Table 5.7 Slenderness factor v for flanged beams of uniform section (BS 5950 Part 1 1990 Table 14)

	Compression / Tension						Compression / Tension				
λ/x \ N	1.0	0.9	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1	0.0
0.5	0.79	0.81	0.84	0.88	0.93	1.00	1.11	1.28	1.57	2.20	12.67
1.0	0.78	0.80	0.83	0.87	0.92	0.99	1.10	1.27	1.53	2.11	6.36
1.5	0.77	0.80	0.82	0.86	0.91	0.97	1.08	1.24	1.48	1.98	4.27
2.0	0.76	0.78	0.81	0.85	0.89	0.96	1.06	1.20	1.42	1.84	3.24
2.5	0.75	0.77	0.80	0.83	0.88	0.93	1.03	1.16	1.35	1.70	2.62
3.0	0.74	0.76	0.78	0.82	0.86	0.91	1.00	1.12	1.29	1.57	2.21
3.5	0.72	0.74	0.77	0.80	0.84	0.89	0.97	1.07	1.22	1.46	1.93
4.0	0.71	0.73	0.75	0.78	0.82	0.86	0.94	1.03	1.16	1.36	1.71
4.5	0.69	0.71	0.73	0.76	0.80	0.84	0.91	0.99	1.11	1.27	1.55
5.0	0.68	0.70	0.72	0.75	0.78	0.82	0.88	0.95	1.05	1.20	1.41
5.5	0.66	0.68	0.70	0.73	0.76	0.79	0.85	0.92	1.01	1.13	1.31
6.0	0.65	0.67	0.69	0.71	0.74	0.77	0.82	0.89	0.97	1.07	1.22
6.5	0.64	0.65	0.67	0.70	0.72	0.75	0.80	0.86	0.93	1.02	1.14
7.0	0.63	0.64	0.66	0.68	0.70	0.73	0.78	0.83	0.89	0.97	1.08
7.5	0.61	0.63	0.65	0.67	0.69	0.72	0.76	0.80	0.86	0.93	1.02
8.0	0.60	0.62	0.63	0.65	0.67	0.70	0.74	0.78	0.83	0.89	0.98
8.5	0.59	0.60	0.62	0.64	0.66	0.68	0.72	0.76	0.80	0.86	0.93
9.0	0.58	0.59	0.61	0.63	0.64	0.67	0.70	0.74	0.78	0.83	0.90
9.5	0.57	0.58	0.60	0.61	0.63	0.65	0.68	0.72	0.76	0.80	0.86
10.0	0.56	0.57	0.59	0.60	0.62	0.64	0.67	0.70	0.74	0.78	0.83
11.0	0.54	0.55	0.57	0.58	0.60	0.61	0.64	0.67	0.70	0.73	0.78
12.0	0.53	0.54	0.55	0.56	0.58	0.59	0.61	0.64	0.66	0.70	0.73
13.0	0.51	0.52	0.53	0.54	0.56	0.57	0.59	0.61	0.64	0.66	0.69
14.0	0.50	0.51	0.52	0.53	0.54	0.55	0.57	0.59	0.61	0.63	0.66
15.0	0.49	0.49	0.50	0.51	0.52	0.53	0.55	0.57	0.59	0.61	0.63
16.0	0.47	0.48	0.49	0.50	0.51	0.52	0.53	0.55	0.57	0.59	0.61
17.0	0.46	0.47	0.48	0.49	0.49	0.50	0.52	0.53	0.55	0.57	0.58
18.0	0.45	0.46	0.47	0.47	0.48	0.49	0.50	0.52	0.53	0.55	0.56
19.0	0.44	0.45	0.46	0.46	0.47	0.48	0.49	0.50	0.52	0.53	0.55
20.0	0.43	0.44	0.45	0.45	0.46	0.47	0.48	0.49	0.50	0.51	0.53

Note 1: For beams with *equal* flanges, $N = 0.5$; for beams with *unequal* flanges refer to clause 4.3.7.5 of BS 5950.

Note 2: v should be determined from the general formulae given in clause B.2.5 of BS 5950, on which this table is based: (a) for sections with *lipped* flanges (e.g. gantry girders composed of channel + universal beam); and (b) for intermediate values to the right of the stepped line in the table.

The factors m and n are interrelated as shown in BS 5950 Table 13, reproduced here as Table 5.8. From this table it can be seen that, when a beam is *not* loaded between points of lateral restraint, n is 1.0 and m should be obtained from BS 5950 Table 18. The value of m depends upon the ratio of the end moments at the points of restraint. If a beam *is* loaded between points of lateral restraint, m is 1.0 and n is obtained by reference

Table 5.8 Use of m and n factors for members of uniform section (BS 5950 Part 1 1990 Table 13)

Description		Members *not* subject to destabilizing loads*		Members subject to destabilizing loads*	
		m	n	m	n
Members loaded between adjacent lateral restraints	Sections with equal flanges	1.0	From Tables 15 and 16 of BS 5950	1.0	1.0
	Sections with unequal flanges	1.0	1.0	1.0	1.0
Members not loaded between adjacent lateral restraints	Sections with equal flanges	From Table 18 of BS 5950	1.0	1.0	1.0
	Sections with unequal flanges	1.0	1.0	1.0	1.0
Cantilevers without intermediate lateral restraints		1.0	1.0	1.0	1.0

* See clause 4.3.4 of BS 5950.

to BS 5950 Tables 15 and 16 (Table 16 is cross-referenced with Table 17). Its value depends upon the ratio of the end moments at the points of restraint and the ratio of the larger moment to the mid-span free moment.

Example 5.2

A simply supported steel beam spans 8 m and supports an ultimate central point load of 170 kN from secondary beams, as shown in Figure 5.11. In addition it carries an ultimate UDL of 9 kN resulting from its self-weight. If the beam is only restrained at the load position and the ends, determine a suitable grade 43 section.

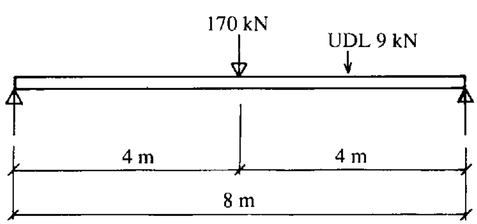

Figure 5.11 *Ultimate load diagram*

The maximum ultimate moment is given by

$$M_A = \frac{WL}{4} + \frac{WL}{8} = \frac{170 \times 8}{4} + \frac{9 \times 8}{8} = 340 + 9 = 349\,\text{kN m}$$

Since the beam is laterally unrestrained it is necessary to select a trial section for checking: try 457 × 152 × 74 kg/m UB ($S_x = 1620\,\text{cm}^3$). The moment capacity of this section when the beam is subject to low shear is given by $M_{cx} = p_y S_x$, where p_y is 265 N/mm² since T is greater than 16 mm. Thus

$$M_{cx} = p_y S_x = 265 \times 1620 \times 10^3 = 429.3 \times 10^6\, Nmm = 429.3\, kN\,m > 349\, kN\,m$$

This is adequate.