

Column load take-down

Axial load storey by storey · imposed load reduction · EN 1991-1-1 6.3.1.2 with the UK or Polish NA

Reference	NAE-RC-019 · version 1.0
Standards	BS EN 1991-1-1:2002 / PN-EN 1991-1-1:2004, 6.2.2(2) and 6.3.1.2(11) · gravity loads factored on the basis of EN 1990 (6.10)
National Annex	Selectable: NA to BS EN 1991-1-1:2002 (NA.2.5, NA.2.6) or PN-EN 1991-1-1:2004 with Ap1:2010, National Annex NA (formerly NB): NB.1 sets only Table 6.2, NB.2 makes no national provision for 6.3.1.2, so the recommended equation 6.2 applies
Issued	29 October 2026

What it does

Characteristic and design axial force in an internal or edge column, storey by storey from the roof down: roof and floor loads on the area the column supports, walls or cladding carried at each floor and the column's own weight. The imposed floor load is reduced by the area or by the number of storeys, as the National Annex allows, and the design force at the foot of every storey is drawn on the elevation. Use NEd in NAE-RC-008 Column design or NAE-RC-006 Pad footing.

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

One column of constant section with the same supported area A and the same loads on every floor (typical floors), a roof with its own area and loads, and n suspended floors (1 to 12). Reduction of the imposed floor load, categories A to D only, n = suspended floors above the section: UK NA $\alpha_A = 1 - A/1000 \geq 0.75$ with A the floor area supported (n A), or $\alpha_n = 1.1 - n/10$ ($n \leq 5$), 0.6 ($n \leq 10$), 0.5 ; the smaller, never both (NA.2.6). PN-EN: $\alpha_n = (2 + (n - 2) \psi_0)/n$ for $n > 2$, else 1 , $\psi_0 = 0.7$ (6.2.2(2), 6.3.1.2(11)); the area factor α_A is for floors and is not used for the column. Roof loads are not reduced. Design force $N_{Ed} = \gamma_G G_k + \gamma_Q Q_k$ with every variable load at its full value: a conservative gravity-load combination based on (6.10), the ψ_0 reduction of accompanying actions omitted. Loads determined from the known use do not qualify for reduction: then choose no reduction. Only the gravity loads entered are included; this is not the complete design envelope of a column or foundation (wind, frame moments, eccentricity, transfer structures are for the user).

Further reading and independent cross-check

- BS EN 1991-1-1:2002, 6.3.1.2(10), (11) and the UK NA, NA.2.5 and NA.2.6.
- PN-EN 1991-1-1:2004 and Ap1:2010, National Annex NA (formerly NB).
- IStructE, Manual for the design of concrete building structures to Eurocode 2 (load take-down).

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Revision history

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

Job no.
Made by
Checked

Inputs · building

Characteristic values

	National Annex		UK NA (BS EN)	
	Imposed load category (Table 6.1)		B offices	
6.3.1.2	Reduce the imposed floor load?		Yes	
	Number of suspended floors below the roof	n	4	
	Storey height, floor to floor	h_s	3500	mm

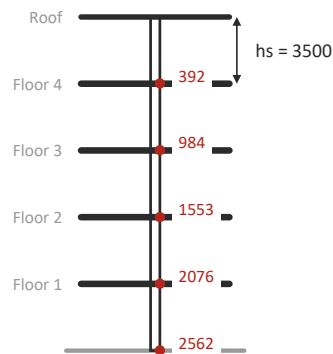
Inputs · loads on the column

	Floor area supported by the column, each floor	A	36.0	m ²
	Floor permanent load (excludes G_w and column weight)	g_k	7.50	kN/m ²
6.3.1.2(8)	Floor imposed load (with the movable partition allowance)	q_k	3.50	kN/m ²
	Roof area supported by the column	A_r	36.0	m ²
	Roof permanent load (include roof plant and parapets)	$g_{k,r}$	6.00	kN/m ²
	Roof imposed load or snow, the larger	$q_{k,r}$	1.50	kN/m ²
	Walls or cladding on the column, each floor (not in g_k)	G_w	20.0	kN
	Column width	b	400	mm
	Column depth	h	400	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

Results · foot of the lowest storey

Design axial force (gravity loads, conservative (6.10))	N_{Ed}	2562	kN
Characteristic permanent load	G_k	1446	kN
Characteristic imposed load, reduced	Q_k	407	kN
Imposed load reduction factor, floors	α	0.70	
Mean axial stress N_{Ed} / A_c	σ_c	16.0	MPa

Your column, storeys to scale · design axial force N_{Ed} at the foot of every storey (kN)



Calculation

Column self weight per storey $25 \text{ kN/m}^3 \times b \times h \times h_s$	G_c	14.0	kN
Roof load on the column $A_r g_{k,r} / A_r q_{k,r}$	G_r / Q_r	216.0 / 54.0	kN
Floor load on the column $A g_k + G_w / A q_k$	G_f / Q_f	290.0 / 126.0	kN

Column below floor t from the top: t suspended floors plus the roof above it and $t + 1$ column storeys down to the section. $G_k = A_r g_{k,r} + t (A g_k + G_w) + (t + 1) G_c$; $Q_k = A_r q_{k,r} + \alpha t A q_k$; $N_{Ed} = \gamma G G_k + \gamma Q Q_k$, every variable load in full (conservative, based on (6.10)). α : UK NA $\min(1 - tA/1000 \geq 0.75; 1.1 - t/10 (t \leq 5), 0.6 (t \leq 10), 0.5)$; PN-EN $(2 + (t - 2) \psi_0)/t$ for $t > 2$, else 1. Right-hand column: α and the characteristic loads.

	Column below the roof	$N_{Ed,0}$	392	kN	α 1.00 G 230 Q 54
6.3.1.2	Column below floor 1 from the top	$N_{Ed,1}$	984	kN	α 0.96 G 534 Q 175
6.3.1.2	Column below floor 2 from the top	$N_{Ed,2}$	1553	kN	α 0.90 G 838 Q 281
6.3.1.2	Column below floor 3 from the top	$N_{Ed,3}$	2076	kN	α 0.80 G 1142 Q 356
6.3.1.2	Column below floor 4 from the top	$N_{Ed,4}$	2562	kN	α 0.70 G 1446 Q 407
6.3.1.2	Column below floor 5 from the top	$N_{Ed,5}$	—	kN	
6.3.1.2	Column below floor 6 from the top	$N_{Ed,6}$	—	kN	
6.3.1.2	Column below floor 7 from the top	$N_{Ed,7}$	—	kN	
6.3.1.2	Column below floor 8 from the top	$N_{Ed,8}$	—	kN	
6.3.1.2	Column below floor 9 from the top	$N_{Ed,9}$	—	kN	
6.3.1.2	Column below floor 10 from the top	$N_{Ed,10}$	—	kN	
6.3.1.2	Column below floor 11 from the top	$N_{Ed,11}$	—	kN	
6.3.1.2	Column below floor 12 from the top	$N_{Ed,12}$	—	kN	

Floors are counted from the top: the last row in use is the column at the foot of the building. The category limits the reduction to A to D ($\psi_0 = 0.7$); storage (E) does not qualify.

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