

Steel Beam

Information Usually Given:

About the Beam	About Loads, Forces and Moments	From Design Standards (Eurocode 5)
A table of Universal Beam (UB) sections (see table 1 below)	Bending moment = 12kNm	Permissible bending stress = 460 N/mm² (or 255 N/mm² etc.)

Table 1: Universal Beams

Designation	Dimensions					Static Parameters			
						Moment of Inertia		Section Modulus	
	Depth (h)	Width (w)	Web Thickness (s)	Sectional Area	Weight	I _x	I _y	W _x	W _y
	(mm)	(mm)	(mm)	(cm ²)	(kg/m)	(cm ⁴)	(cm ⁴)	(cm ³)	(cm ³)
UB 127 x 76 x 13	127	76	4	16.5	13	473	55.7	74.5	14.7
UB 152 x 89 x 16	152.4	88.7	4.5	20.3	16	834	89.6	109.5	20.2
UB 178 x 102 x 19	177.8	101.2	4.8	24.3	19	1356	137	152.5	27
UB 203 x 102 x 23	203.2	101.8	5.4	29.4	23.1	2105	163.9	207.2	32.2
UB 203 x 133 x 25	203.2	133.2	5.7	32	25.1	2340	307.6	230.3	46.2
UB 203 x 133 x 30	206.8	133.9	6.4	38.2	30	2896	384.7	280	57.5
UB 254 x 102 x 22	254	101.6	5.7	28	22	2841	119.3	223.7	23.5
UB 254 x 102 x 25	257.2	101.9	6	32	25.2	3415	148.7	265.5	29.2
UB 254 x 102 x 28	260.4	102.2	6.3	36.1	28.3	4005	178.5	307.6	34.9
UB 254 x 146 x 31	251.4	146.1	6	39.7	31.1	4413	447.5	351.1	61.3
UB 254 x 146 x 37	256	146.4	6.3	47.2	37	5537	570.6	432.6	78
UB 254 x 146 x 43	259.6	147.3	7.2	54.8	43	6544	677.4	504.1	92

Calculations:

Calculations	Remember by Heart (will not be given at the exam)	For information only. No need to remember.
Bending moment applied, $M = 12kNm = 12000000Nmm$		
Permissible bending stress for steel, $f_y = 460 \text{ N/mm}^2$		
The section modulus required, $W = \frac{M}{f_y} = \frac{12000000Nmm}{460 \text{ N/mm}^2} = 26087mm^3 = 26.087cm^3$	For steel calculations where a table of properties is given like here, you always divide the moment by the steel strength to get the section modulus. Pay attention to the units.	

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26.087cm ³ Required, so we look at the final column W _y and decide to provide slightly higher = 27 cm ³ . Which is: UB 178 x 102 x 19		

Highlighted boxes of calculations are what you usually need to do.