

LiteSteel beam Part 7 Members Subject to Axial Tension

Design Capacity Tables For LiteSteel® beam

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7.1 General

Table 7.1 gives values of design section capacity for LiteSteel beam sections in axial tension calculated in accordance with Clause 3.2 of AS/NZS 4600. Values are provided for the following end connection configurations:

- full perimeter welded ends to uniformly stiff supports
- welded connections to the web only (not end plates)
- bolted connections to the web only

7.2 Design Section Capacity

The design axial tension capacity ($\Phi_t N_t$) is calculated in accordance with Clause 3.2.1 of AS/NZS 4600, and is the lesser of:

$$\Phi_t N_t = \Phi_t A_g f_y$$

and $\Phi_t N_t = \Phi_t 0.85 k_t A_n f_u$

where Φ_t = capacity [strength reduction] factor for members in tension
= 0.90 (AS/NZS 4600 Table 1.6)

A_g = gross area of the cross-section

f_y = yield stress used in design

= 380 MPa

k_t = correction factor for distribution of forces
(AS/NZS 4600 Clause 3.2.2)

= 1.0 for fully welded connections providing uniform force distribution

= 0.85 for connections to the web only (AS/NZS 4600 Table 3.2)

A_n = net area of the cross-section, obtained by deducting all penetrations and holes, including fastener holes, from the gross area of the cross-section

f_u = tensile strength used in design

= 490 MPa

A conservative approach has been taken in calculating the axial tension capacities in these Tables by using the lower yield stress and tensile strength of the web for the entire section. No advantage has been taken of the higher yield stress and tensile strength of the flanges.

7.3 Example

1. LSB with fully welded ends and no holes

A tension member with full perimeter welded end connections to a uniformly stiff support is subjected to an axial tension force of 250 kN. Design a suitable LSB member.

Design Data:

$$N^* = 250 \text{ kN}$$

$$k_t = 1.0 \text{ (for full perimeter welded connections)}$$

Solution:

Select a suitable LSB from Table 7.1.

$$200 \times 60 \times 2.0 \text{ LSB } \Phi_t N_t = 311 \text{ kN} > (N^* = 250 \text{ kN})$$

2. LSB with bolted connections to the web

A tension member with 3 M16 bolts connected to the web at each end is subjected to an axial tension force of 250 kN. Design a suitable LSB member.

Design Data:

$$N^* = 250 \text{ kN}$$

$$k_t = 0.85 \text{ (connection to the web only)}$$

Solution:

Select a suitable LSB from Table 7.1.

$$200 \times 60 \times 2.0 \text{ LSB } \Phi_t N_t = 256 \text{ kN} > (N^* = 250 \text{ kN})$$

Note that other design checks need to be carried out in accordance with Section 5.3 of AS/NZS 4600 to ensure the end connection capacity is adequate.

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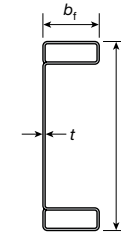
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Table 7.1
LiteSteel beam
Axial Tension Capacities
Fully welded or connected to the web only



Designation			Mass per m	Fully Welded (no holes)	Web Connected													
					Welded (no holes)	Bolted						Hole Dia	Bolted					
						Hole Dia	$\Phi_t N_t$ (kN)			Hole Dia	$\Phi_t N_t$ (kN)			Hole Dia	$\Phi_t N_t$ (kN)			
d	b _f	t	kg/m	$\Phi_t N_t$	$\Phi_t N_t$	Hole Dia	No. of Bolt Rows			Hole Dia	No. of Bolt Rows			Hole Dia	No. of Bolt Rows			
mm	mm	mm		kN	kN	mm	1	2	3	mm	1	2	3	mm	1	2	3	
300 × 75 × 3.0	LSB	3.0	14.5	629	586	22	565	544	523	18	569	552	535	14	573	560	546	
		2.5	12.2	530	494	22	476	459	441	18	480	465	451	14	483	472	460	
300 × 60 × 2.0	LSB	2.0	8.80	380	354	22	340	326	312	18	342	331	319	14	345	336	327	
250 × 75 × 3.0	LSB	3.0	13.3	578	539	22	517	496	475	18	521	504	487	14	525	512	498	
		2.5	11.2	486	452	22	435	417	400	18	438	424	409	14	441	430	419	
250 × 60 × 2.0	LSB	2.0	8.00	345	322	22	308	294	280	18	310	299	287	14	313	304	295	
200 × 60 × 2.5	LSB	2.5	8.86	383	357	22	339	322		18	343	328	314	14	346	335	323	
		2.0	7.21	311	290	22	276	262		18	278	267	256	14	281	272	263	
200 × 45 × 1.6	LSB	1.6	4.95	213	199	22	188	176		18	190	180	171	14	192	184	177	
150 × 45 × 2.0	LSB	2.0	5.31	229	213	22	199			18	202	191		14	205	196	187	
		1.6	4.32	186	173	22	162			18	164	155		14	166	159	152	

Notes:

- Always ensure that you are using current information on the LSB product range. This can be verified by comparing the document version date (noted at the bottom of the page) with the current version date of each publication. The current version date and downloadable versions of all LSB publications can be obtained by referring to www.litesteelbeam.com.au or by contacting LST.
- Steel grade DuoSteel (flange f_{yf} = 450 MPa and f_{yf} = 500 MPa; web f_{yw} = 380 MPa and f_{uw} = 490 MPa).
- Tension capacities are calculated in accordance with AS/NZS 4600.
- Block shear rupture may need to be checked in accordance with Clause 5.6.3 of AS/NZS 4600.



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