Crack control by tables

Bar size and spacing limits · EN 1992-1-1 §7.3.3 · UK NA / PN-EN

Reference	NAE-RC-016 · version 1.0
Standards	BS EN 1992-1-1:2004 with UK NA · PN-EN 1992-1-1:2008 with Polish NA (NDP sources listed on the NDP sheet)
National Annex	Selectable: UK NA to BS EN 1992-1-1 or Polish NA to PN-EN 1992-1-1
Issued	29 October 2026

What it does

Control of cracking without direct calculation (EN 1992-1-1 7.3.3): the steel stress under the quasi-permanent load, and the largest bar size (Table 7.2N, adjusted by (7.6N) or (7.7N)) and bar spacing (Table 7.3N) for the chosen crack width, with the slab exemption of 7.3.3(1).

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

Cracking caused mainly by loading: either Table 7.2N or Table 7.3N is enough (7.3.3(2) Note); for restraint cracking only Table 7.2N applies, with σs the stress just after cracking (enter it directly). Minimum reinforcement to 7.3.2 must be provided. σs under the quasi-permanent combination is estimated as fyd (Gk + ψ2 Qk)/(γG Gk + γQ Qk) × As,req / As,prov / δ (TCC How to), or entered. Linear interpolation between the tabulated stresses; stresses below 160 MPa use the 160 MPa row; above the last value with a limit the table gives none. The bar size adjustment uses fct,eff = fctm (or the value entered for early-age cracking), kc = 0.4 and hcr = 0.5 h for bending, hcr = h for tension. Choose wk from the annex (UK NA Table NA.4; EN Table 7.1N used by PL). Slabs in buildings in bending with h ≤ 200 mm and 9.3 applied need no specific measures (7.3.3(1)).

Further reading and independent cross-check

- EN 1992-1-1, 7.3.2 and 7.3.3.
- The Concrete Centre, How to design concrete structures using Eurocode 2: Getting started (crack control tables).

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About NA Engineering

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Disclaimer

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Revision history

v1.0	29 Oct 2026 · First issue

Project		Job no.	
Element		Made by	
Date		Checked	

Inputs · section and bars

Shaded cells only

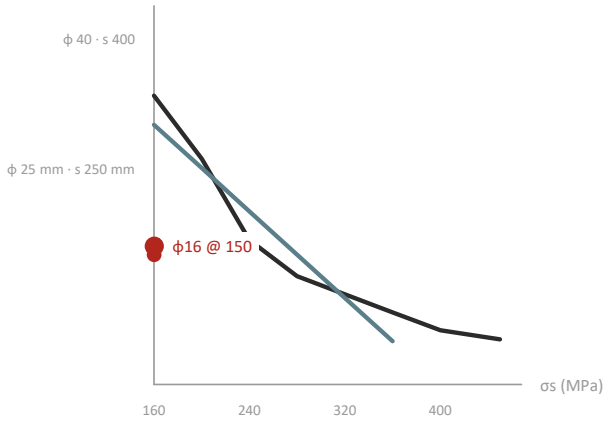
	National Annex		**UK NA (BS EN)**		
Table 3.1	Concrete strength class		**C32/40**		
3.2.2	Reinforcement characteristic yield strength (≤ 500 MPa)	f_{yk}	**500**	MPa	
	Member		**Beam or slab in bending**		
7.3.1(5)	Design crack width wk	w_k	**0.3**	mm	
	Overall depth	h	**500**	mm	
	Effective depth (centroid of the outer layer)	d	**450**	mm	
	Bar diameter	φ	**16**	mm	
	Bar spacing	s	**150**	mm	

Inputs · steel stress

Quasi-permanent combination

	Steel stress		**Estimate from the loads**		
	Steel stress σs (if entered)	σ_s	**240**	MPa	
	Permanent load Gk (any consistent unit)	G_k	**6.00**		
	Variable load Qk	Q_k	**3.00**		
EN 1990 A1.1	ψ2 for the variable load	ψ_2	**0.30**		
	Partial factors γG	γ_G	**1.35**		
	γQ	γ_Q	**1.50**		
	Reinforcement required at ULS As,req	$A_{s,req}$	**900**	mm²	
	Reinforcement provided As,prov	$A_{s,prov}$	**1340**	mm²	
5.5	Moment redistribution δ = redistributed / elastic moment (0.7	δ	**1.00**		1.0 = no redistribution
7.3.2(2)	Tensile strength when the cracks form		**fctm (28 days)**		
	fct,eff (if entered: early age, e.g. 3 – 5 days)	$f_{ct,eff}$	**2.00**	MPa	Used only if entered
	Inputs valid and consistent				**OK**

Tables 7.2N and 7.3N for your wk · bar size adjusted by (7.6N) / (7.7N) (dark) and spacing (blue, scaled 1:10) · your bars at σs (red)



Results

	Steel stress, quasi-permanent	σ_s	**160**	MPa

Bar size ϕ / ϕs,max (Table 7.2N adjusted)	**0.48**			**OK**
Bar spacing s / smax (Table 7.3N)	**0.50**			**OK**
Crack control (loading: either table is enough)	**0.3**	mm		**OK**

Restraint cracking (early thermal, shrinkage): only the bar size check applies, with σs the stress just after cracking — enter it directly. The slab exemption needs h ≤ 200 mm, bending without significant axial tension and the detailing of 9.3.

Calculation

2.4.2.4(1)	Partial factor, reinforcement	γ_s	1.15		NDP sheet
Table 3.1	Characteristic cylinder strength	f_{ck}	32	MPa	
Table 3.1	Mean tensile strength	f_{ctm}	3.02	MPa	
3.2.7	Design yield strength fyk / γs	f_{yd}	434.8	MPa	
7.3.3	Quasi-permanent / ULS load ratio (Gk + ψ2 Qk)/(γG Gk + γQ Qk)		0.548		
7.3.3	Steel stress fyd × ratio × As,req / As,prov / δ (or entered)	σ_s	**159.9**	MPa	
7.3.2(2)	Tensile strength when the cracks form fct,eff	$f_{ct,eff}$	3.02	MPa	
(7.6N), (7.7N)	Bar size factor fct,eff / 2.9 × kc hcr / (2(h − d)) (tension: hcr / (8(h − d)))		1.043		
Table 7.2N	Maximum bar size from the table ϕs*	φ_{s*}	32.0	mm	0: no value in the table
(7.6N), (7.7N)	Adjusted ϕs* (fct,eff/2.9) × kc hcr / (2(h − d)) (tension: hcr / (8(	φ_s	**33.4**	mm	
Table 7.3N	Maximum bar spacing smax	s_{max}	**300**	mm	0: no value in the table
Table 7.2N	Bar size ϕ ≤ ϕs (exempt slab h ≤ 200: not needed)	φ	16	mm	**OK**
Table 7.3N	Bar spacing s ≤ smax (exempt slab h ≤ 200: not needed)	s	150	mm	**OK**

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EN 1992-1-1 Table 7.2N (bar size, mm) and 7.3N (spacing, mm)

σs (MPa)	ϕ, wk 0.4	ϕ, wk 0.3	ϕ, wk 0.2	s, wk 0.4	s, wk 0.3	s, wk 0.2
160	40	32	25	300	300	200
200	32	25	16	300	250	150
240	20	16	12	250	200	100
280	16	12	8	200	150	50
320	12	10	6	150	100	–
360	10	8	5	100	50	–
400	8	6	4	–	–	–
450	6	5	–	–	–	–

Table notes: c = 25 mm; fct,eff = 2.9 MPa; hcr = 0.5 h; (h − d) = 0.1 h; k1 = 0.8; k2 = 0.5; kc = 0.4; k = 1.0; kt = 0.4; k’ = 1.0.

Nationally Determined Parameters

Values used by the Calculation sheet for the selected National Annex. Sources: UK NA to BS EN 1992-1-1:2004, Table NA.1; PN-EN 1992-1-1:2008, Załącznik krajowy NA. Edit only if your project specifies different values.

Parameter	Clause	UK NA	PL NA	Notes
Partial factor, concrete γc	2.4.2.4(1)	**1.5**	**1.4**	Persistent & transient. UK NA: recommended; PL: NA.2, Table NA.2
Partial factor, reinforcement γs	2.4.2.4(1)	**1.15**	**1.15**	UK NA: recommended; PL: NA.2, Table NA.2
αcc (compression in flexure / axial)	3.1.6(1)	**0.85**	**1**	UK NA: 0.85; PL: recommended (NA.9)
αcc (shear and punching)	3.1.6(1)	**1**	**1**	UK NA: 1.0 for other phenomena; PL: recommended (NA.9)
αct (design tensile strength)	3.1.6(2)	**1**	**1**	Recommended value in both annexes
CRd,c numerator (CRd,c = value / γc)	6.2.2(1), 6.4.4(1)	**0.18**	**0.18**	Recommended value in both annexes
k1 (axial stress term, punching)	6.4.4(1)	**0.1**	**0.1**	Recommended value in both annexes
vRd,max factor (vRd,max = factor · ν · fcd)	6.4.5(3)	**0.5**	**0.4**	UK NA: 0.5 ν fcd; PL: recommended value (NA.9), 0.4 ν fcd since EN 1992-1-1 AC:2010 (PN-EN 1992-1-1:200
kmax (vEd ≤ kmax · vRd,c at u1)	6.4.5	**2**	**1.5**	UK NA 6.4.5(3): 2 vRd,c. PL: no limit in PN-EN 1992-1-1:2008; 1.5 (A1:2014 recommendation) applied conse
ϕlarge (large bar threshold, mm)	8.8(1)	**40**	**32**	UK NA: 40 mm; PL: 32 mm recommended (NA.9)
cot θ upper limit (variable strut)	6.2.3(2)	**2.5**	**2**	UK NA: 2.5 (1.25 with axial tension); PL: NA.4, 1 ≤ cot θ ≤ 2.0
k1 (x/d limit, δ ≥ k1 + k2 xu/d)	5.5(4)	**0.4**	**0.44**	UK NA for fyk ≤ 500 MPa; PL: recommended (NA.9)
k2 (x/d limit, εcu2 = 0.0035)	5.5(4)	**1**	**1.25**	UK NA: 0.6 + 0.0014/εcu2; PL: 1.25(0.6 + 0.0014/εcu2)
Upper limit on the (310/σs) factor (0 = none)	7.4.2(2)	**1.5**	**0**	UK NA Table NA.5 Note 5: (310/σs) or (500/fyk)(As,prov/As,req) ≤ 1.5; PL: none
L/d not to exceed 40 K (1 = applies)	7.4.2(2)	**1**	**0**	UK NA Table NA.5 Note 6; not in EN text
ϕmin (longitudinal bars in columns, mm)	9.5.2(1)	**12**	**6**	UK NA: 12 mm; PL: NA.6, 6 mm
k3 (crack spacing)	7.3.4(3)	**3.4**	**3.4**	Recommended value in both annexes
k4 (crack spacing)	7.3.4(3)	**0.425**	**0.425**	Recommended value in both annexes