

Beam actions

Simply supported beam · reactions, shear and bending moment diagrams · EN 1990 (6.10)

Reference	NAE-RC-017 · version 1.0
Standards	EN 1990 (6.10) with the partial factors entered · statics
National Annex	Not applicable
Issued	29 October 2026

What it does

Design actions in a simply supported beam under a uniformly distributed load and up to three point loads: reactions, the shear force and bending moment diagrams, the largest moment and where it occurs, and the largest shear, ready to use in NAE-RC-004 Beam bending and shear.

How to use

1. Open the Calculation sheet and select the National Annex.
2. Fill in the shaded input cells. Everything else is calculated.
3. Read the Results block; every step below it quotes its clause. Print or save as PDF for your calculation package.

Scope and limitations

Statically determinate beam on two simple supports, loads acting downwards: one full-length UDL (permanent and variable) and up to three point loads (permanent and variable) anywhere on the span. Each load is factored by EN 1990 (6.10) with the γ_G and γ_Q entered (all permanent loads unfavourable, all variable loads present: one load case). Pattern loading, other combinations, self weight unless included in g_k , and deflections are for the user. The diagrams are evaluated at 60 stations, on both sides of every point load and at M_{max} ; M_{max} is exact. $V_{Ed,max}$ is the shear in the span: a load standing on a support goes straight into it.

Further reading and independent cross-check

- EN 1990, 6.4.3.2 (6.10).

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About NA Engineering

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Disclaimer

This spreadsheet is provided free of charge, as is, for use by competent engineers. It does not replace engineering judgement. The user is responsible for the input, for checking that the method suits the element being designed and for verifying the results. NA Engineering accepts no liability for any loss arising from its use. Sheets are password-protected and the workbook structure is locked so that the formulas and the NA Engineering details cannot be changed; only the shaded input cells can be edited.

Revision history

v1.0	29 Oct 2026 · First issue
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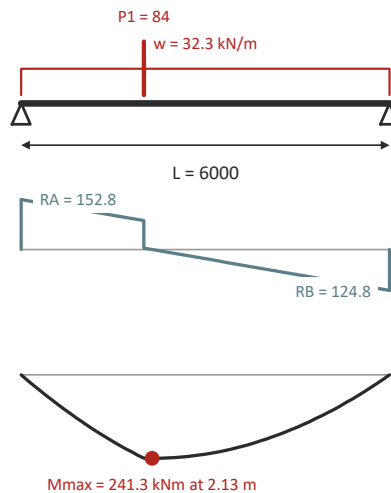
Project
Element
Date

Job no.
Made by
Checked

Inputs · span and loads
Characteristic values

Span	L	6000	mm
UDL, permanent (include the self weight)	g_k	15.00	kN/m
UDL, variable	q_k	8.00	kN/m
Point load 1: permanent	G_1	40.0	kN
Point load 1: variable	Q_1	20.0	kN
Point load 1: distance from the left support	a_1	2000	mm
Point load 2: permanent	G_2	0.0	kN
Point load 2: variable	Q_2	0.0	kN
Point load 2: distance from the left support	a_2	4000	mm
Point load 3: permanent	G_3	0.0	kN
Point load 3: variable	Q_3	0.0	kN
Point load 3: distance from the left support	a_3	5000	mm
EN 1990 A1.2(B) Partial factor, permanent	γ_G	1.35	
EN 1990 A1.2(B) Partial factor, variable	γ_Q	1.50	
Inputs valid and consistent			OK

Your beam · loads (red), shear force (blue) and bending moment (dark, sagging below) · scaled to fit


Results

Largest bending moment	$M_{Ed,max}$	241.3	kNm
Position of the largest moment from the left support	x	2.13	m
Largest shear force	$V_{Ed,max}$	152.8	kN
Reaction at the left support	R_A	152.8	kN

Reaction at the right support

 R_B **124.8**

kN

Use $M_{Ed,max}$ and $V_{Ed,max}$ (at the support face, 6.2.1(8)) in NAE-RC-004 Beam bending and shear.

Calculation

(6.10)	Design UDL $\gamma G g_k + \gamma Q q_k$	w	32.25	kN/m
(6.10)	Design point load 1 $\gamma G G + \gamma Q Q$	P_1	84.0	kN
(6.10)	Design point load 2 $\gamma G G + \gamma Q Q$	P_2	0.0	kN
(6.10)	Design point load 3 $\gamma G G + \gamma Q Q$	P_3	0.0	kN
	Reaction $R_B = (w L^2/2 + \Sigma P a) / L$	R_B	124.75	kN
	Reaction $R_A = w L + \Sigma P - R_B$	R_A	152.75	kN
	Largest shear in the span $\max(R_A - P \text{ at A; } R_B - P \text{ at B})$	V_{max}	152.75	kN
	Largest moment (at a point load or where $V = 0$)	M_{max}	241.28	kNm
	Its position	x	2.132	m

Candidates for M_{max} : every point load and, between them, the point where the shear from the UDL reaches zero. The diagrams on the drawing use 60 stations plus the load positions and M_{max} .

Prepared with NA Engineering calculation tools · naengineering.uk · adrian@naengineering.uk. Free for use by competent engineers; see the About sheet for scope and disclaimer.