57	10.19
	A1001	5.23	2.57	43.60
1250	A1000	1.47	7.14	7.78
	A1001	4.19	4.01	36.00
1500	A1000	1.23	10.29	6.23
	A1001	3.49	5.78	28.49
1750	A1000	1.05	14.00	5.12
	A1001	2.99	7.86	21.58
2000	A1000	0.92	18.29	4.27
	A1001	2.62	10.27	16.52
2250	A1000	0.82	23.15	0.00
	A1001	2.33	12.99	13.05
2500	A1000	0.74	28.58	0.00
	A1001	2.09	16.04	10.57
2750	A1000	0.67	34.58	0.00
	A1001	1.90	19.41	0.00
3000	A1000	0.61	41.15	0.00
	A1001	1.74	23.10	0.00

Note:
The table should be read in conjunction with 'Notes on Derivation of Structural Data' and 'How to use Load Tables' in this Tab Section.

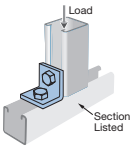
Elements of Section

			Axis XX			Axis YY		
Part No.	Mass kg/m	Area of Section mm²	I 10^6mm⁴	Z 10^3mm³	r mm	I 10^6mm⁴	Z 10^3mm³	r mm
A1000	1.62	207	0.026	1.466	11.2	0.034	2.116	12.8
A1001	3.25	414	0.133	4.175	17.9	0.067	4.237	12.8

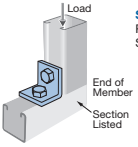
Note:
I *- Moment of Inertia*
Z *- Section Modulus*
r *- Radius of Gyration*

For Slip and Pullout Performance details, refer to this Tab Section.

Load data - For Unistrut sections subject to crushing loads



Section A1000
Recommended Load: 13.3kN
Safety Factor: 2.5



Section A1000
Recommended Load: 8.9kN
Safety Factor: 2.5

"Load capacities have been calculated in accordance with the provisions of AS/NZS 4600:1996 "Cold-formed steel structures", and in particular, Section 6.2.2.7. The bolting system chosen using the data provided in the tables will perform as specified when design, fabrication and erection are carried out in accordance with Unistrut's recommendations and accepted building practice".

Note:
To simplify the table, channel nuts with springs only shown with the exception of P3016. Unistrut nuts without springs will have identical performance.

Figures marked with (*) in the table opposite were obtained using high strength (Grade 8.8) screws.

Figures not marked with (*) were obtained using standard strength (Grade 4.6) screws. It should be noted that unless otherwise specified, standard strength screws (Grade 4.6) are supplied.

For Slip Loads using 4.6 Grade Commercial bolts and screws, Contact your local Unistrut Service Centre.

Hot Dipped Galvanised Channel Nuts

- Apply Pullout Loads as listed
- For Slip Loads - refer to your local Unistrut Service Centre.

Slip and Pullout Performance - Zinc Plated

Channel Type	Nut Type	Pullout (kN)	Slip (kN)	Torque (Nm)
P1000	P1006	7.3	2.7*	9
	P1007	10.1	5.2*	22
	P1008	16.5	8.7*	44
	P1010	16.5	12.9*	77
P2000	P3016	2.1	0.3	9
	P1006	4.8	1.1*	9
	P1007	5.0	4.0*	22
	P1008	10.8	7.1*	37
	P1010	10.8	6.7*	37
P3300	P3016	2.2	0.6	9
	P4006	7.3	2.7*	9
	P4007	10.1	5.2*	22
	P4008	16.5	8.7*	44
	P4010	16.5	12.9*	77
P4000	P3016	2.1	0.3	9
	P4006	4.8	1.1*	9
	P4007	5.0	4.0*	22
	P4008	10.8	7.1*	37
	P4010	10.8	6.7*	37
A1000	A1008	11.3	3.7*	44
P5500	P5508	16.5	8.7*	44
	P5510	16.5	12.9*	77

Note: *Stainless steel grade 316 screws, nuts and channel used to determine loads.*

These figures are results obtained from a comprehensive series of tests carried out by a NATA registered laboratory.

For further technical information please contact your nearest Unistrut Service Centre.

Slip and Pullout Performance - Stainless Steel

Channel Type	Nut Type	Pullout (kN)	Slip (kN)	Torque (Nm)
P1000SS	P1006SS	5.7	0.4	3.5
	P1007SS	8.2	0.5	8.5
	P1008SS	11.6	1.0	17.0
	P1013SS	12.1	1.2	30.0

Slip and Pullout Performance - Aluminium Load Data

Approximate beam load capacities for channel sections may be obtained from the engineering data sections in this catalogue. Multiply data by the following percentages:

Material	Percentage Factor
Extruded Aluminium	38%

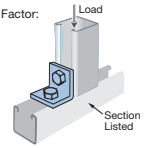
Nut pullout strength and resistance to slip for sections may be obtained from the engineering data sections in this catalogue. Multiply data by the following percentages:

Material	Slip Percentage Factor	Pullout Percentage Factor
Extruded Aluminium	75%	50%

Note: *Some fittings, as shown in this catalogue can be supplied in Aluminium on special order.*

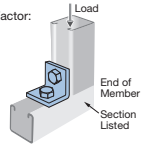
Safe Bearing Loads

Safety Factor: 2.5



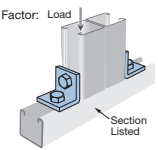
Section	Recommended Load kN
P1000	21.4
P2000	10.8
P3300	25.8
P4000	12.7

Safety Factor: 2.5



Section	Recommended Load kN
P1000	13.5
P2000	6.6
P3300	15.2
P4000	7.2

Safety Factor: 2.5



Section	Recommended Load kN
P1000	30.3
P2000	14.6
P3300	50.9
P4000	33.4

Design Load Data - Typical Channel Connections

Safety Factor = 2.5 based on ultimate strength of connection. Load diagrams indicate up to two design loads, one for 2.5mm sections (listed as P1000), and one for 1.6mm sections (P2000). Loads are calculated using high tensile (Grade 8.8) screws.

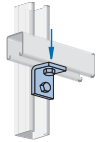
Ninety Degree Fittings - (when used in position shown)

P1026

P1000 9.5kN
P2000 4.5kN

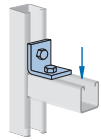
Both Ends Supported

P1068



P1000 3.2kN
P2000 3.2kN

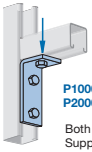
P1026



P1000 7.5kN
P2000 2.7kN

Both Ends Supported

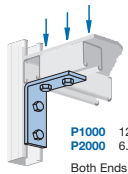
P1346



P1000 10.1kN
P2000 5.4kN

Both Ends Supported

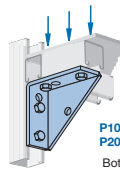
P1325



P1000 12.1kN
P2000 6.3kN

Both Ends Supported

P2484

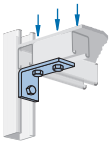


P1000 18.7kN
P2000 8.5kN

Both Ends Supported

Ninety Degree Fittings - (when used in position shown) continued

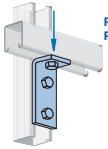
P1458



P1000 9.3kN
P2000 6.1kN

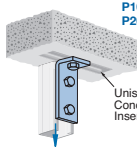
Both Ends Supported

P1326



P1000 6.8kN
P2000 4.1kN

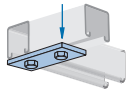
P1346



P1000 6.8kN
P2000 5.9kN

Flat Plate Fittings

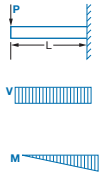
P1065



P1000 6.5kN
P2000 2.5kN

Both Ends Supported

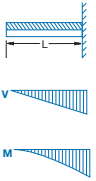
Cantilever Beams



$V_{max.} = P$

$M_{max.} = PL$

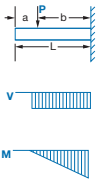
$\Delta_{max.} = \frac{PL^3}{3EI}$



$V_{max.} = W$

$M_{max.} = \frac{WL}{2}$

$\Delta_{max.} = \frac{WL^3}{8EI}$

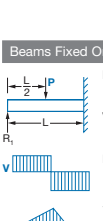


$V_{max.} = P$

$M_{max.} = Pb$

$\Delta_{max.} = \frac{Pb^2(3L-b)}{6EI}$

Simple Beams

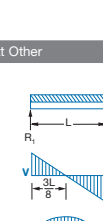


$R = \frac{P}{2}$

$V_{max.} = \frac{P}{2}$

$M_{max.} = \frac{PL}{4}$

$\Delta_{max.} = \frac{PL^3}{48EI}$

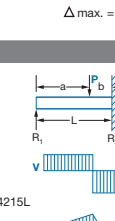


$R = \frac{W}{2}$

$V_{max.} = \frac{W}{2}$

$M_{max.} = \frac{WL}{8}$

$\Delta_{max.} = \frac{5WL^3}{384EI}$



$R_1 = \frac{Pb}{L}$

$R_2 = \frac{Pa}{L}$

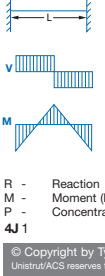
$V_{max.} = \frac{Pa}{L}$

$M_{max.} = \frac{Pab}{L}$

$\Delta_{max.}$ at $x = \sqrt{\frac{a(a+2b)}{3}}$

$\Delta_{max.} = \frac{Pab(a+2b)\sqrt{3a(a+2b)}}{27\,EIL}$

Beams Fixed One End, Supported at Other



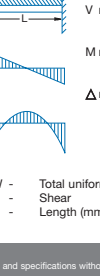
$R_1 = \frac{5P}{16}$

$V_{max.} = \frac{11P}{16}$

$M_{max.} = \frac{3PL}{16}$

$\Delta_{max.}$ at $x = 0.447L$

$\Delta_{max.} = 0.009317\,\frac{PL^3}{EI}$



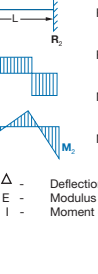
$R_1 = \frac{3W}{8}$

$V_{max.} = \frac{5W}{8}$

$M_{max.} = \frac{WL}{8}$

$\Delta_{max.}$ at $x = 0.4215L$

$\Delta_{max.} = \frac{WL^3}{185EI}$



$R_1 = \frac{Pb^2}{2L^3}\ (a + 2L)$

$R_2 = \frac{Pa}{2L^3}\ (3L2 - a^2)$

M at point of load $= R_1\,a$

M at fixed end $= \frac{Pab}{2L^2}\ (a + L)$

Beams Fixed at Both Ends

$V_{max.} = \frac{P}{2}$

$M_{max.} = \frac{PL}{8}$

$\Delta_{max.} = \frac{PL^3}{192EI}$

$V_{max.} = \frac{W}{2}$

$M_{max.} = \frac{WL}{12}$

$\Delta_{max.} = \frac{WL^3}{384EI}$

$R_1 = \frac{Pb^2}{L^3}\ (3a + b)$

$R_2 = \frac{Pa^2}{L^3}\ (a + 3b)$

$M_1 = \frac{Pab^2}{L^2}$

$M_2 = \frac{Pa^2b}{L^2}$

R - Reaction
M - Moment (Nmm)
P - Concentrated load (N)

W - Total uniform load (N)
V - Shear
L - Length (mm)

Δ - Deflection (mm)
E - Modulus of Elasticity (MPa)
I - Moment of Inertia (mm^4)

Conversion Factors for Beams with various Static Loading Conditions

Load tables in this catalogue for 41mm channel width series and 32mm channel width series are for single span beams supported at the ends. These can be used in the majority of cases. There are times when it is necessary to know what happens with other loading and support conditions. Some common arrangements are shown in Table 1. Simply multiply the loads from the Beam Load Tables by the load factors given in Table 1. Similarly, multiply the deflections from the Beam Load Tables by the deflection factor given in Table 1.

Table 1

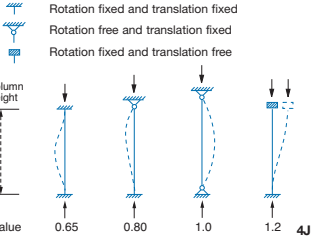
	Load and Support Condition		Load Factor	Deflection Factor
1	Simple Beam - Uniform Load		1.00	1.00
2	Simple Beam Concentrated Load at Centre		0.50	0.80
3	Simple Beam -Two Equal Concentrated Loads at 1/4 Points		1.00	1.10
4	Beam Fixed at Both Ends - Uniform Load		1.50	0.30
5	Beam Fixed at Both Ends - Concentrated Load at Centre		1.00	0.40
6	Cantilever Beam - Uniform Load		0.25	2.40
7	Cantilever Beam - Concentrated Load at End		0.12	3.20
8	Continuous Beam - Two Equal Spans - Uniform Load on One Span		1.30	0.92
9	Continuous Beam - Two Equal Spans - Uniform Load on Both Ends		1.00	0.42
10	Continuous Beam - Two Equal Spans - Concentrated Load at Centre of One Span		0.62	0.71
11	Continuous Beam - Two Equal Spans - Concentrated Load at Centre of Both Spans		0.67	0.48

Unistrut Column Loading

The strength of axially loaded columns or compression members is, in part, dependent on the end conditions, that is, the degree of end fixity or restraint. A column with both ends fixed will support more load than one with both ends free or pin-ended.

Column loads published for UNISTRUT sections in this catalogue are offered as a guide and assume a partially fixed end condition as usually found in flat ended columns that are laterally tied and braced, i.e. K = 1.0.
Assumed K values (effective length factors) for columns with varying end restraints are as follows:

End Condition Code



Unistrut Sections as Beams

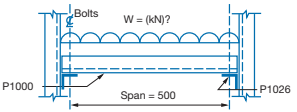
The load capacity of Unistrut members acting as a horizontal beam, between two vertical Unistrut members acting as columns, is governed by:

a. the nature of the load.
b. the particular section to be used.
c. the span of the beam.
d. the beam-load capacity of the section for a given span.
e. the load capacity of the connectors used to support the beams on the columns.
f. the load limitations, if any, resulting from special deflection considerations.

If items a), b) and c) are known, the load capacity is the smallest value of d), e), and f) as read or derived from the listed values in the appropriate tables.

Example 1

What is the uniformly distributed load capacity of a P1000 section used as a beam to span 500mm if P1026 connectors are used to support the beam?



Step 1
- Find beam load at maximum permissible stress.
- From P1000 Beam and Column in this Tab Section, 500mm and Section P1000, W = 7.42kN.

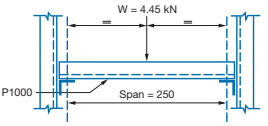
Step 2
- Find load capacity of connectors.
- From Safe Bearing Loads in this Tab Section, for P1000 section supported on P1026 connectors; Support load = 4.1kN
  Beam load = 2 x support load = 2 x 4.1 = 8.2kN.

Step 3
- Check deflection limitations.
- No special deflection considerations apply.

Step 4
- Select smallest load value from Step 1 to 3.
- Smallest value is 7.42kN.
- To convert to mass units divide by 0.0098, hence load capacity W = $\frac{7.42}{0.0098}$ = 757kg uniformly distributed.

Example 2

A beam of 250mm span is to carry a central point load of 4.45kN. Check if P1000 section is a satisfactory beam and if so, what type of connector should be used for supports and what is the resultant central deflection.



Step 1
- Convert point load to equivalent uniformly distributed load by multiplying by 2 (see note on point loads).
- Equivalent U.D.L. = 4.45 x 2 = 8.9kN.

Step 2
- Compare with beam load capacity for P1000 section spanning 250mm. From P1000 Beam and Columns in this Tab Section.
  Tabulated value = 14.83kN.
- Since this is greater than load to be applied, the P1000 section is satisfactory.

Step 3
- Determine support loads, which are each half the applied load. Support load = 2.23kN.

Step 4
- Select appropriate connector from Safe Bearing Loads in this Tab Section.
- Recommended load for P1026 supporting P1000 = 9.5kN.
- As the P1026 connectors exceed the required support load of 2.23kN, use P1026 connectors at each end.

Step 5
- Calculate central Deflection of beam from

$$\delta_2 = \frac{W_2}{W_1} \times \left[\frac{L_2}{L_1}\right]^3 \times \delta_1$$

(See P1000 Elements of Section in this Tab Section)
- From Beam load table for P1000 section with
  L_1 = 250mm
  W_1 = 14.83kN and δ_1 = 0.16mm
- From example data and step 1 above
  W_2 = 8.9kN, L_2 = 250mm
- Substituting values in formula

$$\delta_2 = \frac{8.9}{14.83} \times \left[\frac{250}{250}\right]^3 \times 0.16 = 0.10\text{mm}$$

As this is the value for the equivalent uniformly applied load a correction is necessary to account for a central point load. This is done by multiplying the uniform load deflection by 0.8 (see Notes to Tables). Hence deflection under applied point load:
= 0.10 x 0.8 = 0.08mm.

Unistrut Sections as Columns

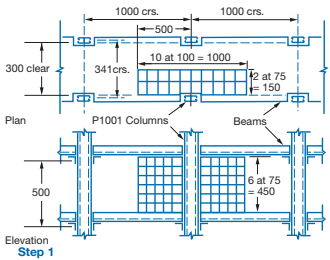
The load capacity of Unistrut Sections acting as columns depends on:

a. the particular section used.
b. the actual height of the column, measured between centres of connections to horizontal members.
c. the location of the resultant axial load with respect to the centre of gravity, CG, of the section (i.e. the intersection of the XX and YY axes as shown on the section diagrams).
d. the restraint to various kinds of movements of the column offered by the connections to horizontal members at various levels.

If a) and b) are known and if c) and d), for the case being considered, match the conditions in Structural Data Notes then the load capacity of the section can be read directly from the tables under 'maximum column load'.
It is emphasised that, for tabulated values to be used directly, the resultant load must be concentric (i.e. act through the C.G.) and connections at each end of a free column height must restrain those ends from both horizontal and torsional movement. If these conditions do not apply, reference should be made to the appropriate sections of AS/NZS 4600 since it is most likely that a smaller value than the listed one should be used.

Example 3

Island-type storage shelving is to be constructed using P1001 main posts (columns) at 1000 x 341mm centres. Shelves are to be at 500mm vertical spacing starting from the floor and connected to the posts so that concentric loading and translational and torsional restraint are provided at each level under full load conditions.
If the shelves are to carry packages of bolts stacked six high per shelf and the packages measure 75 x 75 x 100mm with a mass of 6.5kg each, what is the maximum height (number) of shelving that can be used?



Step 1

- Determine Concentric load for shelf.
- Plan area supported by each main column
  = 1000 x 150 = 150 000mm^2
- This area can be packed with 20 packages 75 x 100mm in plan i.e. 120 packages per shelf.
  Hence mass per shelf = 6.5 x 120kg
  and load per shelf = 6.5 x 120 x 0.0098
  = 7.64kN per column.

Step 2

- Determine load capacity of P1001 section.
  From P1001 Beams and Columns Table in this Tab Section for P1001 with height 500mm.
  Maximum column load = 94.09kN.

Step 3

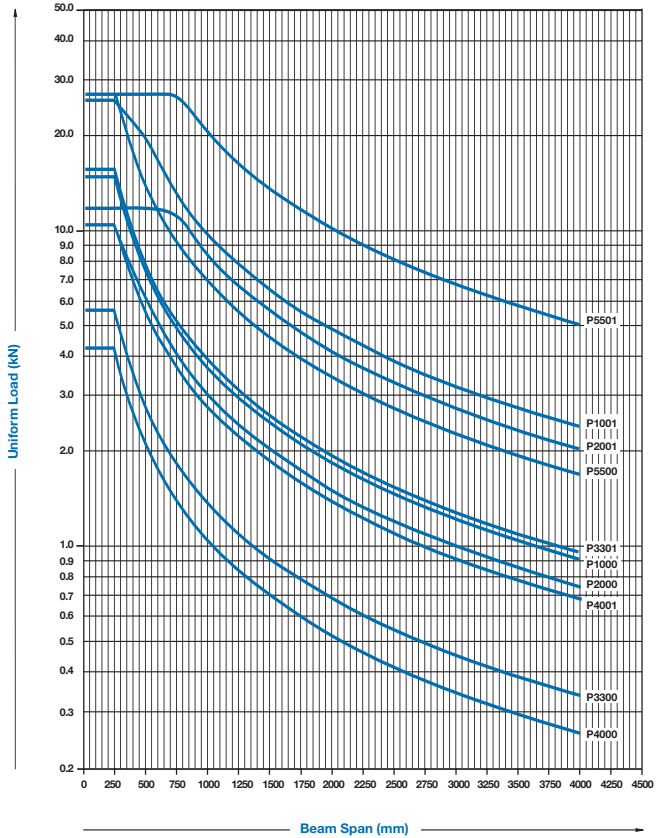
- Determine number of shelves.
- Divide column load capacity by the load per shelf.
  i.e. Number of shelves = $\frac{94.09}{7.64}$ = 12.31

  Hence maximum number of shelves = 12
  i.e. max. height of shelving
  = 12 x 0.5 = 6.0 metres.

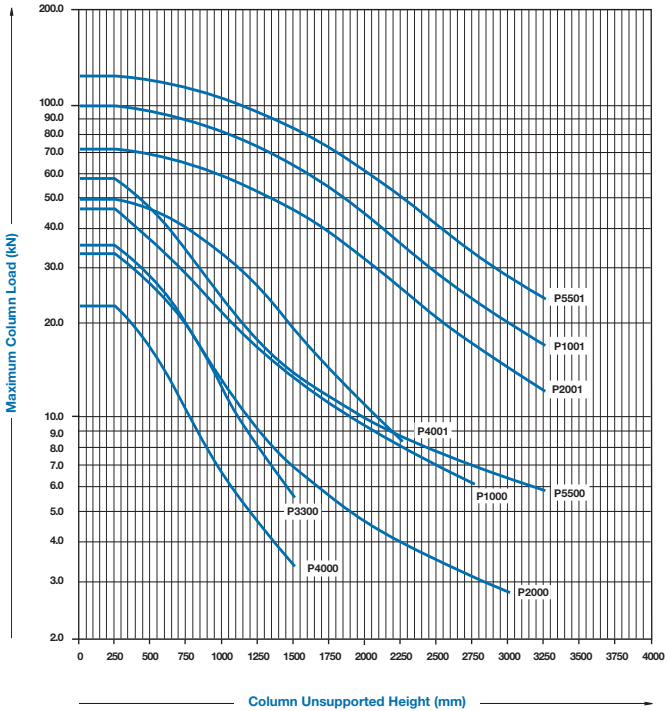
Note : *If the bottoms of the columns bear onto P1000 bearers, which in turn are fixed to the ground, the load capacity of the column would be determined by the Recommended Bearing Load, (refer to Safe Bearing Loads in this Tab Section) of 30.3 kN. The number of shelves would then be given by:* $\frac{30.3}{7.64}$ *= 3.96*

i.e. 3 shelves, totalling 1.5 metres high.

Note: *(Ultimate divided by 1.5)*



Note: *(Ultimate divided by 1.5)*



Engineering Data - Mass Charts

Copper Tube

Nom. Size	Actual Size O.D. (Aust.)	Actual Size O.D. (N.Z)	Mass of Pipe kg/m	Mass of Pipe filled with water kg/m
15 x 0.9	12.7	14.7	0.30	0.39
18 x 1.0	15.9		0.43	0.58
20 x 1.0	19.0	21.0	0.52	0.75
25 x 1.2	25.4	27.4	0.83	1.25
32 x 1.2	31.8	34.1	1.05	1.72
40 x 1.2	38.1	40.6	1.27	2.27
45 x 1.2	44.5		1.48	2.87
50 x 1.2	51.2	53.3	1.70	3.57
65 x 1.2	63.5	65.0	2.14	5.07
80 x 1.6	76.2	79.4	3.42	7.60
90 x 1.6	88.9	92.5	4.00	9.76
100 x 1.6	101.6	105.6	4.58	12.18
125 x 1.6	127.0	130.2	5.74	17.77
150 x 2.0	152.4	158.0	8.58	25.86
175 x 2.0	177.8		10.03	33.74
200 x 2.0	203.2		11.48	42.63
225 x 2.6	228.6		16.77	55.94

Pressure Pipe -

ANSI Sch 80 - API XS (up to 200 NS)

Nom. Pipe Size	Actual Size O.D. x Wall	Mass of Pipe kg/m	Mass of Pipe filled with water kg/m
8	13.7 x 3.02	0.80	0.85
10	17.1 x 3.20	1.10	1.19
15	21.3 x 3.73	1.62	1.77
20	26.7 x 3.91	2.19	2.47
25	33.4 x 4.55	3.23	3.69
32	42.2 x 4.85	4.47	5.30
40	48.3 x 5.08	5.41	6.55
50	60.3 x 5.54	7.48	9.38
65	73.0 x 7.01	11.41	14.14
80	88.9 x 7.62	15.27	19.53
90	101.6 x 8.08	18.63	24.36
100	114.3 x 8.56	22.37	29.73
125	141.3 x 9.53	30.95	42.69
150	168.3 x 10.97	42.56	59.38
200	219.1 x 12.70	64.63	94.10
250	273.0 x 12.70	81.54	129.70
300	323.9 x 12.70	97.44	167.40
350	355.6 x 12.70	107.38	193.00
400	406.4 x 12.70	123.29	234.30
450	457.0 x 12.70	138.19	285.50
500	508.0 x 12.70	155.10	337.00
600	609.6 x 12.70	186.92	455.00

Pressure Pipe -

API Std Wt - ANSI Sch 40 (up to 250 NS)

No. Pipe Size	Actual Size O.D. x Wall	Mass of Pipe kg/m	Mass of Pipe filled with Water kg/m
8	13.7 x 2.24	0.62	0.69
10	17.1 x 2.31	0.85	0.97
15	21.3 x 2.77	1.27	1.47
20	26.7 x 2.87	1.68	2.11
25	33.4 x 3.38	2.50	3.06
32	42.2 x 3.56	3.38	4.35
40	48.3 x 3.68	4.05	5.37
50	60.3 x 3.91	5.44	7.60
65	73.0 x 5.16	8.62	11.71
80	88.9 x 5.49	11.29	16.06
90	101.6 x 5.74	13.57	19.95
100	114.3 x 6.02	16.07	24.28
125	141.3 x 6.55	21.78	34.69
150	168.3 x 7.11	28.26	46.91
200	219.1 x 8.18	42.53	74.81
250	273.0 x 9.27	60.29	111.14
300	323.9 x 9.53	73.82	146.81
350	355.6 x 9.53	81.28	170.23
400	406.4 x 9.53	93.21	211.05
450	457.0 x 9.53	105.14	255.75
500	508.0 x 9.53	117.07	304.85
600	609.6 x 9.53	140.94	414.85

Galvanised Pipe

Nom. Size	Actual Size O.D. x Wall	Mass of Pipe kg/m	Mass of Pipe filled with water kg/m
8 N.B Med.	13.5 x 2.3	0.68	0.74
10 N.BMed.	17.2 x 2.3	0.89	1.01
15 N.B Med.	21.3 x 2.6	1.27	1.47
20 N.B Med.	26.9 x 2.6	1.65	2.02
25 N.B Med.	33.7 x 3.2	2.52	3.11
32 N.B Med.	42.4 x 3.2	3.24	4.26
40 N.B Med.	48.3 x 3.2	3.73	5.11
50 N.B Med.	60.3 x 3.6	5.24	7.46
65 N.B Med.	76.1 x 3.6	6.69	10.42
80 N.B Med.	88.9 x 4.0	8.68	13.82
100 N.B Med.	114.3 x 4.5	12.40	21.11
125 N.B Med.	139.7 x 4.9	16.50	29.75
150 N.B Med.	165.1 x 4.9	19.60	38.55

PVC Pressure Pipe - Class 15

Nom. Size	Actual Size O.D. x Wall	Mass of Pipe kg/m	Mass of pipe filled with Water kg/m
15	21.3 x 1.5	0.14	0.40
20	26.7 x 1.9	0.22	0.61
25	33.5 x 2.3	0.33	0.99
32	42.2 x 2.9	0.54	1.58
40	48.2 x 3.3	0.69	2.05
50	60.3 x 4.1	1.07	3.20
65	75.3 x 5.1	1.66	5.00
80	88.9 x 6.1	2.31	6.93
100	114.3 x 7.7	3.83	11.51
125	140.2 x 9.4	5.76	17.34
150	168.2 x 11.3	8.28	24.93
200	219.1 x 14.8	14.12	42.32

PVC Pressure Pipe - Class 6

Nom. Size	Actual Size O.D. x Wall	Mass of Pipe kg/m	Mass of pipe filled with water kg/m
40	48.2 x 1.5	0.31	1.91
50	60.3 x 1.8	0.48	3.00
65	75.3 x 2.2	0.75	4.70
80	88.9 x 2.6	1.03	6.53
100	114.3 x 3.2	1.70	10.84
125	140.2 x 4.0	2.55	16.28
150	168.2 x 4.8	3.65	23.41
200	219.1 x 6.2	6.19	39.75

Cast Iron Pipes - Class K9

Nom. Size	Actual Size O.D. x Wall	Pipe Mass kg/m	Pipe and Water Kg/m	Concrete Lining Thickness	Mass of Lined Pipe kg/m	Mass of Lined Lined Pipe and Water - kg/m
80	95.5 x 6.0	12.36	17.84	6.0	15.64	19.66
100	121.9 x 6.1	16.55	26.00	6.0	21.09	28.59
150	177.3 x 6.3	25.09	46.39	6.0	31.82	50.13
200	232.2 x 6.4	34.18	71.89	8.0	46.18	78.67
225	259.1 x 6.6	39.45	86.94	8.0	52.91	94.42
250	286.0 x 6.8	44.73	103.00	8.0	60.00	111.63
300	345.4 x 7.2	57.09	143.24	10.0	81.45	157.42
375	426.2 x 7.9	79.27	211.55	10.0	109.45	229.15
400	507.0 x 8.6	107.82	290.24	10.0	138.73	312.08
500	560.3 x 9.0	117.82	347.95	10.0	158.91	373.16

4M